REVISED

DeCoste

WRITING Protocol

Denise C. DeCoste, Ed. D., OTR

DON•JOHNSTON
Human Learning Tools

DeCoste WRITING Protocol

Evidence-Based Research to Make Insatructional And Accommodation Decisions

Edited by:

Ruth Ziolkowski, OTR, MBA and Mary Krenz

Published by:

Don Johnston Incorporated
26799 W. Commerce Drive
Volo, IL 60073
800.999.4660 USA Canada
800.889.5242 Technical Support
donjohnston.com

© 2020 Don Johnston Incorporated

Individual License Rights: When you purchase an individual license, you are allowed to download and print 1 copy for yourself. To share with other clinicians/educators requires additional purchases of individual licenses. Every practitioner/educator is required to have their own license.

District License Rights: District/Organization license administrator is allowed to download and distribute electronically or in print to any employee of your organization. You are also allowed to post this to an internal website that prohibits public access.

License Terms: You have purchased this eBook under a 5 year (five year) license. You have either purchased an individual license or a district license as indicated on your Don Johnston Invoice. At the end of the license, you are required to destroy all electronic copies and print copies or renew your license.

PDF Edition October 2020

International Standard Book Number
ISBN 978-1-4105-1186-7

DON•JOHNSTON
Human Learning Tools

Citation: DeCoste, D. (2014). The DeCoste Writing Protocol:Evidence-Based Research to Make Instructional And Accommodation Decisions. Volo, IL: Don Johnston, Inc.

TABLE OF CONTENTS

INTRODUCTION 8

SECTION ONE 16

WRITING DEVELOPMENT 38

Early Childhood Writing 39

WRITING IN THE PRIMARY GRADES 47

Writing Genres in the Primary Grades 48

WRITING IN THE INTERMEDIATE YEARS 52

WRITING AT SECONDARY GRADE LEVELS 58

SPELLING DEVELOPMENT 71

ASSESSING SPELLING 81

HANDWRITING 99

Dysgraphia 102
Handwriting Research 103
Handwriting and Students with Disabilities 124

KEYBOARDING 129

Keyboarding and High Stakes Assessments 139

SECTION TWO 146

THE MAIN STEPS FOR DEVELOPING A DECOSTE WRITING PROTOCOL 149

Administering the DeCoste Writing Protocol 152

WHO SHOULD ADMINISTER THE DECOSTE WRITING PROTOCOL? 158

RATIONALE AND DESCRIPTION OF THE DECOSTE WRITING PROTOCOL TASKS 165

OPTIONAL CONDITIONS **180**

EVALUATOR INSTRUCTIONS FOR ADMINISTERING THE DECOSTE WRITING PROTOCOL **181**

SCORING THE DECOSTE WRITING PROTOCOL **193**

DWP REMOTE ADAPTATION GUIDELINES **214**

SECTION THREE 226

INTRODUCTION **226**

HANDWRITING INSTRUCTION/INTERVENTION **230**

KEYBOARDING INSTRUCTION/INTERVENTION **241**

SPELLING INSTRUCTION **250**

STRATEGIES TO SUPPORT COMPOSITION **275**

ELEMENTARY INSTRUCTIONAL BEST PRACTICES **280**

SECONDARY INSTRUCTIONAL BEST PRACTICES **283**

RESEARCH ON INSTRUCTIONAL WRITING PRACTICES FOR STUDENTS WITH DISABILITIES **286**

INSTRUCTIONAL WRITING STRATEGIES **291**

STRATEGIES FOR BEGINNING WRITERS **293**

STRATEGIES FOR ELEMENTARY WRITERS **300**

STRATEGIES FOR MIDDLE AND HIGH SCHOOL WRITERS **313**

STRATEGIES FOR WRITERS WITH DISABILITIES **329**

TECHNOLOGY-BASED STRATEGIES AND ACCOMMODATIONS **343**

ASSISTIVE TECHNOLOGIES **349**

Summary of Current Evidence **368**

CONCLUSIONS ON COMPREHENSIVE WRITING INSTRUCTION **379**

REFERENCES **381**

APPENDIX **406**

FORWARD

After many hours reviewing the literature, I am pleased to present an expanded version of the Written Productivity Profile. Today, writing is no longer taking a back seat to reading and, nationally, high standards for writing have been set. Children write earlier and more often than in previous decades. Technology developments afford new pathways for written expression. The advent of computer-based, high-stakes testing and the need to substantiate accommodations make it even more important to document the best method of transcription. Given all of these factors, the time was right to release a revised and expanded version of the original WPP. It is my hope that the expanded section on the literature will answer the types of questions that arise regarding handwriting and keyboarding, and that the sections on spelling and composition will help those who may need more background information on writing development. Also, in the new Writing Protocol is a section on evidence-based strategies. This new Writing Protocol is not simply a how-to manual, but a short course on writing for educators, therapists and diagnosticians working with students who struggle to be productive and effective writers I want to thank Don Johnston, Inc., and particularly Ruth Ziolkowski, for always taking the high road when it comes to products that support students with disabilities. I especially want to thank Dr. Jan Wasowicz, CEO of Learning By Design, for her contribution to the section of the Writing Protocol entitled, What Do Spelling Errors Tell Us? I appreciate Cindy Cavanaugh for sharing thoughts-from-the-field on identifying students appropriate for the Writing Protocol. I want to take this opportunity to thank Trish Janus, Beth Poss, my former HIAT colleagues from Montgomery County Public Schools (Linda Wilson, Eithne Ellis, William McGrath, Cindy Walsh and Kathleen Hamm), and my Maryland

Assistive Technology Network (MATN) friends for their many years of support. And lastly, I want to express my appreciation to my husband, Sam Gutter, for 37 years of love, encouragement, and morning coffee.

INTRODUCTION

The DeCoste Writing Protocol is a formative assessment tool to identify factors that affect an individual student's ability to produce writing. It does not purport to allow examiners to make normative comparisons across students. The Writing Protocol is not meant as a replacement for standardized handwriting, spelling or writing tests, which allow a test administrator to compare students against normed data. Rather, the strength of the DeCoste Writing Protocol lies in the ability to compare a child's individual performance across handwriting and keyboarding tasks, and to examine spelling performance and writing skills in order to make more informed decisions about instructional strategies and the appropriate use of technology to meet classroom demands.

When a student is referred for assistive technology (AT) services to assist with writing goals, the most common concern is that the student is not able to produce written work commensurate with his or her abilities. The first step in the process of offering support is to gather information that will shed light on the nature of the problem. Often there is little quantitative data or concrete evidence that helps identify the issues that are affecting written productivity. Consequently, additional assessment may be necessary to help delineate the critical variables affecting the student's writing abilities. For example, many students referred have a history of handwriting problems. Assessment may demonstrate that handwriting is legible to the student and others, and that productivity rates are acceptable when spelling is factored out. However when spelling is required, the student's written productivity rate may decrease significantly. This suggests that the student is spending an undue amount of time encoding, which may significantly slow his or her written productivity.

If the reason for referral, poor handwriting, was accepted at face value, then simply providing a word processor as an accommodation would be ineffective, unless there are accompanying strategies to address the spelling issues.

Likewise, a student's keyboarding may be commensurate with handwriting speeds, but this will not be enough if the student has insufficient mastery of the writing process and has yet to achieve proficiency on the appropriate writing standards. At other times, the student may truly be struggling with the motor aspects of handwriting or keyboarding, which must be addressed in order to achieve writing automaticity. Writing is a complex, multidimensional skill. According to Moats (2005-2006, p.12), "Even more than reading, writing is a mental juggling act that depends on automatic deployment of basic skills such as handwriting, spelling, grammar, and punctuation, so that the writer can keep track of such concerns as topic, organization, word choice, and audience needs." The DeCoste Writing Protocol is a protocol to capture the various factors that affect writing so that AT strategies can be applied appropriately. It is a formative assessment to help develop a profile of a student's writing skills in order to inform the AT planning process. Furthermore, this edition provides the research base to better understand writing development and the basis for instructional strategies.

To achieve these goals, the DeCoste Writing Protocol provides information to help answer the following questions:

- Is the student struggling with fluent handwriting?
- Is keyboarding automaticity sufficiently fluent to serve as an alternative to handwriting?

- What mode of transcription does the student prefer?
- Is spelling affecting writing fluency?
- Is the student demonstrating appropriate grade-level writing skills?
- What instructional strategies should be considered based on the DeCoste Writing Protocol results?

WHY REVISE THE DECOSTE WRITING PROTOCOL?

The original WPP was first published in 2004, and there are multiple reasons for revising it now. Much has changed in the last decade, inside and outside the classroom, on a national policy and school-based level, fueled by advances in technology and insights from new research. There is evidence that students are writing more on a daily basis in classrooms (Graham, Berninger, Weintraub, & Schafer, 1998; Graham & Harris, 1994). With the advent of computer tablets, children are using computers at an earlier age. New national directives of College and Career standards emphasize the importance of daily writing across different "types" of writing (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). New research findings summarized in this publication provide important background information on writing development for typical students and those with disabilities. New national accommodation policies make it imperative that teachers provide evidence of writing deficits for students with documented writing disabilities. For educators, digital age opportunities afford us the ability not only to create e-books, but also to provide a way to digitally network and engage in discussion on important writing topics related to students with

disabilities. For all of these reasons, it was time to update the protocol, as well as to update the accompanying information on writing to take account of the most recent research.

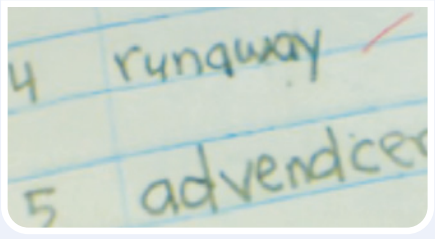
WHAT ARE THE MAJOR CHANGES TO THE PROTOCOL?

The goal of this second edition of the DeCoste Writing Protocol is to match writing tasks to available data regarding writing skills. There four basic areas of the Writing Protocol remain as before:

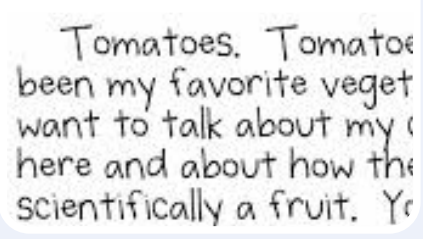
1 Timed Handwriting

2 Timed Keyboarding

3 Spelling



4 Handwriting



However, some of the tasks used to analyze student skills have been modified to reflect current research. For example, new research indicates that handwriting and keyboarding orthographic fluency has a significant impact on writing as measured by the speed of writing the alphabet unaided from memory. A "fast" sentence writing task has been added as there is more data available on students' ability to write quickly without errors, suggesting that students are able to shift to a mode of writing faster in response to classroom and testing demands. Research on the underlying linguistic elements of misspellings, has shifted spelling assessment and intervention such that a new list of spelling words has been added.

Changes to the DeCoste Writing Protocol
• Writing the alphabet unaided from memory
• Fast sentence copying task
• Spelling analysis based on linguistic knowledge
• Extended writing task

Students are expected to write for longer periods, so an extended writing task has been added, as the current research reflects differences in the ways students write brief versus longer responses. Writing samples for 7 to 10 minutes provide more evidence of writing abilities than tasks lasting 3 to 5 minutes (McMaster & Espin, 2014). Writing traits are still a popular method for analyzing writing skills. The revised edition of 6 + 1 Traits (Education Northwest, 2010) is used to examine writing traits as part of the DeCoste Writing Protocol.

The shift by most states to College and Career Standards allows evaluators to use performance standards in order to gauge a student's level of overall writing proficiency. While an important set of yearly benchmarks to examine, these standards are not detailed enough to evaluate a single, discrete writing task. These standards also emphasize the importance of student preference for various accommodations, so a Likert scale has been added to the DeCoste Writing Protocol. The objective for this revised edition was to maintain the efficiency and practicality of this tool, but nonetheless to bring it fully into the 21st century, aligning it with the current state-of-the-art for writing.

SECTION DESCRIPTORS

This manual has multiple sections.

Section One provides background information on writing perspectives and writing development. It also summarizes the most recent research on composition, spelling, handwriting, and keyboarding. The purpose of this expanded section is to provide more detailed information to those who are in the position of making AT decisions, but may not have a strong background in writing development— essentially a "short course" on writing.

Section Two provides a restructured protocol for assessing the written productivity of struggling writers.

Section Three provides review of research-based strategies linked to handwriting, keyboarding, spelling, composing, and technology accommodations.

THE CHANGING ROLE OF ASSISTIVE TECHNOLOGY SERVICES

Change is inevitable and it is essential for professionals in the field of assistive technology to use current knowledge when gathering data and formulating recommendations to support struggling writers. Today, there is more emphasis on data driven decisions. There is a wider range of technology available such that mainstream tools should be considered prior to the use of specialized AT. Writing is a highly complex skill set, and writing difficulties remain the number one reason for AT referrals. Consequently, we need to stay abreast of the research on writing, and look for new ways to provide equitable, preemptive services for a range of students, consistent with the practices of universal design for learning (UDL). The revised version of the WPP has been crafted to support this endeavor.

This segment of the DeCoste Writing Protocol begins with an overview on the history of writing, and then moves to a discussion on current perspectives on writing. The leading writing topics include cognitive processing, social influences, reading and language connections, strategic behaviors for self-regulation, and the role of self-efficacy and motivation. Additionally, the role of technology and new ways of writing are prominent topics. Of course, the advent of national influences on writing resulting in national standards for writing is foremost in any discussion on writing today. The final topic for this segment is writing and students with disabilities, as the national data demonstrates that a large percentage of children overall are not performing at proficient levels.

WRITING
Perspectives and Development

HISTORICAL PERSPECTIVES ON WRITING

In an historical perspective on the language arts, Monaghan and Hartman (2011) describe the emphasis on reading rather than writing in the early 1600s, due in part to the difficulty of handling a quill pen. In the 1700s and first half of the 1800s, teaching the alphabet and spelling by focusing on blending letter sounds and syllables to pronounce and write words was dominant. According to Applebee, during the 1800s, writing focused on penmanship in the elementary years. Composition was the purview of the secondary grades and college education. Then, in the early 1900s, the rise of progressive education, led by John Dewey, emphasized meaningful reading and writing. Instruction on spelling shifted from an emphasis on letters and syllables, to an emphasis on whole words, discouraging attention to phonemes. Early writing instruction continued to concentrate primarily on forming letters, copying words and sentences. Between 1900 and 1970, the emphasis was on features of model writing such as grammar and clarity. Good writing was considered a skill needed for social mobility (Nystrand, 2006). Not until the 1960s and 1970s, however, was more attention paid to the integration of speaking, listening, reading and writing, in part due to research on emergent literacy that demonstrated that these language-based skills develop concurrently.

In 1975, a Newsweek article entitled "Why Johnny can't write" brought to the forefront the lack of good writing instruction and writing standards in public schools (Sheils, 1975). In the 1970s and 1980s, there was an increase in federally funded research in support of cognitive models of writing (Applebee, 1981; Emig, 1971; Flower and Hayes, 1980; Scardmalia, Bereiter and Goelman, 1982). Hayes and Flower's (1980) model proposed three cognitive processes—planning (generating ideas and setting goals), translation (transcribing ideas into written text) and revising (rereading the text to improve clarity of ideas). Berninger and Swanson (1994) expanded upon this to take into account the cognitive processes of young children. Instead of "translation," they described text production as including "text generation" (which encompasses language ability) and "transcription" (to include handwriting and spelling).

The focus on cognitive models, which centered on the thought processes of the individual writer, progressively shifted to social models that focused on socially mediated influences on writing, such as culture, home, teachers, and peers (Shaughnessy, 1977; Nystrand, 1982, Vygotsky, 1978). Also, cognitive models of writing did not explicitly address motivation and affective responses to writing (Hidi and Boscolo, 2006). Under the cognitive model, a writer's inner cognitive resources nurture motivation, whereas, under the social constructivist approach, writing is a meaningful, social activity. Both viewpoints have merit.

In the 1980s, there was intense interest in better understanding how writing emerges in young children. Studies of emergent literacy concentrated on the sociocultural influences on young writers (Clay, 1975, Bissex, 1980; Teale and

Sulzby, 1986; Dyson, 1986). By the end of the 1980s, writing was perceived to be a "dynamic, meaning making process" that evolves inherently in a literacy-rich environment (Nystrand, 2006, p. 18). (See the section on Writing Development for more on emergent literacy.)

In the 1990s, the cognitive demands of writing were examined (Berninger, Vaughan, Abbott, Abbott, Brooks, Rogan, Reed & Graham, 1997). These studies demonstrated the difficulty of simultaneously conducting multiple cognitive tasks when writing, and showed that younger children have less capacity than older students. Young children must allocate more cognitive capacity to graphomotor processing, such that young writers produce shorter, less complex text compared to students who have developed more automaticity of transcription (e.g., handwriting and spelling skills). Graham and Weintraub (1996), state that the mechanical demands of handwriting interfere with the higher order processing needed for composing. They assert that children, who write slowly, cannot keep pace with the ideas and plans that they hold in their memory, and this interferes with getting those ideas on paper. Working memory is also a contributing factor. Students with stronger working memory are better able to apply higher order metacognitive skills. (Berninger & Swanson, 1994).

Circumventing low-level transcription skills has been shown to decrease processing demands. Bereiter & Scardamalia (1987) demonstrated that young writers (ages 6 and 7) produced longer, more elaborate texts when they orally dictated to an adult scribe (text not visible). Clearly, writing is a multidimensional, dynamic process that competes for internal resources in less mature writers. However, research also suggests that the reverse may be

true for more mature writers. Dictation to an adult typist was less effective than writing by hand or by using a word processor for typically developing, more experienced writers (Torrance & Baker, 1998 as cited in Torrance & Galbraith, 2006). For mature writers, researchers concluded that oral dictation (without visible text) requires a more rapid tempo, while writing by hand allows for a slower pace in which to balance the demands of writing (memory retrieval, transcription, text generation, and revision, etc.) (Grabowski, 2005; Bourdin & Fayol, 1994).

In the 1980s and 1990s, the "process writing" approach took root, along with the belief in a balanced literacy approach. Reading and writing instruction developed as a more integrated approach, and new research on spelling development reintroduced spelling instruction with an emphasis on phonics and linguistic patterns in words. According to Berninger and Winn (2006), "the process writing movement not only transformed how writing is taught but also the age at which writing instruction is introduced" (p. 104). In the 1970s, the process writing approach was a more linear, prescriptive method applied more often to writing narratives. Overtime, the process writing approach evolved as a writing framework incorporating a "broad range of strategies that include pre-writing activities such as defining audience, using a variety of resources, planning the writing, as well as drafting and revising," and employing explicit instruction as well as self-regulation strategies (Pritchard & Honeycutt, 2006, p. 277). The process writing approach continues to be the focus of the National Writing Project, a network of educators engaged in professional development on writing instruction across the United States.

Prior to the 1980s, most writing instruction occurred in the upper grades; now it occurs at all levels beginning in the primary grades. The 1990s marked the introduction of personal computers, which are now considered a standard writing tool. In the 2000s, the availability of mobile tablets made it possible for even very young children to explore literacy learning. In the 21st century, computers, keyboarding, mobile devices and multi-media applications are as essential as writing with a pencil for students of all ages. The best ways to employ these tools in today's classrooms are still being explored.

CURRENT PERSPECTIVES ON WRITING

More than ever, the current literature is shining a spotlight on writing. Studies on cognitive processing models, language connections and reading/writing connections have been updated and focus on what goes one in the mind of the learner in literacy and language rich environments. There is a prevailing interest in the social influences on writing, including the role of the teacher to build students' self-efficacy and self-regulatory skills. In recent decades, computer based-learning, the rise of the Internet and the advent of mobile technologies have led to more studies on multiple literacies. This has led to intense discussions on curriculum, on assessment, on the role of the teacher, and on the skills students need for the future. The following presents some of the major contemporary viewpoints on writing.

COGNITIVE PROCESSING MODELS

Today, writing is viewed as a cognitive sociolinguistic process. As was described in the previous section, Berninger and Swanson (1994) redefined the cognitive aspects of writing to include planning, text production, and revising.

Planning

Composing text progresses through stages of growth, relative to cognitive and linguistic development. Young children access their memories to retrieve content as they write, but do little conceptual planning prior to putting pencil to paper (Flower & Hayes, 1980). Writing in the primary grades is characterized by "knowledge telling" (Bereiter & Scardamalia, 1987). According to these researchers, young children start writing within one minute of obtaining a writing assignment, and they often speak aloud the words they write down. At age 10, planning and content generation are still interwoven as students tend to think and write at the same time, and their notes on what to write typically include full sentences that they incorporate into their drafts. By age 10, children can view their writing through the "eyes of the reader" (Strickland and Townsend, 2011). By ages 12 and 14, planning is more distinct from writing and they can list ideas, which they later incorporate into text. As children mature, they are better able to reflect on the purpose of their writing, as well as on the audience for which they are writing, and incorporate this into their planning. The research of Bereiter and Scaramalia (1987) demonstrated that typically skilled writers spend more time planning than less-skilled writers.

Graham (2010) writes:

"All beginning writers struggle with fluency and legibility to some extent, and that inevitably affects their approach to composing. Young writers cope with the multiple demands of handwriting and composing by minimizing the composing process (planning, organizing, etc.). Because so much of their thinking must be devoted to forming legible letters, they turn composing into a knowledge-telling process in which writing is treated as a forward-moving, idea-generation activity. A relevant idea is generated and written down, with each new phrase or idea serving as the stimulus for the next one"(p. 50).

Supportive instructional writing environments are needed to help students move beyond "knowledge telling" and engage in higher level processes involving planning and reviewing (McCutchen, 2006). According to McCutchen, knowledge telling may be an adaptive response to the demands of writing and the limitations of working memory. Writers become more "expert" as they capitalize on skills stored in long-term memory. This occurs as a result of students receiving appropriate writing instruction and supports.

Today, there are more tools available for planning. Graphic organizers are visual representations of information and are considered to be excellent tools for planning writing (Bromley, 2006). They are tools that are often used as part of mandated tests and are often introduced to students in the elementary grades (Bromley, 2011).

Text Production: Transcription and Text Generation

As stated earlier, transcription involves the cognitive and physical acts of forming written representations of text (McCutchen, 2006). It traditionally refers to the mechanics of handwriting plus spelling, though an expanded view would involve any form of transcription (e.g., keyboarding, speech to text). When referring to early writing development, it involves retrieving letters, letter combinations and words from memory and writing them. Berninger and Swanson (1994) found that transcription-related measures were strong predictors of writing quality for young children, but lessened in importance as other components of writing developed. By grade 4, typical students are more adept with transcription, which decreases the demands on working memory.

Text generation is the process of turning ideas into written language. Text length is often used as a measure of text generation; however, fluency and cohesiveness of the text are also important factors (McCutchen, 2006). Text length, writing fluency, and coherence all increase with age (Berninger, & Swanson, 1994; McCutchen, Covill, Hoyne, & Mildes, 1994; Wright & Rosenberg, 1993). Improving handwriting and spelling leads to improvements in text generation by decreasing demands on working memory. (Berninger, et al., 1997, Graham, Harris & Chorzempa, 2002) Transcription difficulties can interfere with text generation (Bereiter and Scardmalia, 1987). For adolescent students with learning disabilities, transcription demands can result in shorter essays of lower quality (Quinlan, 2004).

Revision

Revision "involves schema-guided reading, text evaluation, and rewriting," and requires problem solving, memory resources and audience awareness (McCutchen, 2006, p. 123). More often, children and even some adults use a revision schema that focuses more on the surface features of text, rather than conceptual features, but with age and the maturation of writing skills, they increase their ability to revise for meaning (Chanquoy, 2001; Faigley & Witte, 1981). Less-skilled writers use a sentence-by-sentence approach, whereas skilled writers are able to examine the broader meaning of the full text (McCutchen, Francis, & Kerr, 1997). Revision is an essential aspect of the writing process. Like planning and text generation, revision increases with age and experience.

LANGUAGE CONNECTIONS

Berninger, Abbott, Abbott, Graham and Richards (2002b) discuss the links between language by hand and language by eye. "Language behavior actually draws on four functional systems in the mind/brain: language by ear (aural), language by mouth (oral), language by eye (reading), and language by hand (writing)" and that "each of these language systems is on its own developmental trajectory, has its own internal organization, and interacts with the other language systems to some degree at different stages of development" (p. 39). Children speak long before they can read or write. Research indicates that language abilities are significantly correlated with writing. In a study of 4th and 5th graders, verbal IQ was correlated with the quality, but not the length, of narrative writing (Berninger, Cartwright, Yates, Swanson & Abbott,

1994). Other studies have shown that the number of words, as well as the sophistication of grammar or syntax, is generally higher in oral language as compared to written language in the early grades, but the difference declines with age (O'Donnell, Griffin, & Norris, 1967).

There is a clear difference between spoken language and written language structures; we speak differently compared to the text we generate when writing. For children with early oral language difficulties, the research shows that when oral language problems are resolved, written language issues may continue into adolescence (Naucler & Magnusson, 2002). While there is research supporting the connection between oral language and text production, there is much less evidence on how language intervention can support writing (Shanahan, 2006).

READING AND WRITING CONNECTIONS

Reading and writing connections have a strong research history (Shanahan, 2006, 2009). Reading and writing share similar skills and abilities. The interconnectivity of reading and writing are evident even in the emergent literacy years. The writing behavior of kindergarteners was found to be predictive of their 1st grade reading achievement even when the effects of measured intelligence were controlled (Shatil, Share, & Levin, 2000).

According to a multi-faceted study of 600 students in grades 1 to 6, Berninger et al. (2002) found that relationships between reading and writing are unidirectional and bidirectional (each influences the other). Their research models demonstrated the following:

Bidirectional relationships

- Handwriting contributes to spelling, and spelling contributes to handwriting across grades 1-6; spelling difficulties constrain how much and how well a student composes in the primary grades.
- Spelling and compositional fluency and quality are interconnected in the primary grades.
- Compositional fluency and compositional quality are interconnected across all grades.

Unidirectional relationships

- Handwriting significantly influences word recognition in grade 2.
- There is a direct path of influence from word recognition to handwriting and spelling at all grade levels.
- There is a direct path from spelling to word recognition at all grade levels.
- Spelling has a direct influence on reading comprehension in most grades.
- Reading has a direct influence on spelling at all grade levels; better readers are exposed to more words and this results in better spelling.
- Reading comprehension has a direct effect on compositional fluency and quality; better writers write more.
- Compositional fluency and quality have a direct influence on reading comprehension in the later grades (grades 4,5,6).

In a report titled Writing to Read, Graham and Hebert's (2010) meta-analysis confirmed the effects of writing on reading:

- Writing about a passage improves comprehension more than just reading, rereading, studying, and discussion.
- Explicit instruction in the text structures of model passages, followed by writing using similar structures, along with emphasis on sentence and paragraph construction and sentence combining, improves reading comprehension.
- Explicit instruction in spelling and sentence construction improves reading fluency.

According to Fitzgerald and Shanahan (2000), readers and writers share knowledge across four domains:

1. Content knowledge (e.g., subject and background knowledge)
2. Knowledge of the functions and purposes of literacy tasks
3. Knowledge of the surface features of writing (e.g., phonemic, orthographic, morphological, words knowledge and conversational features)
4. The procedural knowledge of how to generate and use information (e.g., predicting, summarizing, questioning)

Nevertheless, while the interconnectivity between reading and writing is proved, explicit instruction in each is needed. "Instruction in one or the other is unlikely to be an adequate replacement for the other if the goal is to develop students who can read and write well" (Shanahan, 2006, p 177). Shanahan

also discusses the lack of literature on the identification and remediation of writing disabilities as compared to what is available to remediate reading. Reading intervention programs far outweigh writing interventions. In light of strong reading and writing connections, Shanahan (2009) asserts that reading and writing instruction should be integrated.

Social Influences on Writing

Social influences on writing continue to be recognized. Dunsmuir & Blatchford (2004) conducted a recent study on the influence of school and home experiences on writing, with 60 children from urban primary schools. The authors found that the mother's educational level, the size of the family, the parents' appraisal of writing, and home writing experiences predicted writing proficiency at the time the children entered school. By age seven, vocabulary, prereading skills, name writing, handwriting proficiency, and the age of the student upon entering the grade were most associated with writing competence. The only preschool variable that maintained a significant correlation with children at age seven was home writing experience. These finding speak to the importance of the home environment in the primary years. The school environment is equally important. Bruning and Horn (2000) affirm that one's motivation to write is enhanced by nurturing positive beliefs about writing, providing authentic writing contexts, creating a positive classroom climate, and ensuring ongoing teacher support.

Self-Regulation, Self-Efficacy and Motivation

Self-regulation is another topic considered important to writing development. Self-regulation refers to children's ability to use metacognition to monitor and control their learning and behavior. Zimmerman and Kitsantas (1999) state that there is a developmental sequence for the self-regulation of writing that begins with the observation and emulation of teacher modeling, and gradually includes more self-monitoring to use appropriate strategies across different writing tasks. In a study of 122 3rd graders and 106 5th graders who were asked to take notes while reading source material and then write a report from their notes, Altemeier, Jones, Abbott, and Berninger (2006) found that executive functions for self-regulation played a key role in reading to writing tasks. For example, the researchers noted that maturing writers needed to be able to inhibit plagiarizing when taking notes, and make notes only on the most relevant information.

Writing activity demands perseverance and resilience. Self-efficacy beliefs are strong predictors of academic and behavioral performance (Graham & Weiner, 1996). Self-efficacy refers to a writer's perceptions about writing competence. Ineffective writers are less likely to be internally motivated to compose text, which in turn impedes self-efficacy. Pajares and Valiante (2006) report "self efficacy and writing competence increase when students are provided with process goals (i.e., specific strategies they can use to improve their writing), as well as regular feedback regarding how well they are using such strategies" (p. 163). They also report that teachers promote self-efficacy by giving students writing choices and writing goals, allowing students to self-select writing topics, providing collaborative writing opportunities, and teaching self-

regulation strategies. Additionally, individualized feedback, using modeling practices and helping students develop positive "habits of mind," also foster motivation and positive self-perceptions for writers. These authors assert that "teachers do well to take seriously their share of responsibility in nurturing the self-efficacy beliefs of their pupils, for it is clear that these beliefs can have beneficial or destructive influences" (p. 166).

Multiple Literacies

More recently, the process model of writing has been contested by those who feel that it does not fully represent new forms of writing in the 21st century (Yancy, 2009). Social media is redefining how writers express themselves. For example, using social networks, students write quick drafts and modify their "voice" depending upon their audience and purpose. Students become facile in their ability to retrieve relevant content, incorporate mixed media, and use new forms of syntax to communicate in the moment (Hansen & Kissel, 2011). The terms "new literacies" and "multiple literacies" are umbrella categories that include "the ever-changing moving flows of the Internet and other non-print media, and the literacies, practices, and competencies such media require" (Bean & Harper, 2011, p. 63). O'Brien (2006) uses the term "multimediating" to describe how students use a range of literacies to construct knowledge, identities, and meaning-making using multimedia. The process writing approach, while ever evolving, may be too limiting for the range of writing that is needed in a highly networked world. Bridging the gap between in-school and out-of-school literacies is needed to engage today's writers (Vasudevan & Wissman, 2011).

In a policy brief entitled Writing Now, written by the (NCTE, 2008), the National Council of Teachers of English asserts that writing is not a formulaic, nor a linear process, and that students need to engage in authentic, multifaceted and multidirectional writing processes. The role of teachers is to welcome new forms of writing that go beyond the traditional print-based approaches, and provide support on writing across the curriculum, allowing multiple means of expression. New ways of collaborating online, shared digital writing experiences, and digital writing portfolios, are newer strategies meant to facilitate writing progress.

Computer-Based Assessment

The National Assessment of Educational Progress (National Center for Education Statistics, 2012), under the auspices of the U.S. Department of Education, conducted the first computer-based assessment for writing in 2011. Eighth graders (24,100 students from 950 schools) and 12th graders (28,100 students from 1200 schools) from diverse backgrounds were evaluated on two 30-minute randomly assigned writing tasks (writing to persuade, explain or convey experience). Their writing was holistically scored using a six-point scale on the development of ideas, the organization of ideas, language facility and conventions (e.g., spelling, punctuation, grammar, and capitalization). For the purposes of the 2011 NAEP project, writing was defined as follows: "Writing is a complex, multifaceted, and purposeful act of communication that is accomplished in a variety of environments, under various constraints of time, and with a variety of language resources and technological tools" (National Center for Education Statistics, 2012, p. 4). While 24% of students

at grades 8 and 12 performed at proficient levels, far more students scored at basic or below. Of the 8th graders assessed, 54% scored at the basic level and 20% scored below basic. Of the 12th graders assessed, 52% scored at the basic level and 21% scored below basic. Females scored higher than males overall, while race and lower socioeconomics continue to be factors associated with lesser performance. Clearly, based on current data, there is much work still to be done to address the writing needs of students nationally as measured by computer-based writing assessments.

National Influences on Writing Instruction

In 2002, with the federal passage of No Child Left Behind Act of 2001, national and state testing shifted the emphasis to reading (No Child Left Behind [NCLB], 2002). Consequently, an analysis of the National Assessment of Education Progress data showed that between 2002 and 2007, the amount and types of student writing decreased (Hruby, Read, & Landon-Hayes, 2011). The authors report that writing instruction was sparse by comparison, but included creative writing workshops, journaling, research report writing and the formulaic five-paragraph essay. Today's college and career readiness standards are sparking a return to a more balanced approach to reading, writing, listening and speaking.

These explicit writing standards place a renewed emphasis on writing—more time with pen on paper or the use of technology. "Writing is treated as an equal partner to reading, and more than this, writing is assumed to be the vehicle through which a great deal of the reading work and reading assessments will occur"(Calkins, Ehrenworth, & Lehman, 2012, p. 102). These national

standards assert the need for explicit writing instruction, opportunities for sustained practice, frequent feedback, and assessment-based instruction.

College and Career State Standards Emphasis

Overall, the national standards focus on being able to write different types of text, produce and distribute writing, and conduct research to develop and present knowledge. The overarching goal for students is to write routinely for long and short periods for a range of tasks, purposes, and audiences. Types of writing include:

- Narrative: e.g., personal narrative, fiction, historical fiction, fantasy, narrative memoir, biography, narrative nonfiction
- Argument: e.g., persuasive letter, review, personal essay, persuasive essay, literary essay, historical essay, petition, editorial, op-ed
- Informational: e.g., fact sheet, news article, feature article, blog, website, report, analytic memo, research report, nonfiction, how-to book, directions recipe, lab report

There continues to be an emphasis on "process writing" that involves planning, drafting, revising, editing, and rewriting. Students are introduced to different types of writing in the primary grades; narrative, opinion and informative writing, shifting more toward argument and informational writing by high school. Interestingly, Harris, Graham, Brindle and Sandmel (2009) assert that story writing is more difficult than opinion writing for student in the primary grades. Over time, students are expected to be able to produce text across all

types of writing in order to be "college and career ready." The standards offer guidance on the volume of writing that is expected by the end of elementary school; fourth graders are expected to write a minimum of one typed page in one sitting, while fifth graders, a minimum of two typed pages (Calkins, Ehrenworth, & Lehman, 2012). The CCSS does not define the number of words this entails, or the length of a sitting.

Teachers are expected to plan units of study based on a trajectory of progress as outlined by the writing standards, and utilize mentor texts, mini lessons, writing conferences, and small group work. Teachers across all content areas are expected to assess this trajectory for all students by asking them to produce writing on demand. Students' writing abilities are then analyzed across grade level standards to identify writing needs, and teachers are expected to incorporate appropriate strategies into their lessons to the benefit of all learners. The national standards specifically address the use of technology, including the Internet, "to produce and publish writing and to interact and collaborate with others" (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010, pp. 18, 41). Writing standards, whether at national or state levels, are directing more attention to writing than ever before.

Writing and Students with Disabilities

There is a great deal of literature documenting the writing difficulties of students with disabilities. Berenstein (2008) reports that approximately 6% of all school- aged children have disorders in written expression. In a recent large-scale study of 5,718 children ages 5 to 19, Katusic, Colligan, Weaver

and Barbaresi (2012) found that 6.9% to 14. 7% of students demonstrated evidence of writing problems as measured by writing subtest scores and IEP goals. Levine, Oberklaid, & Meltzer, (1981) and Berninger (2009) indicate that around grade four, referrals of student with writing difficulties tend to increase, though given today's emphasis on writing, referrals and response to intervention plans may begin earlier. Writing is considered the most common problem for students with learning disabilities ages 9 to 14 (Cobb-Morocco, Dalton, & Tivnan, 1992). Morris, Schraufnagel, Chudnow and Weinberg (2009) report that around 80% of children with learning disabilities struggle with written language.

Nature of Writing Difficulties

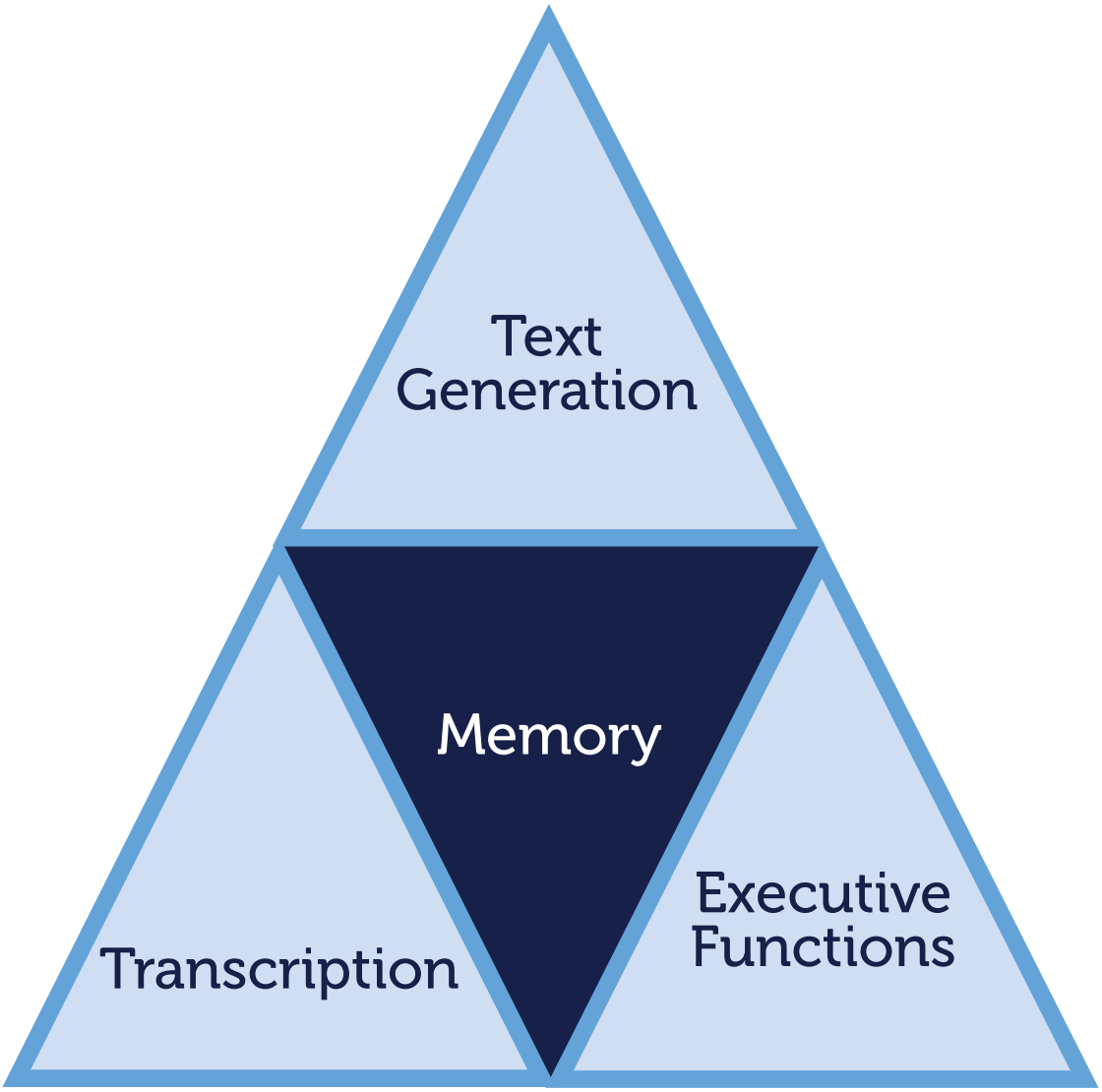
Berninger and Amtmann (2003) cite two waves of research between the 1970s and 1990s that examined writing deficits; one focused on students from grades one to nine, the other focused on issues in early childhood. For example, research confirmed that early writing difficulties began with transcription difficulties involving handwriting (orthographic coding deficits) and spelling (orthographic plus phonological coding deficits). Berninger, Abbott, Rogan, Reed, Abbott, Brooks, Vaughn and Graham (1998) determined that by the end of 2nd grade, children may be impaired in handwriting only, spelling only, or both. They found that children with dual disabilities in spelling and handwriting were most impaired and did not respond as readily to intervention. Later research examined self-regulation deficits. Graham and Harris (2003, 2009) have found that children with learning disabilities have difficulty accessing the cognitive and procedural strategies that are key to proficient writing. Troia (2006) also demonstrated that students with learning

disabilities show limited metacognitive awareness of the strategies needed to be good writers. Troia contends that students with learning disabilities need more time on writing using individualized and explicit writing instruction. Consequently, writing instruction for these students requires the integration of planning, self-monitoring, goal setting and self-evaluation strategies.

Simple View of Writing

The work of Berninger, Vaughan, Abbott, Begay, Coleman, Curtain, Hawkins, and Graham (2002a) on the nature of written expression deficits led to their model of the "Simple View of Writing," which is represented by a group of nested triangles (Figure 1.1). Transcription skills (handwriting keyboarding, and spelling) and executive functions (attention, planning, reviewing, revising, self-regulation) represent the base of the triangle and serve as the foundation for writing. Transcription and executive functions, together, provide the necessary skills that allow students to translate language and ideas into written symbols for purposes of written expression. Text generation (words, sentences, discourse) forms the top of the triangle. All of these occur within short term, working, and long term memory environments. Students with disabilities struggle with some or all of these.

Figure 1.1 The simple view of writing, (Berninger, Vaughan, Abbott, Begay, Coleman, Curtain, Hawkins, and Graham, 2002a)



WRITING DEVELOPMENT

This section will discuss how writing evolves over time. The discussion centers on the development of written expression: how literacy emerges in the early childhood years, followed by writing in the primary grades (K-2), the intermediate grades (3-5), and writing in the secondary grades (middle school grades 6 to 8, and high school grades 9 to12). As the research shows, composing requires a complex set of skills and abilities, and it takes students many years to achieve proficiency.

Composition is a relative term. It can connote one thing when referring to a musical composition, or something entirely different when referring to the composition of an oral speech. Relative to writing, composition refers to written discourse. Today, written composition can refer to early childhood writing that includes drawing, as well as digital literacies where written compositions include visual and auditory elements. For the purposes of this publication, written composition refers to that which is produced using pencil, pens or computing devices. The "how" of composing is much more complex.

When we say the word "writing," to what are we referring--- the mechanical act of producing letters (e.g., handwriting or keyboarding), the act of composing (e.g., text production), or are we referring to types of writing (e.g., narrative, expository)? When we refer to " writing," it is often contextual. With very young children, we may be referring to transcription (handwriting and spelling), but when we refer to older students, we may be discussing compositional skills. When we are discussing adult writers such as journalists or novelists, we may be conversing about a writer's craft. There are many contexts that lead to different ways to reference writing.

Writing requires the coordination of many skills and abilities (Jones and Christensen, 1999). Unlike speaking, listening, and reading, the act of writing is visible and non-transient (Tolchinsky, 2006). It is "out there" for all to see.

Separate from the motor skills of writing, students must generate ideas, and translate these ideas into written form using language processes that involve lexical knowledge and retrieval, semantic knowledge, phonological coding, and syntax. As writing tasks become more complex and longer, higher order processes are needed to sequence information and to produce complex narratives. Other forms of writing include descriptive, explanatory, opinion, and argumentation, all of which require planning, organizing, self-monitoring and revising. For all types of writing, the writer must be able to identify audience and purpose.

Early Childhood Writing

The cognitive developmental theories of Piaget (1962, 1969) gave way to the views of Vygotsky (1978), who believed that learning has a direct effect on mental development. This prompted a shift away from waiting for developmental readiness, to finding ways to promote cognitive learning within a "zone of proximal development." As has been described earlier, writing is no longer considered solely a cognitive developmental ability, but instead is viewed as constructivist— socially influenced. In education, constructivism refers to learning that arises out of experiences. Today, these cognitive and constructivist views are seen as complimentary perspectives (Chapman, 2006). As stated earlier, there are deep connections between writing and language development. Writing, then, is viewed as a socio-cognitive and linguistic process.

The Emergent Literacy Period

Emergent literacy research, which dominated the 4th quarter of the, 20th century, was instrumental in raising awareness of how young children compose— that they combine writing with drawing, imitate the writing of their culture using scribbles and mock letters, incorporate writing into pretend play routines, and intentionally experiment with writing to convey meaning for different purposes within a social context (Chapin, 2006). Writing does not just begin in kindergarten. The emergent literacy period begins in infancy and typically ends by 2nd grade when young children begin to write conventionally. Protowriting (pretend writing) is integrated into a young child's drawing as early as age 2. Drawing is combined with protowriting when the pictures alone do not convey the child's intended meaning. As young as age two to three, children understand that writing and drawing are different. Brennemann, Massey, Machado & Gelman (1996) demonstrated that when young children draw, they make wide continuous movements, whereas when they write, the lift their writing instrument off the page more often.

The research of Clay (1975), Bissex (1980) and Sulzby (1985) shed much needed light on how children engage in writing in early childhood. Preschoolers imitate writing by producing scribbles and mock letters. These letter-like scribbles or letter imitations are clearly used to convey meaning; however, there is typically no letter-sound correspondence. At this point in development, children begin to demonstrate a clear understanding of the function of text, even though they cannot as yet form text conventionally, nor do they understand the phonological system. Young children also understand

something about writing genres before they are enrolled in formal schooling. Their protowriting of a shopping list is visibly different when compared to the writing of a letter to a friend. At age 4 and 5, children gradually learn the relationship between symbols and sounds, and come to understand how words and sentences are constructed.

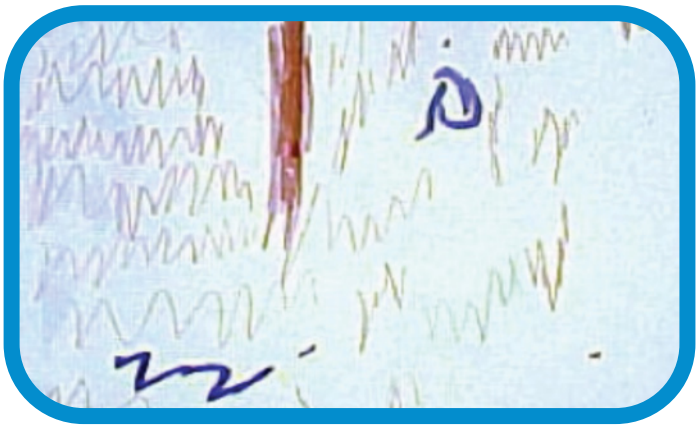
Visual Elements of Early Writing

Preschoolers demonstrate a gradual understanding of the visual features of written language. Clay (1975) determined that, starting around age 3, children make marks on paper to express ideas. By age 4, children's marks are arranged linearly with segmentation (Tolchinsky & Teberosky, 1998). Their early graphomotor skills go through clear stages according to Ehri (2011). Early imitations of writing consist of scribbles or figures (e.g. simple marks such as lines or circles) arranged in a horizontal line. In English-language cultures, young children demonstrate that writing proceeds from left to right. Over time, it can be noted that there is a greater variety in the way they produce such figures. And eventually, it can be observed that their writing is more letter-like. These stages are more than just the evolution of motor planning; they illustrate that children are exploring the formal features of writing.

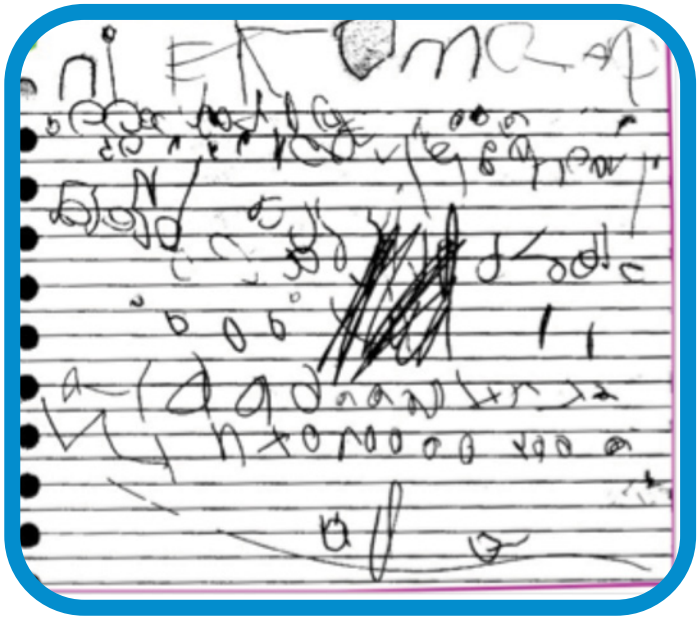
Lavine (1972) describes four visual elements of early writing: non-pictoriality, linearity, variety, and multiplicity.

- Non-pictoriality reflects the fact that children clearly are adding text to their drawings. Scribble-writing or mock letters are clearly not a part of the drawing itself, but are meant to convey a message.

- Linearity can be seen when children write strings of scribbles or mock letters in a linear left to right, or right to left fashion.



- Variety denotes the stage when children begin to do more than just repeat the same motor pattern of scribbles or straight lines. Children begin to consciously vary the shapes of the mock letters.



- Multiplicity reflects the stage where children's writing begins to approach that of conventional text. Children begin to use multiple letter imitations as part of their pretend writing.

Young children first experiment with conventional spelling when they attempt to write their names. Over time, children come to understand that mere scribbles do not accurately imitate their names, nor do strings of random letter-like shapes. Through repeated experience and frequent hypothesis testing ("Does this say my name?"), children come to understand that words are comprised of letters that must be arranged in a particular order.

The Alphabetic Principle

As children develop an understanding of the functions of text, they also begin to be interested in mastering the forms of text—they practice writing letters and they copy words they see in their environment or words that are important to them (mom, dad, sibling names, pet names, etc.). By exposure to alphabet books and television programs that emphasize letter names, and by questioning literate adults or siblings, children learn the names of the letters of the alphabet. Over time they begin to comprehend the alphabetic principle that letters "say their names," and that these phonetic elements can be combined to form words (i.e., inventive spelling). The majority of the letters in the English phonetic system say their names (e.g., B, D, F, M, N, S, T, V). Long vowel letters also say their names. Children begin to take notice of the first letters of words, particularly consonants that say their names, and may even attempt to guess words based on that first letter and its sound.

Speech to Text Correspondence

As children are exposed to books and reread their favorite stories with adults, they begin to notice words that represent characters or actions. For example,

in The Very Hungry Caterpillar (Carle, 1987), the word "caterpillar" is uniquely shaped. Key words begin to grab their attention. The repeated refrain "and he was still hungry" becomes familiar to the child who is then able to point to each word as he recites it aloud from memory. Around age four, children begin to understand that there is a one-to-one correspondence of speech to text. In literacy rich environments, when young children verbalize as they are writing, they demonstrate that writing is related to language and begin to understand the one-to-one correspondence of speech to text.

Children learn to write by writing. As stated by Tolchinsky (2006), "the conventions of writing—letter-sound correspondence, word separation—cannot be learned outside the written system" (p. 94). Children must be actively engaged in writing in the developing years; verbal dictation to an adult is not a substitute. During the primary grades, children use their orthographic knowledge of grapheme-phonemes (letters to sounds), syllabic understanding, and morphographic understanding (word families) to build sight vocabularies and write words retrieved from memory (Ehri, 2011).

Oral and Written Discourse

Oral discourse has a structure that is quite different from written discourse. Sulzby (1996) asked preschoolers to "read" a favorite book to a puppet, then "write" a story and read it aloud. The children used oral-like language to read their story, but used written-like language to read aloud their protowriting. Children seem to understand that oral language is different from the language found in books as early as 4 and 5 years old, even before they can write conventionally. Kroll (1981) demonstrated that in the early elementary years,

the complexity of written text does not imitate speech. Students in the primary grades speak using longer, more grammatically complex sentences when compared to their written text. Young writers write shorter, simpler sentences, presumably because their working memory is concentrating more on the mechanics of writing. At around the age of 9 or 10, when most children have more mastery of writing mechanics, more complex written grammar is prevalent.

WRITING IN THE PRIMARY GRADES

Kindergarten children ease into formal writing. Talking combined with drawing appears to compliment writing in kindergarten and Grade 1 (Calkins, 1986). By grade 2, drawing does not appear to be as necessary, however, discourse with others helps children rehearse what they will write and helps them revise their writing. Bodrova and Leong (2006) contend that talk combined with writing helps young writers remember what they want to write, supports speech to text correspondence, and helps them with phoneme to grapheme representation.

Morrow, Tracey and DelNero (2011) outline the development of writing skills for preschool, kindergarten and first grade children:

- Dictate ideas to an adult
- Make attempts to write
- Use letters to represent written language
- Make connections between letter forms and their sounds
- Imitate the written language found in books
- Participate in functional writing (e.g. letters, lists)
- Engage in narrative and informational writing
- Use technology to engage in new literacies (e.g., email, texting)
- Attempt to use conventional spelling, punctuation, capitalization

Writing Genres in the Primary Grades

Beginning around the 1980s, researchers investigated the ways that writing progresses across the elementary years. While it was once assumed that narrative story writing was the most appropriate form for young writers, research indicated that children engage in writing informational text beginning with labeling, then list-making, then informational statements using inventive spelling as early as kindergarten (Newkirk, 1987; Donovan, 2001); and that by grade 2, children are able to produce narratives and informational text (Donovan and Smolkin, 2002; Read, 2001). Chapman (1994) observed and analyzed 724 texts written by six 1st graders over the course of a year. She identified 15 different genres that could be categorized as action/event oriented or as object oriented. Across the year, the children's writing changed significantly. At the start of the year, most writing in the form of labels accompanied drawing, but by the last third of the year, phrases and simple sentences were produced without pictures. By the end of the year, the children, on average, produced 3 to 5 distinct clauses during "writing workshop." It is now understood that children's understanding of genres is influenced by environment, in that children imitate the writing they see around them in and outside the classroom (Chapman, 1995). Cultural influences are also evident in that young children will write about songs, television characters, videos, movies, etc. (Dyson, 2001). Newkirk (1987) examined 100 informational texts written by children in grades one to three. He found that only about 15% of first graders wrote more than one paragraph, however, by third grade, nearly half of the students wrote informational texts that were longer than one paragraph.

Planning in the Primary Grades

As has been discussed, composing entails a variety of complex skills such as planning, text generation and revising. Young writers acquire these skills gradually. For example, young writers do not plan in advance, but tend to write what comes to mind (e.g., knowledge telling) (Bereiter & Scardamalia, 1987). Young children talk out loud as they write, which reflects their thinking about what they are doing before, during and after writing. In the primary grades, children talk about the mechanics of writing (e.g., letter formation, spelling, word meaning) and talk about their ideas (Chapman, 2006). As they gain experience, they begin to plan more and talk before and during writing lessens (Cioffi, 1984; McGillivray, 1994). Scott (2012) states that "energies devoted to transcription are thought to interfere with planning efforts" (p. 259) and that it is not a coincidence that the ability to plan improves when transcription is more fluent and automatic. Typically, fluent transcription is demonstrated by 4th grade, allowing for longer written texts.

Revising in the Primary Grades

Children in the primary grades revise less than those in intermediate grades. At the second grade level, children can revise for surface (e.g., mechanics) and semantic errors (Cameron, Edmunds, Wigmore, Hunt & Linton, 1997) for small amounts of text. Third graders with teacher support can revise more at the word, sentence and paragraph level (Nistler, 1990). Beal (1993) notes that it is harder for children at the elementary level to "view text with a detached eye and to recognize that it does not really represent their meaning fully or accurately" (p. 650).

Kindergarten Writing Expectations

At the kindergarten level focus on the use of drawing, dictating and writing to state a preference or an opinion, or provide information about a topic, or narrate one or more events. (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) Kindergarteners are expected to print many upper and lower case letters, to spell phonetically common nouns, including plural nouns, to use verbs and common prepositions, and to use question words such as who, what, where, when, why and how. They are expected to produce complete sentences, to capitalize the first word in a sentence, and to use end punctuation.

First Grade Writing Expectations

First graders typically write about themselves, their feelings, families and pets (Manning, Manning & Hughes, 1987). They are able to write informational text and stories (Donovan, 2001). When first graders are writing informational or explanatory text, they are expected to name their topic, supply facts about a topic, and provide some sense of closure when writing. (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) When writing an opinion, they are expected to introduce their topic, state their opinion, supply a reason and provide a sense of closure. When writing a narrative, students in first grade are expected to sequence two or more events, provide some details, use temporal words to signal the order of events, and again, provide a sense of closure. They are expected to write simple and compound sentences, show noun-verb agreement in simple sentences using singular and plural nouns, use pronouns (I, me, my; they,

them, their; anyone, everything), common adjectives, conjunctions (and, but, or, so, because) and prepositions. First graders are also expected to capitalize dates and names, use commas, spell common words conventionally and spell less familiar words phonetically.

Second Grade Writing Expectations

Students in the second grade are expected to build skills by supplying more facts and definitions when writing informative text and providing more of a concluding statement (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). When writing an opinion, they are expected to supply more reasons to support their opinion and use linking words such as because, and, also to connect their opinions with reasons, and supply a concluding statement. When writing narratives, students in the second grade are expected to elaborate on an event or provide a short sequence of events, include details that describe actions, thoughts and feelings, and again, use temporal words and provide a sense of closure. Second graders are expected to produce expanded simple and compound sentences, use adjectives, adverbs, irregular plural nouns (feet), irregular verbs (sat), and reflexive pronouns (myself, ourselves). They should be capitalizing holidays, product names and geographic locations, using apostrophes in contractions (can't, don't) and using appropriate punctuation when writing a letter. They should be able to distinguish more spelling patterns within words, and use strategies to check spelling.

WRITING IN THE INTERMEDIATE YEARS

Children in the primary grades are learning to write, but typically 2nd grade marks the end of the emergent literacy period, as children are able to write and spell more conventionally. By grade 3, writing is an everyday task and students in the upper elementary grades are focusing more on making connections across ideas (Strickland and Townsend, 2011). By 5th grade, students perceive that good writing is imaginative, expressive and presents different genres (McCarthey, 2001). Their writing is more multidimensional (Strickland and Townsend, 2011). In 4th and 5th grades, children begin to read and revise their work, particularly when they discuss their writing with others (Calkins, 1986). Calkins believes that during the upper elementary years, children shift away from immediately writing ideas down, to using more internal self-talk to consider alternative leads, endings, and viewpoints. Vygotsky (1978) believed that children's inner speech helps children think in words and that this self-talk eventually leads to the development of a writer's voice.

Writing Genres in the Intermediate Grades

Research suggests that children in the intermediate grades gain proficiency in narrative and informational writing, then persuasive writing (Scott, 2012), as evidenced by changes in text structures and content. By 5th grade, children are able to produce well-formed narratives (Hidi & Hildyard, 1983), though children with language and learning disabilities have more difficulty achieving this (Scott and Windsor, 2000). Narratives (e.g., stories) are event-based, whereas informational text (e.g., description, compare/contrast) is more

logic-based (Chapman, 2006). While there is evidence that children in the intermediate grades produce text structures that characterize informational text, there is insufficient research on how this emerges across the elementary years. Donovan and Smolkin (2006) demonstrated that children produce more complex text structures associated with writing genres, when they write about familiar topics. Moreover, they found that simplistic tasks constrained students' abilities to demonstrate their writing skills. The CCSS expects that 35% of the assignments at the elementary level will be spent on informative/ explanatory tasks.

Persuasive text is also challenging. Some studies suggest that by age 10, students can produce texts with evidence for a particular claim, but are just beginning to include language that can convince a reader to accept such claims (Golder and Coirier, 1994). Again, there is a paucity of research that documents how different types of writing develop, particularly when one considers that students may not have been exposed to various type of writing on a regular basis. Duke (2000) investigated reading and writing in 29 first grade classrooms in high and low SES school districts. He found that students were exposed to informational genres only 3.6 minutes per day. Given current writing standards that emphasize narrative, informational, and persuasive writing, greater knowledge of how these types of writing emerge in the elementary grades is forthcoming.

Planning in the Intermediate Grades

In the intermediate grades (3rd to 5th grades), children appear to focus more on meaning and linking ideas, and they are better able to plan, connect ideas, monitor, review, and revise to clarify meaning (Langer, 1986). Scardamalia and Bereiter (1986) demonstrated that 10 year olds planned their writing using complete sentences and incorporated them into their drafts, but by age 14, students generated lists of ideas that they then expanded in their written text.

Revising in the Intermediate Grades

Older elementary students are more capable of evaluating their writing and can better revise their work (McCormick, Busching, and Potter, 1992). Whereas younger elementary students focus more on spelling and other surface changes, older elementary students reflect more on content (Lin, Monroe, & Troia, 2007)

Peers and teachers have a great deal of influence on children's compositions. Fourth graders are able to use peer discussion to help them revise for content and clarity (Dahl, 1998). By 6th grade, peer feedback is more likely to result in better quality revisions, and therefore, better quality writing (Olson, 1990). Teacher instruction is highly influential as demonstrated in Gutierrez's (1994) three-year classroom study of elementary classrooms. In classrooms where teaching writing is highly scripted, students participate less and make fewer decisions. Teacher-student collaboration increases when teachers are less directive and more responsive to students. Lensmire (2000) argues for more of a balance between complete teacher control and complete student autonomy.

Third Grade Writing Expectations

At the third grade level students build on K-2 skills. Informative writing is expected to progress to include more details, grouping information as appropriate, and using linking words and phrases to connect ideas. Opinion pieces are expected to have more of an organizational structure that lists reasons, and use more linking words and phrases such as because, therefore, since, or for example. Narrative writing progresses to include the introduction of a narrator or characters use more dialogue and descriptions that show the character's response to situations, and use more temporal words and phrases. All types of writing are expected to provide a sense of closure by way of concluding statements or sections. Third graders are expected to show greater mastery of subject-verb and pronoun agreement and produce complex sentences. They should learn to capitalize titles and use quotation marks in dialogue. They should show greater mastery of spelling patterns and spelling rules, and use suffixes (sitting, smiled).

Fourth Grade Writing Expectations

Fourth graders' informative writing skills should progress to using paragraphs to group information, and use headings, illustrations and multimedia to convey information. They are expected to use more precise language and vocabulary and use a variety of words and phrases to link ideas. Opinion pieces are expected to organize ideas based on their relationships. Narrative writing should progress to using dialogue and description to link character responses to well developed experiences and events. All types of writing are expected to have clear introductions, expanded details or descriptions, and

more specific concluding statements or sections. Their writing should include progressive verb tenses (I was walking), relative pronouns (which, whom) and prepositional phrases. They are expected to sequence adjectives (big, red ball) and avoid run-on sentences or sentence fragments. They are expected to use commas before conjunctions in compound sentences, use quotation marks, and spell grade-appropriate words conventionally (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

Fifth Grade Writing Expectations

Fifth graders are expected to build on previous skills with enhanced details, descriptions, vocabulary, and organization. They should show mastery of verb tenses, use punctuation to separate items in a series, use commas following an introductory phrase within a sentence, use italics, and spell grade-appropriate words conventionally (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

Fifth graders' informative writing skills should build on 4th grade skills. They should provide a general observation and focus and then group related information logically, as well as link ideas using words, phrases and clauses. Narrative writing should progress to using dialogue, description and pacing. They should use concrete words, phrases and clauses to manage the sequence of events. Opinion pieces are expected to build on previous skills, but also provide logically ordered reasons supported by facts and details and link opinions and reasons using words (e.g., consequently specifically), phrases and clauses.

For specific language regarding college and career readiness standards for writing across K-12 grades, as well as language standards please refer to the Appendix for directions on accessing the Common Core State Standards found at http://www.corestandards.org

WRITING AT SECONDARY GRADE LEVELS

In the past four decades, theories and research on composition have evolved slowly at the middle and high school levels. Assessment practices have driven writing instruction. Ethnographic research (data collection examining cultural activities) has examined the teaching practices of highly effective teachers, and points to an underlying lack of teacher preparation on how to teach writing (Langer, 2001; Hillocks, 2006). In 2007, the Writing Next report was published, with the purpose of shedding light on writing proficiency for adolescents. As stated in the introduction, "although the nation has made progress recently in improving the literacy of its elementary school students, adolescent literacy levels have remained stagnant" (Graham and Perin, 2007b, p. 7). Today, with greater accountability on writing progress, more literature is emerging on best practices at secondary levels and more research is expected in the years ahead.

Historical Perspectives on Adolescent Literacy

In the United States, the National Assessment of Educational Progress (NAEP) has been collecting data on student reading, writing and math since 1969 and has largely set the standards for writing performance in the U.S. NAEP testing focused on the three types of writing (narrative, expository, persuasive). States emulating the NAEP standards were using write-on-demand tasks across similar types of writing to measure writing performance. Assessment often drove instruction in that teachers used NAEP-based scoring guides to guide instructional practices (Hillocks, 2002).

In a review of writing at secondary levels, Hillocks (2006) states that between 1963 and 1983, much of the research investigated general writing processes, scales to score writing (holistic, primary traits, and analytical), the syntax of student writing, and the cognitive processes involved in planning, drafting and revising. In the 1980s, Applebee (1981) studied writing in American secondary schools across academic subjects using observation, a national questionnaire, and case studies. Applebee found that while students, on average, were writing 44% of the observed time, only 3% of that time involved writing a paragraph or longer. More often students were not composing, but instead were completing fill-in-the-blank worksheets or writing short responses. Based on 209 secondary classroom observations, Applebee also documented that longer writing assignments were typically test essays to measure knowledge, and that the length of time allocated to prewriting was about three minutes, which included "everything from the time the teacher started introducing a topic until the first student began to write" (Applebee, 1981, p. 74). Only about 1/3 of the teachers required more than one draft, and teacher feedback focused more on mechanics, less on ideas. Applebee's research indicated that 30 years ago, writing instruction was general and superficial.

Twenty years after Applebee, Hillocks (2002) found some significant changes based on 300 teacher interviews. Teachers discussed multi-paragraph compositions even at elementary school levels, often using the five-paragraph approach. This finding confirmed that students were writing far more than before. Teachers also indicated the use of more prewriting activities (e.g., studying models of writing, analyzing characters, brainstorming and organizing ideas). They also indicated more use of peer responses to provide feedback to the writer, although the study did not find that more time was allocated

to revision. Unlike Hillocks, however, Khan (2000) did not find significant changes when examining the writing practices of a high performing, suburban high school. She examined composition assignments, quizzes, unit tests, and final exams, and found that 65 % of writing involved multiple choice, matching or true/false test responses. It is safe to say that the amount of substantive, generative writing produced at secondary levels has been highly variable.

Historically, adherence to rigid instructional practices has often constrained teacher understanding of what constitutes good writing instruction in the secondary grades. For example, Johnson, Smagorinsky, Thompson, and Fry (2003) closely examined the teaching practices of a neophyte teacher who focused on the five-paragraph theme. The researchers concluded that institutional pressures, poor work conditions, and limited professional development helped to explain the limited writing instruction received by students. In the Carnegie report titled "Writing Next," Graham and Perin (2007b) describes the five-paragraph essay as a rigid structure for essay writing, and that students should be able to apply a "variety of forms, strategies, knowledge, and skills" (p. 22). Today, writing instruction is viewed as a recursive, not linear, process that should be flexible to the writer's purpose and the writing context.

Writing Research: Middle School Grades

By the time students reach middle school, they are using writing to express understanding across academic disciplines. Collaborative learning integrating reading and writing, writers' workshops, and writing instruction within

academic subjects occur in middle schools, along with writing strategies that build self-regulation and self-efficacy. Angelis (2003) suggests that "curricular conversations" serve to strengthen student writing. In an observational study by Raphael, Pressley and Mohan (2008), middle school classroom teachers who engage 90% or more of the students in tasks that require thinking at least 90% of the time, used a variety of instructional techniques such as scaffolding, modeled problems solving, and strategy instruction. Moreover, students show increased engagement in writing when they were given more ownership to choose writing genres, styles, and length (Abbott, 2000).

Middle school students are using new literacies to engage in discourse for social and political purposes (Many, Ariail & Fox, 2011). These authors assert that multimodal literacies (e.g., blogging, emailing, podcasting, instant messaging, texting, tweeting, threaded discussion groups, social media such as Facebook and YouTube) are transcending written communication "rendering antiquated the notion of traditional reading and writing as the only legitimate forms of literacy" (p. 55). O'Brien, Beach, and Scharber (2007) conducted a 2-year study of 7th and 8th graders and found that students found digital media to be more engaging than traditional literacy instruction. While some parents and educators express concerns that condensed and abbreviated forms of text will undermine writing skills, Plester, Wood & Bell, (2008) did not find texting to be correlated with weak written language skills. Jacobs (2008) asserts that students need to be able to communicate using formal and informal patterns of language.

Writing Research: High School Grades

In the Nation's Report Card, as reported, by the 2011 National Assessment of Educational Progress (National Center for Education Statistics (NCES), 2012), of the 28,100 12th grade students from 1200 schools who were evaluated, 52 % scored only at the basic level and 21 % scored below basic. High schools are not using effective practices to teach writing since, nationally, more than half of the high school student population is not writing at proficient levels. "At the very least the teaching of basic literacy is no longer considered the exclusive responsibility of the elementary school teacher" (Bean & Harper, 2011, p. 63).

In an article on English language arts in the high school years, Bean and Harper (2011) speak to the impact of changing demographics on classroom instruction. Currently, high school student populations are more racially, culturally and ethnically diverse, due in part to immigration and globalization. If the demographic predictions are realized by 2020, that 2 in 5 students will be foreign-born or have one immigrant parent, this will further widen the range of English proficiency and further increase the heterogeneity in high school classrooms (Jimenez & Teague, 2009). Secondary teachers must attend to the full range of students' literacy skills, and design instruction and content that takes into account the cultural and learning diversity in their classrooms.

Technology has also created shifts in how we view writing. Snyder and Bulfin (2008) claim that more than half of all American teenagers have created material on the Internet. New technology tools for more collaborative forms of communication require multiple literacy competencies for career readiness

and are "redefining 'basic' literacies needed for 21st century life" (Bean and Harper, 2011, p.64). The availability of new tools are creating pedagogical shifts in writing instruction. According to these authors, there must be a shift from traditional, formulaic writing assignments to those that encourage more collaborative production. The end of high school marks the point at which students enter a more global world where they will need greater facility with multimedia technology, and be able to think critically, and communicate collaboratively with diverse, worldwide work communities.

Composing at Secondary Levels

In 1992, Smagorinsky and Smith affirmed three popular positions on teaching composition. The "general knowledge" position involves a process approach to writing (e.g., collecting/brainstorming , focusing/ordering/organizing, developing/drafting, and clarifying/revising ideas). The second position is that writing is "task specific" and requires different types of knowledge and procedures applied to various writing genres (e.g., narrative, informational, argument, opinion). The third position is that advanced writing is task specific and contextualized—more "community specific" whereby writers must learn the standards and processes of different communities (e.g. legal writing, journalism, scientific research). Smagorinsky and Smith (1992) indicate that the general knowledge position is addressed more at the elementary level, the task-specific position is addressed more at secondary levels, and the community-specific position is established more at post-secondary levels. Scott (2012) asserts that writing has a lifelong learning curve. It takes years to integrate the many processes that constitute good writing, such that mastering the craft of writing continues well into the adult years.

Writing Genres in the Secondary Grades

When writing narratives, McKeough (2013) states that typical 6th and 7th grade writers portray experiences that occur at different times and in different situations and then interpret these experiences based on character traits. By 8th and 9th grades, typical students include more character traits and mental states, including internal conflicts within characters. In the remaining high schools years, students add more layers of psychological complexity, employ varying perspectives and alternatives, and include paradoxes, metaphors, foreshadowing, and flashbacks. In middle school, rigorous standards expect logical event sequences, and the use of more precise language to signal shifts in time or location, as well as to capture action. In the high school years, students are expected to manage multiple points of view and multiple plot lines using a variety of narrative techniques (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

Argumentation involves upholding a perspective on a controversial issue. Students' skill with argumentation evolves across the secondary grades. McCann (1989) determined that 9th and 12th graders included more argumentative writing features of than 6th graders. Composing an argument requires problem solving, which is "constrained by the writer's cognitive capacities" (Ferretti & Lewis, 2013, p. 116.) Argumentation requires the full range process writing, from goal setting and planning to revision, and therefore, develops as a result of instruction plus maturation. The standards focus on writing opinion pieces in the elementary grades, but then introduce argumentation in middle school. The expectations for handling claims and counterclaims backed by credible sources, using logical reasoning to create a cohesive composition increases

across the secondary grades (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010).

Informative writing requires students to "create their own texts from other texts" and "analyze, synthesize, and integrate other's ideas" into their own writing (Newell, VanDerHeide & Wilson, 2013). When writing informative or explanatory text, students can build on personal experiences and use a variety of sources (e.g., text, images, art, audio, visual). By middle school, the standards expect that students can employ classification, compare/contrast, and cause/effect strategies, use graphics and multimedia to increase understanding, and craft language to clarify claims, reasons, and evidence. By high school the standards expect, 40% of assignments will be spent on informative/explanatory tasks and that students can organize more complex ideas, concepts and information to articulate differences or associations. Students will also be expected to use metaphor, simile and analogies (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010).

Today, more studies are focusing also on the microstructures in the writing of secondary students. Bermin and Nir (2010) examined the expository writing of students' ages 9-10 years, 12-13 years, and 16-17 years. These researchers found that written grammar becomes more refined over time as evidenced by the more sophisticated use of noun phrases, verb forms, adverbial clauses, transitional words and phrases, etc. By middle school, at the age of 11 or 12, students are able to write more complex sentences that have as many as five or six clauses.

Planning at Secondary Levels

Planning is more than just prewriting; it is part of the recursive writing process. Planning skills are related to age, cognitive development and experience (Lassonde & Richards, 2013). Older students use planning tools more strategically. Bereiter and Scardamalia (1987) found that 14 year-old students planned more with audience and purpose in mind, whereas students a few years younger focused more on planning content. They also found that the number of ideas generated during prewrting planning periods doubled between the ages of 10 to 13. Lassonde and Richards (2013) state that there are two types of planning: top-down advanced planning and real-time writing with extensive revision. Advanced planning, more so than real time writing, minimizes the load on working memory (Dean, Odendahl, Quinlan, Fowles, Welsh & Bivens-Taum, 2008) and gives students more control as they begin to write. However, planning is recursive in nature, in that planning is ongoing throughout the writing process.

Lassonde and Richards (2013) suggest that there are components to the planning process:

1. Contemplation of the task (e.g., nature of the task, structure of the task, page length, elements of the scoring rubric, concepts and vocabulary to address)
2. Activate prior knowledge on the topic (e.g., what is known, what is not known, what needs to be known, feelings on the topic)

3. Consider vocabulary and language use (e.g., concepts, terminology, formal or informal language)
4. Organize ideas (e.g., generate ideas, consider relationships among ideas, arrange ideas, consolidate ideas)
5. Ongoing planning (e.g., reflection, filling in gaps, planning in response to peer or teacher conferencing)

Revising at Secondary Levels

Revision is not something that takes place after writing, nor is it only changes to text already written. Revising refers to making changes "at any point in the writing process" (Fizgerald, 1987, p 484). Furthermore, revision is more than editing spelling and punctuation errors. MacArthur (2012, 2013) believes that learning about revisions to improve the effectiveness of a written assignment has a carryover effect for future writing. He offers multiple purposes for revising:

- Evaluating writing goals
- Making changes to organization and content
- Making changes to language
- Evaluating audience perspective
- Ensuring coherence and paragraph construction

Proficient writers revise frequently during writing. Fitzgerald (1987) found that students at elementary as well as secondary levels did very little substantive revising. However, today's college and career writing standards speak to the importance of revising for developing writers:

- To reconsider content and perspectives
- To ensure that the writing successfully communicates to an audience
- To improve the organization and quality of prose
- To expand ideas
- To transform understanding

Hayes (2004) contends that revising requires reading comprehension in that students must read effectively to detect needed changes. Additionally, writers must be able to distance themselves from the writing in order to evaluate the text. They need metacognitive and self-regulation skills to critically evaluate and revise text (MacArthur 2013). Students with learning issues often struggle with these skills and as such tend only to manage surface edits at a sentence level (De La Paz, Swanson & Graham, 1998).

Middle School Writing Expectations

In middle school the new rigorous writing standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) focus on topic development, logical organization, writing techniques

across types of writing such as previewing, compare/contrast, cause/effect, transitions in writing, use of graphics and multimedia, compound and complex sentence structures, expanding vocabulary to create cohesion and clarify relationships among ideas and concepts, and using evidence and citing sources to support claims. Narrative writing is expected to engage the reader, establish a context, use narrative techniques such as dialogue, pacing, description, and reflection to develop experiences, events and characters, use transitions words, phrases and clauses to show relationships and indicate shifts in time and setting, as well as, use sensory language to convey action, experiences and ideas. The ability to recognize and correct grammatical usage such as dangling modifiers, the use of compound-complex sentences, the appropriate use of verb forms (active and passive voice, imperatives, interrogatives subjunctive mood), morphological applications to spell conventionally, and new uses of punctuation (e.g., parentheses, dashes, ellipsis etc.) are expected at this level.

High School Writing Expectations

As stated earlier, the return to an emphasis on writing as part of the College and Career Standards, combined with the inclusion of writing tasks on high stakes secondary testing, have put writing back in the spotlight. High school writing standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) build on the skills learned in middle school. Informative and explanatory types of writing stress the organization of more complex ideas that make connections and distinctions, as well as expanded topics with more extensive information and well-crafted conclusions. They stress the importance of cohesion, using well crafted

writing to clarify relationships and build effective transitions. They stress learning to use similes, metaphors, and analogy. When writing arguments, students are expected to balance claims/counterclaims, strengths/limitations, reasons/evidence, and values/biases. High school standards encourage the use of multimedia and graphics such as figures and tables. At this level, students are learning to use parallel structures (i.e., balancing phrases or clauses within sentences) and grammatical/syntactical flexibility to improve writing style. They are using a mixture of vocabulary, phrases, and clauses to add variety and interest to their writing. They are learning to use punctuation conventions such as the use of colons, semi-colons and hyphenation. Conventional spelling is the considered the norm.

According to Olinghouse and Wilson (2012), writing research has investigated the different components of writing, but concludes that there is not yet a complete understanding of how writing develops across the grades. College and career readiness standards represent a major effort to articulate this development from grade to grade.

SPELLING DEVELOPMENT

This section presents research on spelling. It will describe changing perspectives on spelling development, as well as the linguistic and semantic knowledge that is necessary for learning to spell. As discussed in this section, the research confirms spelling's contribution to reading and writing fluency. Stage theory and repertoire theory of spelling development will be described to better understand spelling development across the age span. The section also reviews the research on spelling and students with disabilities. Formative approaches to spelling assessment will be discussed as a way to better understand spelling deficits and plan instruction. Detailed information on what spelling errors tell us will be described.

Perspectives on Spelling

Spelling is a skill associated with transcription. Good spelling allows a writer to write with greater fluency, while poor spelling can slow down written expression such that it impedes fluent writing. Between 18% and 27% of students demonstrate daily spelling problems (Graham, Morphy, Harris, Fink-Chorzempa, Saddler and Mason, 2008). For typically developing children, spelling abilities rapidly evolve in the primary grades and continue to improve with age. When using computers with modern day spell checkers and auto correction features, students, as well as adults, no longer have to fret over minor spelling errors. However, for some individuals, spelling is a lifelong problem that interferes with everyday activities such as writing a note to a friend or engaging in word games with friends. This segment presents various perspectives and research on spelling.

Spelling as a Linguistic Skill

Spelling is considered a linguistic skill that requires phonemic, orthographic morphological, and semantic knowledge (Masterson & Apel, 2010). Students use phonemic skills to parse out sounds within words (e.g., "bake" has 3 phonemes /b/a/k). They use orthographic skills when they associate letters with sounds and apply orthographic pattern knowledge to spell longer words (e.g., ph in phone, sch in school, ight in light). They use morphological knowledge to understand base words, prefixes and suffixes when spelling words (e.g., unhappy, unreadable). Over time, they also come to understand less transparent derivational forms (e.g., describe/description; satisfy/dissatisfaction). Apel, Wilson-Fowler, Brimo and Perrin (2012) studied the phonemic, orthographic and morphologic awareness skills of 56 2nd and 3rd graders and found that morphological awareness was the best predictor of students' word level reading and spelling abilities. Conversely, Siegel (2008) found that students with dyslexia scored much lower than their peers on morphological awareness tasks. Smith-Lock (1995) found a similar pattern for children with speech and language impairments, while Apel and Lawrence (2011) also found this to be the case for students with articulation deficits.

Spelling also requires an understanding that word meaning (semantics) can affect spelling. For example, semantic knowledge is needed to address homophones (e.g., there/their; no/know; would/wood; here/hear). As a result of the research that demonstrates the association between language and spelling development, Apel and Masterson (2001) argue that speech language pathologists (SLP) should play a role in spelling assessment and intervention as many SLPs have a unique background in phonology, morphology and semantics.

Mental Graphic Representations

As students read and spell new words by applying linguistic knowledge, they also develop orthographic images (MOI) or mental graphemic representations (MGRs) of these words. MGRs are the mental representations of whole words or parts of words in memory (Apel and Masterson, 2001). MGRs make it possible for a child to spell and read words fluently from memory. When a student cannot access an MGR for a given word, he or she must resort to applying phonological, and orthographic, and morphologic knowledge to parse out the segments and the sounds into phonemes, then link these to graphemes, and then write or type them all down. Apel, Wolter and Masterson's research (2006), indicate that typical preschool children acquire MGRs after minimal exposure to written words and this contributes to their early spelling abilities. However, Wolter and Apel (2010) examined the acquisition of MGRs in kindergarten children with language impairments and found that these students score lower compared to typically developing kindergarteners.

Spelling and Reading Correlations

Spelling ability is highly correlated to word level reading, reading comprehension and written composition (Apel, Masterson, & Brimo, 2012). In order to compose with ease, students must be able to spell efficiently. Decoding words when reading and encoding words when writing tap into similar skills, which is often why students read words that they can spell. The efficient retrieval of MGRs contributes to writing fluency, but also leads to reading fluency, which aids comprehension. Consequently, slow readers who are poor comprehenders are often poor spellers (Lennox & Siegel, 1996).

Spelling and Writing Fluency

Spelling can be a major impediment to written productivity. Writing fluency can be affected by handwriting difficulties and spelling difficulties, or by spelling difficulties alone. When students struggle with spelling, it constrains cognitive resources that would otherwise be used to address written composition. Determining the barrier to written productivity is imperative in order to make informed decisions regarding interventions and accommodations. While spelling is considered a transcription skill, it does not appear to be influenced by the response modality. For students in grades 2 to 6, spelling by hand did not differ significantly from spelling by keyboard (Masterson & Apel, 2006). Earlier research by Vaughn, Schumm, and Gordon (1992, 1993) determined that 3rd and 4th grade students with and without learning disabilities were able to learn to spell new words when writing, typing, tracing or moving letter tiles. Because modality has no apparent effect on the outcomes of spelling assessment, computers can be used to evaluate spelling.

Early Spelling Development

In the 1980s, researchers investigated the progression of spelling development in young writers in the primary and intermediate grades (Bissex, 1980; Gentry, 1982; Henderson and Beers, 1980; Templeton & Morris, 2000). These researchers demonstrated that spelling develops in predictable ways. This stage theory of spelling asserts that spelling progresses through clear stages of development (Bear, Invernizzi, Templeton & Johnston, 2000). Initially, preschool children use strings of alphabetic symbols to represents words. The first piece of writing most children attempt is their names, which challenges

their understanding of how letters are combined to form written words (Clay, 1982; Temple, Nathan, Temple, 2012). At age four or five, children begin to understand the alphabetic principle that letters "say their names," and will attempt use a prominent consonant that says its name to represent that word ("s" for sad, "m" for man). Gradually, they are able to discriminate more letter sounds and may spell words using initial plus final consonants ("bk" for bike). In time, when they are able to parse out more phonemes, they will inventively spell using more consonants and long vowels that "say their names" ("bik" for bike) Deciphering at the single word level is challenging so early writing takes the form of lists and short or incomplete sentences. They combine inventive spelling with high frequency words in first grade. Transitional spelling, which demonstrates an increased understanding of how words are spelled, though not yet conventionally, emerges typically in 2nd grade as children combine their knowledge of phonology and orthography to spell challenging words ("becuz"/because). Conventional spelling increases across 2nd and 3rd grade and beyond.

Misspellings, however, occur well into the middle school years and even into adulthood as longer, more complex words challenge our ability to spell correctly. More challenging words demand the need to apply our understanding of orthography and morphology. Additionally, we must develop mental graphic representations of how words are spelled so that we can write with more fluency. Shaughnessy (1977) was the first to recognize the logic of spelling errors. Spelling errors are not a sign of regression, but of growth during the secondary years.

Stage Theory Applied to Spelling Development

Stage theory descriptions help us understand general spelling progressions (Gentry, 1987; Temple, Nathan, Temple & Burris, 1993; Templeton, 2002; Bear and Templeton, 1998). Initially, when young children pretend to write (protowriting), they use letters to represent words and ideas, however, there is no letters-sound correspondence. This is often referred to as the preliterate or the prephonetic stage. As children come to understand the alphabetic principle, they begin to discriminate or decode initial letters that say their names, mostly consonants and long vowel sounds which is called the initial consonant stage. Over time, children begin to discriminate initial plus final consonant sounds in words—the consonant frame stage. Over time, children at the phonetic stage write words using letters to represent each phoneme. They begin to include long vowels in their inventive spellings, while short vowels tend to be place holders as they have not yet mastered short vowel decoding. At the transitional stage, children write words that follow the rules of English orthography, however over-generalized. Bear and Templeton (1998) further subdivided the transitional stage to include 3 substages: within-word patterns, syllable juncture, and derivational constancy (Figure 1.2). Eventually, as children read and write more, they retain the conventional spellings of words. At first, they more often retain the spellings of high frequency words, but gradually they are able to spell more novel words automatically.

Figure 1.2. Developmental spelling stages (Ferroli and Shanahan, 1987; Bear and Templeton 2002)

Spelling stage	Characteristics of this stage	Examples
Prephonemic	Random letter strings or mock letters. No sound to symbol relationship.	zxcv = team
Semiphonetic Early Phonemic	Beginning awareness of the alphabetic principle. One consonant sound or equivalent consonant that is prominent in the word.	 t or m = team
Consonant Frame	2-3 of the prominent consonants or equivalent consonants. Students are generally at this stage in the kindergarten, and early first grade levels.	tm = team
Phonetic	Each sound in the word is represented with a letter. Students are generally at this stage in the 1st grade.	tem, tim = team
Transitional **Within-word pattern**	Incorrect spellings that apply standard English spelling conventions. Students enter this stage generally around the 2nd grade Students begin to understand orthographic rules (e.g., spell short vowel sounds correctly and some long vowel combinations). Students are generally at this stage between the 2nd and 4th grades.	 teem, teme = team
Syllable juncture [or affiixes]	Students are working on the unstressed syllables in words with more than one syllable (prefixes and suffixes). Single syllable words are spelled with correct vowel patterns. Students demonstrate this between grades 3 and 8.	hopeing = hoping sampul = sample misstake = mistake desimeter = decimetee
Derivational constancy	Students understand that words are derived from the same root, but can be modified at the multisyllabic level. Depending upon the complexity of the word, this stage can begin around 5th grade, continues into middle school and even extends into adulthood.	hopeing = hoping sampul = sample misstake = mistake desimeter = decimeter
Conventional	Correct spellings	

Repertoire Theories of Spelling Development

Recently, the stair-stepped, stage theory of spelling development has been reconsidered. Critical analysis of spelling development demonstrates that children use their knowledge of phonology, orthography, vocabulary, morphology and multiple linguistic strategies throughout the process of learning to spell. Based on spelling research, the "repertoire theory" of spelling development has been proposed. According to Apel, Masterson, and Neissen (2004b), "The repertoire theory of spelling suggests that from kindergarten through adulthood, spellers access and utilize the various linguistic factors underlying spelling across time" (p. 647). For example, children at phonetic stages apply phonemic, as well as orthographic and even rudimentary morphological skills combined with MGRs. Students at transitional stages will apply orthographic and morphological rules more often, but also draw upon phonologic when attempting to spell complex, multisyllabic words. Students typically present spelling abilities across more than one developmental stage. Young (2007) analyzed spelling across multiple tasks (e.g., spelling lists, compositions) and determined that a small percentage of errors fell outside the students' identified stage of spelling development, and were typically associated with the previous stage of development. While there is general agreement that spelling progresses developmentally (Schlagal, 2013), the repertoire model accounts for the uneven, overlapping spelling development skills that children demonstrate as their writing skills progress.

Spelling and Students with Disabilities

Persistent spelling difficulties are a signature characteristic associated with severe reading disabilities affecting 5-10% of the population (Maughn, Messer, Collishaw, Pickles, Snowling, Yule, & Rutter, 2009). Genetic links and phonological deficits have been identified with boys more affected than girls (Snowling and Hulme, 2008). There is also evidence that poor readers continue to show impairments in spelling into their adult years, even though they demonstrate some resolution of reading difficulties (Shaywitz, Fletcher, Holahan, Shneider, Marchione, Stuebing, Francis, Pugh & Shaywitz, 1999; Bruck, 1992). Masterson and Apel (2010) state, "children with LD experience greater struggles segmenting and blending sounds in words, acquiring knowledge of and using typical orthographic rules and MGRs, and recognizing or identifying appropriate derivational forms. These difficulties in the different linguistic awareness areas are highly associated with their abilities to read and spell" (p. 188).

Older students with spelling disabilities often demonstrate difficulties with more advanced levels of morphological spelling knowledge due to the complexity of word patterns, persistent deficits in phonological analysis, and the lack of systematic instruction. For students with learning disabilities, researchers have demonstrated that spelling improves when underlying linguistic knowledge is addressed (Apel, Masterson, & Hart, 2004; Kellman & Apel, 2004; Roberts & Meiring, 2006).

A study of the writing skills of college age students with and without dyslexia showed that the overall essay quality of students with dyslexia was poorer

than same-age peers and was linked to their level of spelling accuracy, working memory, and handwriting fluency (Connelly, Campbell, MacLean, and Barnes, 2006). In this study, students with dyslexia produced more spelling errors even when compared to a younger group of students without dyslexia matched by spelling level. The researchers also found that vocabulary, capitalization and punctuation were poorer in college students with dyslexia; however, ideas, organization, sentence structure, and grammar were less affected. These findings suggest that low-level transcription factors continue to impact student writing in young adults with dyslexia.

On the Isle of Wight, a 30 year follow-up study was conducted with individuals initially identified, at ages 14 and 15, to have significant reading disabilities and spelling deficits (Maughan, et al., 2009). Poor readers' spelling abilities continued to be impaired at ages 44 and 45. These individuals, with reading skills delayed more than 28 months when tested in adolescence, were more likely to have left school or have completed their education earlier than the control group, and were more likely to have jobs with less literacy demands. Eighty percent of the adults with poor reading perceived themselves as poor spellers who experienced difficulty writing a letter.

ASSESSING SPELLING

Standardized educational tests such as the Woodcock-Johnson III spelling subtests (Woodcock, McGrew, & Mather, 2007), and the Test of Written Language, 4th edition spelling subtest (Hammill & Larsen, 2009) allow educators to compare a student's performance to a normative sample. The Woodcock-Johnson III looks at the overall spelling accuracy of dictated letters, words, and pseudowords, while the Test of Written Language, 4th edition measures the overall spelling accuracy of dictated sentences. Both tests allow educators to understand how a student's spelling skills compare to a normed group, however, neither of these provides information to guide instruction nor monitor progress. Neither test is designed to delineate a student's level of linguistic knowledge (Masterson & Apel, 2010).

Traditional spelling tests using graded word lists can provide data on spelling proficiencies (e.g., at grade level, below grade level), but this data may not shed light on the nature of spelling difficulties. Masterson and Apel (2010) conducted two studies comparing traditional (correct/incorrect) scoring, to scoring that examined linguistic knowledge ("spelling sensitivity scoring"). The first study involved 46 kindergarten and first grade children spelling from dictated word lists, and the second involved 78 3rd, 4th, and 5th grade students based on a 15-minute story writing task. The results across both studies indicated that sensitivity scoring was better able to detect changes in spelling ability and provided more specific information on changes in students' linguistic knowledge.

Currently, the evaluation of the developmental progression of spelling abilities employing a more linguistic approach is widely accepted. Examination of linguistic skills is considered a formative approach that better informs instruction (Apel et al., 2012). Spelling from a dictated inventory of words with a variety of linguistic patterns, as well as words that demand MGRs, provides insight into children's spelling development. Authentic writing tasks also can provide insight into spelling development, however, children may choose to use words they perceive that they can spell when generating writing and avoid those they cannot spell with ease. Together, the analysis of misspellings using dictated word lists and writing samples can help educators analyze students' current levels of spelling abilities based on linguistic knowledge (Masterson & Apel, 2010). The input of speech language pathologists trained in linguistics may be particularly helpful to classroom teachers seeking assistance translating linguistic-based spelling assessment data in an effort to adjust instruction.

What Do Spelling Errors Tell Us?

Spelling, like reading, is a written language skill that draws upon an individual's repertoire of linguistic knowledge, including phonological awareness, and knowledge of orthography, vocabulary, morphological and semantic relationships, as well as mental orthographic images. Each of these areas of linguistic or "word study" knowledge contributes to spelling success, and a deficit in any one of these areas of word study knowledge will manifest as a specific pattern of misspelling (Wasowicz, 2007).

Phonological Awareness

Individuals rely upon the phonological awareness skills of phoneme segmentation, sequencing, discrimination, and identification during the spelling or "encoding" process. They use phonological segmentation skills when spelling by breaking down words into smaller units-such as syllables and phonemes-then linking these smaller units to their written forms. They use sound sequencing skills to map the letters to sounds in the correct order. They use phoneme discrimination and identification skills to perceive differences between speech sounds (e.g., between the short vowel e and short vowel i sounds), and to recognize that a difference in sound signals a difference in meaning.

Orthographic Knowledge

Individuals also draw upon their orthographic knowledge during the encoding process. Specifically, individuals draw upon their knowledge of sound-letter relationships and knowledge of letter patterns and conventional spelling rules to convert spoken language to written form. Orthographic knowledge includes knowledge of specific letter-sound correspondences (e.g., the / k /sound can be represented by the letters c, k, ck, cc, lk, ch, que); knowing which letter patterns are acceptable (e.g., the / k /sound is almost always spelled with the letter k at the end of a word after a long vowel sound); and understanding sound, syllable, and word position constraints on spelling patterns (e.g., the / k /sound at the beginning of a word is never spelled with the letters ck, cc, lk).

Vocabulary

Individuals use vocabulary knowledge to accurately store and retrieve the correct spelling of words. The knowledge of word meaning is particularly important for the correct spelling of homophone words (e.g., bare and bear). Vocabulary knowledge is also helpful to correctly spell the wh consonant digraph because the /w / sound at the beginning of question words (what, where, when, why, which) is always spelled with the letters wh.

Morphological Knowledge & Semantic Relationships

Individuals also rely upon their morphological knowledge and knowledge of semantic relationships when spelling inflected or derived forms of words. Specifically, individuals rely upon their knowledge of letter-meaning relationships of individual morphemes (i.e., suffixes, prefixes, base words, and word roots), their understanding of semantic relationships between a base word and related words, and their knowledge of modification rules when adding prefixes and suffixes. Inflected words contain suffixes that provide information about time or quantity without changing the meaning or class of the words (e.g., walk-walked; cat-cats). Derived words contain affixes (prefixes or suffixes) that change the meaning and sometimes the class of words (e.g., cycle–recycle; friend–friendly). When an individual is required to spell an unfamiliar word (e.g., exception), knowledge of the base word (i.e., except) and certain word endings (e.g.,-ion) can help the student spell the unfamiliar word correctly. An individual draws upon knowledge of rules for modifying base words to correctly spell inflected and derived forms of words. Individuals also draw upon knowledge of semantic relationships and rules for modifying

words to spell irregular plural nouns, irregular past tense verbs, contractions, and possessive nouns. The use of knowledge of word parts and related words to spell words becomes increasingly important as individuals begin to spell words of greater length and complexity.

Mental Orthographic Images

As previously discussed, individuals need to develop clear and complete mental representations of previously read words. These mental images of words, also known as mental orthographic images (MOIs) or mental graphemic representations (MGRs) are stored in an individual's long-term memory after repeated exposure to them in print. Inadequate MGRs are often formed when individuals use inappropriate reading strategies such as partial cue analysis, a process whereby the student guesses the identity of a word after decoding only the first letter(s) of the word. Clearly and completely developed MGRs allow individuals to quickly recall and correctly spell words and word parts. Individuals must rely upon the mental image of a word when phonological awareness and knowledge of orthography, vocabulary, word parts, and related words are not sufficient to correctly spell a spelling pattern within a word (e.g., rope not roap, bucket not buckit, actor not acter).

Error Analysis Using Spelling Word Lists

Spelling word lists that present a range of linguistic patterns can provide insight into a student's linguistic knowledge. The following charts, developed by Dr. Jan Wasowicz, Ph.D. CCC-SLP, present examples of different types of misspellings that may reflect a deficit within each of the five areas of language described above. Figure 1.3 shows error analysis for student in grades K-2, Figure 1.4 displays a word list appropriate for intermediate students in grades 3-5, and Figure 1.5 shows a word list for secondary students in middle and high school.

These lists present a way to screen for error patterns. For example, if an elementary student spelled the word "truck" with tc or tk , this would suggest that the student can detect some but not all phonemes, and that targeted instruction on phonemic awareness might be needed. If another student spelled this same word as trock, this would suggest that the student detects the number of phonemes but is not discriminating the vowel sound, such that instruction on the short "u" vowel might be needed. If another student spelled "truck" as truk, this would indicate that this student could detect the correct number of phonemes but does not demonstrate full orthographic knowledge of the "ck" pattern at the end of a word.

As an example using a word from the secondary level list, if a student spelled the word "edition" as endition, this would show that the student is not detecting all phonemes accurately. If another student spelled it as editian, this would suggest that the student detects the sequence of phonemes, but does not demonstrate morphologic knowledge of the suffix "ion". If a third

student spells this word as “edision”, it implies that the student does not fully understand that the base word is “edit,” and the ion suffix means “process or act.” And finally if a fourth student spelled the word “edition” as “addition”, this indicates that the student in unaware of the meaning of the target word or has not established a solid connection between the word’s meaning and its correct spelling.

In the 7th grade writing sample below, this student demonstrated:

- Deficits in phonological awareness: repluic (republic), indivial (individual), Amarican (America), aleginec (allegiance), libety (liberty)
- A deficits in vocabulary knowledge: two (to), wich (which)
- A deficit in morphological knowledge: justos (justice),
- A deficit in mental graphic representations: pleage (pledge), on (one)

> I pleage of aleginec to the flag of the United States of Amarican and two the repluic for wich it stands on nation under G-d indivial to libety and justos for all.

It is important to note that educators should use these error analysis charts only for general guidance when analyzing spelling errors; this list is not exhaustive and additional information may be needed to correctly identify the full nature of spelling errors. Teachers can consult with speech language pathologists who have received training in conducting spelling error analysis for help with linguistic error analysis. Teachers also can use commercially-available software, SPELL-2, to conduct spelling error analysis.

Early Elementary Spelling Word List

Figure 1.3. Early Elementary (K-3) misspellings that may reflect a deficit within each of these five areas of language

		Deficit in Phonological Awareness	Deficit in Orthographic Knowledge	Vocabulary Deficits	Deficit in Morphological Knowledge	Deficit in Mental Graphemic Representation
1	hen	hn henu han hne	hon henn	N/A	N/A	N/A
2	jog	jg joga jug goj	yog jogg gog	N/A	N/A	N/A
3	was	ws wasa wos saw	yas whas uas	N/A	N/A	N/A
4	thing	thng thingng thin thnig	hing theng	N/A	N/A	N/A
5	choke	chk cho chokes shoke chkoe	joke chock tchoke	N/A	N/A	N/A
6	raid	rd ray raind red rdai	waid rad rraid	N/A	N/A	N/A

		Deficit in Phonological Awareness	Deficit in Orthographic Knowledge	Vocabulary Deficits	Deficit in Morphological Knowledge	Deficit in Mental Graphemic Representation
7	call	kl cll calld clal	cole kall ckall	N/A	N/A	N/A
8	where	whr whuere weher	yere were uere	were wear ware	N/A	N/A
9	truck	tk tuck turuck trock turck	chruck truk trucc	N/A	N/A	N/A
10	switch	swtch sitch	swit swich sawitch swetch swtich	N/A	N/A	N/A
11	bushes	bushs bushises buches bsuhes	dushes	N/A	bushez	N/A
12	shopping	shoing shoppaing shupping sohpping	hopping sopping	N/A	shoppeng shoping shoppin	N/A
13	cries	cies curies cires	kries	N/A	cryes crys crise	N/A
14	biked	bk bike spiked bkied	diked	N/A	N/A	sed
15	said	sd saind sad siad	caid	N/A	N/A	sed

N/A = not applicable to this word

Given the list of words above:

- At the kindergarten level, you can expect that students are attempting to spell words using primarily their phonological and orthographic pattern awareness (mostly alphabetic principle), with some MGRs for high frequency words.
- At the 1st grade level, you can expect that students are demonstrating more mastery of their phonological and orthographic awareness with more MGRs for high frequency words.
- At the 2nd grade level, you can expect that students are demonstrating more orthographic patterns within words and more MGRs for common words. They also are using some morphological awareness, typically for inflectional morphology (e.g., –s, -ing).
- By the end of third grade, we expect most students to correctly spell these words.

Intermediate Spelling Word List

Figure 1.4. Late Elementary (3-5) misspellings that may reflect a deficit within each of these five areas of language

		Deficit in Phonological Awareness	Deficit in Orthographic Knowledge	Vocabulary Deficits	Deficit in Morphological Knowledge	Deficit in Mental Graphemic Representation
1	fruit	frt fuit faruit thruit firut	frat frut	N/A	N/A	froot
2	place	plc pace plance plece plaec	pllace plac	N/A	N/A	plase
3	city	cit cinty cety ctiy	cite cyty	N/A	N/A	sity cidy
4	knife	knf knifet knithe kinfe	kife kniffe	N/A	N/A	nife
5	flavor	favor flavord flevor flaovr	flavr flavvor	N/A	N/A	flaver
6	bottle	btl bole bonttle buttle botlte	dottle bottl bottil	N/A	N/A	boddle
7	grudge	gudge grundge grodge grduge	grud gruj	N/A	N/A	N/A
8	caught	ct cut caugh caughft caguht	cauht kaught	N/A	N/A	cought
9	their	thr theia tehir	thure	There They're	N/A	there, they're thare, thair

		Deficit in Phonological Awareness	Deficit in Orthographic Knowledge	Vocabulary Deficits	Deficit in Morphological Knowledge	Deficit in Mental Graphemic Representation
10	climbed	cimbed climb culimbed	klimbed climmed	N/A	climbd climbbed climed	N/A
11	calves	calv clves cales colves	celves kalves	N/A	calfz calfes caves	N/A
12	squinting	sqinting squininting squenting squniting	skwinting scuinting	N/A	squinteng squintting	N/A
13	voyage	voyge voylage vyoage	vouage voyag	N/A	voyuge	voiage
14	measure	msr meaure meansure masure meausre	measurre	N/A	measur	mesure
15	misspell	msspell mispelld missepll	missppell misspel	N/A	musspell mispell	N/A
16	guilty	guity guility guitly	guillty	N/A	guiltee guiltty gilty	N/A
17	Friendliest	fiendliest friendlest frandliest friendilest	fhriendliest	N/A	friendiast friendlyest	N/A
18	magician	mgician magicn magecian maigcian	najician majycian	N/A	magishun magition mugician	N/A
19	majority	mjority majorinty maojrity	magority	N/A	majorety majorrity	N/A
20	continuous	continous contintuous contenuous conitnuous	kontinuous contanuous	N/A	continuis continueous	N/A

N/A = not applicable to this word

Given the list of words above:

- At the 3rd grade level, you can expect that students are demonstrating more mastery of orthographic spellings, with more correct vowel patterns, and morphological spellings using basic suffixes (e.g., -es, -ed,).
- At the 4th grade level, you can expect that students are demonstrating more common morphological spellings for 2 and 3 syllable multi-morphemic words (e.g., likeable, happiness, friendliest).
- By the end of fifth grade, we expect students to correctly spell most of these words; some MGR errors may be observed for low frequency words.

Secondary Word List

Figure 1.5. Middle to high school misspellings that may reflect a deficit within each of these five areas of language

		Deficit in Phonological Awareness	Deficit in Orthographic Knowledge	Vocabulary Deficits	Deficit in Morphological Knowledge	Deficit in Mental Graphemic Representation
1	trounce	trouce tarounce trunce tronuce	chrounce trounc trounse	N/A	N/A	N/A
2	enough	nough enoupgh enawgh enoguh	enoug enuf	N/A	N/A	enouf anough
3	distinct	dstinct distict disticnt	distinkt distingct	N/A	destinct distenct	distingt
4	whistling	whistlng whestling wihstling	whiistling whystling	N/A	wistling whissaling whistleing whistleng	N/A
5	appealing	appealng appealding appealin appelaing	appealling	N/A	apealing appeeling uppealing	N/A
6	statue	satue stantue stetue satute	sdatue stautue	N/A	stattue stachue	Statu
7	misheard	mishrd mistheard misherad	mishearrd mischeard	misherd	missheard misheared	N/A
8	spectator	spetator spectatator spictator spectaotr	specthator spectattor	N/A	specktator spectatir spectador	spectater
9	criticize	citicize caritицize creticize critizice	kriticize criticisse	N/A	critisize cridicize criticise	N/A

		Deficit in Phonological Awareness	Deficit in Orthographic Knowledge	Vocabu-lary Deficit	Deficit in Morphological Knowledge	Deficit in Mental Graphemic Representa-tion
10	changeable	chageable changedable chengeable chanegable	changable channgeable	N/A	changeabel chaingeable	changeible
11	reinforcement	reinforcemet reinforcetment reinforcemnet	reinforcment	N/A	reanforcement reinforsement	reenforcement
12	indefinite	indefnite indefininte indifinite indfeinite	indephinite	N/A	indefanite indefinate indefinnite endefinite	indefinit
13	edition	editn endition edetion	edisshion edytion	addition	eddition edision editian	N/A
14	chlorinated	chlornated chlorinanted chlorineted cholrinated	klorinated chlorinatted	N/A	clorinated chlorinatid chloranated chlorinaded	N/A
15	irreversible	irrevrsible irreversetible irreversbile	irreversibull	N/A	erreversible ireversible irrevercible	irreversable
16	predetermination	predetermnation predetermindation predeterminetion predeternimation	predeterminattion	N/A	predeturmination pridetermination predetermmination	predetermin
17	permissibility	prmissibility permistibility permessibility permissibitily	permassibility	N/A	permiscibility permisibility	permissabiility
18	disciplinary	disciplnary disctiplinary desciplinary disicplinary	dicsiplinary	N/A	discipline ary disiplinary disciplinnary	N/A
19	commercialism	commerclism commercitalism commercialsim	commercalism	N/A	commershalism commercielism commurcialism	N/A
20	expeditious	expditious expenditious expedetious expdeitious	expeditous	N/A	expettotious expeditius expaditious ekspeditious	N/A

N/A = not applicable to this word

Given the word list on previous page:

- You can expect middle school and high school students to correctly spell most of these words; some morphological errors may be present and MGR errors may be observed for low frequency words.

At any point in spelling development, an individual's spelling of words reflects his or her linguistic knowledge and literary capabilities at that moment in time. Accordingly, an individual's misspellings are a "window" to underlying linguistic deficits and analysis of a carefully collected sample of his or her spelling errors can be used to identify which linguistic deficits are interfering with that student's reading and spelling.

It's important to keep in mind, however, that the example misspellings presented in the charts above are just that – examples of how a student with a language-based spelling problem may misspell a word. For each example provided here, there may be a multitude of misspellings of the target word that reflect the same type of underlying linguistic deficit. Also important to keep in mind is that the limited number of words in the word lists provided here, and the absence of additional data that would need to be collected for valid interpretation of the full range of spelling errors, precludes using these words lists for comprehensive diagnosis and instructional-planning. For all of these reasons, use this resource only for screening, to assist you with determining if a language-based spelling problem may be present Further assessment of a student's word study language skills may be warranted.

Comprehensive Assessment of Language-Based Spelling Deficits

If you suspect a language-based spelling problem, the next step is a comprehensive assessment to obtain a valid and reliable measure of the student's word study knowledge and to plan appropriate, differentiated word study intervention to remediate the underlying language deficit(s).

Using carefully constructed and extensive word lists (80-185 words) that adequately represent specific types of spelling knowledge used throughout the spelling acquisition process and collecting additional diagnostically-relevant data as needed is it possible to reliably determine if, and which, linguistic deficits are interfering with that individual's spelling and reading and precisely what type of intervention the student needs. Note that this diagnostic, prescriptive method of assessment is very different from developmental spelling inventories (e.g., Bear, Invernizzi, Templeton, & Johnston, 2000) that describe what letter patterns a student can and cannot spell. A diagnostic, prescriptive assessment goes beyond these developmental inventory measures by using error analysis to determine why a student misspells words (i.e., what are the underlying linguistic deficits) and precisely what type of word study instruction is needed.

A comprehensive, diagnostic and prescriptive method of spelling error analysis is implemented in the SPELL software assessment program (Masterson, Apel, & Wasowicz, 2006: Learning By Design, Inc. Evanston, IL). The SPELL software program saves valuable time and enormously simplifies the tedious task of conducting a diagnostic prescriptive assessment. A criterion validity study (Masterson & Mooney, 2006) conducted with 135 students in grades 1-6 compared participants' performance on SPELL to their performance on

two subtests of the Woodcock Diagnostic Reading Battery (Woodcock, 1997) and the Test of Written Spelling-4 (TWS-4; Larsen et al., 1999). Pearson-r correlations and multiple regression analysis indicate SPELL validly measures students' spelling abilities, decoding skills, and identification of sight words and that SPELL can be used to identify word study goals in a variety of grades and settings.

This method of assessment has been successfully performed using the SPELL software with individuals as young as seven years of age, and with a variety of clinical populations including individuals with language impairments, severe speech and physical impairments, and hearing impairments; as well as with students who are in general education (Apel, Masterson, & Hart, 2004a; Hart, Scherz, Apel, &, 2007; Kelman & Apel, 2004; Yakey, Wilkerson, & Throneburg, 2006). When done properly, this type of analysis may even be more sensitive than standardized measures of linguistic competencies. In other words, a student may score within normal limits on the more general measure associated with the standardized test, yet linguistic deficits can be uncovered through spelling error analysis.

Once the linguistic deficits are identified, the clinician has a clear roadmap for systematic instruction or remediation of spelling and related linguistic skills. Research indicates that a multiple-linguistic approach to spelling instruction, as prescribed by SPELL, leads to significant improvement in spelling performance and word-level reading ability (Kelman & Apel, 2004; Wolter, 2009). When compared with traditional spelling instruction, the multiple-linguistic approach to spelling instruction, as prescribed by SPELL, is significantly more effective (Apel, et al., 2004a).

HANDWRITING

This section presents various perspectives and research on handwriting. It begins by addressing the role of handwriting and the classification of dysgraphia. The research covers the prevalence of handwriting difficulties, grasp patterns, handwriting styles, as well as the importance of achieving handwriting automaticity. Updated studies on handwriting speeds and research related to students with disabilities are also presented. Judging by the literature, there continues to be an interest in handwriting, and in particular, the role that it plays in fostering early literacy.

Perspectives on Handwriting

Writing remains a multi-faceted task that involves far more than motor skills. According to Rosenblum, Weiss, and Parush (2003), "to produce written text, a student must initiate and execute simultaneously a number of motor and cognitive tasks, including ideation, planning, text production, spelling, punctuation, grammar, self monitoring, evaluation and orthographic-motor integration" (p. 42). These authors report that, in general, handwriting fluency improves with age and schooling, and that most children develop sufficient proficiency to write legibly without undue effort so as not to interfere with higher-level thinking. Nevertheless, handwriting is only one component of writing. Medwell, Strand and Wray (2009) write, "handwriting is not just about training the hand; it is about training the memory and hand to work together to generate the correct mental images and patterns of letters and translate these into motor patterns of letters—automatically and without effort!" (p. 330).

It is difficult to estimate the amount of time students spend performing writing tasks per day. McHale and Cermak (1992) are widely cited and report that that 30%-60% of a child's school day is spent performing fine motor tasks, consisting mostly of handwriting tasks. A national study on handwriting practices as detailed by Graham (2010) found that 90% of teachers in grades one to three reported that they allocated an average of 70 minutes per week to handwriting, which amounts to around 14 minutes per day.

Is Handwriting Still Necessary?

Handwriting is formally introduced in kindergarten. Handwriting proficiency typically increases across grades one to three. By 4th grade, today's students are expected to be able to handwrite for longer periods and, in the ensuing years, to handwrite longer answers for test questions and extended essays. Currently, handwriting is still needed for class work to take notes and complete worksheets. At the secondary level, speed of production is more of an issue and students must balance speed with legibility as they write for extended periods of time. Mogey, Haywood, van Heynigen, Dewhurst, Hounsell, et al. (2008) contend that given the unresolved challenges of replacing handwritten exams with computer-based exams, handwriting is still important at secondary and post-secondary levels. Handwriting is also a life skill for taking a phone message, completing a form, and writing a personal note. Barnett, Henderson, Scheib, and Schultz (2009) assert that, at present, both handwriting and computing skills are necessary.

Is Cursive Handwriting Still Needed?

In an article titled "Do we really need cursive writing?" Carpenter (2008) reports that cursive styles are needed for signatures and personal notes and that it is important to be able to read cursive writing. But Carpenter also notes contrary opinions. Some feel that we spend far less time writing personal notes because there are other faster tools for communication, such as email and social networking. Graham (as cited by Carpenter, 2008) states that style of handwriting is not the central issue; it is more important that students have some form of fluent transcription, whether it is manuscript, cursive, a combination of the two, or keyboarding. He asserts that when considering the number of students who struggle with writing "handwriting is a small part of the overall writing picture" (p. 81).

Research still does not provide a clear answer of the effectiveness of various forms of script. Duvall (1985) conducted a study of styles of handwriting and found that cursive was the most difficult style for beginning writers and that manuscript was easier than D'Nealian. More recently, Morin, La Voie, and Montesinos (2012) examined manuscript, cursive, and manuscript/cursive combined in 715 children at the beginning and end of 2nd grade and found that students who wrote cursive wrote slower than students using other styles of writing. Graham (2010) recommends that teachers begin with manuscript because children more often enter formal schooling knowing how to make some manuscript letters, that there is some evidence that manuscript is easier to learn than cursive, that once mastered it can be as fast as cursive, and that manuscript writing may facilitate reading development in the early grades since it more closely resembles the text found in books. He reports that

children ultimately develop their own personal style of handwriting, which is often a combination of manuscript and cursive writing with strokes that are modified or eliminated.

Dysgraphia

Handwriting legibility has long been a concern. Complaints about handwriting date back to 200 BC in a comic play by a Roman comedian when attempting to read a handwritten letter (Carpenter, 2008). And in 1848, the father of American penmanship, Plati Rogers Spencer, first published exercises to improve handwriting, which led to decades of classroom emphasis on penmanship (Carpenter, 2008).

The word "dysgraphia" comes from the Greek words dys, meaning "impaired," and graphia, meaning "making letter forms by hand." Berninger and Wolf (2009) support an expanded definition, in which dysgraphia is described as a transcription disability. They describe dysgraphia as a writing disorder associated with impaired handwriting and orthographic coding (i.e., the correspondence of phonemes to alphabetic letters that contribute to spelling). While dysgraphia was referenced in previous Diagnostic Manuals of Mental Disorders (American Psychiatric Association, 2013), in the latest DSM-V, the term dysgraphia is not referenced. Instead, impairments of written expression are listed under specific leaning disorders and include impairments in spelling, grammar and punctuation accuracy, and/or clarity and organization of written expression.

For some children, handwriting difficulties are transient; for others, handwriting deficits are linked with physical or learning disabilities. Prolonged difficulties with handwriting are often associated with academic and learning difficulties (Simner, 1982; Harvey and Henderson, 1997). Poor handwriting is characterized by inappropriate spacing between letters or words, incorrect or inconsistent shaping of letters, poorly graded pencil pressure, letter inversions and the mixing of different letter forms (Hamstra-Bletz and Blote, 1993; Rubin and Henderson, 1982; Sovik, Arntzen & Thygesen, 1987). Overvelde and Hulstijn (2011) believe that all children's handwriting should be examined in the 2nd half of grade 3 when handwriting is more stable, and that children should not be described as dysgraphic prior to grade 3.

Handwriting Research

In a 1995 review of handwriting research, Dobbie and Askov (1995) reported that handwriting research was plentiful in the 1960s and 1970s, and expanded in number in the 1980s. Research in the 1980s focused on letter formation legibility, body and hand positioning, speed, handwriting tools, and instructional instruments and techniques. In the 1970s and 1980s, there was also significant research on how typically developing children acquire literacy, with a focus on early writing development. In literacy rich environments, writing was seen as developing naturally. There was more focus on the function of writing rather than form. In the 1990s, attention shifted away from formal handwriting instruction.

Prevalence of Handwriting Difficulties

Estimates of the prevalence of handwriting difficulties vary widely from 10%-34% (Smits-Engelsman, Niemeijer & van Galen, 2001), depending upon the age of the student population and the measuring instrument. Prevalence is generally higher for children in the primary grades compared to upper grades. Graham (2010) reports that at the elementary level, the range is from 12 – 44% of children. The latter statistic, however, is based more on teacher surveys (Alston, 1985; Rubin and Henderson, 1982). Overvelde and Hulstijn (2011) assessed handwriting development in the fall and spring of the school year across grades 2 and 3. They found that students who scored as dysgraphic decreased from 37% to 17% by the end of grade 2, and further decreased to 6% by grade 3. A large-scale survey of primary school children in the U.K. showed the number of children with handwriting difficulties to be around 12% (Barnett, Stainthorp, Henderson, & Scheib, 2006). In a national survey on handwriting instruction in grades one to three, only 39% of teachers classified their students' writing as adequate, and just 46% reported that their students' handwriting kept pace with classroom demands (Graham, 2010). The problem does not necessarily rest only with students; only 12% of teachers reported receiving adequate training on how to teach handwriting (Graham, 2010).

Handwriting and Gender

Handwriting and gender have been examined by numerous researchers, who consistently find that girls outpace and write more neatly than boys. Multiple studies in the 1980s and 1990s show that boys are more likely to be identified with handwriting problems than girls (Hamstra-Bletz & Blote, 1993; Rubin and Henderson, 1982). Research confirms that girls show better quality and letter formation than boys (Graham & Miller, 1980; Ziviani and Elkins, 1984). Girls also tend to write faster than boys (Berninger & Fuller, 1992; Ziviani and Elkins 1984.) More recently, Medwell et al. (2009) found that boys in grade 5 on average scored 5 letters per minute (LPM) lower than girls, and boys in grade 1 scored 3.5 LPM lower than girls.

This research suggests that boys are at higher risk for difficulties with motor control and handwriting automaticity, which interferes with the ability to compose. Katusic, Colligan, Weaver and Barbaresi's study (2009) showed that boys were two to three times more likely to demonstrate writing difficulties as indicated by poor handwriting, poor grammar and punctuation, poor paragraph organization, spelling errors, and written language disorders. It calls into question whether more attention should be paid to boys' handwriting development in the early years to avoid long-term effects on self-efficacy.

Language by Hand

As students transition out of the elementary grades, the emphasis in the past decade has been on composing text rather than on transcription skills. Handwriting and keyboarding have been viewed as mere presentation skills (Medwell &Wray, 2007). However, there is a growing body of literature showing that handwriting in the primary grades is more than just a motor act; it is integral to learning to write. Berninger, et al. (2002b) stress that writing involves "language by hand." Their research demonstrates that the memory needed to recall letter shapes, as well as how letters are combined to generate words, is integrated into motor patterns. In essence, handwriting contributes to literacy learning in the early grades.

Pacton, Fayol and Perruchet (2005) introduced the concept of graphotactic learning. They assert that the motor construction of writing words results in tactile sensations in the brain, and that these sensations help children link letters to written words, in the same way that speaking letter sounds helps children combine phonemes in words (Richards, Berninger, Stock, Altemeier, Trivedi, & Maravilla, 2011). Their research shows that handwriting may help children link letters to single words more so than keyboarding, which involves different tactile feedback (i.e., forming letters vs. touching a key). Additional research is needed on the extent to which graphotactic learning is related to early literacy development.

Pencil Grip, Grasp Patterns and Writing Tools

Schneck (1991) examined pencil grip patterns in first graders with good and poor handwriting and found a lower grip score and lower proprioceptive-kinesthetic finger awareness for struggling handwriters. Engel-Yeger & Rosenblum (2010) examined pinch strength in children with dysgraphia when writing for extended periods (copying two paragraphs). This study demonstrated that pinch strength decreased by the end of the 2nd paragraph, suggesting that fatigue may affect handwriting. Students' writing speed was also slower when writing the second paragraph. Dennis and Swinth (2001) also looked at legibility based on the length of the writing task. They found that children's legibility was indeed better on short rather than long writing tasks. Likewise, Graham, Struck, Santoro & Berninger (2006) also determined that legibility varied depending upon the writing task.

A recent study by Schwellnus, Carnahan, Kushki, Polatajko, Missiuna, & Chau (2012) examined pencil grasp patterns. They found that non-standard pencil grasp did not influence handwriting speed or legibility in 120 typical fourth graders. Using a two minute writing task on a special digital tablet along with video, the researchers found 4 mature grasp patterns, 1 immature grasp pattern and one alternating pattern (switching from one pattern to another). They found that the dynamic tripod grasp (thumb plus two fingers) was the most frequently used (22.5%) with the lateral quadruped (thumb and three fingers) a close second (21.7%), and that 20% of students switched grasp patterns when writing. They and others (Dennis & Swinth, 2001) conclude that a variety of grasp patterns can produce legible letters at functional speeds. Graham (2010) states that grasp needs to be comfortable, but not perfect.

Studies on writing tools have also been conducted. Studies on pencil diameter showed no effects on handwriting (Moss, 1989; Carlson and Cunningham, 1990). Studies on wide spaced paper show an apparent benefit to students in the primary grades (Trap-Porter, 1983; Hill, 1982).

The Contribution of Visual Motor Integration to Handwriting Automaticity

Beery (2004) defines visual motor integration (VMI) as the coordination between visual perception and the movement of the fingers, as measured by the Beery–Buktenica Developmental Test of Visual-Motor Integration (DTVMI). VMI relies more on spatial perception, whereas motor coordination involves more eye- hand coordination when writing. The role of visual motor integration (VMI) has been examined in a number of studies with varying results. Marr and Cermark (2002) found that DTVMI scores obtained in kindergarten were not predictive of handwriting difficulties in 1st grade children with handwriting delays. However, Cornhill & Case-Smith (1996), as well as Weintraub and Graham (2000), determined that DTVMI scores were a predictor of handwriting difficulties in young children. A more recent study of 99 students in grades 3-6 with learning disabilities and/or behavior problems used a variety of tests to examine correlations with handwriting and found that only the DTVMI revealed differences between skilled and unskilled handwriters (Klein, Guiltner, Sollereder, and Cui, 2011). Karlsdottir and Stefansson (2003) found that the correlations between handwriting skill and VMI scores decreased with age.

In a study by Kaiser, Albaret & Doudin (2009), the Developmental Test of Visual Perception (DTVP-2) and the Movement Assessment Battery for

Children (M-ABC) were used to measure the correlation between eye-hand coordination (tracing tasks) and visual motor integration (copying tasks) in 75 typically developing children with a mean age of 8.1. They found results similar to those of Tseng and Murray (1994), in that both copying and tracing tasks have a strong correlation with handwriting. Volman, van Schendel, & Jongmans (2006) used tests of visual perception, visual motor integration, fine motor coordination and cognitive planning abilities with 29 students with handwriting problems along with 20 typically developing peers in 2nd and 3rd grades. They found that VMI was the only significant predictor for quality of handwriting for students with handwriting problems, whereas motor coordination was the only reliable predictor of handwriting quality in the typically developing control group. Tseng and Chow (2000) had similar findings. They contend that children with normal speed of handwriting tend to rely on motor skills, whereas students with poor handwriting fluency tend to rely more on visual processing. Overall, this research suggests that fine motor, eye-hand coordination plays a role in the early years, but that VMI is a measurable factor associated with students with handwriting deficits.

Research on VMI also suggests that visual motor integration contributes to greater automaticity of writing. Automatic letter writing is the single best predictor of length and quality of written composition in the primary grades (Graham, Berninger, Abbott, Abbott & Whitaker, 1997) and in the secondary years (Peverly 2006, Connelly et al., 2006). Medwell and Wray (2007) state that automaticity develops in early childhood, but Scardamalia et al. (1982) suggest this continues to develop until age 10, while Berninger and Graham (1998) suggest that it continues into the secondary years.

The Contribution of Orthographic-Motor Integration to Handwriting Automaticity

Students need to integrate motor and orthographic information to write letters, clusters of letters, and words. Orthographic-motor integration (OMI) of handwriting "involves mentally coding and rehearsing visual representations of letter patterns and integrating them with motor patterns" (Berninger et al.,1994a, p. 333). Recent research affirms that deficits in OMI may be a significant underlying factor for students with poor handwriting (Volman et al., 2006; Horne, Ferrier, Singleton & Read, 2011).

Christensen & Jones (2000) found that orthographic-motor integration accounts for more than 50 % of the variance in written language in elementary children, and that it is likely that this continues to be influential on writing for secondary students. Hence, there appears to be a strong connection between OMI and the length and quality of handwriting. The authors conclude that improving students' abilities to produce letters with more automaticity allows them to attend to other writing processes by freeing up cognitive resources. They also believe that the Matthew Effect (i.e. the rich get richer; the poor get poorer) applies to writing as well as reading in that the lack of automaticity may lead to lower motivation, causing students to avoid writing tasks.

Medwell et al. (2009) point to the growing body of literature that demonstrates that OMI, which contributes to handwriting automaticity, plays a key role in composition. They examined the link between handwriting and composing in 198 children ages 10 to 11 (equivalent to 5th grade). These students wrote short and long compositions as part of national testing. Researchers measured

quality of handwriting using a style and neatness rubric. They measured speed by having students copy "The quick brown fox jumps over the lazy dog" for 3 minutes. And, they measured orthographic-motor integration by having students continuously write the letters of the alphabet from memory for 1 minute. The latter task is thought to require more processing skills than a straight copying task because it requires the retrieval of letter forms from visual memory, combined with the generation of motor patterns to write the letters. Results indicated a high correlation between composition quality and the orthographic motor task of writing the alphabet. The mean number of letters per minute for the 5th graders in this study was 31.7. The alphabet task for 5th graders accounted for 21.5% of the variance in composition. This result was similar to Berninger and Graham's (1998) result of 25% variance in the primary grades. In contrast, pure speed of writing did not predict composition scores, implying that orthographic motor is a better predictor of written composition quality.

Medwell and Wray (2007) agree that OMI, more than speed of handwriting, frees up working memory to focus on composing. Medwell and colleagues reported that the mean LPM score on the alphabet task for 1st grade children was 16.7 LPM. While they do not suggest that the alphabet writing task alone should be used to predict writing skill, they do suggest that by 5th grade, if students are having difficulty writing neatly and cannot write the alphabet at a rate greater than 22 letters per minute, then they may be candidates for more diagnostic testing.

Orthographic-Motor Integration Speeds

As discussed in the previous section on the contribution of orthographic-motor integration, the research shows that writing the alphabet from memory (without prompting) is an effective measure of OMI contributing to handwriting automaticity. It requires the child to retrieve letter sequences from memory, then recall and execute the motor production of the letters. Recognizable letters in the correct sequence were counted. Figure X shows continuous improvement in OMI for students' ages 9 to 16, when writing the alphabet from memory (Barnett et al., 2009). In the Barnett et al. study, reliability and validity were established with 546 racially and socioeconomically diverse children ages 9 to 16. It should be noted that the mean score for 10 year-old students (5th graders) is significantly higher than the score noted by Medwell et al. (2009).

Figure 1.6. Mean letter per minute scores for students ages 9-16 writing the alphabet from memory. (Barnett, Henderson, Scheib and Schulz, 2007)

Age	Mean LPM
9	42.04
10	47.32
11	54.76
12	55.44
13	67.73
14	70.45
15	73.45
16	75.08

Barnett et al. (2011) conducted a second study with young adults. The mean scores on the alphabet writing task suggest that orthographic motor integration continues to increase into young adulthood.

Figure 1.7. Mean letter per minute scores for young adults writing the alphabet from memory. (Barnett, Henderson, Scheib and Schulz, 2011)

Age	Mean LPM
17-18 years	79.60
19-21 years	86.71
22-25 years	88.77

Handwriting Speed

Studies on the speed of handwriting increased in the 1980s and 1990s; however, the age of subjects, the writing tasks, and the length of time for writing tasks varied. Data on handwriting speed prior to the 1990s is less reliable today as it likely does not reflect changes in writing demands in current school environments. Graham, Berninger, Weintraub, & Schafer (1998) contend that "because data for the previous studies of handwriting speed were collected before 1985, it is likely that students in these investigations received traditional instruction, emphasizing skill development, and spent less time actually composing connected text" (p. 50).

Writing fluency, which involves speed plus legibility, are considered the two most important elements of handwriting performance (Feder &Majnemer, 2007). While legibility contributes to readability, speed allows students to

keep pace with writing assignments. Speed, however, is variable in that it is dependent upon the context of the writing task, the instructions, and whether the student is copying, writing from dictation, or composing. In general, handwriting speed using copying tasks increases gradually as students age and then levels off around the end of middle school, but continues to increase into young adulthood (Graham et al., 1998a). It is important to remember that speed is only one variable that contributes to automaticity and overall writing fluency, and research suggests that speed by itself does not lead to improvements in writing quality (Graham, et al., 1998a; Ziviani & Watson-Will, 1998; Karlsdottir & Stefansson, 2002; Volman, et al., 2006). Speed, however, is an objective measure of written productivity in that it reflects a measure of written output.

Handwriting Speed for Copying Tasks

There are two studies with large populations of students that are often cited in the current literature relative to data on speed of writing: Graham et. al (1998 a or b) and Barnett, Henderson, Scheib and Schultz (2007).

The Graham, Berninger, Weintraub & Schafer (1998) study was conducted with 900 racially and socioeconomically diverse elementary students who scored within the average range on reading and measures of intelligence, as well as middle school students scoring within the normal range of achievement. In the Graham, et al. (1998a) study, the word per minute scores represented on the following chart were obtained by asking students to copy a short paragraph as fast as they could without making any mistakes (i.e., fast copying task).

Figure 1.8. Mean handwriting speed scores in letters per minute (LPM) and words per minute (WPM) (Graham, Berninger, Weintraub, & Schafer, 1998)

Grade	Boys LPM	Girls LPM	WPM Range
1	17	21	3-4
2	32	37	6-7
3	45	50	9-10
4	61	66	12-13
5	71	75	14-15
6	78	91	16-18
7	91	109	18-22
8	112	118	22-24
9	114	121	23-24

In addition to measuring IQ and reading ability, Graham, et al. (1998a) also measured legibility using the Test of Legible Handwriting (TOHL; Larsen & Hammill, 1989). With this data, they were able to analyze correlations. They found that legibility was not related to whether an individual was left or right handed. They also found that legibility did not increase until the later part of elementary school, but that it was maintained through middle school. They also determined that in grades 1 to 6, handwriting was more legible when copying and less legible when creating a narrative or expository text. The latter finding suggests that the process of composing hampers legibility in the elementary years. This relationship is bidirectional in that legibility also affects composing.

Overall, Graham, et al. (1998a), found that handwriting speed steadily increases with age and begins to level off around grade 9. Handwriting speed, however, does not predict legibility. This research confirms that children can

adjust the speed of writing to various tasks, and that when asked to write faster, legibility declines.

The more recent Barnett, et al. (2007) study of handwriting speed was conducted in the U.K. Again, reliability and validity were established with 546 racially and socioeconomically diverse children ages 9 to 16. The researchers used 5 writing tasks as part of Detailed Assessment of Speed of Handwriting (DASH).

1. Copy Best: Copying the "The quick brown fox jumps over the lazy dog" for 2 minutes, counting all letters that are discernible.
2. Alphabet Writing: Writing the alphabet from memory for 1 minute.
3. Copy Fast: Copying quickly "The quick brown fox jumps over the lazy dog" for 2 minutes, but making sure every word is readable.
4. Graphic Speed: Quickly drawing an "X" inside small circles.
5. Free Writing: Students use a spider diagram (graphic organizer) to generate ideas and then write about "my life" for 10 minutes.

The results of this study suggested that children tended to reach the maximum performance on the copy best task at around age 15-16, whereas the copy fast task and the free writing task showed room for improvement beyond age 16. Gender differences showed girls writing faster than boys. Barnett, et al. (2007) data below is reported as median scores (i.e., the middle score that has an equal number of scores above and below), which are less skewed by atypically high or low outlier scores in data samples. Barnett, et al. (2007)

data also show that the difference between the fast copy and the best copy speed for students was around 5-6 WPM in the elementary grades, 6-7 WPM in the middle school years, and 7-8 WPM in the high school years. These scores indicate that students' fast copying speed increases some with age.

Figure 1.9. Median WPM scores. (Barnett, Henderson, Scheib and Schulz, 2007, p.73)

Age	Copy Best Median WPM	Copy Fast Median WPM	Free Write Median WPM
9	12.00	16.50	11.45
10	13.75	20.50	13.90
11	17.50	24.00	17.10
12	19.50	26.00	18.60
13	20.00	27.50	21.50
14	21.50	29.50	22.70
15	23.25	30.50	23.30
16	23.00	31.50	23.60

Extended Writing Task Speed

In the course of norm referencing the Handwriting Speed Test (HST), O'Mahoney, Dempsey & Killeen (2008) argued for including a 9-minute extended writing task in addition to a brief 3-minute writing task. The authors contend that extended writing tasks provide a way to make inferences about a student's ability to manage writing assignments and examinations that take a longer amount of time. A longer writing task may also provide an opportunity to observe self-regulation skills. O'Mahoney, et al. (2008) suggest that a slower speed on the longer task would indicate that the student is having difficulty sustaining writing speed or that the student is struggling with

generating text due to difficulties with attention or written language issues. Conversely, if the student's score is slower on the shorter writing task, this might indicate that the student has difficulty with task initiation, which could be impacted by planning difficulties. Slow speeds on both tasks would provide strong evidence of written productivity difficulties that could be the result of motor, transcription or text generation issues, or a combination of one or more of these.

The DASH handwriting test by Barnett, et al. (2007, 2011) also includes a 10-minute, extended free writing task. The data in Figure X shows that scores on the free writing task were consistently slower than the copy fast task across all ages. This data confirms that free writing is more demanding than copying.

Ferrier, Horne & Singleton (2013) assert that the "average speed of free writing in secondary school is largely a function of the cognitive load imposed on the task" (p. 4). Writing tasks that ask students to simply complete a sentence such as "I like……" would require less cognitive load than a task that requires the student to generate and organize ideas. For example, Hedderly (1995) found that the average speed for 13 year-old students on sentence completion tasks was 15 WPM, whereas Christensen (2004) found that the average speed for students of a similar age who wrote for 20 minutes composing text on a given topic (Three Wishes) was 8.5 WPM. Ferrier, et al. (2013) reported that more studies are needed on generative writing tasks.

Young Adult Handwriting Speeds

A second U.K. study provides data on young adults. Barnett, et al. (2011) examined handwriting in 393 students ages 17-25. Non-English proficient students were not included, but students who reported a disability or those receiving special needs support were included. The four tasks were identical to those in the Barnett, et al. 2009 study with adjustments made to make the free writing topics age appropriate. Norms for males and females in words per minute are displayed in Figure 1.10; gender differences were considered minimal.

Figure 1.10. Adult word per minute scores Barnett, Henderson, Scheib, & Schulz (2011)

Age Group	Copy Best Mean WPM	Copy Fast Mean WPM	Free Write Mean WPM
17-18	24.31	32.98	23.54
19-21	26.73	35.57	25.26
22-25	28.21	36.19	26.94

This study demonstrates that writing speeds continue to increase somewhat after age 16, leveling out around age 25. The standard deviation was reported to be around 5 WPM for all tasks, indicating that scores of 6 WPM below the mean for a given age level would indicate slow handwriting.

Studies of young adult writers have also looked at speed relative to note-taking, essay writing and test-taking. Brown, McDonald, Brown and Carr (1998) found that writing speed decreases as attention load increases. Conversely, writing speed increases as the information the writer needs is more readily available.

Olive and Kellog (2002) confirmed that what is known about children with handwriting difficulties is also true in adult writers — that working memory constrains higher level processing skills in adults who are slow handwriters and lack automaticity.

Connelly, Dockrell, and Barnett (2005) found that handwriting speed is associated with writing quantity and quality when cognitive load is substantial such as in exam essay conditions. Peverly (2006) determined that handwriting automaticity is correlated with the quality of note taking when listening to a lecture, and further that the quality of note taking is a predictor of test performance (Peverly, Ramaswamy, Brown, Sumowski, Alidoost & Garner, 2007). Peverly's 2013 study showed that note taking requires handwriting speed plus language comprehension. The latter study also confirmed that main topic outlines help post secondary students record and recall more information when taking notes. All in all, the research underscores the importance of handwriting speed and automaticity even into the young adult years. Handwriting's role is more than mere neatness of presentation.

A Cautionary Note about Handwriting Speed Norms

Rosenblum, et al. (2003) conducted a review of available handwriting instruments and concluded that given the variability of methods of assessment, it is difficult to make clear pronouncements about the speed of handwriting at different age levels. They state that the only clear trend that can be derived from the research is that handwriting speed increases with age. Handwriting speed is influenced by gender, physical, spatial and orthographic factors. Speed is also influenced by the type of handwriting task and the directions given. Graham, et al. (1998a) urges caution when using handwriting speed norms, as normative data vary across research studies. Comparisons across students may be less dependable and, therefore, of limited value in making instructional decisions; performance comparisons across multiple tasks for an individual student may be more useful for adjusting instruction and progress monitoring. For professionals looking for standardized assessment batteries for handwriting speed, see Figure 1.11.

Figure 1.11. Standardized instruments measuring handwriting speed. Available at: www.pearsonclinical.co.uk/

Handwriting Tests	Test Authors	Purpose
The Detailed Assessment of Speed of Handwriting (DASH)	Barnett, Henderson, Scheib, Schultz, 2011	Handwriting speed assessment for ages 17-25.
Detailed Assessment of Handwriting Speed (DASH)	Barnett, A., Henderson, S. E., Scheib, B. & Schulz, J. (2007).	Handwriting speed assessment for ages 9-16
Movement Assessment Battery for Children-2nd Edition (Movement ABC-2)	Henderson, S. E, Sugden, D. A., and Barnett, A. L. (2007).	Handwriting speed assessment for ages 3-16

Handwriting Quality

Up until about 30 to 40 years ago, writing instruction emphasized penmanship across the elementary years. Today, handwriting instruction is emphasized in the primary grades, but shifts to an emphasis on written expression by third grade. Quality of handwriting refers to letter formation, spacing, size, and slant. Previous research has demonstrated that letter formation errors in kindergarten were correlated with academic performance in grade 1 (Simner, 1982); and that speed and qualitative handwriting characteristics differentiated between good and poor handwriters (Rubin & Henderson, 1982). Handwriting initially requires attentional control, and over time with practice becomes more automatic, and therefore, more fluent (Tucha, Tucha, & Lange, 2008; Sassoon, 1993). In a study of 300 children in 1st through 3rd grade, six letters (j, k, n, q, u, z) accounted for 48% of omissions, miscues, and illegibility when writing lower case letters (Graham, 2010), suggesting that some letters may require more instruction than others. The research is clear that handwriting must evolve to the point where letters can be constructed quickly with minimal conscious effort.

Lack of legible handwriting is correlated with a number of findings (Barnett et al, 2007; Connelly et al., 2006).

- Difficulties with handwriting lead children to avoid writing and see themselves as less competent writers.
- Poor handwriting is correlated with underachievement and low self-esteem.

- Handwriting deficits are highly correlated with other learning disabilities.
- Lower marks are more often assigned to students with poor handwriting quality.

The ratio of time spent on improving handwriting quality in the early grades for typically developing students, as well as for older students with handwriting deficits, is still being debated. The Medway et al. (2009) study sheds some light on the role of handwriting instruction that focuses on letter formation and neatness. This study included a school where all the 5th grade students had unexpectedly high neatness scores, but low composition scores. Students in this school had used a handwriting program that stressed neatness of letter formation for 10-15 minutes per day for two years. In this situation, handwriting practice did not lead to higher composition scores. The authors suggest that handwriting practice that focuses more on letter formation and neatness may not constitute a best practice.

Tucha, et al. (2008) contend that an over emphasis on neatness during instruction can have a negative effect on fluent writing production. They posed the question of whether well-formed handwriting is more important than handwriting fluency. The researchers used a special digital tablet to examine spatial and kinematic measures of handwriting. They concluded that today's handwriting instruction focuses more on well-formed handwriting and neglects speed of handwriting and orthographic automaticity. They also found that automatic handwriting was independent of visual feedback. When

children must rely on conscious visual control of handwriting, it adversely affects automaticity. Weintraub and Graham (1998) contend that on the basis of handwriting fluency alone, students with learning disabilities would take 50 minutes to complete a task that typically developing students would take 30 minutes to complete.

The upshot of this research suggests that while handwriting quality is important, it must be looked at in the wider context of written productivity. Instruction on handwriting quality is important for young writers and students with handwriting deficits; however, instruction must balance neatness of letter formation, size, spacing and slant against the need to write letters with increasing automaticity.

Handwriting and Students with Disabilities

A number of studies have examined the handwriting of students with disabilities. First grade children born less than 34 weeks without physical or cognitive disabilities were matched to full term controls. Preterm children demonstrated decreased handwriting legibility and slower writing speeds (Feder, Majnemer, Bourbonnais, Platt, Blayney & Synnes, 2005). Van Hoorn, Maathuis, Peters, and Hadders-Algra (2010) found that quality of handwriting and writing speed were related to the severity of neurological dysfunctions in school-age children. Children with unilateral cerebral palsy took longer to develop handwriting skills in their unaffected side and show lower performance overall in quality and speed (Kavak & Eliasson, 2011). Intelligence is not correlated to writing speed. According to Ferrier et al. (2013), the correlation

between intelligence and writing speed is not high, in that only 4% of the variance of writing speed is attributable to intelligence.

While no difference in speed was found, Rosenblum, Aloni & Josman (2010) found correlations between handwriting performance and organizational abilities in children ages 7 and 8 with dyslexia. In non-medicated children with ADHD, ages 6 to 11, handwriting performance was highly variable relative to speed and legibility, but improved with age; and visual motor integration was the best predictor of letter and word legibility (Brossard-Racine, Majnemer, Shevell, Snider & Belanger, 2011).

Kushki, Chau and Anagnostou (2011) conducted a review of handwriting in individuals with autism spectrum disorders (ASD). Based on available literature, ASD is associated with a high prevalence of fine motor and visual motor integration deficits. Handwriting legibility and letter formation difficulties were often reported (Fuentes, Mostofsky and Bastain, 2009). Mayes and Calhoun (2006) estimated the incidence of writing disabilities to be as high as 67% in students with high functioning autism. Hellincix, Roeyers, & Van Waelvelde (2013) conducted a study of 131 Flemish children, 70 of whom were diagnosed with ASD (IQ > 80). They found that age, gender and visual motor integration predicted handwriting quality, while reading abilities and fine motor coordination predicted handwriting speed.

Special tablet technologies that measure handwriting are contributing to our knowledge of handwriting performance in students with disabilities. Schoemaker, Schellekens, Kalverboer, and Kooistra (1994) used special digital tablets and computerized analysis of handwriting and found that students

with gross motor difficulties and poor handwriting demonstrated longer pause durations compared to their peers. Similarly, Rosenblum et al. (2003) used a computerized digital tablet to compare the handwriting of proficient and non-proficient handwriters, ages 8 and 9. They found that non-proficient handwriters spent more time with their pen in the air resulting in more pauses in the flow of writing. More "in air" time may indicate that students with poor handwriting may need more time to initiate or motor plan the execution of letters.

Writers typically generate text in bursts (i.e., the number of words produced between pauses). Connelly, Dockrell, Walter & Critten (2012) examined the written language of children with specific language impairments (SLI) (n = 33) and compared their performance to that of age-matched peers (CA = 11 y.o.) (n = 33) and to younger language skill-matched children (LA)(n = 33). All children produced the same number of writing bursts during a 5 minute writing task, however the children with specific language impairments produced a smaller number of words per burst when compared to age-matched peers, but a similar number of words when compared to the younger language-skill matched peers (Figure 1.12). Analysis of the text indicated that burst lengths varied by language skill level, and were hampered by spelling and handwriting fluency. The authors state that "pauses between bursts are related to bottlenecks in processing and, in the case of children, are most likely related to transcription difficulties such as spelling and handwriting", (p. 291).

Figure 1.12. Selected writing task measures for SLI, CA, and LA groups (Connelly, Dockrell, Walter & Critten (2012).

Measure	SLI	CA	LI
Total number of words	52.0	76.4	51.7
Total number of bursts	12.8	12.3	13.6
Average burst length in words	4.2	6.9	3.9
Total number of spelling errors	5.1	2.4	5.7

In a similar study of children with dyslexia, Sumner, Connelly and Barnett (2013) examined the handwriting of 9 year olds with dyslexia using a digital handwriting tablet and found no difference in sheer motor speed, but they wrote fewer words per minute when composing text compared to same age peers. Likewise, they found that when matched to younger children by spelling ability, children with dyslexia paused at comparable rates. These authors concluded that pausing when composing is related to spelling difficulties rather than motor deficits for these students with dyslexia.

Comparing Handwriting Speeds of Students With an Without Disabilities

A study investigating the reliability and validity of a Dutch handwriting screening tool (Van Waelvelde, Hellincix, Peersman & Smits-Engelsman, 2012) included 603 students ages 7-12 from regular, mainstream schools and 259 children from special school settings. All students had an IQ greater than 70 with no physical or sensory disabilities. The writing task required children to copy a paragraph, or a minimum of 5 lines of text, for 5 minutes "as quickly and as neatly as you usually do." Results clearly showed that handwriting

speed gradually increased for all students across the age span. Students receiving special education lagged behind typically developing children. In both groups, boys lagged behind girls. Figure 1.13 shows adjusted rates for typically developing boys and girls, ages 7 to 10, and students of the same age in special education settings.

Figure 1.13. Mean handwriting speeds (adjusted LPM and WPM scores) of typically developing children (TD) and children in special education (SE) (Van Waelvelde, Hellincix, Peersman & Smits-Engelsman, 2012)

Grade	TD Boys LPM	TD Girls LPM	Average TD WPM	SE Boys LPM	SE Girls LPM	Average SE WPM
2	27	27	5.4	15	18	3.3
3	30	32	6.2	21	27	4.8
4	33	38	7.1	27	32	5.9
5	45	44	8.9	32	36	6.8

This study demonstrated typical handwriting speeds that were much slower than Graham et al (1998) by as much as 5 to 6 words per minute at ages equivalent to grades 4 and 5. This is a notable difference. The writing task is similar to Graham, et al. (1998), except the students were asked to write quickly and neatly. The authors do not compare their findings to previous studies. If compared to Barnett et al. (2007) the differences are even greater. What makes this study important, however, is the comparison of typically developing students to those receiving special education. This study demonstrates that students receiving special education in the early elementary grades tend to make gains in handwriting speed at a similar trajectory, but score lower than their typically developing peers.

KEYBOARDING

Keyboarding is more than just another form of transcription. Word processing using a keyboard allows students to legibly generate and record their ideas, to correct spelling or grammatical errors, to edit and make revisions. Research shows that word processing can have a positive effect on composing skills for typically developing children (Morphy and Graham, 2012), as well as children with disabilities (Cochran-Smith, 1991; MacArthur, 2009b). While keyboarding offers advantages over handwriting, it also superimposes additional challenges to achieve fluency with accuracy. Without fluency, keyboarding is an accommodation that does not rise to the level of proficiency that will potentially free up the higher cognitive resources needed to improve writing quality.

Classroom keyboarding expectations are not tied to normative keyboarding speeds as there is little data that demonstrates how fast an elementary student can type during a generative writing task. There are no clear elementary standards for font size, margins, or line spacing that would clarify the expected number of words written per line to produce a page of text. However, the CCSS (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). state that in the 4th grade, students should develop sufficient "command of keyboarding skills to type a minimum of 1 page in a single sitting," and by 5th grade, to type 2 pages in a single sitting.

Like all CCSS standards, schools are expected to design a means of building keyboarding skills into the elementary curriculum to support these standards.

In this section, the research examines the relationship between keyboarding and orthographic-motor integration. In order to address the merits of keyboarding, current research on typing speeds are compared to handwriting speeds. Young adult handwriting and keyboarding comparisons are provided to show target rates in preparation for college and careers. Research contributing to controversies that surround the shift to computer-based high stakes testing is described. And finally, research on keyboarding and students with disabilities is presented.

Keyboarding and Orthographic-Motor Integration

As previously discussed, orthographic-motor integration (OMI) has been found to be strongly associated with handwriting quality and length. Since keyboarding is a form of transcription, researchers investigated whether OMI was associated with compositions produced using keyboarding. Christensen (2004) conducted research to confirm whether OMI applied to keyboarding. Students (276) in grades 8 and 9 were measured on their abilities to write as many letters of the alphabet in one minute, and write extended essays using handwriting and keyboarding. OMI accounted for slightly more than 30% of the variance when typing. The author concluded that, like handwriting, students must achieve a level of orthographic-motor integration relative to keyboarding, in order to devote cognitive resources for ideation, organization

of ideas, spelling, and grammar. The results of this study confirmed the relationships between handwriting quality and fluency, but indicated an even stronger correlation for quality (29%) and fluency (30%) when writing is produced using a computer. The results affirmed that improvements in typing led to improved OMI, which in turn led to more cognitive resources available for attention to higher order writing skills using keyboarding. The author notes, however, that keyboarding automaticity is a necessary condition, but by itself does not guarantee more sophisticated text production. Explicit writing instruction is still needed to support composition.

Keyboarding Research

Keyboarding is often introduced in elementary school and is not solely used for academics, but also as a life skill for college and careers. Human-computer interface design guidelines (Brown, 1988) cite that using a computer, the average adult fast typist can produce 40 WPM, moderate typists can produce 35 WPM; and slow typists produce 23 WPM. Two finger typists using a more hunt and peck method can achieve speeds of 37 WPM for memorized text, and 27 WPM for copying text. A more recent study indicated average speeds, for adults who used computers daily with a mean age of 25, ranged from 17 WPM for slow keyboarders to 33 WPM for fast keyboarders (Weintraub, Gilmour-Gill, & Weiss, 2010).

Keyboarding Compared to Handwriting Speed

Early on, Balajthy (1988) asserted, "For touch typing to be useful, the process must be automatic and students must reach a typing speed that is at least equivalent to their handwriting speed" (p 41). Dunn and Reay (1989) confirmed this in a study of 52 students age 12 to 13 years old. They found that students, whose keyboarding speeds were equal to or greater than their handwriting speeds, were more proficient with narrative writing when using a word processor. The reverse of this was also demonstrated in that when students' keyboarding speeds were less than their handwriting speeds, they demonstrated less proficiency when word processing.

In Freeman, MacKinnon and Miller's (2005) meta-analysis of handwriting and keyboarding literature, they report rates across a wide range of studies across a wide span of time, from 1912-2004. Acknowledging the differences in these investigations, the data show that the there is a wider range of speeds when using keyboarding compared to handwriting, and that the top letter-per-minute rates for keyboarding are higher than that of handwriting.

Accepting the premise that students should be able to keyboard at least as fast as they can handwrite, Freeman et al. (2005) contend that handwriting speed norms are more useful than keyboarding speeds for estimating target speeds. They caution, however, that these decisions should be based on the individual profile of student needs since some students may not be able reach comparative speeds, but require an alternative to handwriting due to significant legibility deficits. The researchers note that numerous authors recommend ten finger touch typing as a more efficient method, but acknowledge that

there is insufficient data to support this, and that for some students, the need to produce legible work will outweigh the need to master touch typing.

Handwriting and Keyboarding Comparisons Using Copying Tasks

Kahn and Freyd (1990) argue that little keyboarding instruction is needed to reach a level that is commensurate with handwriting. In their study of 34 6th grade students who did not receive touch typing training and instead used a hunt and peck method to compose using computers approximately one hour per week, their keyboarding rate increased from 6.62 WPM in October to 10.12 WPM by May which was similar to their handwriting speed of 11.4 WPM. They argue that touch-typing may not make writing easier, and has the potential to provide another layer of transcription difficulty. Kahn and Freyd (1990) also found that kindergarten and 1st grade children took as much time to decide what letter to type as they did to find it on the keyboard, indicating that for young children, touch typing instruction was not warranted as a child's ability to generate text was more dependent on the ability to determine how to spell words rather than locate keys. Shorter (2001), Nichols (1995) and Pisha (1993) share the viewpoint that keyboarding instruction for children in the early primary grades may not constitute an optimal time for achieving keyboarding fluency.

Other studies demonstrate that explicit keyboarding instruction makes a difference. Rogers and Case-Smith (2002) examined handwriting and keyboarding speed and their relationship to underlying factors in 40 6th grade students who had received keyboarding instruction for 12 weeks (30 sessions;

40 minutes per class period). Students copied a common poem (Twinkle, Twinkle Little Star) for 2 minutes using cursive handwriting and keyboarding. Results indicated that provided with touch typing keyboarding instruction, mean keyboarding speeds were higher than handwriting speeds for 6th graders. Mean handwriting speeds were 9.3 WPM; mean keyboarding speeds were 14.9 WPM. Additionally 70% of the students using keyboarding produced more text compared to handwriting. Moreover, handwriting accounted for less than 15% of keyboarding variance suggesting that students with poor handwriting can achieve keyboarding proficiency. In their study, 5 participants who demonstrated significantly slow handwriting (i.e., > 15 WPM) were fast keyboarders.

Connelly, Gee, and Walsh (2007) measured the handwriting and typing speeds of 312 U.K. children ages 4 to 11 years by having them copy "The quick brown fox jumps over the lazy dog" repeatedly for 2 minutes. They found that without explicit keyboarding instruction, typing speeds were lower than handwriting speeds throughout the primary school years. In the second part of this study, the researchers used an essay writing task with 48 grade 4 and 5 students (equivalent to year 5 and 6 in the UK) to compare the writing quality of students based on keyboarding speed. The authors' premise was that slow keyboarding, like slow handwriting, would interfere with working memory and impede cognitive resources for higher order writing skills, while more fluent keyboarding would not impede the quality of writing. The results confirmed that fast keyboarders (i.e., those who could type faster than they could handwrite) produced on average better quality writing. They found that even without keyboarding instruction, fast handwriters were likely to

be fast keyboarders. The handwritten essays of students who demonstrated fast keyboarding also scored high in quality. The authors conclude that in the absence of keyboarding instruction, handwritten essays will likely prevail in the primary grades as students have more experience with handwriting. Moreover, the researchers argue that without keyboarding instruction that results in fluent keyboarding, essay writing using keyboarding could potentially hinder writing quality.

Figure 1.14. Mean adjusted LPM and WPM for repeated sentence copying task (Connelly, Gee, and Walsh, 2007).

Grade	Handwriting LPM (WPM)	Keyboarding LPM (WPM)
Kind.	16 (3.2)	7 (1.4)
1	33 (6.6)	12(2.4)
2	33 (6.6)	13 (2.6)
3	45(9.0)	24 (4.8)
4	57 (11.4)	31 (6.2)
5	65(13.0)	47 (9.4)

Additional studies suggest that in the absence of keyboarding instruction, handwriting may be more effective at elementary levels, particularly when students are producing higher-level writing tasks. Berninger, Abbott, Augsburger & Garcia (2009) followed over 200 students across 5 years, conducting handwriting and keyboarding comparisons in children with and without learning disabilities using 3 levels of writing tasks (letters, sentences and essays). Cohort one began the study in 1st grade, ending in grade 5; cohort two began the study in 3rd grade, ending in the 7th grade. Data are reported for the cohorts during grades 2, 4, and 6 and showed that students produced

letters in roughly the same length of time using a pen or keyboard; however, both groups took longer to compose sentences and essays by keyboard than by pencil. Fourth and 6th graders also wrote more complete sentences using handwriting. The authors suggest that this may be due to more writing experience with a pencil as a method of transcription, as well as the lack of keyboarding instruction and automaticity.

For older students to achieve keyboarding proficiency that leads to increased speed and quality of writing, direct keyboarding instruction has been shown to be important. In part two of Christensen's (2004) research, the researchers assessed the essays of 35 8th and 9th grade students identified as having slow typing speeds, half of whom received 8 weeks of keyboarding instruction for 20 minutes per day. The remaining students constituted a control group engaged in daily journal writing on the computer without keyboarding instruction. Although both groups scored higher on length and text quality upon post-testing, the results demonstrated that slow keyboarders receiving keyboarding instruction scored higher on typing and on the quality of typewritten text compared to the control group. Students receiving keyboarding instruction were able to type as fast or faster than their handwriting speeds at post-testing. This study confirmed that the quality of essay writing using a word processor could improve once keyboarding can keep pace or exceed handwriting speeds.

Handwriting and Keyboarding Comparisons Via Dictation

Horne et al. (2011) compared handwriting to keyboarding speeds in 952 students ages 11 -17, randomly selected from 19 schools. (Prior keyboarding experience was not reported.) Passages were not copied but were dictated via the computer's digitized speech. The researchers believed that this measure of transcription speed better simulated school writing activities compared to repeatedly copying a sentence to measure speed, and factored out the "thinking time" typically needed for a free writing task. Their results showed keyboarding speeds generally increased with age in the middle and high school years. Their data (Figure 1.15) showed that handwriting speeds were somewhat higher through the 7th grade. At the 8th grade level (age 13), handwriting and keyboarding were roughly equivalent. Thereafter, keyboarding speeds were somewhat higher. Based on the totality of the data, one in five students demonstrated slow handwriting. Yet, they found that over half of the students who demonstrated slow handwriting often had average or better typing speeds than their peers. The researchers concluded that it is likely that teenagers today are more proficient with keyboarding. In a second study, Horne, et al. found that students age 13 to 14 with slow handwriting and keyboarding speeds, were also below average on reading and spelling abilities and needed additional educational support.

Figure 1.15. Mean WPM scores for dictated handwriting and keyboarding tasks, extrapolated from Horne, Ferrier, Singleton and Read (2011)

Grade equivalent	Handwriting (WPM)	Keyboarding (WPM)
6th	16	14
7th	18	16
8th	20	20
9th	22	24
10th	22	25
11th	23	26
12th	24	27

Young Adult Handwriting and Keyboarding Comparisons

Adult studies comparing handwriting to keyboarding provide insight into long-range capabilities. Weintraub, Gilmour-Gill, and Weiss (2010) compared handwriting and keyboarding speeds in 63 adults with a mean age of 25 who use computers on a daily basis. Interestingly, only 2 of these adults used touch-typing, while the vast majority used their vision to mediate keyboarding. Keyboarding and handwriting speed was measured using a copied paragraph and a dictated paragraph. Mean typing speed for adult fast keyboarders in the top quartile was 33 WPM, while the mean speed for those in the lowest quartile was 17 WPM. Adults who were fast keyboarders reported spending more hours on the computer compared to slow keyboarders. The researchers also affirmed that speed of handwriting is not a predictor of keyboarding speed for slow adult keyboarders. Interestingly, when you compare these adult speeds to the Horne et al. (2011) study, most high school students' keyboarding speeds exceeded or were close to adult speeds.

In general, there is still a shortage of studies comparing keyboarding to handwriting (Horne et al., 2011; Weintraub et al. 2010). Consequently, there is a lack of normative data regarding the best time to introduce keyboarding as an alternative writing method. Also, researchers use different tasks to measure speed across different lengths of time, with students who may or may not have had keyboarding instruction. As a result, therapists and educators should exercise caution regarding the use of normative keyboarding data.

Keyboarding and High Stakes Assessments

Today, there is more dialogue on the use of computers for national high stakes testing, including the acceptable use of built-in features and accommodations. There is some research, however, that would suggest that the shift from handwritten assessments to computer-based assessment is not so straightforward.

Given that most students today have more experience with computers, some studies have shown that secondary students who become comfortable writing with computers perform worse on open-ended test essay questions when writing with pen and paper (Russell, 2000). The Russell study was conducted to help understand why high school students who increasingly used technology for writing tasks scored lower on annual paper-based writing tests. In this study, 68 students completed multiple choice and open-ended questions using paper, while 46 took the same tests on the computer (without spell or grammar checking tools). Prior to scoring, answers produced on paper were transcribed to the computer to eliminate bias. The findings indicated that there was no difference on multiple-choice items, however, on open-ended

items, students who regularly used a computer for writing scored much lower when writing by hand. Answering paper-based open-ended questions, only 30% performed at "passing" levels, but using the computer, 67% passed.

Russell (2000) also reports on a second study of roughly 200 8th grade students. Data were collected on students' keyboarding speeds and computer experience. Students who could keyboard at 20 WPM or above performed much better on the computer. However, students with slower keyboarding speeds did not perform as well on the computer. Again, this speaks to the importance of keyboarding fluency. A third study with 4th, 8th and 10th graders had similar results. Additionally, students who regularly used portable electronic writing devices (eMates) performed significantly worse on a paper-based state writing exam. All three studies point to the importance of allowing students to use the writing modality with which they are most fluent on high stakes tests. In fact, when the state language arts scores were analyzed as part of this research, it was projected that allowing that choice would have increased student proficiency, allowing many more students to pass the test, thus significantly changing the district's overall outcomes.

Comparing keyboarding to handwriting on high-stakes writing assessments at university levels provides further insight on the importance of allowing students to use the modality with which they are most comfortable. Whithaus, Harrison, and Midyette (2008) analyzed exit exams for writing proficiency across a 10-month span at Old Dominion University where 280 students

were given the option of taking the test using pencil and paper or using a computer. Students were given a choice of topics and exam questions and wrote for 3 hours. Essays were rated using a rubric and raters were instructed to be sensitive to the differences in the two methods of composing. Post-exam surveys were collected to gather data on why students chose to handwrite or keyboard. On average, students who took the keyboarded exam had a pass rate that was about 3% higher than students who handwrote. Students who used keyboarding reported that keyboarding was faster, more legible and more easily edited. Students who handwrote cited reliability and a greater comfort level when using paper and pencil. Having the dual-option format was overwhelmingly positive based on student feedback. Students felt they were able to choose the method that best demonstrated their writing abilities.

Keyboarding And Students With Disabilities

Pisha's dissertation (1993) provided data on the acquisition of keyboarding skills in typically developing students and those with special needs. Using a sample of 88 students ages 8 to 13, Pisha was able to demonstrate that even with small to moderate amounts of keyboarding instruction, the rate of improvement was associated with students' age, the amount of practice, and the practical application of using the computer for producing homework. He contends that age is a factor when introducing keyboarding as older students in grades 5 and 6 developed keyboarding skills more rapidly than younger students in grades 3 and 4. He also demonstrated that students receiving special education services started out with a lower baseline of keyboarding skills compared to typical students, and that while there was a similar upward

trend in progress, speeds of those receiving services lagged behind that of their same age peers. Based on the findings, Pisha asserts that students should begin keyboarding instruction in the 3rd grade with regular practice at a minimum of one half hour per week, and that thereafter, students need to routinely use the computer for writing assignments. Pisha's findings coincide with others (Rogers and Case-Smith, 2002; Horne et al., 2011), supporting the view that handwriting quality is not correlated with keyboarding ability such that students with poor handwriting can learn keyboarding.

Data that examines the keyboarding performance of students with documented disabilities is scant. In a 2005 literature review on keyboarding for students with handwriting difficulties (Freeman et al., 2005), there were some general conclusions in spite of the limited literature:

- Students should be able to keyboard at least as quickly as they can produce handwriting
- Touch typing is an appropriate method
- Keyboarding instruction is critical to reach proficiency, needing as much as 25-30 hours of instruction
- Keyboarding is best introduced in the upper elementary grades
- Students with handwriting difficulties may need customized goals and strategies.

The amount of keyboarding instruction needed for students with disabilities is unclear. Single subject design research was conducted by Klein, Erickson, James, Perrott, Williamson and Zacharuk (2008) with six 3rd to 5th grade students with documented below average fine motor and visual motor integration abilities. None of the students had prior keyboarding instruction. Intervention consisted of only 10 one-hour sessions over a two-week period that focused on four components: finger dexterity, software-based typing instruction, word processing instruction, and brief writing activities. Similar to Pisha's data, children with handwriting difficulties in grade 3 did not show significant improvement in keyboarding speeds; however children in grades 4 and 5 did show improvement. Overall, the brief period of intervention did not result in students achieving keyboarding speeds that were commensurate with handwriting speeds. Children in grades 3 and 4 used touch typing with visual feedback, but 5th grade students relied less on visual feedback. This research suggests that intense intervention over a short period of time in the upper elementary grades may not be sufficient to increase fluency and achieve speeds that equal or exceed handwriting for students with disabilities. It also supports the hypothesis that older elementary students acquire more proficiency than younger students who may need to initially use vision to mediate keyboarding.

Students with ASD often display handwriting difficulties. Ashburner, Siviani and Pennington (2012, July) evaluated the handwriting and keyboarding skills of 22 students with ASD ages 9 to 12 who had been using portable word processors in mainstream classes for 6 months or more. Handwriting legibility and speed, keyboarding speed and quality of essay writing were

assessed. Teacher, parent and student surveys measured the frequency of use of handwriting and keyboarding, the factors that limited the use of technology, preferences, motivation, and student abilities. The surveys indicated that student motivation for using keyboarding was higher compared to handwriting, and that parents and teachers perceived the portable word processors as helpful. The group mean scores for keyboarding speed, length and quality of keyboarded compositions were higher compared to group means scores for handwriting, although the data did not reach statistical significance. Nonetheless, keyboarding bypassed difficulties with handwriting legibility for these students.

As part of a longitudinal study, Berninger et al. (2009) examined the relationship between transcription mode and spelling abilities, as well as transcription mode and learning disabilities. Data from eight 4th grade students with transcription-based learning disabilities who demonstrated transcription deficits in handwriting and spelling were matched on verbal skills with 12 typically developing students. Functional magnetic imaging testing was conducted on all students and the results demonstrated significant differences on tasks involving idea generation, handwriting, spelling and sequential finger movement for students with disabilities. The results demonstrated that students with handwriting and spelling deficits did not produce more written language, nor produce written language faster when using a keyboard. Composing using a keyboard is not a guaranteed solution for handwriting difficulties. These results also speak to the need for focused writing instruction. The researchers suggest that the use of the keyboard alone, without additional writing instruction, may not ameliorate difficulties

with spelling and handwriting. For students with significant legibility issues, keyboarding as an accommodation may be necessary, but it is not sufficient unto itself.

Transcription speed, whether by pen or keyboard, appears to be related to experience with each mode and the extent of instruction. Automaticity in either mode appears to be an important factor that contributes to the length and quality of writing. For children with or without learning disabilities, MacArthur (2006) and Bangert-Drowns (1993) contend that computers can have a small to moderate beneficial effect on the quality of students' writing, especially for editing and revising. However, writing success, whether using handwriting and keyboarding, also depends upon the use of evidence-based, teacher-guided strategies that are explicit to the writing process (Graham & Perin, 2007a). Students need some form of writing that is legible, fluent, and demonstrates conventional spelling and grammar in order to allow working memory to enlist cognitive resources for higher-level writing. Handwriting and keyboarding strategies may need to be developed and monitored in parallel for students who struggle with transcription. Ongoing diagnostics are necessary to identify students with handwriting difficulties, spelling disabilities, or both, and whether these writing deficits are part of larger writing and reading disabilities that will require added interventions.

WRITING
Writing Protocol Procedures

INTRODUCTION

Writing is a complex, multidimensional task. Given the research described in Section One of this publication, there is a better understanding of the importance of handwriting, keyboarding and spelling fluency. And given research on composition and the national data on writing proficiency, there is a renewed interest in improving writing standards across all grades. To make decisions regarding writing strategies and accommodations, we need a more evidence-based process. The DeCoste Writing Protocol has been is developed to help educators make more informed decisions on where to focus instruction, and the provision of accommodations using technology. For example, is there a need for customized instruction on:

- Handwriting to improve transcription fluency?
- Keyboarding to improve transcription fluency?
- An alternative modality (e.g., touch screen, speech-to-text)?
- Spelling to improve transcription fluency?
- Spelling plus handwriting or keyboarding?
- Computer-based spelling supports?

- Composition?
- Composition plus spelling?
- Composition plus spelling plus transcription?

The intent of the DeCoste Writing Protocol is to examine the effectiveness of writing accommodations that may help a student access the curriculum. The Protocol is not a test of writing, but a protocol to help educators, therapists, literacy specialists and diagnosticians make informed decisions on writing strategies to support instruction in the general education curriculum, as well as to provide evidence to document the needs of students on high stakes testing. Much like the development of Protocol for Accommodation in Reading (DeCoste & Wilson, 2012), which provides a process for making decisions about reading supports, the Writing Protocol is intended to help educators make more informed decisions about writing supports and writing interventions.

As in the original Written Productivity Profile, the revised version has been designed to parse out transcription demands compared to higher order writing demands (Figure 2.1). For example, a simple sentence copying task involves fewer cognitive demands because a model of each word is provided, as compared to writing from oral dictation, which requires children to work out how to spell each word. A fast sentence copy task and a longer generative writing task will allow you to look at the student's ability to organize and convey ideas, as well as attend to vocabulary, spelling and writing conventions (i.e., grammar, punctuation and capitalization) over a longer period of time.

For example, does the student initially get his or her ideas out and then struggle to add more content, or does the student have difficulty getting started and struggles throughout? The choice of writing topics allows you to examine a student's performance using a specific type of writing (i.e., narrative, opinion/argument, informative) in accordance with national writing standards. In addition to examining spelling as part of an extended writing task, the spelling list on the DeCoste Writing Protocol allows further analysis of developmental linguistic elements. The Writing Protocol allows educators to compare these writing tasks for individual students across different conditions using handwriting, standard keyboarding, touch screen keyboarding, word prediction, and speech recognition.

Figure 2.1.

DeCoste Writing Protocol Task	Purpose of Task
Alphabet	A timed orthographic motor integration task
Best Sentence Copy	A timed straightforward visual-motor copying task that required fewer cognitive demands because a model of each word is provided
Dictated Sentence	Adds the element of spelling to the timed writing task
Fast Sentence Copy	Allows you to compare straight copying against a timed copying task that requires writing speed.
Composed Text	Adds the element of generative writing to a timed writing task
Spelling List	Allows you to analyze linguistic knowledge
Extended Writing	Allows you to examine writing skills for a longer compositional task

It is essential for therapists, diagnosticians and teachers to understand the low-level and high-level demands that contribute to writing progress.

THE MAIN STEPS FOR DEVELOPING A DECOSTE WRITING PROTOCOL

There are four basic steps to developing a DeCoste Writing Protocol, which are outlined in Figure 2.2. The first three steps look at elements of transcription, which are critical foundational writing skills. Step 1 and 2 use five brief tasks to compare handwriting and keyboarding across conditions, while Step 3 looks at the word-level linguistic knowledge that underlies spelling development. Step 4 looks at higher order aspects of writing using an extended writing task. Additional conditions can be added as needed to examine other writing methods.

Figure 2.2. Basic steps of the DeCoste Writing Protocol process

Step 1: Timed Handwriting

The student:

- Handwrites the alphabet from memory for 1 minute.
- Handwrites a copied sentence for 1 minute.
- Handwrites a sentence from dictation for 1 minute.
- Handwrites a copied sentence quickly for 1 minute.
- Composes and handwrites text, measured in one minute intervals.
- Indicates on a Likert scale his or her feelings about handwriting.

Step 2: Timed Keyboarding

The student:

- Keyboards the alphabet from memory for 1 minute.
- Keyboards a copied sentence for 1 minute.
- Keyboards a sentence from dictation for one minute.
- Keyboards a copied sentence quickly for 1 minute.
- Composes and keyboards text, measured in one minute intervals.
- Indicates on a Likert scale his or her feelings about keyboarding.

Step 3: Spelling Word List

The student:

- Uses a keyboard to spell words dictated by an adult. If the student is unfamiliar with the keyboard, then the student can use handwriting.
- Indicates on the Likert scale his or her feelings about spelling abilities.

Step 4: Extended Writing

To examine writing ability, the student:

- Uses a graphic web to preplan what he or she will write.

Using the mode of writing that is most fluent based on the timed writing tasks in Steps 1 and 2, the student:

- Handwrites or keyboards on a given topic until the student stops writing for 1 full minute (no longer than 10 minutes).
- The student reads what he or she wrote aloud.
- Indicates on a Likert scale his or her feelings about writing.

Optional Conditions

Once the four steps above have been completed, the evaluator may want to consider additional options to further gauge the student's use of additional writing accommodations (e.g., on-screen keyboarding, text-to speech, word prediction, speech-to-text). More information on this can be found in the segment, "Evaluator Instructions for Administering the DeCoste Writing Protocol".

Administering the DeCoste Writing Protocol

As stated previously, the DeCoste Writing Protocol evolved out of a need to outline a process that school teams could use to delineate which writing accommodations worked for individual students in situations where the benefit of one method over another was previously unclear. In some situations, the need for a writing accommodation is evident, such as physical disabilities that interfere with handwriting legibility. In this situation, staff would develop an assistive technology plan for handwriting alternatives. More often, accommodation decisions for students with writing difficulties are more multifaceted. Ongoing assessment is needed to identify what type of writing supports are needed, to gauge the effectiveness of writing supports in order make further modifications using a range of strategies, as well as when to systematically introduce or withdraw writing accommodations.

Which Students are Appropriate for the DeCoste Writing Protocol?

To identify which students are appropriate for the DeCoste Writing Protocol, you can use two types of preview processes: criterion-based or data-based. The former may constitute a quicker preview process, but the latter can provide comparative classroom data.

Criteria-Based Preview Processes

In advance of administering the DeCoste Writing Protocol, educators are encouraged to "preview" students who may be in need of an accommodation. Using a preview process to select students appropriate for the DeCoste Writing Protocol, educators are using a process-driven approach to examine instructional and accommodation decisions for targeted students. The DeCoste Writing Protocol is also useful for districts invested in reducing the number of students using a scribe accommodation by providing evidence of whether technology-based accommodations provide greater independence for students. This preview process can begin with the following questions for a given student. (Preview from Appendix)

Check Yes if this Applies	
	Does the student demonstrate handwriting that cannot be read by an unfamiliar reader, where no accommodations are in place?
	Does the student currently have a scribe accommodations listed on their IEP, 504 or ELL plan?
	Is the student's writing achievement below basic on measures of writing proficiency?
	Is the student significantly below grade level on college and career readiness writing standards?
	Will the student still be writing well below grade level if the current writing goals are achieved?

If the answer to any of the above questions for a given student is "yes", then the DeCoste Writing Protocol is recommended to gain insight into writing needs and gather documentation for data-driven decisions about instruction and writing accommodations. Optimally, this preview process should take place prior to or at the beginning of the school year.

Additionally, the following criteria may help you consider whether a student would benefit from the DeCoste Writing Protocol.

Additional Guiding Criteria

Data-Driven Preview Processes

A more data-driven preview process is to conduct a writing probe. While this can be conducted with a individual or group of at risk students, administering this probe to a general education classroom as a whole provides comparative data for a full range of students at a given grade level. Wright (2013) has developed guidelines for curriculum-based measurements for written expression. Using a grade appropriate writing prompt (e.g. story starter sentence or phrase), students are given one minute to think about the writing prompt and then 3 minutes to write. Wright provides the following instructions (p. 2-16):

- The evaluator selects a grade appropriate narrative writing prompt.
- I want you to write a story. I am going to read a sentence to you first and then I want you to write a short story about what happens. You will have one minute to think about the story you will write and then

have 3 minutes to write it. Do your best work. If you don't know how to spell a word, you should guess. Are there any questions?

- For the next minute, think about… [Insert story-starter]. Start the one-minute countdown timer.
- At the end of 1 minute, say "Start writing." Start the three-minute countdown timer.
- While the students are writing, the examiner(s) circulate around the room. If students stop before the end of the three-minute period, encourage the student to continue writing.
- At the end of three minutes, say "Stop writing" and collect the writing probes.

Tallying the number of words written and the number of correctly spelled words on the writing probe provides a simple way to identify students performing below grade level on two aspects of writing. Using writing norms by Gansle, VanDerHeyden, Noell, Resetar and Williams (2006), you can gauge whether a student's writing fluency and spelling is falling below expected norms. Using the appropriate norms based on the student's grade level and the time of year the data is obtained, you can identify which students would be appropriate candidates for the DeCoste Writing Protocol. Fall and spring measures for total words displayed in figures 2.3 and 2.4. Fall and spring measures for correctly spelled words are displayed in figures 2.5 and 2.6). While this form of preview process provides only a rough estimate of fluency and spelling skills, students' whose grade-level scores fall outside one standard deviation below the mean would be appropriate candidates for the DeCoste Writing Protocol.

Figure 2.3. Total Words Written-Fall Measures (Gansle et al., 2012)

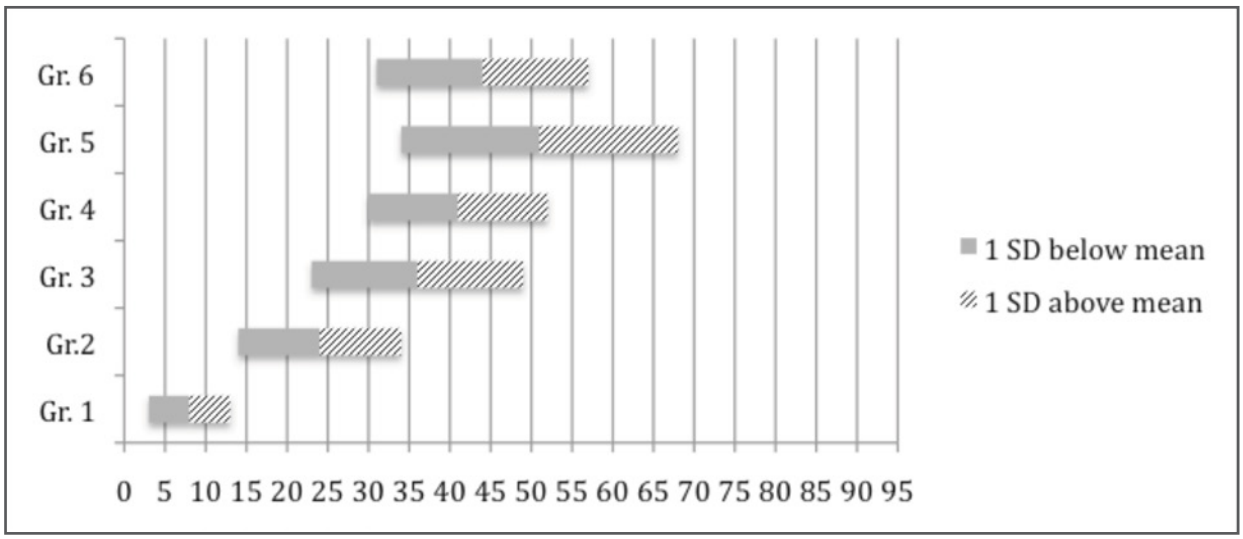


Figure 2.4. Total Words Written-Spring Measures (Gansle et al., 2012).

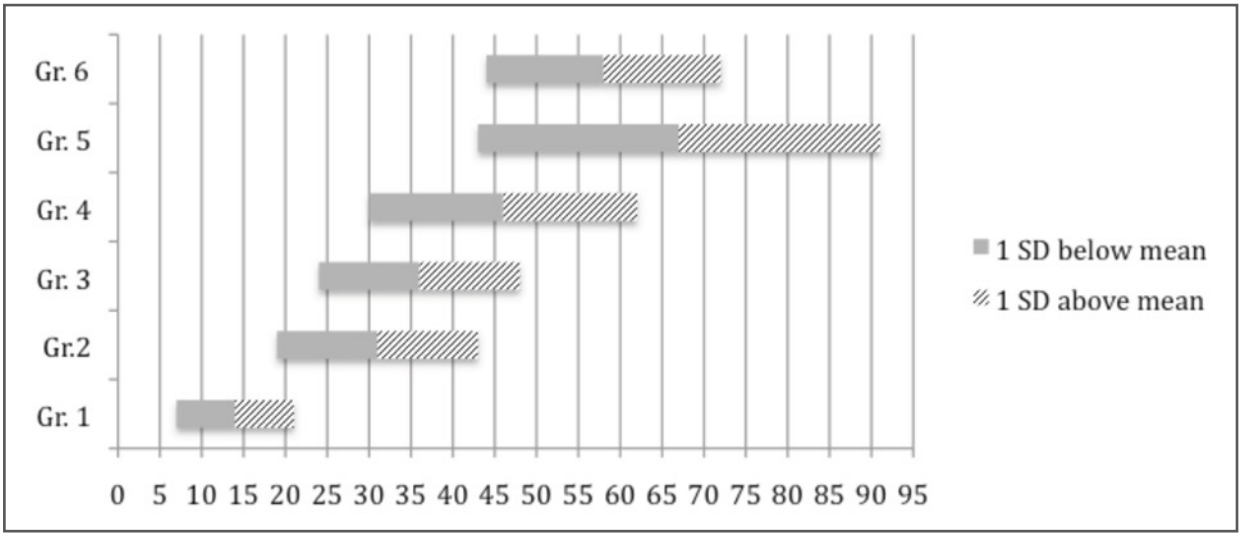


Figure 2.5. Correctly spelled words-Fall Measures (Gansle et al., 2012)

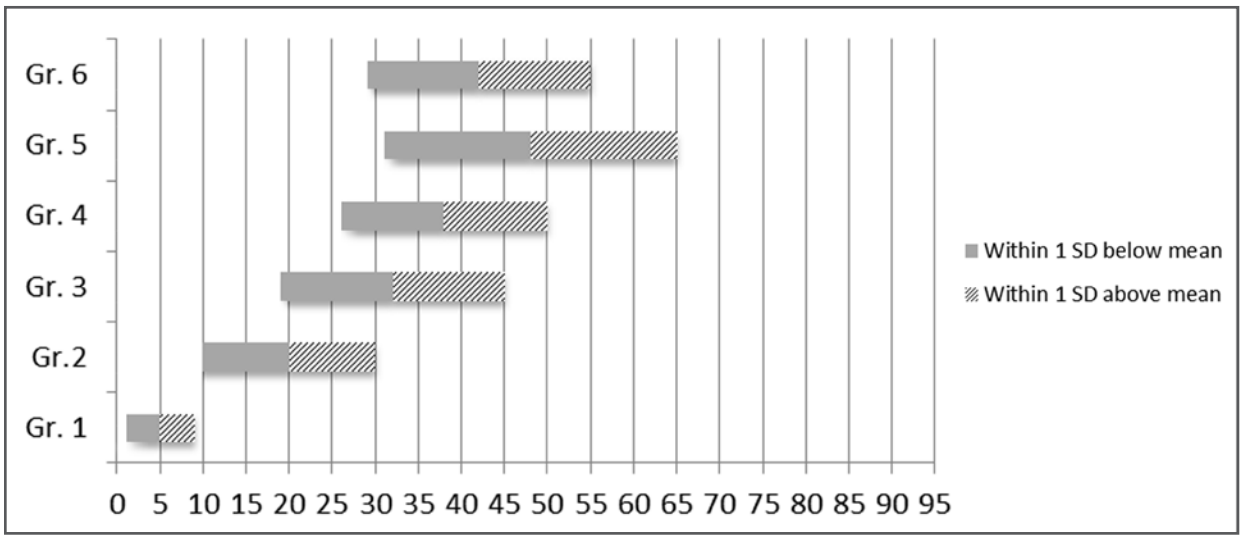
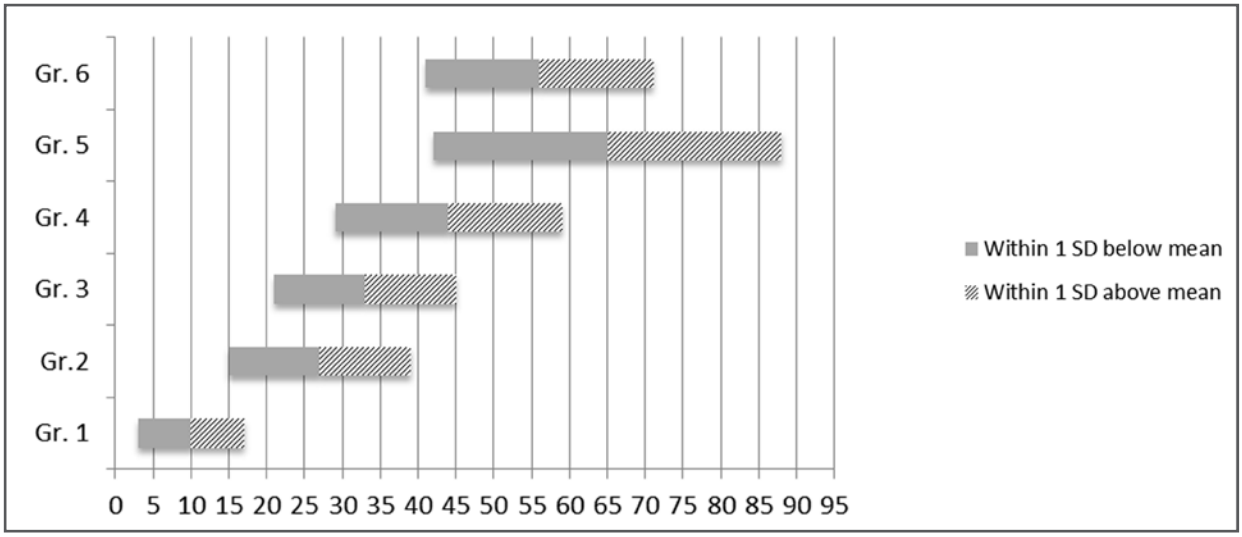


Figure 2.6. Correctly spelled words-Spring Measures (Gansle et al., 2012)



Once you have completed a preview process, to determine who is appropriate for the DeCoste Writing Protocol, it is advisable to create a calendar to schedule times for administering the DeCoste Writing Protocol.

WHO SHOULD ADMINISTER THE DECOSTE WRITING PROTOCOL?

The DeCoste Writing Protocol is not a standardized assessment. Instead of comparing a student's performance against normative data, the DeCoste Writing Protocol compares the student's productivity across writing tasks to help select a successful method based on individual performance data. Assistive technology specialists using an expert model of direct service delivery can administer the DeCoste Writing Protocol to targeted students. However, if you are using a capacity-building model of service delivery and have a high number of students that may be served by the use of the DeCoste Writing Protocol, then consider training school teams to use the Protocol. This process promotes ownership of writing accommodation decisions at the school level. You can also consider training departments such as Occupational Therapy (OT), Speech-Language Pathology (SLP), resource teachers, or diagnosticians to administer the DeCoste Writing Protocol in schools to which they are assigned. Often OT practitioners will administer the handwriting and keyboarding sections, and any additional modalities, and then partner with the SLP to administer the spelling tasks, and a teacher to administer the writing tasks.

The DeCoste Writing Protocol manual has been written to provide detailed instructions for all educators. However, supplementary professional development can also be conducted via face-to-face training, webinars, web conferencing, or as part of an online course.

The DeCoste Writing Protocol is a process to help make more evidenced-based decisions about writing accommodations and writing supports. Therefore, all educators and related service practitioners who need to delineate writing supports can use it. It should be understood that the information can help school teams make concrete plans for students with persistent writing difficulties who need support to achieve writing standards at the highest possible level of challenge. Writing accommodations, when used appropriately, help students surmount organic barriers, allowing them to better demonstrate what they know. Periodic re-evaluation using the DeCoste Writing Protocol can also confirm whether the student is still in need of an assigned accommodation.

Preparing to Administer the DeCoste Writing Protocol

1. Gather Background Information about the Student

Use the DeCoste Writing Protocol Background form for capturing the following information (Located in the Appendix):

Identifying information

Identified disabilities

Reading proficiency levels

History of handwriting difficulties and any interventions

Keyboarding methods and previous instruction

Experience with speech recognition or word prediction

Outcomes of writing accommodations currently in place

It is useful to obtain background information that documents the length and type of services the student received that addressed handwriting. Occupational Therapists and other appropriate professional staff who are familiar with the student should be consulted to obtain additional observations and data regarding handwriting. It is also useful to obtain handwriting samples. This can best be accomplished by making a copy of work samples that may have been completed in class. Student notebooks often provide samples that will provide evidence of the student's typical handwriting. Occupational Therapists will be able to describe the current quality of the student's handwriting, including letter formation, spacing, slant, etc.

Background information on keyboarding is also important. Determine how often the student uses keyboarding at home and at school and what type of keyboarding instruction has been provided. If you plan to include word prediction or speech-to-text as optional conditions, then it will also be important to document the student's level of experience with each of these methods. When comparing writing performance across conditions, it is essential to be aware of the student's experiential background.

2. Prepare Materials

Print out the copying sentences, the dictation sentences, the spelling word list, the extended writing topics, and the data collection forms located in the Appendices. Select the appropriate sentences to be copied and dictated, and the appropriate spelling word list. Select the type of extended writing prompt (narrative, opinion/argument, informative).

Print the following from the Appendices:

1. Sentences to be Copied
2. Sentences to be Dictated
3. Spelling Word List
4. Topics for Extended Writing
5. Graphic Organizer
6. Data Collection Form
7. Likert Graphic

Helpful Hint:

It is useful to print out all copying and dictated sentences, writing prompts, Likert graphic and scoring forms and compile them in a notebook.

Gather the following:

Pencil or pen

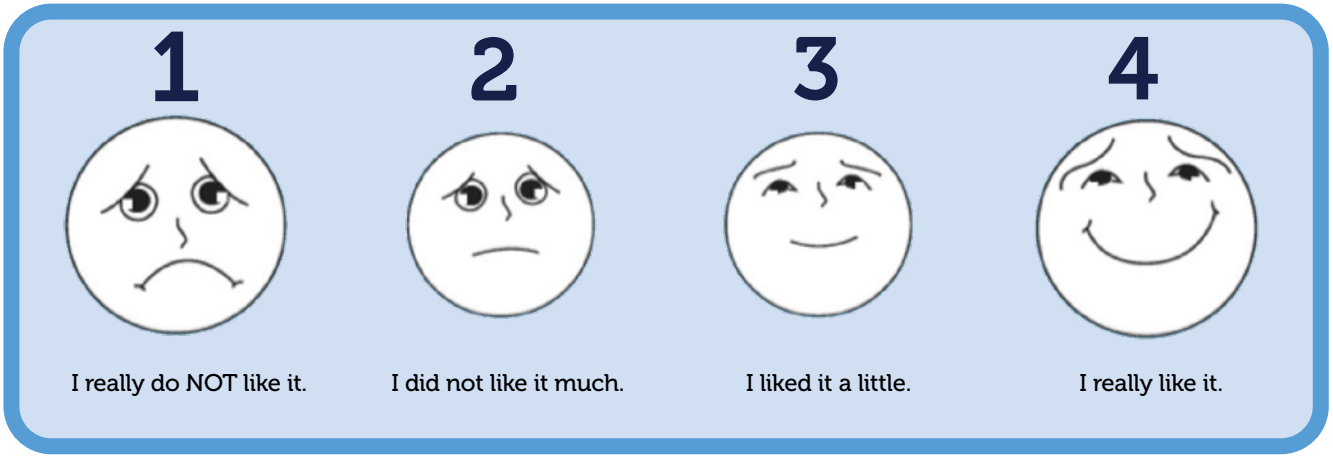
Lined paper appropriate to the student's grade level

Computer or tablet the student typically uses to write using word processing.

Speech recognition or word prediction applications as needed

Timer

Instructions



8. Arrange a Location

Pre-arrange a quiet space to administer the DeCoste Writing Protocol. The handwriting and standard keyboarding conditions can be administered in about 20-30 minutes; the spelling list can be completed in about 15 minutes. The extended writing task takes approximately 15 minutes. The Writing Protocol can be administered in two sessions if necessary to obtain a student's optimal performance.

Notes on Administering the DeCoste Writing Protocol

Verbal instructions for administration should be delivered in a friendly manner. Minor modifications are acceptable to allow for a more natural presentation, but essentially should be delivered in the same manner across conditions.

If the student begins to fatigue, it may be best to take a break or complete the Protocol in two sessions (e.g., handwriting and keyboarding tasks in the 1st session; spelling and extended writing in the 2nd session).

- Because the outcome of the Writing Protocol is focused on making informed decisions about instruction and the use of writing accommodations, the student should complete the Protocol tasks using the writing tool that is most often available to the student (e.g., type of keyboard or other writing devices).

- After using each modality (handwriting, keyboard, on-screen keyboard, speech to text), and after the spelling and extended writing task, students are asked to rate the degree to which they liked or disliked each writing method or writing task using the 4-point Likert scale. It is important that students understand that they are rating the methodology or task; they are not rating the writing topic.
- At the conclusion of the session, students are asked to state which overall method(s) they preferred (i.e., handwriting, keyboarding, or optional modalities).

RATIONALE AND DESCRIPTION OF THE DECOSTE WRITING PROTOCOL TASKS

To examine low-level transcription and the higher-level writing skills, the DeCoste Writing Protocol uses a variety of tasks. These tasks are described in more detail to better understand their purpose and how they are administered.

Alphabet Writing Task

In the original Written Productivity Profile, the alphabet writing task was designed primarily to look at a child's ability to construct all the letters of the alphabet, and so examiners were encouraged to tell the student what letter came next in the alphabet. **In the revised DeCoste Writing Protocol, in keeping with current research, the timed alphabet writing must be completed from memory.** The timed alphabet writing task has been found to be a strong predictor of orthographic-motor integration which contributes to writing fluency when using either handwriting or keyboarding (Christensen, 2004; Christensen & Jones, 2000; Medwell et al., 2009). Students are instructed to continue to write or type the alphabet in the correct sequence for one full minute. **No help is provided on the sequence of the letters**. If the student completes the alphabet in less than one minute, have the student write or type the alphabet again until the one-minute mark. Comparing beginning to end-of-year performance may be of particular interest to Occupational Therapists as it provides a measure of writing automaticity. To avoid practice effects, this DeCoste Writing Protocol task should not be a frequently practiced therapeutic activity.

Sentence Copying Tasks

Sentence copying tasks have been used by many researchers as a way to measure handwriting speed (Wallen, Bonney, & Lennox, 1996; Connelly, Gee & Walsh, 2007). Copied sentences demand less working memory, and do not require composing or spelling (Barnett, et. al, 2009). Because students with writing disabilities often demonstrate difficulties with the visual motor task of copying, this task continues to be included in the DeCoste Writing Protocol. In order for the sentences to reflect *copying*, rather than memorized writing, additional sentences are included (Figure 2.7). These sentences, called "pangrams" include all the letters of the alphabet and are categorized by broad measures of readability for use at different grade levels. Use the traditional "quick brown fox" sentence for younger students or select the sentence that corresponds to your student's reading level. "The quick brown fox…" sentence is often used by Occupational Therapists to monitor handwriting and keyboarding progress in students with disabilities, and is therefore more likely to be subject to practice effects. If this is the case, select a different sentence. **These sentences can be used to compare "copying" ability across different conditions (e.g., handwriting, keyboarding, and speech-to-text) for individual students.** Performance is measured in one-minute intervals.

Given research (Weintraub & Graham, 1998) on transcription that indicates that students are able to modify their speed to complete different task demands (e.g. quick writes, timed quizzes and exams), a fast copying task has been added to the DeCoste Writing Protocol. **The *best copying* task should**

reflect the student's best effort to produce his or her usual handwriting or keyboarding. The *fast copying* task should follow the dictation task, and reflect the student's ability to write as quickly as possible without making mistakes. Again, performance should be measured in one-minute intervals. Comparing the student's performance on best and fast copying tasks across conditions provides information on the student's ability to increase his or her speed relative to writing demands.

Figure 2.7. Sentences for Best and Fast Sentence Copying Tasks

Sentences for Copying Tasks	Grade Levels
The quick brown fox jumps over the lazy dog. *(33 letters)*	1-3
The five boxing wizards jump quickly. *(31 letters)*	2-4
Six big juicy steaks sizzled in a pan as five workmen left the quarry. *(56 letters)*	3-5
A mad boxer shot a quick, gloved jab to the jaw of his dizzy opponent. *(54 letters)*	5-8
The public was amazed to view the quickness and dexterity of the juggler. *(60 letters)*	6-8
While making deep excavations we found some quaint bronze jewelry. (56 letters)	8-12
No kidding, Lorenzo called off his trip to visit Mexico City just because they told him the conquistadores were extinct. (99 letters)	10-11

Pangrams Source: http://www.rinkworks.com/words/pangrams.shtml

Dictation Sentence Task

When handwriting or keyboarding sentences from oral dictation, reading and higher order thinking to compose is not factored (Horne, Ferrier, Singleton and Read, 2011), while spelling is factored in. Writing from dictation diminishes the demands of reading and composing, and instead, students must combine the orthographic-motor task of writing with the added transcription skill of spelling. Horne et al. (2011) contend that straight copying tasks are more removed from classroom writing processes, and therefore dictations writing tasks provide a purer measure of speed to demonstrate handwriting or keyboarding in the classroom. In this version of the DeCoste Writing Protocol, more sentences with words at different graded reading levels have been created. Sentences should be selected based on the student's grade level. with (Dictation Sentences are located in the Appendices)

For most students, including students with mild disabilities who are being held to college and career readiness standards, use the level that matches the student's grade level. In some situations, you may be evaluating students with moderate cognitive impairments who are using modified materials. In this case, you may want to consider using the level commensurate with the student's reading level.

Speed of writing dictated sentences should be measured in one-minute intervals. Typically, students will write dictated sentences at a slightly slower rate (1 to 2 WPM slower) when compared to their copying rates. Some students who demonstrate sufficient orthographic-motor speed when handwriting and keyboarding during the alphabet writing task may demonstrate speeds

that are comparatively slower when writing from dictation due to spelling hurdles. Students, who demonstrate slow orthographic-motor speeds, slow copying and dictation speeds may be experiencing difficulties with motor and spelling demands. Analyzing the student's linguistic knowledge based on his or her performance on the dictation task and the spelling portion (Step 3) of the DeCoste Writing Protocol may help to explain the impact of spelling on written productivity.

Grades K-2 Dictation Sentences

Dictations tasks require the student to manage orthographic-motor plus spelling skills. The following sentence sets can be used with students in grades K to 2. These sentences contain core words for grades K-2. The underlining provides readability coding. These sentences are dictated to students. (A hard copy of the sentences is not provided for this task.) Scoring words per minute rates provides a measure of written productivity; the student is not penalized for spelling errors. Misspellings, however, offer an additional opportunity to examine the linguistic knowledge that contributes to spelling.

Pre	Grade 1	Grade 2

1. My dog is black and white. (6 words -- Pre: 3, G1: 3)

2. She is my best friend. (5 words -- Pre: 2, G1: 3)

3. I ran all the way up the hill. (8 words -- Pre: 4, G1: 4)

4. All that running made me tired. (6 words -- Pre: 1, G1: 4; G2: 1)

5. She went to buy new shoes at the store. (9 words -- Pre: 3, G1: 6)

6. Her old shoes are too small. (6 words -- G1: 5, G2: 1)

7. The boy got up late this morning. (7 words -- Pre: 3, G1: 3, G2: 1)

8. He was almost late for school. (6 words -- Pre: 2, G1: 2, G2: 2)

9. I have the best teacher in the school. (8 words -- Pre: 5, G1: 2, G2: 1)

10. We read and write every day. (6 words -- Pre: 2, G1: 3, G2: 1)

Grades 3-5 Dictation Sentences

The following sentences can be used with students in grades 3 to 5. These sentences contain orthographic word patterns using short vowels and long vowel combinations, as well as basic suffixes. Sentences include core vocabulary words for grades 3 to 5. The underlining provides readability coding. These sentences are dictated to students. (A hard copy of the sentences is not provided for this task.). Scoring words per minute rates provides a measure of written productivity; the student is not penalized for spelling errors. Misspellings, however, offer an additional opportunity to examine the linguistic knowledge that contributes to spelling.

Words	Grade 3	Grade 4	Grade 5

1. The talented acrobats amazed the crowd with their exciting and dangerous leaps and flips through flaming hoops. (17 words – G3: 4, G4: 3, G5: 2)

2. Observers were astonished when the magician appeared to make a volunteer from the audience vanish into thin air. (19 words – G3: 3, G4: 2, G5: 3)

3. The English soldiers could not avoid defeat and capture once they ran out of ammunition following a heated battle. (19 words – G3: 2, G4: 4, G5: 2)

4. The tourists flung their coins into the ancient fountain hoping their dreams of travel and adventure might come true. (20 words – G3: 3, G4: 2, G5: 3)

5. The early astronauts are considered to be the first pioneers to explore the mysterious spaces beyond the atmosphere of Earth. (20 words – G3: 2, G4: 4, G5: 2)

Grades 6-8 Dictation Sentences

The following sentences can be used with students in grades 6 to 8. These sentences contain two to three syllable words with prefixes and suffixes. Sentences include core vocabulary words for grades 6 to 8. The underlining provides readability coding. These sentences are dictated to students. (A hard copy of the sentences is not provided for this task.). Scoring words per minute rates provides a measure of written productivity; the student is not penalized for spelling errors. Misspellings, however, offer an additional opportunity to examine the linguistic knowledge that contributes to spelling.

Grade 6 Grade 7 Grade 8

1. Her enthusiastic attitude and professional appearance made the job applicant an attractive candidate for the job. (16 words – G6: 4, G7: 1, G8: 1)

2. It was the distinct misfortune of high seas travelers to stumble across the path of the notorious and violent pirate, Captain Cook. (22 words – G6: 2, G7: 1, G8: 1)

3. The exploration and protection of the artifacts left behind by primitive civilizations is an interesting and admirable profession. (18 words – G6: 4, G7: 1, G8: 1)

4. My favorite actress recently received recognition for her outstanding performance as a loving and resourceful single mother. (17 words – G6: 3, G7: 1, G8: 1)

5. The surgeon gazed with amazement at the bravery and determination his patient displayed while learning to walk using his new artificial leg. (22 words – G6: 4, G7: 1, G8: 1)

Grade 9-12 Dictation Sentences

The following sentences can be used with students in grades 9-12. These sentences include derivational word patterns. The underlining provides readability coding. The sentences are dictated to students. (A hard copy of the sentences is not provided for this task.). Scoring words per minute rates provides a measure of written productivity; the student is not penalized for spelling errors. Misspellings, however, offer an additional opportunity to examine the linguistic knowledge that contributes to spelling.

Grade 9 Grade 10 Grade 11 Grade 12

1. All Olympic gymnasts must incorporate a number of compulsory moves in their gymnastic routines. (14 words; 2 derivational, 1 Grade 9, 1 Grade 10)

2. Air pollution and global warming are only two of the possible consequences of our dependence on fossil fuels. (18 words; 2 derivational, 1 Grade 10)

3. The composition of the rock layer includes mineral and organic sediments that predate the time of the dinosaurs. (18 words; 2 derivational, 2 Grade 10)

4. Teens with an addiction to video gaming become so immersed in their games that have very little social interaction with friends and family. (23 words; 2 Grade 11 that are also derivational)

5. The usual drugs and treatments were mostly ineffectual against the highly infectious disease sweeping across the country. (17 words; 2 Grade 12 words that are also derivational)

Composed Text

Composing sentences requires the student to integrate transcriptions skills with some measure of higher order thinking. The student needs to generate ideas, activate working memory, and formulate written language. Similar to the task in the original version of the Written Productivity Profile, the evaluator can engage the student in conversation about a topic that is of interest to the student. After one to two minutes, once the student has verbally generated some ideas, the student is asked to write some sentences about these ideas.

Do not visually or verbally model sentences. The evaluator should track what is written in one-minute intervals to obtain word per minute scores. This task is looking at a student's ability to compose a brief writing response. For this task, the student must integrate transcription and written language skills.

Spelling Word List

The spelling word list, developed by Dr. Jan Wasowicz, is described in Section One. It includes a range of grade-appropriate words that can be used to screen linguistic knowledge. For most students, including students with mild disabilities who are being held to college and career readiness standards, use the list that matches the student's grade level. In some situations, you may be evaluating students with moderate cognitive impairments using modified materials. In this case, you may want to consider using the level commensurate with the student's reading level.

Using a keyboard is preferable because it allows the examiner to more easily analyze misspellings and also provides a way to check on the usefulness of spell checkers. Words from the list that are misspelled can be more easily checked using the spell checking tools of a word processor to see if they appear on the suggested spelling list. Likewise, using a word prediction application, you can check to see whether word prediction will suggest intended spellings, and therefore, gauge the usefulness of word prediction for a given student. However, if the student is unfamiliar with the keyboard, then the student can handwrite.

When presenting each word on the spelling list, the examiner should speak the targeted spelling word, verbally present the targeted word in the context of a sentence, and then speak the targeted word once again.

Figure 2.5. Spelling word lists.

Primary Grade (K-2) Spelling Words	Upper Elementary (3-5) Spelling Words	Middle and High School Spelling Words
hen	fruit	trounce
jog	place	enough
was	city	distinct
thing	knife	whistling
choke	flavor	appealing
raid	bottle	statue
call	grudge	misheard
where	caught	spectator
truck	their	criticize
switch	climbed	changeable
bushes	calves	reinforcement
shopping	squinting	indefinite
cries	voyage	edition
biked	measure	chlorinated
said	misspell	irreversible
	guilty	predetermination
	friendliest	permissibility
	magician	disciplinary
	majority	commercialism
	continuous	expeditious

Extended Writing

The extended writing task was added because the overarching goal for today's students is to write routinely for long and short periods for a range of tasks, purposes, and audiences, beginning in the primary grades (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). As with the previous version of the Written Productivity Profile, a writing traits rubric is used to gauge writing strengths and weaknesses. Writing rubrics continue to be recommended in the literature as a guide for teachers to monitor students' writing performance (Moore, Moore, Cunningham & Cunningham, 2011; Olinghouse and Wilson, 2012, Honigsfeld & Dove, 2013). They provide specific criteria to gauge writing strengths and weaknesses, to help plan instruction, and to sharpen feedback to steer writing improvement (Spandel, 2006).

Given the national emphasis on writing structures, three different prompts are provided for three types of writing in the revised DeCoste Writing Protocol. Evaluators should select the type of writing that is being emphasized as part of the student's classroom writing instruction. Select a topic that will engage the writer. Writing prompts were designed to be open-ended enough to allow for sufficient generation of text at elementary (Figure 2.9) and secondary levels (Figure 2.10).

Efforts were made to design writing tasks that tap into everyday experiences. Just as teachers would do in a classroom when introducing a writing topic, it is acceptable to briefly present the topic and engage in some general conversation about the topic. Then the student is given one minute to plan what he or she wants to write. Because this is an extended writing task and

because you will be examining the degree to which the student organizes and presents details, a graphic organizer is provided (Appendix). If the student struggles with planning, it is acceptable to ask probing questions, but not provide specific ideas.

Since current research suggests that students perform best when using their most fluent method of writing (Christensen, 2004; Russell, 2000), students should be encouraged to complete the extended writing task using their best method of transcription, based on their orthographic speed and performance on copying tasks. Once the student ceases to write for one full minute, then the student should read aloud what he or she wrote in order to check on words that are unclear.

This task provides evidence of a student's ability to write on demand, and it offers a longer writing sample for the examination of writing traits. It can also be an opportunity to reflect on the degree to which grade-level college and career readiness language arts standards are being met. One writing sample, however, may not be sufficient. It is advisable to examine additional extended writing tasks that have been completed in class without adult edits or revisions.

Students with severe writing deficits may have difficulty completing this task. Nonetheless, whenever possible, the extended writing task should be administered to establish a baseline writing sample that allows educators to look at the achievement of writing standards, and various aspects of the writing process. If the student is unwilling or unable to attempt the task, then request recent examples of the student's independent writing to analyze.

Figure 2.9. Topics for Elementary Writing Tasks

Elementary		
Type of Writing:	**Topic Titles**	**Prompt**
Narrative	My life at home	Tell about an important event that happened to you at home.
	My life at school	Tell about an important event that happened to you at school.
	My community	Tell about an important event that happened to you out in your community.
Opinion	Should kids have chores?	Provide facts and reasons to support your opinion on this topic
	Should kids have homework?	Provide facts and reasons to support your opinion on this topic
	Should kids have recess everyday at school?	Provide facts and reasons to support your opinion on this topic
Informative	All about sports or hobbies	Describe a sport or hobby that you know a great deal about. Provide facts, definitions, and details that would help someone new to this sport or hobby learn more about it.
	All about animals	Describe an animal that you know a great deal about. Provide facts, definitions, and details that would help someone who is not an expert with the animal learn more about it.
	All about a special place	Describe a place or location that you know a great deal about. Provide facts, definitions, and details that would help someone who has never visited this location learn more about it.

Figure 2.10. Topics for Secondary Writing

Middle and High School Grades		
Type of writing:	**Topic Titles**	**Prompt**
Narrative	A perfect day	Describe your perfect day. Include well-chosen details that help describe the events of the day and why it was so perfect.
	My worst day	Describe your worst day. Include well-chosen details that help describe the events of the day and why it was so awful.
	A day in the life	Describe a day in the life of your pet (or someone else's). Include well-chosen details that help describe the events of the day from the animals' perspective.
Argument	Dress codes	Do you believe that schools should have a dress code? Why or why not? Provide facts and reasons to support your stand on this.
	Snacks at school	Do you believe that schools should sell sodas and sugary snacks at lunch or after school? Why or why not? Provide facts and reasons to support your stand on this.
	Mobile phones at school	Should students be able to use mobile phones in school? Why or why not? Provide facts and reasons that support your stand on this.
Informative	School activities	A new student has come to your school. Describe the types of extra-curricular activities that they can get involved in. Provide facts and details that would help them choose some clubs or groups to join.
	A pet for the family	Your family wants to get a pet. Describe some options for pets that they might want to consider. Provide facts and details that will help them choose one.
	My town	Your hometown is being featured in a magazine. Describe your town to the magazine editors. Provide facts and details that will allow them to learn about your town before they come to visit it.

OPTIONAL CONDITIONS

Optional conditions can be added to determine a student's productivity with additional writing accommodations.

Figure 2.11

OPTION	CONSIDERATIONS	PURPOSE
On-screen keyboarding	When the student is more often using a tablet with an on-screen keyboard	To document a baseline using an on-screen keyboard
Text-to-Speech with word processing	When the student struggles to monitor or edit spelling and written language.	To determine if the student benefits from having text-to-speech feedback when spelling and composing
Speech-to-Text (Speech recognition)	When handwriting, nor keyboarding are possible given physical disabilities, or when there are persistent, severe spelling deficits	To develop a baseline or document the usefulness of speech-to-text to more independently produce writing
Word Prediction	When the student has persistent spelling deficits, but can spell at least at a phonetic level; or when motor deficits affect the ability to type efficiently	To gauge whether word prediction is useful in that it increases spelling and writing independence.

EVALUATOR INSTRUCTIONS FOR ADMINISTERING THE DECOSTE WRITING PROTOCOL

The following section details the four part process for documenting the lower and higher order skills that contribute to written productivity. This process examines handwriting, keyboarding, spelling and composition.

Figure 2.12. Using Handwriting

	Examiner	To Student
1	In a quiet space, arrange materials, e.g., timer, pencil (no eraser) or pen, paper, instructions, sentences to copy, dictation sentences, spelling word lists, extended writing prompts, graphic organizer, and scoring sheets.	
2	Tell the student:	"Today we're going to find out about the ways that you write best. First you're going to do some handwriting and keyboarding tasks, then some spelling and writing tasks."
3	Be prepared to note the following: Pencil grip, posture, attitude, frustration, refusals, anxiety, persistence, self-monitoring strategies, background knowledge and overall engagement.	
4	**Timed Alphabet Writing:** The timed alphabet writing task is recognized as a valid measure of orthographic-motor integration. Instruct the student to use lower case letters to write the alphabet. The student is encouraged to <u>not</u> spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keep writing. Start timing the task once the student begins to write the first letter. Tell the student to stop at the 1-minute mark. In cases where the student completes the task in less than one minute, the student is instructed to write the alphabet again until you've reached one minute.	Write the letters of the alphabet in the correct order until I say "stop". Use lower case letters. If you get to the end of the alphabet, just start again until I say "stop". "If you make a mistake, just cross it out and keep going."

	Examiner	To Student
	Count the number of discernible, correctly sequenced letters produced in one minute. For example, in the sequence 'abcdfeghi' , the 'e' would not count. In the sequence 'adcbefgh', the 'd' and 'b' would not count. No penalty for missing letters. Record the number of letters written in one minute.	
5	**Best Sentence copying:** Select the sentence to be copied based on the student's grade level (Appendix). For an older student with moderate cognitive impairments, you may want to select the sentence based on reading level. The student is instructed to copy the sentence using his or her best handwriting. The student is encouraged to not spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keep writing. Start timing when the student begins to handwrite. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the fully copied sentence, you can allow the student to finish the task, but do not count those letters. In cases where the student completes the copying task in less than 1-minute, the student is instructed to begin the task again. **Scoring:** Count all discernible letters even if poorly formed for the one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute.	"Keep writing this sentence using your best handwriting until I say "stop". If you get to the end of the sentence, then write the sentence again until I say 'stop'. " "If you make a mistake, just cross it out and keep going." "Stop writing now."
6	**Dictation Sentence Writing:** Select a dictation sentence that would be typical for the grade-level of the student (Appendix). The sentence should not be too difficult for the student, but should also include some words that provide a reasonable spelling challenge. Read the dictation sentences to the student. Then speak each word of the sentence carefully one word at a time, keeping pace with the student's handwriting. When he or she has completed a word, supply the next word in the sentence.	"Now I want you to write a sentence that I will read to you. Do your best to write each word in the sentence. "If you make a mistake, just cross it out and keep going." "First listen to the full sentence." [Read the dictation sentence]

	Examiner	To Student
	Do not provide a visual model of the sentence. Do not stretch or over articulate words such that the word is phonetically disassembled. The student is encouraged <u>not</u> to spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keeps writing. Start timing once the student begins to write the first letter of the first word. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the complete dictation sentence, you can allow the student to finish the task, but do not count these letters. In cases where the student completes the dictation task in less than 1-minute, repeat the sentence until you've reached one minute. **Scoring** Count all discernible letters even if poorly formed that were written in the one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute.	"Now you can write each word I say in the sentence." [Say the first word in the dictation sentence]
7	**Fast Sentence Copying:** Select a different sentence to be copied at the student's grade level (Appendix). For older students with moderate cognitive impairments, you may want to select the sentence based on reading level. Instruct the student to write the sentence as quickly as possible without making mistakes. Start timing when the student begins to handwrite. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the fully copied sentence, you can allow the student to finish the task, but do not count these letters. In cases where the student completes the dictation task in less than 1-minute, the student is instructed to copy the sentence again until you've reached one minute. **Scoring:** Count all discernible letters even if poorly formed that were written in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute.	"Write this sentence as quickly as you can without making mistakes, but make sure I can read each word. If you finish the sentence, just start again, until I say 'stop'." "If you make a mistake, just cross it out and keep going." "Stop writing now."

	Examiner	To Student
8	**Composed Text:** Casually engage the student in a conversation that is of interest to the student. After 1 to 2 minutes, ask the student to write about what was discussed. Do not visually or verbally model sentences for the student. Encourage the student to write as many sentences as he or she can. Start timing when the student begins to handwrite. Note the last letter in the word that was written at one-minute intervals until the student has completed the task. **Scoring:** Count all discernible letters even if poorly formed. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written for each one full minute interval.	"Write some sentences about what we just talked about." "What else can you write about?"
9	**Likert Scale** Use the Likert graphic to ask the student how he/she likes to write by hand. Be sure the student is not responding to the content of each task, but to the use of handwriting.	"Tell me how you feel about handwriting?"

Using Keyboarding

	Examiner	To Student
1	Using the keyboard that is most often used by the student in the classroom (e.g., computer keyboard, portable word processor, tablet). Open a word processing document. Save the file with the student's name and date. (keyboard_smith_9_16_14)	
2	Tell the student:	"Now we're going to find out about the ways that you use a keyboard best."

	Examiner	To Student
3	Be prepared to note the following: Style of keyboarding (use of one or two hands, fingering, use of vision), comfort level with computer functions, attitude, frustration, refusals, anxiety, persistence, self-monitoring strategies, and overall engagement.	
4	**Timed Alphabet Writing:** Instruct the student to type the alphabet in the correct order. Start timing the task once the student begins to type the first letter. Tell the student to stop at the one-minute mark. In cases where the student completes the task in less than one minute, the student is instructed to write the alphabet again until you've reached one minute. **Scoring:** Count the number of correctly sequenced letters. No penalty for missing letters. For example, in the sequence abcdfeghi' , the 'e' would not count. In the sequence 'adcbefgh', the 'd' and 'b' would not count. Record the number of letters typed in one minute. Save the file.	"Type the letters of the alphabet in the correct order until I say "stop". Use lower case letters. If you get to the end of the alphabet, just start again until I say "stop". "Stop writing now."
5	**Best Sentence Copying:** Use the sentence that was used for "best copying" when handwriting. Start timing when the student begins to type. Stop timing at the 1-minute mark and note the last letter in the word that was typed. You can allow the student to finish the sentence, but do not count those letters. In cases where the student completes the task in less than one minute, the student is instructed to type the alphabet again until you've reached one minute. **Scoring:** Count all letters typed. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed in one minute. Save the file.	"Keep typing this sentence using your best keyboarding until I say "stop". If you get to the end of the sentence, then type the sentence again until I say 'stop'. " "Stop typing now."

	Examiner	To Student
6	**Dictation Sentence Writing:** Use the same dictation sentence that was used when handwriting. The sentence should not be too difficult for the student, but should also include some words that provide a reasonable spelling challenge. When using a word processor, turn off auto correct and the spell checker, or instruct the student not to use the spell checker. Read the dictation sentence to the student. Then speak each word of the sentence carefully one word at a time, keeping pace with the student's typing. When he or she has completed a word, supply the next word in the sentence. Do not provide a visual model of the sentence. Do not stretch or over articulate words such that the word is phonetically disassembled. Start timing once the student begins to type the first letter of the first word. Stop timing at the one-minute mark and note the last letter in the word that was written. You can allow the student to finish the sentence, but do not count these letters. In cases where the student completes the dictation task in less than one-minute, repeat the sentence until you've reached one minute. **Scoring:** Count all the letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed in one minute. Save the file	*"Now I want you to write a sentence that I will read to you. Do your best to write each word in the sentence.* *Do not use the spell checker."* *First listen to the full sentence.* [Read the dictation sentence] *"Now you can type each word I say in the sentence."* [Say the first word in the dictation sentence]
7	**Fast Sentence Copying:** Use the sentence that was used for "fast copying" when handwriting. Instruct the student to type the sentence as quickly as possible without making mistakes. Start timing when the student begins to type the first letter. Stop timing at the one-minute mark and note the last letter in the word that was typed. You can allow the student to finish the task, but do not count these letters. In cases where the student completes the fast copying task in less than one-minute, the student is instructed to copy the sentence again until you've reached one minute.	Type this sentence again as quickly as you can without making mistakes. If you finish the sentence, just start again, until I say 'stop'." "Stop typing now."

	Examiner	To Student
	Scoring: Record the number of letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Save the file.	
8	**Composed Text:** Casually engage the student in a new conversation that is of interest to the student. After 1 to 2 minutes, ask the student to write some sentences about what was discussed. Do not visually or verbally model sentences for the student. Start timing when the student begins to type the first letter. Encourage the student to write as many sentences as he or she can. Note the last letter in the word that was written at each one-minute interval. **Scoring:** Count all letters typed within each one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed for each one full minute interval. Save the file.	"Write some sentences about what we just talked about." "What else can you write about?"
9	Use the Likert graphic to ask the student how he/she likes to write using a keyboard. Be sure the student is not responding to the content of each task, but to the use of a keyboard.	"Tell me how you feel about writing using a keyboard."

Using the Spelling Word List

1	This is an untimed task. Open a new word processing document. Turn off spell check and autocorrect in the word processing program, or instruct the student to not use right click, nor spell check. Save the file with the student's name and date. (spelling_jones_9_16_14). Using a keyboard and word processing program allows you to gauge the number of words that can be detected by a spell checker once the student has completed the task. If the student is unfamiliar with the keyboard, the student can handwrite the spelling words. Hold the list of spelling words in a way that the student cannot see the words. Use the words at the grade appropriate level.	
2	Tell the student:	"Now you will type some spelling words." I'll say each word out loud for you to type."
3	Say the targeted spelling word clearly. Then use the word in the context of a sentence. Then say the word again. Save the file. Scoring: After completing the DeCoste Writing Protocol, analyze the spelling errors using the charts in Figure X. Then copy and paste the student's spelling into a new word processing file. Calculate the percentage of correctly spelled words. You can also determine the percentage of words that could be spell checked using "right click".	[Example: "Their. It was their first trip on an airplane. Their."]
4	Use the Likert graphic to ask the student how he or she feels about spelling.	"Tell me how you feel about spelling."

Using the Extended Writing Task

1	Use the student's mode of writing that is most fluent based on the overall WPM speed obtained in step 1 (handwriting) and step 2 (keyboarding). All things being relatively equal, let the student choose between handwriting or keyboarding. Open a new word processing file. Be sure auto correct is turned off. Save the file with the student's name and date. (writing_jones_9_16_14) Select the appropriate type of writing and writing prompt at the elementary or secondary level (Appendix).	
2	**Extended Writing Task:** Tell the student the writing topic and engage the student in some discussion on the topic. It is important that the student has a sufficient number of ideas to write an extended period. Do not tell the student what to write, but encourage him or her to generate ideas. The student is given about one minute to plan what he or she will write. For students in grades 3 or above, provide them with the graphic organizer to plan his or her writing. (Appendix) Have the student write the title topic in the center. Then the student can begin planning For students in grades 2 or under, students who are reluctant writers or reading below 2nd grade, you can use questions to prompt ideas. You can help the student as needed to transcribe his or her ideas onto the graphic organizer or draw a picture on the graphic organizer to represent the student's idea. Start the timer once the student begins to write the first letter of his or her first word. Prompt the student to keep writing.	"Now you will write on a topic for about 10 minutes. After you finish writing, I'll have you read what you wrote." Your topic is _____. Let's talk about this topic first. What are some of your ideas about this topic?" "What else do you know about this topic?" "Before you start to write, you will have 1 minute to plan what you want to write. Let's write the title here [on the graphic organizer]. Now you can begin planning what you will write." "You can start writing now." "Write more about your topic." "What else can you add?"

Using the Extended Writing Task

	Make a note of the word that was written at the end of each 1-minute interval. You can allow the student to finish his or her sentence, but do not count the words completed beyond 10 minutes. Once the student stops writing for one full minute, end the writing task and have the student read his or her writing. If the student is still writing after nine minutes, give the student one more minute to finish his or her writing Save the file. Have the student read aloud what he or she wrote. The examiner matches the students reading to written words that are unclear in order to appropriately score the writing and spelling. Scoring: To score WPM speeds, count and record the number of words for each one-minute interval, including misspelled words, crossed out words, and partial words. After completing the DeCoste Writing Protocol, count the total number of words written and divide by the number of one-minute intervals to get a mean WPM score. Use the 6 + 1 Writing Traits rubric specified in Appendix to gauge the quality of the students writing abilities. This data combined with data from classroom writing tasks is intended to help identify instructional writing needs. Optionally, you can also examine spelling in the context of generative writing. You can calculate the percentage of misspelled words. You can also analyze linguistic knowledge based on misspellings.	*"You have about 1 more minute to finish your writing."* After an additional minute, say, *"You can stop writing now."* *"Now I'd like you to read what you wrote out loud."*
3	Use the Likert graphic to ask the student how he or she feels about writing. Be sure the student is reflecting on writing to express ideas, and not on the topic alone.	"Tell me how you feel about writing."

Using Optional Writing Conditions

You may want to consider writing under different conditions or using different writing modalities. Instructions will vary depending upon the modality or conditions you are exploring. Minimally, you will want to use the Best Copying task and the Composing Text task. Under some conditions (i.e., the text-to-speech and the word prediction task), the Alphabet Writing task in not useful. You can use the Likert scale to ask students how they felt about different methods of writing.

On-Screen Keyboarding

Set up for on-screen keyboarding using a computer or tablet.
Use a variation of the keyboarding instructions, but alter the introductory instructions:
"Now we're going to find out about how you use on-screen keyboarding."

Text-to-Speech with Word Processing

Open the text-to-speech application and check the settings to set basic parameters, or those settings familiar to the student.
Note these settings on you the form you use to record results.
Use a variation of the keyboarding instructions, but alter the introductory instructions to:
"Now we're going to find out whether having the text read aloud as you write is useful to you."

Speech to Text

Open the appropriate software, and check the settings to set basic parameters, or those settings familiar to the student. Note these settings on you the form you use to record results.
Use a variation of the keyboarding instructions. (Skip the Alphabet Writing Task.) Alter the introductory instructions to: **"Now we're going to find out about the ways that you use your voice to write."**

Word Prediction

Open the appropriate software, and check the settings to set basic parameters, or those settings familiar to the student. Note these settings on you the form you use to record results.
Use a variation of the keyboarding instructions. (Skip the Alphabet Writing Task.) Alter the introductory instructions:
"Now we're going to find out about the ways that you use word prediction to help you write."

Overall Response to Writing Modalities

1	Ask the student to state which overall method(s) he or she preferred.	*What works best for you when you are writing?"* [Handwriting, Keyboarding, other modalities]

Calculating Words Per Minute

Dividing the number of characters by 5 to reach a WPM score is a common formula (Dunn & Reay, 1989; Pisha, 1993; Rogers & Case-Smith, 2002), as the mean written word length in general news publications is five letters.

SCORING THE DECOSTE WRITING PROTOCOL

The basic DeCoste Writing Protocol assesses writing in four steps: handwriting, keyboarding, spelling and composing. The DeCoste Writing Protocol consists of five writing conditions applied to handwriting and keyboarding. The best coping condition was added to this revised edition of the DeCoste Writing Protocol. Optional conditions can be added (e.g., on-screen keyboarding, test-to-speech, speech recognition, word predictions). The DeCoste Writing Protocol continues to include a spelling word list, though the words and the analysis of the words have been updated. The Extended Writing task was added to provide an opportunity to understand baseline-writing skills commensurate with college and career writing standards. Scoring information is described below for each of the four steps of the DeCoste Writing Protocol.

While each of the writing tasks in steps one (handwriting) and step two (keyboarding) measures the rate in letters-per-minute, it is important to convert this to words-per-minute for later comparison. "Discernible" letters are defined as letters that could be identified out of the context of the sentence. Do not count spaces. Do not penalize the student for omitted or incorrect letters. Then divide the letters per minute by 5 to obtain a words-per-minute score.

Analyzing Handwriting Trends

While currently available research can be used to broadly gauge a whether a student's orthographic-motor speed and other handwriting speed rates (see Section One page 112 and 113) are close to the norm, it is important to remember that using the DeCoste Writing Protocol, a student's performance is compared across conditions, not to other students.

Each of the handwriting tasks provides varying perspectives: the alphabet writing task provides a measure of orthographic-motor integration. The best sentence copying provides a baseline of handwriting speed to copy text (with no spelling ability required), while the fast sentence copying demonstrates the upper register of handwriting speed for copying. Dictation sentences factor in spelling, while the composed text factors in spelling and text generation. Confer with Occupational Therapists on handwriting and keyboarding quality. For students with slow handwriting on copying tasks, evidence-based activities to improve handwriting automaticity are described in Section Three.

Timed Alphabet Writing:

Count the number of legible, correctly sequenced letters. For example, in the sequence 'abcdfeghi' , the 'e' would not count. In the sequence 'adcbefgh', the'd' and 'b' would not count. No penalty for missing letters. Record the number of letters written in one minute. Convert to words-per-minute.

Best Sentence Copying:

Count all discernible letters even if poorly formed for the one minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute. Convert to words-per-minute.

Dictation Sentence Writing:

Count all discernible letters even if poorly formed for the one minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute. Convert to words-per-minute.

Fast Sentence Copying:

Count all discernible letters even if poorly formed for the one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute. Convert to words-per-minute.

Composed Text:

Count all discernible letters even if poorly formed for each one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written for each one full minute interval. Convert to words-per-minute.

Analyzing Keyboarding Trends

Keyboarding fluency (speed plus accuracy) impacts writing quality. Initially the goal is for keyboarding to be equivalent to handwriting fluency, but eventually, keyboarding has the potential to be faster and can accommodate handwriting legibility issues. While currently available research can be used (Section One page 135 and 138) to broadly gauge whether a student's rate of keyboarding is close to the norm, it is more important to determine how their keyboarding compares to handwriting or other modalities such as speech-to-text. Again, using the DeCoste Writing Protocol, a student's performance is compared across conditions, not to other students.

Similar to handwriting, there are four keyboarding tasks. Each of the keyboarding tasks provides varying perspectives: the timed alphabet writing provides a measure of orthographic-motor integration. The best sentence copying provides a baseline of typing speed to copy (with no spelling ability required), while the fast sentence copying demonstrates the upper register of typing to copy. Dictation sentences factor in spelling, while the composed text factors in spelling and text generation.

Changes in speeds across all keyboarding tasks should be examined for trends. Handwriting speeds for each task can also be compared to keyboarding speeds. These comparisons provides data for team discussions on the student's current best writing modality, and provides a basis for planning to address any areas of need.

Timed Alphabet Writing:

Count the number of correctly sequenced letters typed in one minute. No penalty for missing letters. For example, in the sequence abcdfeghi, the 'e' would not count. In the sequence 'adcbefgh', the 'd' and 'b' would not count. Record the number of letters typed in one minute. Convert to words-per-minute.

Best Sentence Copying:

Count all letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed in one minute. Convert to words-per-minute.

Dictation Sentence Writing:

Count all the letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed in one minute. Convert to words-per-minute.

Fast Sentence Copying:

Record the number of letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters.

Record the number of letters typed in one minute. Convert to words-per-minute.

Composed Text:

Count all the letters typed within each one, minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed for each one, full minute interval. Convert to words-per-minute.

Comparing Handwriting and Keyboarding Performance

Once you have determined the word-per-minute rate for the handwriting and keyboarding tasks, you can compare speeds for each of these tasks. While you can refer to the research that provides normative data for writing tasks in Section One, the DeCoste Writing Protocol places more emphasis on comparing the individual's performance on writing tasks across conditions.

- The alphabet writing task provides a baseline for orthographic motor integration for handwriting compared to keyboarding.
- The sentence copying tasks provide a means for comparing copying speeds for handwriting and keyboarding.
- The dictation task adds the component of spelling while minimizing the need to compose across both conditions.
- The composition task provides a brief writing sample across both conditions.

The comparative data may suggest that keyboarding is more productive than handwriting, or it may suggest that keyboarding is not yet sufficiently developed. While you can expect that the WPM data will be somewhat lower as the writing tasks increase in difficulty, the data may also show a marked decline in words per minute corresponding to added requirement to spell and compose. The following scenario illustrates the analysis of writing performance across conditions.

Data from Step Two of the DeCoste Writing Protocol on keyboarding provides useful information. The comparison of keyboarding to handwriting speeds across tasks provides additional information on whether keyboarding is a functional alternative to handwrting and whether keyboarding instruction is warranted. In this case, the student has had little systematic instruction on key boarding, but uses multiple fingers and visually mediates key locations. Keyboarding speeds range from 2 to 3 words slower compared to handwriting across all tasks. The student does not demonstrate keyboarding that is equal to or exceeds his current handwriting speed, however, the difference is such that with some keyboarding instruction and practice, keyboarding speeds may approach handwriting speeds.

It is not uncommon that children who have yet to achieve handwriting automaticity by third grade will show some delays in achieving higher order writing skills, such that writing traits from the extended writing task (Step 4 of the DeCoste Writing Protocol) may be uneven or there may be delays in the achievement of 3rd grade writing standards. For this student, writing traits score in the low (organization, voice, sentence fluency) to moderate (ideas, word choice, conventions) range. Conferring with the teacher, to examine college and career writing standards, there are numerous grade level standards for which the student has yet to show proficiency. (See Section Three for more information on strategies to support elementary writing.

Student Scenario

Let's consider an example of a 3rd grader who continues to demonstrate only moderate handwriting legibility. The data from Step One on the DeCoste Writing Protocol shows that this student scores below age level based on available normative data on orthographic-motor integration, which indicates that the student has not achieved sufficient handwriting automaticity. Best and Fast Copying speeds using handwriting are also delayed. The Dictation Sentence and Composing Text task show deficits in speed, but do not show evidence of spelling errors.

The Spelling List (Step 3 of the DeCoste Writing Protocol) shows no deficits in linguistic awareness at the phonetic level, only a few at the orthographic level and some at the morphological level, which would be typical at the 3rd grade level. The extended writing sample, also, does not show a high percentage of spelling errors. Spelling is not the main contributing factor that is slowing written productivity. In this case, the student's difficulties center on the lack of ability to achieve handwriting fluency (accuracy plus speed).

For this student, intervention to increase handwriting fluency is crucial. An analysis of what letterforms have not been mastered is essential. Short daily handwriting activities can be used as warm up activity to spelling activities or incorporated into spelling activities. (See Section Three for more information on handwriting, as well as how to incorporate spelling into handwriting activities.)

Analyzing Spelling Performance

The purpose of the spelling portion of the DeCoste Writing Protocol is to better understand the level of linguistic knowledge for a given student, and therefore, to more appropriately tailor spelling instruction. Spelling is a critical transcription skill. Along with handwriting or keyboarding, it is a lower-order skill that serves as a critical foundation for writing, which involves a multitude of higher order thinking skills.

Linguistic Analysis of Spelling Errors:

Analyze each word on the spelling list. Circle the correctly spelled words. For each misspelled word, use the examples provided in (Section One, pages 88-95) to determine the type of linguistic deficit. It's important to keep in mind that the misspellings presented in the charts demonstrate only some examples of how a student with spelling deficits may misspell a word. There may be a multitude of misspellings of the target word that reflect the same type of underlying linguistic deficit. Confer with a speech-language pathologist. Use the descriptions of the levels of linguistic knowledge to help identify linguistic deficits. Make a list of the patterns of errors. This information can help plan the type of word study instruction that is needed. (See the Section Three on spelling instruction activities.)

Look for types of deficits and identify the spelling patterns that are misspelled. Some students may show a wide range of linguistic deficits. For example, some students with autism spectrum disorders can spell many familiar words from memory, but when presented with an unfamiliar word, their misspelling

Student Scenario

Let's consider the example of a 5th grader, who is struggling to complete writing assignments. Upon the completion of the DeCoste Writing Protocol, the student demonstrates good handwriting legibility with handwriting speed and orthographic fluency within normal limits, but also demonstrates misspellings at younger phonetic and orthographic levels of linguistic knowledge. Misspellings are evident when writing from dictation and when composing text. Many misspellings are also evident on the extended writing sample. The focus for this student needs to be on spelling instruction and technology-based spelling supports. It is likely that spelling deficits are impeding written productivity. Handwriting is not the central issue.

For this student, individualized spelling assessment is needed to delineate the level of word knowledge, as well as to identify specific instructional needs and the starting point for linguistics-based spelling instruction. Technology-based spelling supports also should be considered.

As an optional condition using the DeCoste Writing Protocol, word processing with speech to text and spell checking can be assessed to see if this provides sufficient support for spelling. Alternatively, word processing with word prediction should be considered.

Comparing handwriting and keyboarding speeds, keyboarding is 5 to 7 WPM slower than handwriting. For this student, keyboarding fluency is insufficient to fully replace handwriting at the current time. Keyboarding will need further instruction and practice to achieve keyboarding fluency that is commensurate with or exceeds handwriting speed.

Students, who struggle with the transcription skill of spelling, often have difficulty attending to higher order writing skills. They may replace higher level vocabulary words with easier words they can spell. For this student, organization, sentence fluency, word choice, conventions scored a 3, while voice and ideas scored a 4. Conferring with the teacher to analyze college and career writing standards, there are numerous grade level standards for which the student has yet to show proficiency. These should be addressed in order to develop writing proficiency. (See Section Three for more information on spelling and writing instruction.)

presents evidence of much younger phonological deficits. Students who cannot write legibly, who rely more often on adult scribes, often show a wide range of linguistic knowledge due to a lack of direct writing experience. Older students with significant dyslexia may employ a wide array of spelling deficits as they struggle to spell even common words.

Elective- Calculating the Number of Misspelled Words That Could Be Corrected Using Spelling Tools

You can also determine the percentage of words that could be spelled checked using the "right click" or other spell checking feature (i.e., number of misspelled words that could be corrected by the total number of misspelled words). Right click on each misspelled word to see if the student's attempt could be corrected. This information can help make decisions regarding the instruction on the use of a standard spell checker.

If you have completed the four basic steps of the DeCoste Writing Protocol and choose to look at the use of word prediction as an optional condition, then the number of misspelled words using a standard spell checker can be compared to the number of words misspelled using word prediction.

It is important to note that this information reflects what is possible given spell checkers or word prediction. A student may or may not select the correct word when the spell checker or word prediction presents it. Students need instruction on how to use either effectively.

Analyzing Extended Writing

The ability to convey meaning artfully across different types of writing, for different audiences is the long-term objective of writing instruction. For many struggling writers, the lack of solid lower order foundational skills competes with the ability to compose text. The goal is not to simply have students who can write neatly and spell accurately, but to have students who can manage these lower order skills sufficiently to free up the resources to focus on the higher order aspects of writing, including generating and organizing ideas, and writing well developed sentences and paragraphs for a variety of audiences and purposes.

It is not uncommon that students with identified disabilities struggle with transcription in the primary grades. Overtime, some students make gains with handwriting, keyboarding or spelling, but what remains is a lack of progress with higher order writing. The DeCoste Writing Protocol is designed to parse out which factors are presently affecting writing proficiency in order to make decisions on strategies to support writing.

The DeCoste Writing Protocol continues to use a writing traits rubric to examine compositional skills. The 6 + 1 Traits focus on the elements of good writing (Education Northwest, 2010):

- Ideas: The details that support the message or story
- Organization: the structure of the writing, based on the writing genre
- Voice: The quality of the author's writing that keeps us "tuned in"

- Word Choice: The use of the right words or phrases that contribute to clarity of writing
- Sentence Fluency: the rhythm and flow of written language
- Conventions and Presentation: Spelling, punctuation, capitalization, grammar, usage, indentation, paragraphing, visual features

The 6 + 1 Traits were first developed in 1984 by a group of 17 teachers who read and ranked hundreds of student papers (grades 3-12), documenting the rationale for their rankings. Working independently, they found the same six important writing features (Spandel, 2012). Out of this, the 6 + 1 Traits were born with periodic updates and enhanced descriptions. Today, College and Career State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) for English language arts have set the stage for new ways of evaluating changes in writing. However, these standards gauge changes from grade to grade and are not detailed enough to assess single writing tasks. Nonetheless, it is important for educators to understand the scope and sequence of these standards. If your state or district does not use 6 + 1 Traits or uses their own version of college and career readiness standards, then you should use the writing standards or writing rubrics that your district uses to measure writing progress.

The 2014 revised 6 + 1 Traits rubric for grades 3-12 can be downloaded from the Education Northwest website at http://educationnorthwest.org/sites/default/files/new-rubrics-3-12.pdf. Read the student's text carefully to evaluate each writing trait. For scoring information and practice using the writing traits rubric, and to view scored examples at selected grade levels, refer to the

Education Northwest website at http://educationnorthwest.org/traits/61-trait-writing-scoring-practice

For students in the primary grades, or for students with cognitive impairments using modified materials, you will want to use the 5-Point Beginning Writer's Rubric for K-2, which can be found at http://educationnorthwest.org/sites/default/files/new-rubrics-k-2.pdf

Elective 1- Calculating the Mean Word-Per-Minute Rate for the Extended Writing Task

Count and record the number of words for each one-minute interval, including misspelled words, crossed out words, and partial words. Count the total number of words written and divide by the number of one-minute intervals to get a mean WPM score. This data can provide additional information on the productivity of a student when generating text for a longer writing period. Composing to complete "quick writes," and short writing assignments or to respond to test questions requires the student to engage higher order thinking. The Extended Writing task provides insight into the student's ability to plan and generate writing. It does not provide ample opportunity for revisions and editing.

Elective 2- Calculating the Number of Misspelled Words

You can also examine spelling in the context of generative writing. You can calculate the percentage of misspelled words. Divide the number of misspelled words by the total number of words generated. It is likely that students who misspell more than one out of ten words (90% or less), are struggling with spelling to the degree that it will affect productivity and overall performance.

Elective 3- Analyzing Spelling Errors

You can also analyze linguistic knowledge based on misspellings. Spelling word lists plus generative writing tasks provide opportunities to examine linguistic knowledge. It is important to note that research indicates that students will often use less complex words in their generative text, as compared to their verbal descriptions of what they intend to write, in order to avoid misspellings. This information can supplement the information from the Spelling Word List task.

Recommended - Reviewing College and Career Readiness Standards

If the teacher has already recently applied her state or district's college and career readiness standards to multiple writing samples produced by the student in class, then this task may not be necessary. If, however, the level of writing proficiency is unclear, then the analysis of writing traits along with the writing/language standards can facilitate the conversation with the student's family and school team relative to writing strengths and weaknesses.

Use the Common Core college and career readiness standards or use the college and career readiness standards that are used by the student's school district. Confer with general and special educators familiar with district writing standards. This data combined with additional data from classroom writing tasks is intended to help identify areas of writing strength and writing needs, and plan appropriate writing instruction.

The Common Core State Standards for English language arts (National Governors Association Center for Best Practices, Council of Chief State School Officers , 2010) are available at http://www.corestandards.org/ELA-Literacy/. It is recommended that you be familiar with the 10 "Writing Standards" as well as Language Standards 1 to 3 across the grades.

For information on how the Common Core State Standards intersect with 6 +1 Writing Traits, refer to http://educationnorthwest.org/traits/traits-and-common-core

Student Scenario

Let's consider an example of an 8th grade student with a history of learning disabilities affecting reading and writing. This student has a history of handwriting difficulties and spelling difficulties. However, current handwriting and keyboarding orthographic motor speeds and copying speeds are close to that of typical students. Spelling errors are frequent when writing from dictation, when composing text and on the extended writing sample. The analysis of the Spelling Word List demonstrates spelling errors at all levels of linguistic knowledge.

Individualized spelling support is needed to help this student develop linguistic knowledge. Instruction should focus first on phonological error patterns then on orthographic error patterns, and mental graphic representations. Thereafter, morphological error patterns can be addressed using interventions discussed in the spelling portion of Section Three.

Using an informative writing task on the subject of skateboarding, the student was able to write for 9 full minutes. There was a recognizable topic sentence, but only general ideas with little detail were presented. Sentences were short and choppy or rambling with a lack of phrases to link ideas. The student more often used everyday words with only a few precise words. Most sentences began in the same way and there were frequent spelling and punctuation errors. The concluding

Student Scenario

Let's consider an example of an 8th grade student with a history of learning disabilities affecting reading and writing. This student has a history of handwriting difficulties and spelling difficulties. However, current handwriting and keyboarding orthographic motor speeds and copying speeds are close to that of typical students. Spelling errors are frequent when writing from dictation, when composing text and on the extended writing sample. The analysis of the Spelling Word List demonstrates spelling errors at all levels of linguistic knowledge.

Individualized spelling support is needed to help this student develop linguistic knowledge. Instruction should focus first on phonological error patterns then on orthographic error patterns, and mental graphic representations. Thereafter, morphological error patterns can be addressed using interventions discussed in the spelling portion of Section Three.

Using an informative writing task on the subject of skateboarding, the student was able to write for 9 full minutes. There was a recognizable topic sentence, but only general ideas with little detail were presented. Sentences were short and choppy or rambling with a lack of phrases to link ideas. The student more often used everyday words with only a few precise words. Most sentences began in the same way and there were frequent spelling and punctuation errors. The concluding sentence

was brief and was not tied to the information presented. Ideas and organization each received a score of 3, voice, word choice, and sentence fluency scored a 2, while conventions scored a 1.

His teacher indicates that the student's performance with regard to college and career writing standards is well below grade level.

The analysis of spelling errors in the Extended Writing task indicated that only 42% of the spellings could be detected using a standard spell checker.

Using word prediction as an optional condition with the dictation and composed sentence tasks demonstrated that the student was able to choose correctly spelled words from the list of suggestions. Using the Likert scale, the student did not like this method of input and expressed that it was too slow.

Further exploration is needed to determine if speech to text is an option for this student.

In addition to individualized spelling instruction based on current linguistic error patterns, writing interventions should focus on planning and organizing strategies that will increase the level of detail and enhance vocabulary. Instruction is needed to reduce run-on sentences, and on the use of transitional words to link sentences. (See Section Three for more information on spelling and writing strategies for Secondary students.)

DWP REMOTE SCREENING ADAPTATION GUIDELINES

DeCoste Writing Profile (DWP)

Introduction

Under ordinary conditions, the full version of the DeCoste Writing Protocol (DWP) is recommended because it provides multiple points of data that reinforce the findings upon which instructional and technology decisions are made. This DWP Remote Screening Adaptation has been designed for situations where remote administration is the best option due to mitigating circumstances (e.g., home-based learning, distance learning, even prolonged health and climate emergencies). It provides for real-time assistive technology assessment in a timely manner. Both the full version and the screening adaptation versions can include optional conditions (e.g., word prediction, speech-to-text, use of non-standard keyboards such as tablets, alternative keyboards). The remote Evaluator should refer to the manual to make decisions regarding optional conditions.

Overview

The complete version of the DWP measures handwriting, keyboarding, spelling and written composition (extended writing task). Each of these provides multiple points of data. In the full version of the DWP, handwriting looks at orthographic-motor integration, handwriting automaticity, effects of spelling, and extended writing. To ease the time required for administration remotely at school or at home, a screening adaptation has been developed. In this remote DWP screening, the designated "Facilitator" is in-person assisting

the screening process (e.g., the teacher, school-based staff, parent at home). The "Evaluator" remotely leads, observes and supervises the screening, and analyzes the data (e.g., the remote teacher or related services, AT specialist). Verbal instructions for administration are included in this document. While in most instances, the Evaluator presents the instructions to the student, either the Evaluator or Facilitator can present the instructions, depending upon the strength of the video and audio connection when using a video conferencing application (e.g., Zoom).

Handwriting and Keyboarding:

In the Remote Screening Adaptation, handwriting and keyboarding tasks can be reduced to two tasks (copied sentence & dictated sentence) that look at automaticity and spelling effects. Video recording of these tasks (approximately 1-2 minutes per subtask) would provide information on ease of handwriting and keyboarding form (e.g., fingering, knowledge of keyboard layout). The Evaluator can provide the prompts and instructions for completing these tasks. Use of a shared document such as a Google Sheet will allow you to also observe the text entry. After administration, the Evaluator can score handwriting and keyboarding speeds.

Spelling:

In the Remote Screening Adaptation of spelling, the Evaluator can dictate the appropriate word list. Video meeting applications that allow for shared video will enable the Evaluator to observe the student performing the spelling task. Alternatively, using a shared document such as a Google Sheet will allow you to also observe the spelling entries. After administration, the Evaluator can analyze spelling error patterns.

Extended Writing:

The final task in the full version of the DWP is an extended writing task. This longer written composition task (up to 10 minutes) provides a writing sample that can be analyzed by the Evaluator for writing traits and spelling error patterns. In the Remote Screening Adaptation, the Evaluator can provide the writing prompts and instructions for completing this task. Video meeting applications that allow for shared video will enable the Evaluator to observe the student composting text. Alternatively, using a shared document such as a Google Sheet will allow you to also view the composed text.

Optional Writing Conditions:

An additional remote session will allow you to examine writing using other modalities such as speech recognition or word prediction for the copying task and extended writing task. The extended writing task using word recognition or speech recognition also provides spelling accuracy comparisons to traditional handwriting or keyboarding.

Subtasks: Full version and Remote Screening Adaptation Recommendation Differences

Task	Full Version Subtasks	Remote Screening Adaptation
Handwriting	5 timed tasks	Copied sentence Sentence from dictation
Keyboarding	5 timed tasks	Copied sentence Sentence from dictation
Spelling	15 to 20-word list	15-20-word list
Extended Writing Task	Maximum 10-minute writing task from a writing prompt	Likert scale after each task

Student Reflection	Likert scale after each task	Likert scale after each task
Optional Writing Conditions	e.g., Speech recognition or word prediction for timed tasks	Refer to the full manual to determine optional conditions. e.g., speech recognition or word prediction using a copied sentence and/or dictated sentence task

Remote Administration Set Up and Roles

Task	Remote Evaluator	In-Person Facilitator
Prior To Administration		
Materials Needed	• Computer with internet and video conferencing application • Timer • DeCoste Writing Protocol Manual • Verbal instructions for each subtask (in the DWP manual) • DeCoste Writing Protocol Observation Guide • Data Collection form	• Computer with Internet • Link to the video conference • Lined paper that is typically used by the student • Pen or pencil without an eraser (student choice) • DeCoste Writing Protocol Observation Guide • Graphic Organizer
Background Information Survey	Copy and send the survey to the student's teacher to obtain background information. • Survey	
Date/Time Set up	1. Establish a date, time and place for administration of the DWP. 2. Determine who will be the in-person Facilitator. Send information about the meeting and verify receipt. 3. Set up the Video Conference. Share the link with the Facilitator. 4. Determine whether you will do a full DWP administration or the screening adaptation.	15-20-word list

Remote Administration Set Up and Roles

Task	Remote Evaluator	In-Person Facilitator
Prior To Administration		
Date/Time Set up	5. Determine whether to include optional conditions (e.g., word prediction, speech-to-text)	15-20-word list
DeCoste Writing Protocol Observation Guide	6. Select the sentence to be copied (p. 424-426) for the handwriting and keyboarding tasks, select the sentences to be dictated for the handwriting and keyboarding tasks (p. 427-430), and select the extended writing topic (p. 432-438). Enter these on the DWP Observation Guide Google Sheet • DeCoste Writing Protocol Observation Guide (Google sheet) If you are unable to access Google Sheets, open the document with Microsoft Excel. We recommend using Google Sheets if possible, because the Evaluator will be able to see the student writing in live time. 7. Copy/send the Extended Writing Graphic Organizer • Extended Writing Graphic Organizer (pg 439) in the DWP manual 8. Use the full DWP Manual for the verbal prompts for each subtask	Open the DeCoste Writing Protocol Observation Guide (Google sheet) and have it accessible for the administration. Print off the Extended Writing Graphic Organizer and have it accessible for administration. • Extended Writing Graphic Organizer (pg 439) in the DWP manual

Task	Remote Evaluator	In-Person Facilitator
Data Collection Form	Print off a hardcopy of the data collection form or open the PDF and have it accessible for the administration. • Data collection form (pg 420-422) in the DWP manual, PDF with Fillable Fields)	
30 Minutes before Meeting		
	1. Log into Meeting. If your virtual meeting allows you to see the student, proceed with administration. If your virtual meeting does not allow you to see the student, guide the Facilitator to observe and take notes about the student's writing. 2. Open up the DeCoste Writing Protocol Observation Guide Google Sheet 3. Have Data collection form ready 4. Ensure that the Facilitator has access to and is comfortable using the DeCoste Writing Protocol Observation Guide Google Sheet.	1. Log into Meeting. If your virtual meeting does not allow the remote Evaluator to see the student, observe and take notes about the student's writing. At the end of the administration, email or send a photo of your notes to the remote Evaluator. 2. Open up DeCoste Writing Protocol Observation Guide Google Sheet 3. Have materials ready (Paper, Pen/Pencil, Graphic Organizer) For graphic organizer and student handwriting samples, the Facilitator will need to send completed documents to the Evaluator, or take a picture of these and send them to the Evaluator.

Task	Remote Evaluator	In-Person Facilitator
DURING Administration		
	1. Make sure your student and in-person Facilitator are ready. Ensure the Facilitator has the Remote Administration DeCoste Writing Protocol printed out or open in a window that is visible at all times. 2. Check sound. Can the student and the Facilitator hear you? Can you hear them? 3. If you are using a tool other than the Google Sheet, consider turning on screen sharing so you can see what the student is writing in real time.	1. Log into Meeting. If your virtual meeting does not allow the remote Evaluator to see the student, observe and take notes about the student's writing. At the end of the administration, email or send a photo of your notes to the remote Evaluator. 2. Open up DeCoste Writing Protocol Observation Guide Google Sheet 3. Have materials ready (Paper, Pen/ Pencil, Graphic Organizer) 4. For graphic organizer and student handwritingsamples, the Facilitator will need to send completed documents to the Evaluator, or take a picture of these and send them to the Evaluator.
AFTER Administration		
	1. Score the subtests using DeCoste Writing Protocol Manual. 2. Meet with the student's educational team, including parents, to share survey information, DWP data, Likert results, and observations. 3. Based on this data, discuss writing strengths and areas of instructional need.	Take an image of the handwriting sample and graphic organizer and email these to the Evaluator. (If there is no way to take a picture and email, hold up the document to the camera for the Evaluator/Administrator for them to capture.

Task	Remote Evaluator	In-Person Facilitator
AFTER Administration		
	4. Create an educational implementation plan that addresses instruction for all writing skills needing improvement (e.g., handwriting, keyboarding, spelling and/or composing), as well as a plan for use of assistive technology and accommodations. Discuss this plan with the parent(s) and student.	Take an image of the handwriting sample and graphic organizer and email these to the Evaluator. (If there is no way to take a picture and email, hold up the document to the camera for the Evaluator/Administrator for them to capture.

Instructions for Administering the Screening Adaptation of the DeCoste Writing Profile

The in-person Facilitator and the remote Evaluator work together to administer the screening adaptation of the DeCoste Writing Protocol. The instructions below suggest the roles for each but can be flexible given logistics (e.g., using Google Sheets and video features, vs. using video and printed pdf forms.). For verbatim instructions, use the full manual.

	Remote Evaluator	In-Person Facilitator
1	Have the DeCoste Writing Protocol Observation Guide available. Be prepared to take notes on the student's pencil grip, posture, attitude, frustration, refusals, anxiety, persistence, self-monitoring strategies, background knowledge and overall engagement.	In a quiet space, arrange materials, e.g., timer, pencil (no eraser) or pen, paper, instructions, computer with DeCoste Writing Protocol Observation Guide open, and the Extended Writing graphic organizer printed.

	Remote Evaluator	In-Person Facilitator
2	**Handwriting** **Best Sentence copying using handwriting:** The student is instructed to copy the sentence using his or her best handwriting. Use the verbatim instructions from the full DWP manual. The student is encouraged to not spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keep writing. Start timing when the student begins to handwrite. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the fully copied sentence, you can allow the student to finish the task, but do not count those letters. In cases where the student completes the copying task in less than 1-minute, the student is instructed to continue by copying the same sentence again.	Open the Google Sheet for Sentence Copying or present a hard copy of the sentence on paper. When the student has copied the sentence for 1-minute, note the last letter written and inform the remote Evaluator.
3	**Dictation Sentence** **Best Sentence copying using dictation:** Use the verbatim instructions from the full DWP manual. First, read the full dictation sentence to the student. Then speak each word of the sentence carefully one word at a time, keeping pace with the student's handwriting. When he or she has completed a work, supply the next word in the sentence. In cases where the student completes the dictation task in less than 1 minute, re-dictate the same sentence again until the 1-minute mark has been reached.	Open the Google Sheet for Dictation Sentence Writing. When the student has copied the sentence for 1-minute, note the last letter written and inform the remote Evaluator.
4	**Likert Scale** Use the Likert graphic to ask the student how he/she likes to write by hand. Be sure the student is not responding to the content of each task, but to the use of handwriting.	Show the Likert Graphic to the student. Be sure the remote Evaluator is clear on the student's response.

	Remote Evaluator	In-Person Facilitator
5	**Keyboarding** **Best Sentence copying using a keyboard:** The student is instructed to copy the sentence using the keyboard. Use the sentence that was used for "best copying" when handwriting. Use the verbatim instructions from the full DWP manual. Start timing when the student begins to type. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the fully copied sentence, you can allow the student to finish the task, but do not count those letters. (For example, if the last word copied was "school" but the student only entered "scho" in the time allotted, then this would count as 4 letters). In cases where the student completes the copying task in less than 1-minute, the student is instructed to continue by copying the same sentence again.	Open the Google Sheet for Keyboarding a Copied Sentence. Use the keyboard that is most often used by the student. When the student has copied the sentence for 1-minute, note the last letter written and inform the Evaluator.
6	**Dictation Sentence** **Using Keyboarding:** First, read the full dictation sentence to the student. Then speak each word of the sentence carefully one word at a time, keeping pace with the student's keyboarding. When he or she has completed a word, supply the next word in the sentence. Use the verbatim instructions from the full DWP manual. In cases where the student completes the dictation task in less than 1-minute, re-dictate the same sentence again until the 1-minute mark has been reached.	Open the Google Sheet for Keyboarding Dictation. When the student has keyboarded the sentence for 1-minute, note the last letter written and inform the Evaluator.
7	**Likert Scale** Use the Likert graphic to ask the student how he/she likes to keyboard. Be sure the student is not responding to the content of each task, but to the use of keyboarding.	Show the Likert Graphic to the student. Be sure the remote Evaluator is clear on the student's response.

	Remote Evaluator	In-Person Facilitator
8	**Spelling:** This is an untimed task. Work with the in-person Facilitator to turn off spell check and autocorrect, or instruct the student to not use right click, nor spell check. If the student is unfamiliar with the keyboard, the student can handwrite the spelling words. Use the verbatim instructions from the full DWP manual. Say the targeted spelling word clearly. Then use the word in the context of a sentence. Then say the word again.	Open the Google Sheet for spelling. Be sure to turn off spell check and autocorrect in the Google Sheets, or instruct the student to not use right click, nor spell check.
9	**Likert Scale** Use the Likert graphic to ask the student how he/she likes to spell.	Show the Likert Graphic to the student. Be sure the remote Evaluator is clear on the student's response.
10	**Extended Writing** Use the mode of writing that is easier for the student. All things being relatively equal, choose keyboarding. Work with the in-person Facilitator to turn off spell check and autocorrect, or instruct the student not to use right click, nor spell check. Tell the student the writing topic and engage the student in some discussion on the topic. Use the verbatim instructions from the full DWP manual. It is important that the student has a sufficient number of ideas to write an extended period. Do not tell the student what to write, but encourage him or her to generate ideas. The student is given about one minute to plan what he or she will write. For students in grades 3 or above, provide them with the graphic organizer to plan his or her writing. Have the student write the title topic in the center. Then the student can begin planning.	Open the Google Sheet for Extended Writing. Be sure to turn off spell check and autocorrect in the Google Sheets, or instruct the student to not use right click, nor spell check. Have the Extended Writing Graphic Organizer available.

	Remote Evaluator	In-Person Facilitator
11	**Likert Scale** Use the Likert graphic to ask the student how he/she likes to write.	Show the Likert Graphic to the student. Be sure the remote Evaluator is clear on the student's response.
12	**Likert Scale** Ask the student to state which overall method(s) he or she preferred.	Show the Likert Graphic to the student. Be sure the remote Evaluator is clear on the student's response.

A REVIEW of Evidence-Based Instructional Interventions and Accommodations

INTRODUCTION

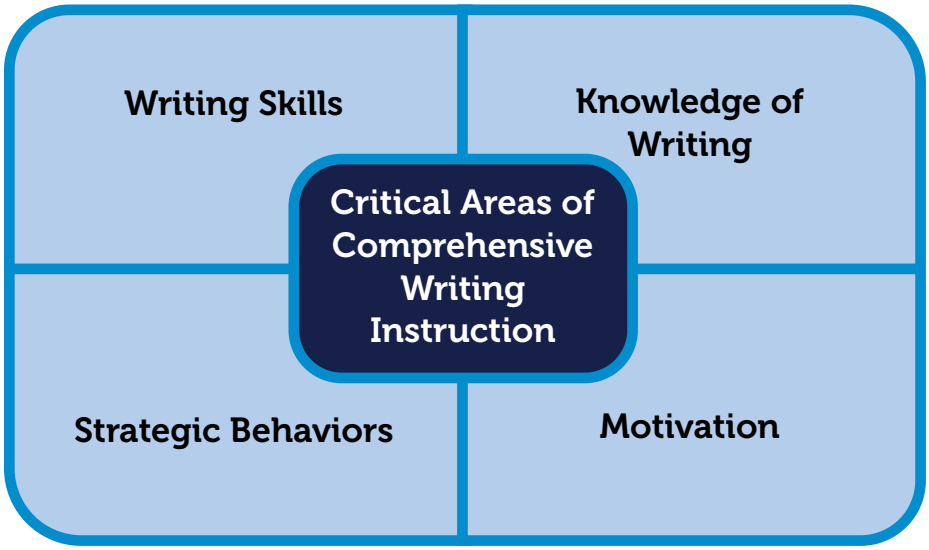
Writing is considered to be the most complex literacy skill that all students need to learn, according to Wendling and Mather (200 9). Particularly for our struggling writers, we need to have a clear grasp on the status of foundational, lower order skills (handwriting, keyboarding, spelling, and other conventions), so that more mental energy can be allocated to the higher order skills of composing (planning, organizing, generating content and revising). Without a balance of instruction, the gap in writing abilities widens significantly affecting self-efficacy and, thereby, the motivation to write. This negative pattern can be evident in elementary school and becomes more difficult to reverse at secondary levels.

With the implementation of college and career readiness standards, expectations have been elevated for students with disabilities at all ages. According to Graham and Harris (2009), Today's teachers need to provide customized instruction to address:

- Writing skills (e.g., fluent handwriting or keyboarding, spelling, sentence construction)
- Knowledge of writing (e.g., genres and text structures, process writing)
- Strategic behaviors (e.g, self-regulation strategies to plan, generate text and revise)
- Motivation (e.g., attitude toward writing, persistence, self-efficacy)

All teachers are expected to address these areas of instruction. At the secondary level, English language arts teachers, as well as content teachers and special educators, will take on the responsibility of providing writing instruction to meet the college and career readiness new standards. On the other end of the spectrum, teachers who are working with young students with LD, or students with cognitive disabilities using modified goals, will need to have a thorough understanding of early literacy development. (See Section One on Beginning Writers.)

Figure 3-1. Critical Areas of Comprehensive Writing Instruction (Graham & Harris, 2009).



Additionally, it is imperative that teachers use accommodations, including assistive technology, to provide writing support. Technology tools provide support for writing skills, for example, as an accommodation for poor handwriting, or as a way to support spelling. But technology can also support process writing and strategic behaviors by providing tools to promote planning, generative writing and revision— skills owned by proficient writers. Additionally, technology tools provide multiple means of expression. Multimedia tools offer an increasing array of options to engage and motivate student to write meaningfully.

There is no one method of writing assessment and there is no one method of instruction. Effective instruction relies on ongoing formative assessment to identify areas of need, the identification of writing goals, and the design, delivery and adjustment of instructional strategies tied to those needs and goals.

This section presents evidence-based practices associated with the four main areas of writing address by the DeCoste Writing Protocol: Handwriting, Keyboarding, Spelling and Composing. It also presents available research on technology accommodations. Once the DeCoste Writing Protocol has been administered and scored, this marks the beginning, not the end, of team-based discussions on best practices for struggling writers. The intent of this section is to provide research and information on effective instructional strategies and tools, as a way to help educators link the DeCoste Writing Protocol results with credible actions.

HANDWRITING INSTRUCTION/ INTERVENTION

This section on handwriting interventions begins with an historical perspective on handwriting methods and then discusses current perspectives in light of research reviews and college and career readiness standards. Handwriting interventions to build fluency will also be described.

Perspectives on Handwriting Intervention

Formal handwriting instruction in the "common" schools dates back to the mid 1800s when a highly stylized, Spencerian script was taught. According to Alston and Taylor (1987), the Palmer method, a simpler and faster method of cursive-style handwriting, was widely published in the late 1800s. The Zaner-Bloser method which has only four basic strokes was developed in the late 1800s and gained popularity in the mid 1950s, introducing manuscript in order to allow young children to engage in written expression. The D'Nealian method offered a return to a more slanted, fluid style of writing. The debate over the ease of producing vertical manuscript handwriting versus slanted cursive-style handwriting continues today. Nonetheless, manuscript is more commonly introduced in the primary grades.

Graham, Berninger & Weintraub, & Schafer (1998) investigated the commonly held assumption that manuscript is more legible, but cursive writing is faster, with a sample of 600 children in 4th to 9th grades. The researchers found that there was no difference between manuscript and cursive writing on measures of handwriting legibility and speed. These researchers noted that children

who used a combination of manuscript and cursive (40% of the sample) demonstrated handwriting that was faster and yet legible. What is most important is that students have some form of fluent transcription, whether it is manuscript, cursive, or a combination of the two.

Graham (2010) suggests that handwriting be taught in the primary grades (1st to 3rd) in short daily sessions, the equivalent of 10 to 20 minutes per day for a typical student. He advocates starting with manuscript letters; because research has shown that manuscript is easier than cursive for young writers and that most children starting school know how to write some manuscript letters. More often, manuscript letters are what children are exposed to in books and in environmental print (e.g., signs, advertisements, products).

There are differing viewpoints on what sequence letters should be introduced: letters based on motor formation, letter frequency, or letters based on literacy learning that follow the alphabetic principal (i.e., letters that say their names). For struggling handwriters, Graham (2010) advocates letters similar in formation, but incorporating activities that help students quickly and easily name the letters, match letters to their names, and write letters when they are named. He also promotes learning to write the letter within the alphabetic sequence (e.g., the student writes the letter that comes after p, q, r, s,___). In his study, Graham found that six letters accounted for most of the omissions, miscues and illegible attempts (j, k, n, q, u, and z) and encourages more attention to these letters when providing instruction.

Graham has researched and written about handwriting development extensively. In his 1999 review, Graham confirms the importance of a

comfortable pencil grip, appropriate paper slant, and explicit instruction on letter forms. Graham, like others, urges early intervention for struggling handwriters to build handwriting fluency and avoid negative self-concepts. Graham has demonstrated that fine motor training influences letter formation, but not automaticity or fluency. He advocates for self-evaluation strategies by having slow handwriters set goals to increase fluency, directing them to copy a short passage legibly with more speed and having them chart their progress. Additionally, he contends that handwriting speed develops over time as a consequence of writing connected text, not just repeatedly copying letters in isolation (Graham 2010).

Research on handwriting instruction is still ongoing, particularly as it relates to young children and struggling handwriters, and there are some large-scale, controlled studies on handwriting interventions (Feder & Majnemer, 2007). Hoy, Egan, and Feder (2011) conducted a review of handwriting treatments that could be used by an occupational therapist with school-age children to improve handwriting. Only 11 studies met the inclusion criteria, but nonetheless demonstrated that interventions that totaled less than 20 practice sessions and interventions that did not include direct handwriting practice were ineffective. Case-Smith (2002) compared the effects of direct Occupational Therapy (mean of 16.4 sessions) for students ages 7 to 10 (n = 29) to students with poor handwriting who did not receive OT services (n = 9). Most OTs participating in the study reported the use of visual motor activities and handwriting practice. On average, students who received OT improved legibility by 14.2% compared to 5.8% for students who did not receive services; however, speed of handwriting did not improve.

Handwriting and College and Career Standards

Handwriting, according to Schlagal (2013), is minimally represented in the curriculum and in pre-service teacher preparation. The Common Core State Standards only refer to handwriting fluency and legibility in kindergarten and 1st grade; however Schlagal asserts that there is no evidence that most children can achieve this within those two years. This also tends to contradict what the research shows —that copying and orthographic-motor integration speeds show gradual improvement well beyond the primary grades. It also disregards the impact of handwriting fluency on writing quantity and quality.

Handwriting Interventions for Compositional Fluency

There are many good handwriting programs available to teach basic letter formation. (Consult with Occupational Therapists to obtain recommendations.) This segment will focus, instead, on instructional research that looks at improving compositional fluency (written productivity under timed conditions) for students who struggle with legibility and automaticity. The three studies described below demonstrate improvements in handwriting and compositional fluency. Whereas most of these studies are early intervention studies, the activities could be modified for older elementary students, targeting letters based on individual handwriting assessment. Additional research that combines spelling with handwriting intervention is described in the Spelling Instruction segment.

Study 1 - Berninger et al. (1997) used a combination of handwriting and composing activities with 144 1st graders who were low performing on measures of handwriting legibility and automaticity. The students were randomly assigned to a control group (receiving phonological awareness training) or one of five treatment groups:

1. Conventional repeated copying of letters
2. Conventional modeling and imitating the motor components of letter formations
3. Using visual cues (numbered arrows) to sequentially plan letter formation
4. Writing letters from memory with increasing delays
5. Combination of 3 and 4

Following the handwriting instruction, all children spent time composing and reading aloud their compositions. After 24 lessons over four months, the combination of visual cues, plus writing letters from memory, plus composing were found to be more effective than copying and imitating adult modeling to improve handwriting legibility, automaticity and productivity.

Study 2 - Jones and Christensen (1999) employed a very explicit handwriting instructional program with 19 first grade children with orthographic motor integration difficulties as measured by the Writing Speed and Accuracy Measure (Berninger, Mizokawa, & Bragg, 1991). These children were matched based on reading scores to a control group of children with no evidence of

handwriting problems. The control group used the school's traditional 1st grade writing curriculum. The students with handwriting difficulties received direct instruction on letter formation along with activities to promote speed and accuracy. Individual and small group instruction was provided to help students achieve mastery of letters using a variety of activities (e.g., red dot/green dot, rainbow letters, writing letters in the air, visual association strategies to facilitate memory of letter formations, charts to graph the speed of writing the alphabet). Before intervention, the control group performed best, but after 7 months of instruction, there was no difference between the treatment group and the control group on measures of handwriting and written expression. This handwriting intervention emphasized increasing the automaticity of letter formation rather than just copying activities.

Study 3 - Graham, Harris and Fink (2000) conducted a six-month study with 1st grade students with handwriting difficulties. Thirty-eight children were identified as at risk for handwriting problems, some with identified disabilities. The students were randomly assigned to treatment groups. Half received supplementary interventions focusing on accuracy and fluency, while the control group received phonological awareness instruction. The results indicated that the students in the handwriting treatment group outperformed the students in the control group based on the ability to name and write letters. Handwriting instruction led to greater gains in compositional fluency when writing letters of the alphabet and when copying connected text, but not in overall story quality. Improvements were maintained after six months. There were nine units focusing on three lower case letters per unit with similar formational characteristics (lit/oea/nsr/phf/cdg/bum/vwy/xkz/jq). Letters that

were easily confused or subject to reversals were not included in the same unit. There were three 15-minute lessons per unit to total 27 lessons. Each lesson had four activities: Alphabet Warm Up, Alphabet Practice, Alphabet Rockets and Alphabet Fun. The students worked towards mastery for naming and forming each letter before moving on the next unit of three new letters. The lessons are outlined below.

HANDWRITING INTERVENTION

Lesson One

Warm Up Activity (2 minutes)

This activity focuses on naming letters, matching names to letters, and knowing the sequence of the letter in the alphabet.

- Singing the ABC song and pointing to corresponding target letters on an alphabet chart.
- The child points to the targeted letter names verbalized by the instructor.
- The instructor points to a target letter and the child names the letter.
- The instructor says the target letter and the child says what letter comes before or after it using the ABC chart. (Chart use is faded over time.)

Alphabet Practice Activity (6 minutes)

During each of the following steps, the student says the name of the letter while tracing or writing.

- The instructor traces and describes aloud the formation of the target letters using card with numbered arrows, while saying the letter.

- The student imitates the instructor.
- The instructor and student discuss how the target letters are similar and different.
- Using a worksheet, the student:
    - Traces the target letters three times on a model with the numbered arrows.
    - Traces the target letters three times on a model without the numbered arrows.
    - Writes the target letter within the outlines of that letter three times.
    - Writes the letter on lined paper three times.
- For each target letter, the student circles the letter written best.

Alphabet Rockets Activity (5 minutes)

This activity focuses on handwriting fluency,

- The student copies a sentence (26 to 34 letters) that contains words with target letters as quickly as possible without making mistakes for 3 minutes.
- The instructor and student count the number of letters copied and charts this data on the “alphabet rocket” graph.

Alphabet Fun Activity (2 minutes)

- The student draws the letter in a funny way or uses it as part of a picture (e.g., turning *s* into a snake) or practices writing the letter.

Alterations to Lessons Two and Three of each unit

- Repeat the Alphabet Warm Up activity.
- Repeat the Alphabet Practice, but with less practice repetitions and the student copies words that contain the target letters and circles the best formed word. The instructor highlights any formation errors.
- Repeat the Alphabet Rocket activity, encouraging the student to beat his previous score. Graph the score.
- Repeat the Alphabet Fun Activity.

Handwriting is still considered an important topic because of the role it plays in early literacy learning and because handwriting fluency is strongly correlated with writing proficiency. Conversely, a lack of handwriting automaticity constrains the writer's ability to free up cognitive resources to focus on higher order writing skills. The research on handwriting intervention supports the following:

- Direct handwriting practice is more effective than activities that isolate fine motor or visual motor skills.

- Activities that emphasize fluency enhance writing output more than just emphasis on letter formation.
- The use of visual cues, with an emphasis on memory and automaticity, is more effective than modeling and copying activities alone.
- Encouraging students to chart the progress of handwriting speed is an effective self-monitoring strategy.
- Meaningful writing should accompany handwriting practice.

KEYBOARDING INSTRUCTION/ INTERVENTION

This segment on keyboarding instruction and interventions begins with a perspective on the rise of computer usage and how this has influenced keyboarding instruction. Views on keyboarding methods, time allocated to keyboarding instruction, and the age at which keyboarding should be introduced will be discussed. Keyboarding interventions and keyboarding as an accommodation will be presented.

Perspectives on Keyboarding Instruction

According to the Digest of Education Statistics 2012 (Snyder & Dillow, 2013), as of 2008 the average ratio in elementary schools was 3.2 students to one computer for instructional use and access to the Internet. The average ratio at the secondary level was 2.9 students to one computer. The availability of computers has improved compared to 2000 when the ratio at the elementary and secondary levels was 7.8 and 5.2 students per computer, respectively. Also as of 2008, the percentage of schools with Internet access was 98%. (Statistics on the use of portable tablets and other mobile technologies were not available.) Home computer availability was reported to be 71% overall, although this number is lower for Black (50%) and Hispanic (56%) students. Internet access was related to family income: 32% of families with a household income under $10,000 had Internet access, compared to 83% for families with incomes over $75,000. Fifty percent of children ages 3 and 4 used computers at home. In general, these statistics indicate that overall access to computers has improved over time and that children are using computers at

earlier ages, but the digital divide is still an issue for home computer use and Internet access.

These statistics provide useful background information in light of decisions regarding keyboarding instruction. Opinions vary widely on when to introduce keyboarding with some suggesting that keyboarding should be introduced as soon as children get beyond single key responses to operate a computer, and begin to input words and sentences (Erthal, 2003; Bartholome, 1998). Others suggest that formal keyboarding instruction should commence before children begin using the computer and develop poor keyboarding habits (Nieman, 1996; Bartholome, 1998). These perspectives may be outdated, given that children are now accessing computers at younger ages— even before formal schooling commences. The more popular position is for students to become familiar with the key locations in the primary grades, but learn touch typing somewhere between 3rd and 5th grade once they have the fine motor and literacy skills to make use of keyboarding, and have sufficient attention for keyboarding lessons (Zeitz, 2008). Research provides support for this position in that older elementary rather than younger students are more adept with touch typing (Pisha, 1993; Case-Smith & Weintraub, 2002; Freeman et al., 2005). There is general agreement that, for keyboarding to be functional, it needs to be commensurate or exceed handwriting speeds (Balajthy, 1988; Dunn and Reay, 1989; Freeman, et al. 2005). However, given the increasing popularity of portable tablets, mobile devices, handwriting recognition software, and speech recognition, it is difficult to gauge whether high speed, ten-finger typing will even be necessary in future classrooms.

Keyboarding Methods

There is no clear answer on what form of keyboarding is needed for generative typing when composing directly on the computer (Cooper, 1983). Shuller (1989) referred to three levels of keyboarding skills: 1) hunt and peck, 2) hunt and peck with less hunting, and 3) the touch method. Crews, North and Erthal (2006) describe three stages of motor learning for keyboarding: the *cognitive phase* when keystrokes and ergonomics are introduced, the *associative stimulus phase* when practice exercises facilitate "kinesthetic memory traces," and the *autonomous muscle response phase*, when the individual is able to complete keyboarded writing tasks without thinking about finger movements. Motivation is also considered to be a key variable. Keyboarding activities should be interesting, provide feedback on progress and match student skill levels (Zeitz, 2008).

The current 10-finger touch typing system was introduced by Frank McGurrin in 1878 (as cited by Bartholome, 1998), and became entrenched during World War I when skilled typists were in demand. There are different approaches to touch-typing. Nichols (1995) provided students in 3rd to 6th grades weekly keyboarding instruction for a full school year using two different methods: the teacher-directed alphabetic approach (Diana King Method) and software-directed home keys approach (Type to Learn software). At the conclusion of the school year, the average keyboarding speed for the teacher-directed, alphabetic approach for 3rd, 4th and 5th graders was 5.1, 6.5, and 8.4 WPM, respectively. The average speed for the software-directed home keys approach was 6.4, 7.8, and 9.8 WPM, respectively. Instruction was completed in 12 weeks using the teacher-directed approach, but took 21 weeks using the software approach.

Bullock and Schmertzing (2005) used Type to Learn software with and without keyboard masking with 43 5th grade students on a daily basis for 19 sessions totaling 312 minutes of instruction (16 minutes of instruction per session). With or without keyboarding masking, students achieved keyboarding speeds of 13 WPM. With this limited amount of instructional time, students were not able to reach speeds commensurate with their handwriting speed of 18 WPM. Bullock and Schmertzing report that the dilemma for teachers is the amount of time that must be allocated in order to reach functional speeds in elementary school. Other authors argue that there is limited access to computers in schools to conduct sufficient keyboarding instruction to reach functional levels (Zeitz, 2008). Sufficient generative writing time using the computer to maintain keyboarding speeds was also a concern (Rogers, Laehn, Lang, O'Leary, & Sommers, 2003; Zeitz, 2008).

KEYBOARDING INTERVENTIONS

Based on statewide education surveys, more schools are including keyboarding instruction in the elementary grades. Rogers, et al. (2003) reported 85% of schools across 285 school districts in Wisconsin included keyboarding instruction at elementary levels. Touch-typing instruction was commonly introduced in third grade, more often delivered by elementary classroom teachers, and more often integrated into language arts and social studies curricula. The most commonly recommended instructional time for teaching keyboarding was 30 to 40 minutes once a week for 36 weeks, or roughly the same amount of time per session on a daily basis for 6 weeks. Keyboarding software was preferred, as most teachers did not have formal training in keyboarding instruction. The authors emphasized the importance of formal keyboarding instruction that is structured, consistent and sequential to reach a level of automaticity.

The level at which automaticity is achieved is unclear. Crews, North and Erthal (2006) suggest that automaticity is not achieved until keyboarding is at least 50 WPM, whereas Bartholome (1998) reports that keyboarding response patterns are somewhat automated by 20 to 25 WPM. Given that research on keyboarding speeds demonstrates that the average adult fast keyboarding speed is around 33 WPM (Weintraub et. al, 2010), Crews and colleagues' rate of automaticity would appear to set a very high bar. Zeitz (2008) asserts that skill transfer requires practice to reach a level of automaticity, whereby students must move beyond copying using keyboarding software to composing using keyboarding in real world situations.

Allocation of Instructional Time

Freeman, et al.'s (2005) literature review on keyboarding reports that the number of hours of keyboarding instruction ranged from 5 to 30 hours, the frequency ranged from 2 to 5 sessions per week, and the length of sessions ranged from 20 to 45 minutes. Investigations often reported that more time was needed and suggested 25 to 30 hours as optimal. Figure 3.2 displays suggested durations between 10 to 24 hours of keyboarding instruction for elementary students, although most of these suggestions are based on survey data and opinion. Researchers' views on targeted keyboarding speeds in words-per-minute are shown in Figure 3.3.

Figure 3-2. Research (R), Survey Data (S) and Opinion (O) on duration of keyboarding instruction

Source	Session length	Sessions per week	Period of Time	Approximate Total Time
Bartholome, 1998(O)	30 min.	3 days per week	1 semester	15-23 hours
Dennee 1989(O)	30-40 min.	Daily	6-7 week	15-23 hours
Rogers, et al. 2003 (S)	30-40 min.	1 time per week	36 weeks	18-24 hours
Rogers, et al. 2003 (S)	30-45 min.	Daily	6 weeks	15-23 hours
Sormunen 1988(R)	20 min.	3 times per week	12 weeks	12 hours
Sormunen 1991(R)	30 min.	daily	4 weeks	10 hours

Figure 3-3. Recommended Keyboarding Instruction Target Speeds

Source	Grade Level	WPM Target
Rogers, et al. 2003	2nd to 4th grade 5th grade	10-15 WPM 15-20 WPM
Sormunen 1988	3rd to 5th grade	13- 15 WPM
Sormunen 1993	End of 4th grade	17.3

Scope and Sequence of Keyboarding Instruction

The sequence of teaching typing typically begins in elementary school. By middle school, it is expected that students are familiar with keyboard layouts and can begin to use keyboarding routinely for school-related assignments. By high school, the assumption is that students have achieved keyboarding automaticity with speeds approaching that of adult users. Bartholome (1998) outlines the scope and sequence for keyboarding instruction:

Figure 3-4. Keyboarding Instruction at Different Grade Levels (Bartholome, 1998)

Level	Focus	Practice
Elementary	Home Keys	
	Alphabet keys and common punctuation marks	Spelling words and short writing activities
	Alphabet keys, numbers and common symbols	Integrate keyboarding into language arts
Middle School	Review and reinforce keyboarding skills	Personal use, reports, essays
High School	Advanced uses of keyboarding	Business applications

Keyboarding as an Accommodation

For students with disabilities, handwriting fluency may be difficult to achieve, and requires explicit instruction over an extended period of time. So when keyboarding as an accommodation should be considered? The best approach is to regularly monitor handwriting and keyboarding to look for trends in student development using comparative data. If handwriting is illegible in the primary years, keyboarding (hunt and peck) should be used in parallel as an accommodation so that young students can actively engage in literacy learning to develop spelling and composing skills. Oral language dictated to an adult scribe is not a substitute for this. DeCoste (2000) demonstrated that in less than one academic year, elementary students with physical disabilities made two or more years of spelling and writing progress once they were actively engaged in daily writing using computerized access instead of dictating to adult scribes.

For students with handwriting difficulties (e.g., slow or labored handwriting) in the early elementary years, transcription speeds should be closely monitored at least twice per year. Using Steps 1 and 2 of the DeCoste Writing Protocol, baseline measures can be taken for handwriting and keyboarding to gauge whether handwriting is continuing to improve and when explicit instruction on keyboarding would benefit an individual child. **If handwriting continues to be arduous, but keyboarding baselines are increasing, then it may be an opportune time for structured keyboarding instruction.** In the later elementary years, once students with handwriting difficulties are more familiar with keyboard layouts or have had some touch-typing instruction, twice-yearly measures of handwriting and keyboarding should be conducted

across writing tasks of varied lengths. This is recommended not only to continue to monitor fluency, but to examine whether keyboarding speed is equal to or surpassing handwriting and, therefore, should be considered as a regularly occurring accommodation. Spelling should also be monitored, as poor spelling contributes to writing dysfluency.

Though handwriting speed typically increases somewhat in the middle and high school years, it is at a slower trajectory. Typically, when ample keyboarding instruction is provided, keyboarding speeds can overtake handwriting speeds in the secondary grades. Yearly monitoring should take place for at-risk writers to ensure that they are progressing on writing standards and reaching fluency in whatever method of transcription works best for them.

For older middle and high school students, when neither handwriting nor keyboarding automaticity is achieved after explicit instruction and practice, and/or when severe spelling deficits often associated with dyslexia persist, speech recognition is a form of transcription that should be evaluated. As stated by Graham (2010), what is most important, to the extent possible, is that students have some form of fluent transcription in order to reduce the cognitive load and allow for the development of higher-level writing skills. Additional strategies to reduce cognitive load and support working memory should include pre-planning organizers and self-regulation strategies.

SPELLING INSTRUCTION

In this segment, perspectives on spelling instruction will be described, including how Common Core State Standards address spelling. The research on spelling instruction will be followed by a description of evidence-based practices to support spelling development. The role that technology plays in supporting spelling will also be addressed.

Perspectives on Spelling Instruction

In 2000, the National Reading Panel published a report based on a research review listing five key areas of instruction: phonemic awareness, phonics, reading fluency, vocabulary and comprehension (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2000). Instruction specific to spelling was not included. There was an assumption that spelling would develop as a result of good phonological and reading instruction. The results of a longitudinal, large-scale study of students in 1st to 4th grades in 17 high-poverty schools indicates otherwise— that reading achievement can remain steady while spelling declines (Mehta, Foorman, Branum-Martin and Taylor, 2005). These results suggest that explicit spelling instruction is necessary.

Over the years, there have been a variety of perspectives on spelling instruction as described in Graham's (1999) review of handwriting and spelling instruction for students with learning disabilities. During the whole language movement, more natural approaches to spelling revolved around immersing children in literacy-rich environments, but also included the use

of mini-lessons and teachable moments to address spelling (Graham, 1999). Poor spellers without explicit instruction, however, appear to learn to spell a smaller proportion of words through reading and writing as compared to good spellers (Morris, Blanton, Blanton, Nowacek & Perney, 1995; Graham, 1999). Graham advocates that spelling must be "caught and taught."

There is a longstanding myth that spelling is a visual-spatial skill (Kamhi and Hinton, 2000). Analysis of English words shows that spelling is regular and pattern-based (Moats, 2006). Hanna, Hanna, Hodges and Rudorf (1966) determined that half of all English words can be spelled based on sound-symbol correspondence. Another 34% would have only one error if spelled on the basis of sound-symbol correspondence. Therefore 84% of English spellings are predictable. Even more words can be spelled correctly once word meaning or word origin is considered. Hanna et al. estimate that only 4% of the words in English are truly irregular. The work of Hanna et al. jumpstarted the shift in spelling instruction away from memorizing high frequency word lists alone, moving it toward linguistics.

According to Graham, et al. (2008), understanding the developmental linguistic elements of spelling has not led to the individualization of spelling instruction. The Friday spelling test approach to teaching spelling continues to be more predominant than spelling instruction that is tailored to individualized development. In a national survey, Graham, et al. (2008), found that 90% of 1st to 3rd grade teachers reported using the Friday test approach to teaching spelling. Graham, et al. assert that the typical "approach to word selection and instruction does not align with current understanding of the many linguistic strategies that can be used to spell words" (p. 186). They found that only about

5% of students' time spent at school was dedicated to spelling instruction, which is similar to educational practices reported 100 years ago. Their survey also found that 42% of teachers do not adjust instruction for students who struggle with spelling. When they do make adaptations, it is more often in the form of reducing the number of words on the weekly spelling test, re-teaching the words on the test, lessening spelling homework, or offering spelling aids. While teachers group children for reading instruction, this is not the case as often for spelling instruction. Morris, et al. (1995) suggested that this may be a management issue in that teachers are provided single grade-level spelling books and use whole class instruction which implies that one-size-fits-all.

Spelling Assessment as a Prerequisite to Spelling Instruction

Individual student assessment is key to instructional planning. According to Apel et al. (2004b), the best approach to evaluate spelling performance and competence is through connected writing samples and dictated word inventories. Analyzing students' error patterns allows educators to evaluate students' current linguistic understandings and future instructional needs. It is important to note that error pattern analysis is a form of assessment and is not a method of instruction. Instruction focusing only on students' misspellings builds negative attitudes toward spelling.

The instructional trend today is to assess the level of spelling development of students, and to teach pattern generalization at the student's instructional level (Schlagal, 2013). Targeted word lists should be based on an assessment of the student's instructional level of word knowledge. Spelling posttest results should be used to help teachers make informed decisions on subsequent words

lists. Time will also need to be directed toward developing mental images of irregular high frequency words (e.g., said, aunt, come, know, friend), as well as to word meaning relative to spelling homonyms (e.g., pair/ pear; some/sum).

Spelling Instruction and Common Core State Standards

The CCSS for spelling are more explicit in the early elementary grades. Kindergarten students are expected to associate letters with their sounds (/m/ = m), while 1st grade students are expected to spell one-syllable words with one-to-one sound to letter correspondence (/m/a/p/ = map) and learn to spell high frequency words. Second graders are expected to generalize learned spelling patterns when writing words, (say > may > tray) along with more high frequency words. Third graders are expected to learn more spelling patterns within words (e.g., word families, and spellings that depend on the position of the letters within a word (ck/ back; kn/ know), as well as irregular, multisyllabic words and basic prefixes (re-, -un, mis-) and suffixes (-est, -er). From grade four to grade 12, the CCSS standards relative to spelling are very general (e.g., "Spell grade appropriate words correctly"). However, Carreker (2012) states that in the 4th grade, students are expected to learn more about root words, prefixes and suffixes, and by 5th grade students acquire more understanding of derivational word forms (bio, biology, biological). Spelling is hardly mastered by the 4th grade, so there is some criticism that the CCSS standards do not explicitly address spelling in the higher grades (Schlagal, 2013).

Research on Spelling Instruction

Research indicates that poor spellers in the intermediate and middle school grades continue to demonstrate difficulties with orthographic knowledge and that the gap between reading and spelling can widen over time (Moats, Foorman & Taylor, 2006; Cassar, Treiman, Moats, Pollo and Kessler (2005). Moats (1996) contend that adolescent students with severe phonological impairments may make relatively small gains even with good instruction. Cassar et al. (2005) found that older students with dyslexia made progress similar to that of younger students, but that for some students, the spelling hurdles proved difficult to overcome. Clearly, spelling deficits can be long term requiring individualized instruction supplemented by accommodations.

Fayol, Zorman and Lete (2009) examined the relationship between reading and spelling in 1,453 5th graders who were asked to read and spell regular, irregular and pseudo words. The results showed that while most good readers were good spellers and conversely, poor readers were poor spellers, there were exceptions to this in 2% of the overall sample. Some students were fast and accurate readers but poor spellers, while others were slow readers who could spell effectively. The researchers argue that given reading practice, students with mild phonological deficits can overcome phonological difficulties and read fluently and accurately, but reading practice is insufficient to overcome spelling deficits as spelling (encoding) requires more precision than word decoding. They hypothesize that students who are slow readers, but nonetheless accurate readers and spellers, pay more attention to phonological and orthographic word patterns. This study speaks to the need for explicit spelling instruction

Moats (2010) states that while there is less research on spelling compared to reading, there is principle convergence on the following spelling strategies:

- Multisensory methods (visual, auditory, tactile)
- Instruction emphasizing patterns in language (phoneme-grapheme, within word patterns, syllable patterns, morphological patterns)
- Limiting the number of non-pattern (irregular) words taught at any one time, and provide corrective feedback on these words
- Systematic and explicit spelling instruction, leading to independent generalization to writing

Another evidence-based practice leading to gains in spelling performance includes the following (Berninger et al., 1998; Johnson & Watson, 2006):

- The teacher provides instruction on a new concept (spelling word, pattern or rule)
- The teacher models its use
- The teacher provides guided practice until the student independently can demonstrate the application of the spelling concept

Apel, Masterson, and Hart (2004a) conducted traditional spelling instruction in one 3rd grade classroom, while another 3rd grade classroom received multilinguistic spelling instruction. Classrooms had similar racial and linguistic backgrounds, as well the number of students receiving special services. Based on a list of 40 words, the results indicated that after nine weeks of instruction, the multilinguistic approach demonstrated improvements with a medium effect size (d = .65) while the traditional approach showed no improvements (d = .07).

Multilinguistic Approaches to Spelling Instruction

While some high frequency words (MGRs) do depend on visual memory, most English words have predictable patterns (Schlagal, 2013). Teachers, today, have access to many spelling word lists organized by grade level. When a teacher selects vocabulary words from the curriculum or basal readers, and from high frequency word lists, he or she may be presenting word lists requiring more rote memory. According to Schlagal, these lists of words may be unrelated by linguistic patterns and thus rely on spelling memorization. Instead of a list of 10 to 20 unrelated words to memorize for one week, the trend today is to provide students with groups of words that have similar patterns. Using a multi-linguistic approach, the goal is for students to recognize the letter patterns and then generalize this to untaught words.

Currently, spelling basal programs are available that are organized by grade level and may be more developmentally based. However, often these basal programs offer a prescribed list of spelling words that may not be commensurate with multilinguistic spelling principles. Spelling researchers

contend that single grade level spelling books do not meet the needs of all students in a classroom (Schlagal, 2013, Templeton & Morris, 2000). While grade level spelling basals may be fine for typical students, they may not be appropriate for advanced students or for students with spelling delays. For students with spelling deficits, the words may be outside of the students' pattern of linguistic knowledge.

Developmental Spelling Instruction

To spell words to convey meaning, children first develop an understanding that letters say their names (the alphabetic principle). Teaching activities in pre-k and kindergarten typically focus on sound to letter associations. Initially children may represent words with only one or two letters that reasonably represent sounds (e.g. /r/d/ = read). Gradually, children are able to parse out more sounds with more accuracy such that a letter represents each phoneme in the word (e.g. /r/e/d/ = read). To reach this skill level, young children need a literacy-rich environment and instruction that helps them make letter-sound connections. Inventive spelling is encouraged so that students actively develop letter-sound relationships.

Young children and older poor spellers who demonstrate the alphabetic principle, but are not representing all the sounds within the spelling of the word, will benefit from activities that help them segment sounds within words. A popular strategy involves using beads on a string (Apel, Masterson, & Brimo, 2012), wooden blocks, or other tokens. The child listens to a dictated word. He then moves the beads or places the tokens to represent each phoneme in the word. The child then writes at least one letter per token on paper or on an

erasable white board. Thereafter, the child reads his word. For example, the spoken word "school" would be represented by four blocks to represent the four phonemes /s/k/oo/l/. The child might write "scol" or "skul" demonstrating that he is able to represent all the sounds in the word. The objective at this level is not on conventional spelling, but on discerning phonemes within a word.

Students, who can spell phonetically, but show difficulties with orthographic patterns, are ready for word study instruction. Cunningham and Hall (2008a, 2008b) have a series of popular books called *Making Words* for the elementary grades. These books provide hands-on activities focusing on phonics and spelling activities. Students have a limited set of tag board letters arranged in a tag board pocket folder. They use these letters to make words. For example, a student might have the letters, e, i, n, w, p, s. With these letters the student is instructed to make the word *in*. Then add a letter to make *win,* then change it to *pin,* then add a letter to make *spin,* then add another letter to make *spine*. These hands-on activities provide guided discovery to help students understand how to combine letter sounds to make words. Using this type of activity, the type of word families or orthographic patterns should match the student's instructional level. For example, consonant blends or vowel combinations would be introduced at the student's instructional level.

Words Their Way by Bear, Invernizzi, Templeton and Johnston (2011) is a book based on the work of Henderson and Beers (1980) and provides a systematic, word study approach to teaching spelling and reinforcing word recognition. Following an assessment of each child's instructional level of word knowledge, children start out by naming and sorting words based on spelling patterns

(e.g., make-take-bake; hide-side-ride). Once a child can name and sort these words quickly and describe how they are the same, then additional word study activities are introduced. Children can look in stories and poems for words of the same pattern. Using letter tiles or cut out letters, they can change letters (e.g., a single consonant, or blend or digraph) at the beginning or end of the word to make new words (e.g., bake > make > made > shade). The authors have created word sorting manuals to help teachers provide instruction at all levels of linguistic knowledge, from elementary to high school.

Bailet (2004) indicates that explicit spelling instruction should not end once students master basic phoneme-grapheme and orthographic patterns at the single syllable level. As students move into the later elementary grades and into secondary grades, more of the words they need to write are multi-morphemic words that are derived from some base or root word (e.g., enjoy/enjoyment; compose/composition). Students who can spell multisyllabic words phonetically are ready for morphological word study.

Wasowicz, Apel, Masterson, and Whitney (2004) offer the Word Relatives strategy. Using this strategy, the teacher first discusses the word "relatives" and how relatives resemble one another even if they do not look or sound alike. This analogy is applied to words that are morphologically related. The teacher then introduces a base word and asks the student to generate related words (e.g., enjoy > enjoyment, enjoyable, or compare > comparison, comparative, comparable). This activity is meant to help students understand word derivations and successfully use strategies to correctly spell these words. Students can also search informational text for morphologically related words.

Instruction on Irregular Words

Unpredictable spellings comprise a small percentage of English words, but are often found on high frequency word lists. In addition to word study, explicit instruction on irregular words is needed. Irregular, high frequency words should be taught a few at a time and practiced until mastered. Once irregular words are learned, they can be put in a box for periodic review. Previously learned words can be intermixed with new words as a way to reinforce spelling abilities. Students can also create personal spelling dictionaries organized alphabetically that include words that are used frequently, but are difficult to spell.

All three of the following strategies use a self-evaluation, self-correction component. According to Schlagal (2013), the weekly approach of "pretest-study- posttest-self correction" is an effective method, using a "look-say-cover-write-check" as a study strategy for irregular words (e.g., *friend, from, said, was).* Nies and Belfior (2006) conducted an alternating treatment, single subject design for three weeks with third grade students with learning disabilities to examine the effectiveness of simply copying words versus the "cover, copy, compare" (CCC) strategy. At the start of each week of intervention, 12 words were pretested. Posttests were conducted at the end of the week and the following Monday. Figure 3.4 compares these two interventions. The CCC strategy was more effective then the copy-only approach as measured by the number of words learned and the number of words retained.

Figure 3.4. Copy-only and Cover-Copy-Compare Strategies (Nies & Belfior, 2006)

Copy-Only	Cover, Copy, Compare
The teacher says the word as the student points to the word on paper.	Same
	Same
The teacher says the word as the student points to and says the word.	The teacher says the word as the student points, says the word, and *covers the word* (by folding over half of the paper to cover the word). The student *writes the word*. The student *checks the word* by comparing the two words and makes needed corrections.
The teacher says the word as the student points, says the word, and *spells the word aloud.*	Same

SPELLING INTERVENTIONS

Even as adults, we can read more words than we can spell. But for some students, particularly those with dyslexia and language disabilities, spelling problems persist even when reading improves. Spelling involves more than memory such that one cannot expect students to learn to spell just by seeing words in text (Moats, 2010). Students with severe phonological problems typically have the most difficulties with spelling (Lindamood, 1994; Olson, 2006). Bailet (2004) states that the spelling errors of students with language-based learning disabilities can span several developmental stages throughout elementary school and beyond, while Khami and Hinton (2000) note that poor spellers may demonstrate a variety of developmental patterns because they attempt to rely on visual memory in the absence of well-developed phonological processing.

Morris et. al (1995) studied the spelling performance of four 3rd grade classrooms and found that although these students performed well on the end-of-the-week spelling test, long-term retention and understanding of spelling pattern knowledge was delayed compared to their peers (Figure 3.5). In fact, the authors suggest that the weekly spelling task masked their lack of linguistic knowledge.

Figure 3.5. Comparative Percentage of Correct Spelling) of 3rd Grade Students (Morris, Blanton, Blanton, Nowacek and Perney, 1995)

	High Spelling Group	Low Spelling Group
Pretest	55%	13%
Weekly Test	96%	83%
6 Week Review Test	85%	49%
End of Year Posttest	86%	46%

In a second study, Morris et al. (1995) studied the progress of 48 poor spellers in seven 3rd grade classrooms using grade level spelling books. Over the course of a year, 24 of the low achieving spellers received the traditional third grade spelling book instruction, while the remaining 24 of the identified low achieving spellers received 2nd grade spelling book instruction that was better matched to their level of word knowledge. The results indicated that the latter group retained more across the year and were better able to generalize spelling concepts to even untaught words at a third grade level. This research speaks to the importance of respecting developmental progressions in spelling, teaching to the instructional level of need, and the avoidance of preset spelling curriculums.

Scott (2000) emphasizes four types of spelling activities for poor spellers that are supported by research:

- Word analysis and sorting
- Memorizing
- Authentic reading and writing activities
- Teaching students strategies to self-monitor spelling

Teacher Practices

Masterson and Apel (2010) contend that spelling instruction should not be a preset curriculum where words are introduced at the start of the week and tested at the end of the week, nor should new words be introduced the following week with no regard for competency. These researchers advocate for prescriptive, multilinguistic instruction tailored to student needs. Initial linguistic analysis of spelling abilities can help teachers form spelling groups, but thereafter, should be flexible in light of ongoing formative assessment and posttest analysis for individual students.

Bailet (2004) provides a comprehensive list of teacher practices that support spelling instruction:

Teachers should:

- Be familiar with linguistic terms, principles, and patterns
- Be familiar with developmental spelling trends
- Provide inventive spelling opportunities for young children
- Provide direct instruction on phonological awareness
- Begin formal spelling instruction with phoneme-graphemes with the lowest degree of linguistic complexity
- Provide numerous examples of targeted spelling patterns
- Explicitly teach rules of spelling
- Change color/font, exaggerate pronunciation, or state the base word to emphasize aspects of targeted words
- Use manipulatives for word building and word sorting
- Compare/contrast examples of words that do not fit word patterns
- Begin with spelling activities at the highest level of structure (dictation with one word pattern) and gradually move to less structure (composing using target word patterns)
- Introduce only a few sight words a day and practice for consecutive days
- Review and periodically retest previously mastered words
- Use multisensory and mnemonic strategies for irregular spellings
- Incorporate reading and writing into spelling instruction
- Provide quick correction to misspellings
- Provide direct instruction for proof reading, error detection, and corrections strategies
- Provide frequent positive feedback

Spelling Instruction Combined with Handwriting

Handwriting and spelling deficits often co-occur. Research indicates that handwriting and spelling account for about 40 % of essay quality (Graham et al., 1997). Severe handwriting struggles should not confound spelling instruction (Bailet, 2004). While there is research that indicates that handwriting can facilitate the learning of letter shapes, as well as how letters are combined to form words (Berninger, et al., 2002b; Richards et al., 2011), studies has been conducted more often with handwriters without severe motor planning deficits.

Young children, who have yet to develop legible handwriting, can use alphabet letter tiles to work on spelling patterns. Younger, as well as older students with severe handwriting deficits, may need to use a computer to work on spelling activities. However, prerequisite activities to acquire an awareness of keyboard layout (e.g., letters of the alphabet, the spacebar, and delete keys) may be necessary.

Berninger, Abbott, et al., (1998) found that young children with handwriting difficulties and/or spelling deficits performed well with a pencil when writing words with predictable letter-sound correspondence, but performed better with a computer to spell words with lower predictability. The researchers suggested that the computer allowed these students to devote more cognitive energy to spelling. Overall, studies suggest that handwriting and keyboarding can support spelling instruction, although the minimal degree of handwriting or keyboarding skill necessary has not been established.

As children gain more handwriting skills, spelling and handwriting instruction can be combined. As previously discussed in this publication (Graham 1999), handwriting and spelling instruction are critical for at least three reasons: 1) teachers tend to give lower marks to papers with poor spelling and legibility; 2) students' spelling and handwriting difficulties can interfere with higher order thinking and composing; and 3) poor spelling and handwriting can affect student attitudes, causing them to doubt their abilities as writers such that they avoid writing or write minimally.

Graham and Harris (2006) merged handwriting and spelling instruction with 30 first graders with average word recognition skills who were having difficulty with handwriting, spelling and composing. Half of the students received instruction focused on phonological awareness (control group), while the other half received the intervention described below (experimental group). Two or more spelling patterns were used in each lesson unit, which consisted of six lessons. Students in the experimental group made greater gains in spelling, handwriting legibility and fluency, as well as with sentence writing and vocabulary.

- Phonics warm up (2 minutes): The teacher holds up a picture and asks "What letter makes the sound you hear at the (beginning, middle, end) of this word?"
- Alphabet writing (5 minutes): The student practice writing two letters that are difficult for him or her to form correctly (based on a pretest).

1. The teacher traces the target letter following the arrows that show how to make the letter.
2. The student traces the letter.
3. The student traces and verbalizes how to form the letter.
4. The student copies the letter. As the lessons progress, the student writes words that contain the target letters and circles the word the student formed best.

- Word building (4 minutes; 2 rimes per unit): The teacher introduces a word pattern (_at). The student build words using consonants, blends or digraphs (cat, fat, flat, that) using letter tiles and in the next day's lesson, writes the words.
- Word study (4 minutes): The student practices spelling five high frequency words written on index cards that he or she spelled incorrectly on a high frequency word pretest or during a prior writing period. The student says the word and the letters, writes the word from memory, checks the spelling, and makes corrections. When the student spells the word correctly 6 times in a row, that word is retired and a new word is added. The teacher periodically retests students on the words they've learned.
- Writing (5 minutes): The student is prompted to write a narrative with the words used during Word Building.
- Word Sorts (on day 6 of each lesson unit): The student sorts words written on index cards with the word patterns learned that week.

(2 sets of 6 words for each word pattern; total of 12 words). The teacher talks about the word pattern and then models how to sort the words by their patterns. With guided support, the student sorts the words. The teacher helps the student verbalize the pattern for each set of words. A student can also write new words that fit the pattern, or search for words that use this pattern.

Graham and Harris' program is an integrated approach to handwriting and spelling and could be adapted for use with students beyond first grade classrooms. First, educators would need to conduct an analysis of misspellings to help to identify the types of word patterns to use during instruction. (Refer to the Section One on Spelling in this publication.) Additionally, a pretest of irregular high frequency words would identify target words for the Word Study activity designed to help students form mental graphic images.

The activities described above can be done in small groups in the classroom, providing the students are at similar levels of spelling development, working on similar word patterns. As a supplemental service, speech language pathologists can incorporate these multi-linguistic activities into therapy settings, or model this in the classroom. Occupational therapists serving students in classrooms should collaborate with teachers to identify what word patterns the student is learning and integrate handwriting instruction into a more multi-linguistic approach to word spelling and writing. This would better ensure that handwriting instruction is generalized to word-level and sentence-level writing.

Spelling errors occur even in the writing of mature adults, so the eradication of spelling errors is not realistic. The goal is to provide explicit instruction and sufficient strategies and resources to lessen the frustration of poor spellers (Bailet, 2004). Bailet reminds us that spelling is but one component of writing instruction. She goes on to say, "The worst outcome occurs when students so restrict their writing, due to low spelling ability and confidence, that their teachers never know the richness of their thoughts, and the students never discover the sense of accomplishment that comes through writings one's thoughts well" (p. 675). Vaughn and Bos (2009) have succinctly summarized the key components of effective spelling instruction: select appropriate words, teach spelling patterns, provide direct instruction, provide practice and feedback, help to maintain previously learned words, teach dictionary skills, and provide motivation. To this, add the use of computer-based tools that support spelling, including assistive technology tools. It is crucial for teachers and therapists to understand the current research on spelling and spelling instruction in order to know when and how to use technology to enhance and accommodate spelling.

Spelling and Technology

Software is available to comprehensively analyze patterns of linguistic spelling development, to provide computer-assisted instruction to practice spelling, and to help students surmount learning barriers through the use of assistive technology

Assessment and Computer Assisted Instruction

Software is available to comprehensively assess the word-level linguistic knowledge of students. SPELL-2 evaluates the misspellings of students across four levels of linguistic knowledge, identifies specific deficits, and recommends the exact type of word study instruction needed to improve spelling and decoding skills. Spell-Links provides strategies for systematic spelling instruction with connected reading and writing activities that build linguistic word knowledge. Computer assisted instruction (CAI) can help students develop and reinforce spelling. (See the Educator's Toolbox.) Programs such as WordMaker use more developmental, multi-linguistic approaches to spelling instruction.

Assistive Technology

Assistive technology options for students with spelling deficits can include mainstream tools such as spell checkers or autocorrecting tools that are typically built into word processors (e.g. Microsoft Word's spell checker, red underline, or features). Students with memory or attention issues, who struggle to express their ideas, may prefer to type their ideas first and later use spell checking tools. Other students may prefer to correct their spelling as they

go, using the "right click" option to immediately view suggested corrections and replace misspelled words. Auto-correction is a common feature that is designed to automatically correct commonly mistyped or misspelled words (there/their). For students who type very slowly or struggle to spell frequently used words, auto correction can be customized to recognize abbreviations. For example, if each day a student must type the phrase "Social Studies Homework", auto-correction can be set to automatically type the full phrase when the student types the abbreviation "SSH". Word completion is a feature often found on smart phones that is designed to speed up text entry, however, it can also provide spelling support to students who struggle to correctly spell high frequency words. For each of these mainstream spelling tools, the student must be able to recognize the correct spelling of the word they are intending to spell.

Assistive technology applications specifically designed for students with spelling deficits are available (e.g., word prediction, speech-to-text). Word prediction programs (e.g., Co:Writer, WordQ) are typically floating applications that are used in conjunction with word processors, web browsers, social media, and email to predict the word the student is attempting to write based on initial letter combinations. These programs are designed to be flexible enough to make spelling suggestions based on phonetic spellings (anamlz/animals lfnt/elephant). Good word prediction applications can speak suggested words and can make linguistic predictions to spell words (e.g., homonyms) based on the context of word in the sentence. (e.g., Co:Writer, WordQ, Ginger, Ghotit) Smart spell checking applications support spelling and grammar. The ability to customize curriculum-based topic dictionaries and develop personal spelling

dictionaries within the word prediction application are important features for struggling spellers. For the research on word prediction and spell checkers, refer to the next segment on Technology-Based Strategies and Accommodations.

Increasingly, speech recognition (SR) is easier to use, and more commonplace on everyday devices (e.g., mobile phones, tablets). For students with severe dyslexia, for those who consistently struggle to retrieve MGRs, or for those who make little progress after many years of spelling instruction, speech recognition can enable students to write more fluently. Students speak in phrases or sentences, which are translated onto the computer screen, bypassing the encoding of every word they want to write. Students still need word recognition skills, the ability to cognitively multi-task, and understand the writing process to use SR effectively. For the research on speech recognition, refer to the next segment on Technology-Based Strategies and Accommodations.

Educator Tool Kit: Spelling

BOOKS

Phonics They Use: Words for Reading and Writing (6th ed.) by P. Cunningham (2012)

Making Words series, by P. Cunningham and D. Hall (2008)

Words Their Way (5th ed.), by Bear, Invernizzi, Templeton and Johnston (2011).

SPELL-Links to Reading and Writing by Learning By Design, Inc.,
(http://donjohnston.com/spell-2-and-spell-links) (www.learningbydesign.com)

TECHNOLOGY

Computer-based spelling assessment

- SPELL-2 (http://donjohnston.com/spell-2-and-spell-links)

Spell checkers

- Built into word processing programs
- Personal spelling dictionary

Computer-assisted spelling instruction

- WordMaker (http://donjohnston.com/wordmaker)
- Simon S.I.O. (http://donjohnston.com/simonsio)

Word prediction software

- Co:Writer (http://donjohnston.com/cowriter)
- WordQ (www.goqsoftware.com)

Smart spell checkers

- Ginger (www.gingersoftware.com)
- Ghotit (http://www.ghotit.com)

Speech Recognition

- Speak Q (www.goqsoftware.com)
- Dragon NaturallySpeaking (www.nuance.com)

STRATEGIES TO SUPPORT COMPOSITION

Composition is defined by Russell (2006) as "the conscious and explicit development of students' writing in formal education, from preschool to higher education" (p. 243). As discussed in Section One of this publication, composition is a cognitive sociolinguistic process that requires the integration of lower level transcription with the higher order skills of retrieving knowledge and then transforming this into written text across a variety of purposes for different audiences. This segment of the DeCoste Writing Protocol will begin with findings on best practices for writing and then present evidence-based strategies for students across the grades, including findings on instructional best practices for students with disabilities. This section concludes with the available research on technology-based strategies and accommodations.

Instructional Research

In 2004, the Writing Study Group of the National Council of Teachers of English (NCTE) Executive Committee published a list of NCTE beliefs about the teaching of writing. This committee recognizes that writing is multifaceted, and that technology provides increasingly new ways to produce text. These beliefs set the stage for this section of the DeCoste Writing Protocol, which will focus on strategies to support composition:

1. Everyone has the capacity to write; writing can be taught and teachers can help students become better writers
2. People learn to write by writing

3. Writing is a process
4. Writing is a tool for thinking
5. Writing grows out of many different purposes
6. Conventions of finished and edited texts are important to readers and therefore to writers
7. Writing and reading are related
8. Writing has a complex relationship to talk
9. Literate practices are embedded in complicated social relationships
10. Composing occurs in different modalities and technologies

General Research on Instructional Best Practices

The National Commission on Writing report (2005) elevated the importance of writing proficiency. This provided a springboard for the analysis of effective writing instruction that is presented in the Writing Next report (Graham & Perin, 2007b) commissioned by the National Carnegie Corporation of New York. This report delivers a large-scale, meta-analysis of true and quasi-experimental research on instructional techniques purported to support writers from 4th to 12th grades, particularly struggling writers. The report identifies 11 evidence-based strategies showing positive effects for improving instruction. Only isolated grammar instruction demonstrated negative effects.

The Writing Next report concludes "students need to write clearly and for a wide variety of real-life purposes. Thus flexibility is now perhaps the most

prized goal of writing instruction because the fully proficient writer can adapt to different contexts, formats, and purposes for writing" (Graham & Perin, 2007b, p. 22).

Figure 3.6. 2007 Meta-analysis of Instructional Writing Strategies (Writing Next report, Graham & Perin, 2007b).

Strategies	Examples
Strong positive effect sizes (≥.80) • Writing strategies to explicitly teach planning, revising and editing of compositions (.82) • Summarization strategies (.82)	• Self-Regulated Strategy Development (SRSD) (De La Paz & Graham, 2002) • Teaching and progressively fading summarization strategies
Moderately positive effect sizes (≥.50) • Collaborative Writing (.75) • Setting product goals (.70) • Word Processing (.55) • Sentence Combining (.50)	• Students work together to plan, draft, revise and edit compositions • Teachers establish writing goals and benchmarks to produce different types of writing • Use of word processing software, including spell checkers • Alternate approach to grammar instruction to create more complex sentences
Mildly positive effect sizes (≥ .20) • Pre-writing strategies (.32) • Inquiry Activities (.32) • Process writing approaches (.32) • Study of models (.25) • Writing for content area learning (.23)	• Visual representations (concept maps, graphic organizers), brainstorming, group planning, reading materials to stimulate ideas • Engaging students in activities that will develop content for specific writing tasks (e.g., data review, interviews, hands-on activities, dramatization) • A framework for writing that includes goal setting, defining audience, using resources to plan, draft and revise • Students analyze models of good writing across different types of writing • Writing as a tool to summarize, analyze, interpret, explain, comment, or elaborate on academic topics

Strategies	Examples
Negative effect sizes (≥0) • Grammar instruction	• Explicit, isolated instruction on parts of speech and sentence structure

In 2009, Graham and Harris extended the meta-analysis of experimental research by Graham and Perin (2007a, b) to include single subject designs (Rogers and Graham, 2008), and a meta-synthesis of qualitative research (Graham & Perin, 2007c). Using these three sources of evidence, the researchers categorized evidence-based strategies for students in grades 4 to 10 in the following ways, listed by magnitude of effect sizes:

Figure 3.7. 2009 Meta-analysis on Instructional Strategies (Graham and Harris, 2009)

Positive recommendations supported by all three sources of evidence: • Teach students strategies for planning, revising and editing • Communicate clear and specific goals for what students are to accomplish when writing • Teach students to write more sophisticated sentences • Use pre-writing strategies to help students gather and organize ideas for compositions
Positive recommendations supported by two sources of evidence • Engage students in the process writing approach
Positive recommendations supported by one sources of evidence • Teach students strategies and procedures to summarize reading material • Provide opportunities for students to work together to plan, draft, revise and edit their compositions • Have students use word processing as a tool for writing • Use inquiry-based writing activities • Provide models for types of writing • Have struggling writers self-monitor their writing and behavior • Provide ample time to write
Negative recommendations • Traditional grammar instruction

Taken together, these meta-analyses provide a useful summary of evidence-based strategies that can be used to guide writing instruction. These instructional strategies are discussed throughout this publication. Nonetheless, the authors caution that teachers need to select strategies based on the needs of their students and use ongoing data collection to monitor their effectiveness.

ELEMENTARY INSTRUCTIONAL BEST PRACTICES

In a recent practice guide published by a panel of experts for the U.S. Department of Education, Institute of Education Sciences (Graham, Bollinger, Booth Olson, D'Aoust, MacArthur, McCutchen & Olinghouse, 2012) research paired with writing experts resulted in four recommendations for elementary educators, all of which are appropriate or can be modified for students with disabilities. The authors affirm that writing begins with the development of foundational skills (handwriting, spelling, sentence construction and typing), followed by the gradual achievement of more complex and refined writing techniques. They emphasize the writing process (i.e., drafting, sharing, revising, editing, evaluating, and at times, publishing), the vital role of technology (e.g., typing, word processing, computer skills, Internet navigation, web-based tools), and ongoing assessment to guide instruction. Their expertise combined with the research resulted in the recommendations listed in Figure 3.8.

Figure 3. 8. U.S. Department of Education, Institute of Education Sciences recommendations for teaching elementary students to be effective writers (Graham, et al. 2012),

	Recommendation	Purpose	Research-Based Strategies
1.	Provide daily time for students to write.	To learn and practice writing skills, strategies and techniques, integrated into content instruction.	30 minutes per day in kindergarten. A minimum of 1 hour per day starting at 1st grade with 30 minutes devoted to grade-appropriate writing skills, strategies and techniques, as well as, 30 minutes for writing practice to apply new learning
2.	Teach students to use the writing process for a variety of purposes. 2a. Teach students the writing process. 2b. Teach students to write for a variety of purposes.	To think critically about purpose, planning what to say and how to say it. To use the writing process effectively and flexibly for a variety of real-life purposes and audiences.	• Self-regulated strategy instruction* • Goal setting • Teach forms/genres of writing (story grammar, KWL charts, STOP, DARE, TREE strategie*) • Planning (POW strategy*, ordering ideas, outlining) • Drafting (emulating exemplary text, sentence construction) • Sharing (peer partners, "author's chair) • Evaluating (self-evaluation, self-monitoring) • Revising and editing (peer revising, COPS editing strategy) • Publishing (classroom displays, gallery walks, school websites, blogs)

	Recommendation	Purpose	Research-Based Strategies
3.	Teach students to become fluent with handwriting, spelling, sentence construction, typing, and word processing.	To master foundational skills in order to allocate more attention to composing.	• Learning letter formations and writing letters from memory • Spelling skills: phonological awareness, sound structures of groups of letters, morphological spelling • Spelling by analogy • Personal spelling dictionaries • Sentence Construction (sentence framing, sentence expanding, sentence combining) • Introduce typing in 1st grade with regular practice in 2d grade, typing faster then handwriting by the end of 2nd or 3rd grade • Using word processing beginning in 1st grade with the ability to produce and revise text using a word processor by the end of 2nd grade; using spelling and grammar checkers
4.	Cultivate an engage community of writers.	To collaborate with others to fully engage in the writing process utilizing constructive feedback from peers and teachers.	• Teachers modeling writing • Provide choice in writing assignments • Topic journals • Curriculum content-related writing prompts • Collaborative writing; share-the-pen • Guided peer editing, teaching students how to give and receive feedback • Teacher-student conferencing with emphasis on meaning over form in earlier drafts. • Author's chair

* Strategies described later in this section

SECONDARY INSTRUCTIONAL BEST PRACTICES

Numerous studies have sought to define what constitutes good writing instruction for secondary students. Yeh (1998) compared task-specific procedures for writing an argument with 110 middle school minority students divided into experimental and control groups. The experimental groups used two different prewriting strategies. All groups read a book on a topic, engaged in debate and then wrote essays using process writing from prewriting to revision to final draft. Both experimental conditions significantly outperformed the control groups, demonstrating the strength of task-specific procedures combined with process writing instruction.

Freedman (1987) conducted a careful study of the impact of teachers' responses to student writing using a survey of 560 teachers along with selected students. The National Writing Project had identified these teachers as successful writing teachers. This data combined with two 9th grade classroom ethnographic studies demonstrated that the importance of three conditions:

1. Successful teachers do not take over the writing of their students;
2. They communicate high expectations;
3. They provide a great deal of help and support for students during the writing process.

Sperling and Woodlief (1997) also studied teachers whose teaching approach was commensurate with the National Writing Project. These teachers allowed students to write for a variety of purposes (e.g. current events, first hand experiences, literature, research projects), allocated time to prewriting activities, and provided feedback through teacher conferences and peer interaction. Using interviews and observations, they found that the teachers developed a community of writers who willingly shared ideas and drafts and engaged in inquiry-based learning.

In 2001, Langer examined high-performing teachers who taught in diverse, urban secondary settings. She determined that highly effective teachers go beyond the acquisition of skills and knowledge, to engage students at a deeper level of understanding, whereas, other teachers tended to move on to additional activities once instructional goals had been achieved. These highly effective teachers, tended to work in school environments, that valued professional development and student achievement. High performance teachers used a combination of approaches to teach English language arts including:

- The use of simulated instruction (e.g., modeling, examples and exercises) where they practice new skills as part of mini lessons.
- The integration of skills into curriculum objectives to apply new skills.
- The integration, rather than the isolation, of test preparation skills.
- Making explicit connections across concepts, rather than regarding knowledge and skills as isolated entities.

- Teaching explicit self-regulation strategies for organizing and completing tasks (e.g., the use of self-evaluation rubrics and mnemonics).
- Engaging students in shared conversations to foster multiple perspectives and develop depth and complexity of understanding, rather than relying on individual thought.

RESEARCH ON INSTRUCTIONAL WRITING PRACTICES FOR STUDENTS WITH DISABILITIES

Research in the last quarter of the 20th century led to a focus on process, rather than product (Westby, 2012). Then, the dominant constructivist perspective focused on "learning to write by writing" with little explicit writing instruction. While this was an improvement over a purely skills-based approach, the constructivist approach, alone, was not sufficient for all students. According to Westby, the constructivist approach was "replaced by a more balanced approach to writing that integrates authentic writing activities and the stages of the process writing with explicit skill teaching" (p. 270). Harris and Graham (1996) promoted the need for explicit writing strategy instruction for students with disabilities. They recognized that mini-lessons and teachable moments were insufficient for these struggling writers.

Graham and Harris (1997) state that to improve their writing, students with writing difficulties must attend to planning, authoring and revising text for 45 minutes per day, and that teachers need to provide explicit feedback along the way. Decades ago, teachers focused on mastery of basic skills such as handwriting, punctuation and spelling before engaging in instruction on more challenging writing processes. This led to a diet of lean writing instruction for students with LD. At the turn of the century, studies of students with learning disabilities shifted to a focus on composition. Previously, more studies had focused on writing mechanics and grammar (Baker, Gersten, & Graham, 2003). Additionally, research focused on the need to teach strategic behaviors

to students with learning disabilities (Englert, Raphael, Anderson, Anthony & Stevens, 1991; Graham & Harris, 1989, 1993). Today, it is believed that writing skills, knowledge of writing, strategic behaviors, and motivation must be individualized, but nonetheless, addressed simultaneously Graham & Haris, 2009).

To address the needs of struggling writers, Singer and Bashir (2004) offer an instructional framework that addresses four foundational writing skills and five writing processes, including cognitive strategies such as self-regulation and executive functions:

Foundations:

1. Graphomotor skills (e.g., handwriting or keyboarding)
2. Cognitive/linguistic skills (e.g., phonological skills, vocabulary, syntax, knowledge of genres, metacognitive skills)
3. Social rhetorical knowledge (e.g., when and how to use writing genres)
4. Writer beliefs and self-perceptions

Processes:

1. Planning (e.g. clear writing goals)
2. Organizing (e.g., structuring and sequencing text)
3. Generating text (e.g., ideas into text)

4. Revising (e.g., making changes to improve text)
5. Executive functions and self-regulation (e.g., regulating attention, self-monitoring)

A 2001 meta-analysis by Gersten and Baker (2001) described 13 studies with strategies proven (mean effect size of .81) to support the planning, organization and execution of compositions by students with LD. They identified three broad categories of instruction addressed by these studies, which are listed and then described in more detail below:

1. Explicit instruction on strategies to teach the steps of a writing process (e.g., thinking sheets, planning sheets, prompt cards, and mnemonic aids)
2. Peer or teacher feedback and elaborated dialogue
3. Explicit instruction on text structures related to different types of writing

Explicit Instruction on Strategies

Graham and Harris (1996) focused their research on the use of self-regulation strategies to help student set writing goals, self-monitor their writing, and more effectively make revisions. In their study, students were exposed to explicit revising strategies and were directed to add at least 3 things to improve their stories, which resulted in improvements that enhanced the quality of their writing. Gersten and Baker (2001) reported that the use of writing process supports such as thinking sheets, planning sheets, prompt cards, and mnemonic aids have resulted in writing improvement for students

with LD. They contend that these supports provide a common language and a guiding structural framework. Englert, Raphael, Anderson, Anthony, Stevens and Fear, (1991, p. 345) demonstrated the effectiveness of worksheets using the acronym POWER (Plan, Organize, Write, Edit and Revise) to "make the writing process visible to students." Explicit instruction helped students master each step of the writing process.

Feedback and Dialogue

Literacy instruction today emphasizes the connections between reading, writing speaking and listening. Writing and language are interrelated; the role of self-talk and dialogue contribute to the development of writing. Process writing combined with focused dialogue appear to improve composition quality. Using dialogue, teachers or students engage in providing substantive comments, thoughts and suggestions (Wong, Butler, Ficzere & Kuperis, 1996; Englert et al., 1991). In Wong et al.'s 1997 study with 9th and 10th graders, students with LD successfully used process writing supports along with teacher modeling, think-alouds and peer interactive dialogue to improve their compare-contrast compositions. Interactive dialogues are a structured way for students with LD to reflect on their own ideas, gain a sense of audience and engage in the recursive process of writing and revising— a practice that is more difficult when working alone (Wong, et al., 1996; MacArthur, Schwartz & Graham, 1991).

Explicit Text Structure Instruction

Students with LD also appear to benefit from task-specific writing instruction that teaches them about the core structural elements within different types of writing (e.g., persuasive, narrative, explanatory, etc.) (Englert, Raphael & Anderson, 1992). Explicit instruction does not imply teaching a rigid, linear structure. According to Englert et al., students must gradually learn to attend to different text structures with appropriate flexibility.

INSTRUCTIONAL WRITING STRATEGIES

While this publication focuses for the most part on K-12 writers, it begins with instructional strategies for beginning writers— young children or students with cognitive disabilities who do not yet demonstrate an understanding of the alphabetic principle. It is an incorrect assumption that all writing begins at the kindergarten door, and subsequently that instruction begins with a kindergarten curriculum. Research clearly demonstrates that writing develops long before formal schooling. Simply watering down the kindergarten curriculum is as developmentally inappropriate for preschoolers as it is for students with disabilities at emergent literacy levels. There is strong sentiment that writing follows a developmental sequence in the early years and must be respected as part of instruction.

In the preschool years, children experiment with writing, imitating what they observe in their environment. During kindergarten, students gradually understand that letters say their names and begin to experiment with handwritten letters to spell words and convey ideas. In kindergarten, writing instruction is still informal, but more structured. In kindergarten, children use a combination of drawing, dictating and writing to convey ideas with the help and guidance of adults.

Over time, writing instruction becomes increasingly more formalized in 1st through 5th grades. Digital tools and multimedia are incorporated across all elementary grades. According to the CCSS, in the elementary grades, students are expected to become increasing adept at grouping and linking ideas using words and phrases. Their work gradually shows more organizational structure,

and they become more skilled at crafting introductions and conclusions. Over time, when writing narratives, they learn to establish a narrator and develop characters using dialogue (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010)).

By the time students reach middle school, it is expected that foundational skills are in place, such that writing instruction can focus more on the nuances of writing across genres and content areas using precise language while skillfully managing writing transitions. Based on college and career standards, middle school students are expected to describe cause and effect, to compare and contract and present information logically. In high school, students, continue to refine their writing skills using a variety of techniques to create cohesion and clarify relationships among more complex ideas. They learn to use similes, metaphors and analogies, and clearly lay out evidence, counterclaims and reasoning.

STRATEGIES FOR BEGINNING WRITERS

There are no Common Core standards for beginning writers, but this should not suggest that there are no best practices at the preschool and early kindergarten levels. Beginning writers are increasing aware of and fascinated by the writing they see around them. Writing focuses on real world purposes, like making a grocery list, writing a thank you note, or creating a sign. Typical preschoolers imitate writing in their play routines: recipes for the kitchen, a doctor taking notes, or taking an order in a restaurant. Using drawing and pretend writing, they add labels to their pictures, and write about their experiences and even make up stories. Freeman (1998) states,

> We don't need to wait until children know all their letters, know their sound-to-symbol relationships, know how to spell all the words they want to use. We don't need to wait until children can read. Young children are writers as soon as they draw or put a symbol on paper and tell us what it says" (p. ix)

Beginning writers sort through their memories for things to write about and then have to decide on the right words to convey this. They learn about concepts of print such as knowing to start writing on the left side of a page, to write from left to right, and to put spaces between their words. And they begin to learn the alphabetic principle to link sounds to corresponding letters. Learning to write their names challenges their ideas on how letters are put together to make a word. Self-regulation strategies are modeled to help children set goals, plan, gather information, rehearse, self-evaluate their work and seek assistance then needed.

Developmentally Appropriate Practices for Beginning Writers

Pinnell and Fountas have researched and written extensively about emergent literacy. The following table (Figure 3.9) describes their suggestions for developmentally appropriate practices for preschool writers (Pinnell & Fountas, 2011).

Figure 3.9. Best practices for Beginning Writers (Pinnell and Fountas, 2011).

Strategies	Purpose	Examples
Pretend play areas that incorporate writing	To view writing as a way to communicate in everyday life	**Create different free play areas and include writing tools:** • Kitchen (family calendar) • Restaurant (order pads) • Grocery store (sign making materials) • Doctor's office (charts)
Rotating activity centers for choice time	To focus attention on writing activities	• A writing center with tools to make lists, cards, posters • A book making area with pre-stapled blank pages and writing tools • Art Center with tools for drawing and labeling • Computer area with appropriate software to combine graphics and writing
Circle time	Engaging in phonics activities or teacher-modeled writing with an emphasis on concepts of print, letter names, and vocabulary	• Rhyming songs and poems • Alphabet song • Learning about sounds letters and words, starting with children's names • Big books and read alouds

Strategies	Purpose	Examples
Phonemic awareness, phonics, word study activities	Attending to sounds (rhyming words, syllables, letter forms, letters that say their names)	• Matching pictures of rhyming words • Sorting words with the same first letter • Sorting long and short words • Making words with magnetic letters
Interactive writing time	Share-the-pen activities to write about the day's events, or classroom experiences related to science, or books read aloud	• The teacher engages in interactive writing and strategically takes turns with students to point to letters or help write letters in words
Independent writing time	A more structured time that takes place over a series of days, when children plan, draft, revise, edit and share to begin to view themselves as capable writers Teachers provide guidance by circulating and conferring with children	• Writing process activities take place over a series of days • Planning: children rehearse what they will write about, draw about their topic, choose topics (informational, narrative, opinion), choose materials • Drafting: Protowriting or inventive spelling to write down their ideas • Revising: Rereading and adding more details • Editing: Making drawing or writing look better (emphasis is not on correctness) • Sharing: Sharing their work with peers

It is important to encourage pretend writing, experimentation with letter forms, and using inventive spelling as a way to enable students to think about letter sounds. At this stage, it is not about correct spelling. Research demonstrates that inventive spelling does not impact long term spelling development; rather, it helps children refine their understanding of sounds within words (Tolchinsky, 2001). This is the work of emerging writers. When working with young children or students with literacy delays, sometimes you can help translate their story writing using conventional spelling. It is important to

use language that does not inhibit this experimentation. You can write the conventional spelling in smaller letters at the bottom of the page and say, "I like the way you wrote that. It's just the way kids write. Down here, I'm going to write it the way the dictionary does."

Pinnell and Fountas (2011) emphasize the importance of teacher language to facilitate early writing behaviors in ways that encourage beginning writers.

- Tell me about the pictures in your story.
- I like the way you made the letter _____.
- I like the way you say the name of the letters when you write them.
- When you got to the end of the line, I like the way you started again on the left.
- I like how you put spaces between your words.
- Listen to how I say the word slowly so I can hear the sounds in the word. (Emphasis on letters that say their names).
- Say the word slowly and listen for the first sound.
- What did you do when……? Let's plan a book about that.
- That was a good story you told. Can you plan a book about that?
- Tell me more about what you are thinking about?
- I like the change that you made.
- You made it look just right.

A well-rounded curriculum supports the development of beginning writers. Typically, by kindergarten, children understand that the alphabet is used to represent speech sounds. Research has shows that simply understanding letter-sound correspondence is not enough to help children move into phonetic spelling. Kindergarten children also need reading and spelling instruction (Ehri & Wilce 1987; O'Connor & Jenkins, 1995; Vandervelden & Seigel, 1997). Developmentally appropriate spelling activities can include sorting words based on simple patterns, using magnetic letters to spell words, letter deletion and substitution activities (ball > call, sat > mat).

Kindergarten children need to develop the ability to handwrite the letters of the alphabet (or become familiar with a keyboard in the case of students with graphomotor deficits or physical disabilities) well enough to begin to express their ideas. Opportunities to write connected text can follow short lessons on letter formation. Activities to build automaticity of handwriting can occur once the letters can be made with reasonable accuracy (Coker, 2013). Because writing is more than handwriting, there need to be activities that promote language. Young children's language skills (vocabulary, syntax, morphology) predict the quality of writing in 3rd to 5th grade according to research by Hooper, Roberts, Nelson, Zeisel, & Kasambira Fannin (2010).

Rigorous state standards for kindergarten stress exposure to different types of writing (narrative, opinion and informative) with opportunities to construct simple compositions. Exposure to different types of books can set the stage for the various types of writing. Process writing approaches, modified for younger writers, modeled and guided by adults, are appropriate. Similar to

that of older writers, it is a recursive process, not a linear process. By the time students finish kindergarten, they are expected to write sentences using common nouns (including plural nouns), verbs, and prepositions (from, for, by, with). They should be producing complete sentences and be using question words (who, what, where, when, why, how) (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010).

Process Writing for Beginning Writers

Spandel (2012) provides examples of strategies that support process writing for beginning writers (Figure 3.10):

Figure 3.10. Process Writing in the Primary Years (Spandel, 2012)

Strategies	Purpose	Examples
Planning	Building on children's experiences	**Primary forms of prewriting:** • Talking • Drawing • Listing details • Listing questions • Simple idea webs • Interviewing
Drafting	Writing as a form of communication to convey a message and ideas	**Primary writing formats:** • Drawing wordless books • Drawing plus writing • Writing a story • Writing a letter • A poem • Cartoon bubbles
Revising	Self-talk or sharing with a partner to see what can be added to alter the content	• Adding a picture detail • Adding another drawing • Adding words to enhance the drawing • Adding phrases or a sentence • Changing words
Editing	Polishing the work, making it more visually appealing, fixing distracting errors, making it easier to read	• Checking the presentation of the work (cover, illustrations, handwriting or fonts) • Checking for basic conventions
Publishing (student choice)	Writing for a purpose	• Posting the work on the wall • Adding "book features." (cover, title page, credits, dedication, about the author, other graphics)

STRATEGIES FOR ELEMENTARY WRITERS

When 1st grade writers compose, they often rely on talking and drawing. However, by grade 2, the need to draw decreases, but talking with others to rehearse what will be written and to get feedback on drafts is still important (Calkins, 1986). By the 3rd grade, writers are gaining more control of the writing process, the focus on meaning and the connection among ideas (Langer 1986). In 4th and 5th grade, students are better able to reread their compositions and make revisions (Calkins, 1986). Writing becomes more than just ideas written down; it is a means of thinking and rethinking (Strickland & Townsend, 2011).

The research consistently reports that children prefer to write using computers, and they become more comfortable using digital tools to compose (Yancy, 2000). The CCSS (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010) state that in the 4th grade, students should develop sufficient "command of keyboarding skills" to type a minimum of 1 page in a single sitting, and by 5th grade, to type 2 pages in a single sitting. Like all CCSS standards, schools are expected to design a means of building keyboarding skills into the elementary curriculum to support these standards.

Writing research reveals that there are many components of writing that need to be explicitly taught and practiced over time in the elementary grades. Olinghouse and Wilson (2012) note the importance of foundational skills, including transcription and vocabulary development. They also note the importance of compositional skills, including sentence conventions, genre and text structures and process writing. Self-regulation is an important component in the elementary years. More details on sentence conventions, genre and text structures, process writing, and self-regulation are presented below.

Sentence Conventions

The Language Standards within the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010) have outlined grade-level sentence conventions (grammar, usage, sentence construction, punctuation, capitalization, spelling) Figure 3.11 describes some of these conventions.

Figure 3.11. Common Core State Standards for Sentence Conventions (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

Grade Level	Expectations
1st	Print all upper and lower case letters. Use simple and compound sentences (declarative, interrogative, imperative and exclamatory), and use end punctuation. They demonstrate noun-verb agreement, and use personal (I, me), possessive (my, mine), and indefinite (everything, anyone) pronouns. They demonstrate past, present and future verb tenses, articles (the, an) and commonly occurring adjectives, conjunctions (and, but, because, so) and prepositions (during, toward). Capitalize dates and names and use commas to separate words. Spell untaught words phonetically.
2nd	Use collective nouns (group, team), commonly occurring irregular plural nouns (feet, children), and past tense irregular verbs (sat, hid). They use adjectives and adverbs, produce and expand simple and compound sentences, using apostrophes for commonly occurring possessives and to form contractions (don't, can't). They capitalize holiday, product and geographical names. Generalize learned spelling patterns.
3rd	Use regular and irregular plural nouns and verbs. They produce simple, compound and complex sentences that show subject-verb agreement, verb tenses (I run, I will run, I ran) and pronoun-antecedent agreement (each boy plays an instrument). They use comparative (faster, less hungry) and superlative (best, biggest) adjectives and adverbs, as well as coordinating (yet, or) and subordinating conjunctions (after, though, while). They capitalize words in titles, and use quotation marks. Use convention spelling for high frequency words and taught words, adding suffixes to base words.

Grade Level	Expectations
4th	Use relative pronouns (which, that) and relative adverbs (This is the house where I grew up). Use progressive tense (I will be) and auxiliaries (can, may, must). They construct complete sentences (no run-on sentences or fragments) and complex sentences with prepositional phrases and accurately order adjectives (the small red balloon) and use the correct form of easily confused words (to, too, two; their, there). They use correct capitalization and use commas in compound sentences. Spell grade appropriate words.
5th	Use a variety of sentence structures. Use perfect tense (I have walked, I will have walked), verbs that convey time, sequences and conditions, and correlative conjunctions (either/ or; neither/nor). They use commas after introductory phrases, and to set off words (yes, thank you; Isn't that you, Sam?). Expand, combine, and reduce sentences for meaning, interest, and style. Spell grade appropriate words.

Writing Genres and Text Structures

Writing genres refers to categories of text. For example, fictional writing is comprised of many categories (e.g., realistic, fantasy, crime, etc.). Each of these has various text structures. Text structure refers to how information in the text is organized. The CCSS highlights three types of writing. Olinghouse and Wilson (2012) provide examples of elementary writing tasks for each of these types of writing. (Figure 3.12). Again, each of the tasks for each type of writing will have a different text structure. For example, the text of a news article is structured differently compared to an autobiography.

Figure 3.12. Writing Tasks for Three Types of Text (Olinghouse and Wilson, 2012)

Type of Text	Examples of Tasks
Informative/explanatory	• Book report • Autobiography • News article • Report • Character analysis • Science experiment
Opinion	• Opinion letter • Advertisement • Movie or book review • Speech • Blog • Persuasive essay

Type of Text	Examples of Tasks
Narrative	• Fairy tale • Fable • Memoir • Realistic fiction • Fantasy

Process Writing

The *process writing* approach is considered to be a foundation for composing. The research supporting process writing is described in Section One of the DeCoste Writing Protocol. Olinghouse and Wilson (2012) provide examples of process writing activities suitable at the elementary level (Figure 3.13).

Figure 3.13. Process Writing in the Elementary Grades (adapted from Olinghouse and Wilson, 2012)

Writing Process	Examples of Tasks
Planning	• Brainstorming • Graphic organizers • Story planners • Outlining • Dramatizing • Researching • Summarizing and organizing notes
Drafting	Rough draft, 1st drafts and final drafts • Working from an outline or graphic organizer • Using a word processor
Revising	• Adding words, details or information • Removing unnecessary information • Restructuring text or reorganizing sections • Evaluating “voice “ or “tone”
Editing	• Rereading and checking for conventions, including spelling • Using synonyms to replace repetitive words • Editing checklists
Publishing	• Producing a final copy to display or share • Creating a book • Adding a cover or title page

Process writing unfolds gradually across the elementary grades (Olinghouse & Wilson 2012; Cunningham and Allington, 2011). For example, simpler planning strategies are first introduced to younger elementary students, and you might focus only on a few things when editing. Too much emphasis on editing can be discouraging. Revising strategies may not be presented until a student is producing more writing. Strategic instruction across all aspects of process writing is gradually introduced. The goal of process writing is not to create perfect papers, but to allow students to grow as writers. "The process is as important as the product"(Fountas & Pinnell, 2001. p 66).

To get started, a teacher will first consider his or her district's curriculum and make informed decisions based on assessment about the writing standards that need to be addressed for the full range of students in the classroom. The teacher will then need to consider how much time will be devoted to a particular writing task within the curriculum. Students need to become increasingly adept at managing short and long term writing tasks. Additionally, the teacher will need to decide on the type of text structure. Narrative, opinion, and informational writing have different text structures depending on the writing task. Moreover, a variety of mini-lessons can be incorporated into instruction in order to explicitly address the many elements of writing (Fountas & Pinell, 2001). For each of the areas in Figure 3.13, these authors provide many specific topics for mini-lessons to improve students' writing. For more specifics, see Fountas and Pinnell (2001) and Pinnell & Fountas (2008). For struggling writers, teachers will need a firm grasp on individualized needs across all areas of writing (skills, knowledge, strategic behaviors, and motivation), design and incorporate focused instruction as well as accommodations, including assistive technology.

Figure 3.13. Mini lessons (Fountas and Pinnell, 2001)

Management • Managing time, materials and equipment • Managing student interactions and cooperation • Managing independent work time
The **Craft of Writing** • Finding the right topic • Learning from other writers • Using a writers notebook • Learning about a variety of purposes for writing • Developing a sense of audience • Learning about perspective • Writing skills (Drafting, revising, editing, publishing, research skills, writing in different genres)
The Conventions of Writing • Spelling lessons • Paragraphing • Grammar • Punctuation • Use of capital letters

Writer's Workshop is the term used to describe a structured approach to writing in the elementary grades that begins with students choosing a topic and then following the process writing approach (Moore et. al (2011). For example, students may be presented with an instructional theme (e.g., ecosystems; historical heroes). The students would engage in reading or research to select their topic and begin the planning process. Writer's Workshop typically begins with a mini-lesson and concludes with students sharing their writing. While revising and editing are important, meaning takes precedence over correctness in order to help children see themselves as proficient authors.

Teacher and peer conferencing are an important part of developing writing proficiency. Because students define their own topics and can progress on their own timetable, this approach can be sensitive to the needs of students with writing disabilities.

Teaching Scaffolds: Before, During and After Writing

There are a variety of writing scaffolds to consider addressing the needs of a wide range of writers in any classroom. Writing scaffolds are supports that you can build in before, during, and after writing (Moore et al., 2011). After a teacher is clear on the writing task and the level of needs of the full range of writers in his or her classroom, then he or she will need to consider the types of scaffolds that are needed. For example, a teacher may want to develop a scoring rubric or checklist that he or she can review with students when introducing a new writing assignment to allow for self-reflection and self-assessment. A variety of activities can be designed to develop background information. Different planning strategies can be used to support high and low skilled writers (note-taking, webs, story maps, charts, online graphic organizers). During writing, when students are writing independently, the teacher can move around the room providing support, or confer with individuals or small groups of writers to provide guidance and present needed mini-lessons. (See Figure 3.14 for conferencing suggestions.)

After writing, when students have completed their writing for the day, the teacher may want to speak to the class about one or two important elements based on his or her classroom observations and provide feedback as a way to motivate developing writers. Students can fill out capture sheets or use

a writer's journal to reflect on their writing progress. When students have completed the final drafts of their writing assignment, a special culminating activity such as a gallery walk can be scheduled to celebrate, or their writing projects can be shared with parents via an online educational site such as Edmodo.

Figure 3.14. Conferencing Suggestions (adapted from Fountas & Pinell, 2001).

Writing conferences may involve:

- Listening to the student read his/her writing
- Determining the kind of help the student wants
- Praising the writer's skills
- Discussing specific aspects of the writing
- Setting writing goals

Language to use during writing conferences:

- How is your writing coming along?
- How can I help you?
- What do you think about your writing draft?
- Tell me more about……
- What might you add to your writing?
- Did you remember to…..?
- What will you be working on next?

Revising

Revising is a difficult skill for young writers and struggling older writers. As part of Writer's Workshop, Moore et al. (2011) describe four stages as part of an instructional progression to help students revise: adding, replacing, reordering and removing (Figure 3.15).

Figure 3.15. Four Stages for Instruction on Revision (adapted from Moore et. al, 2011).

Revision Stages	Instructional Activities
Adding	• Instruction on how to add words or phrases • Using a writing sample with very basic sentences, model how to add more colorful words and phrases • Use special colored revising pens
Replacing	• Replace boring or overused words • Using a writing sample with lots of boring words, model how to replace these words
Reordering	• Teach sequencing • Provide sentences on strips (i.e., simple recipes, story details) and model how to reorder these to create a more logical sequence. • Have student cut and paste the sentences to reorder their own writing
Removing	• Teach students to remove sentences or paragraphs that are not on topic or are distracting.

Using Rubrics as a Component of Instruction

While large scale assessments appear to influence what is taught (Stecher, Barron, Chun & Ross, 2000), they typically are not detailed enough for measuring gradual change. Analytic rubrics provide criteria for understanding what a student can or cannot do. Rubrics can be customized to address student goals (e.g., to examine text structures for different types of writing) or use established criteria as in the case of the 6 + 1 writing traits rubric (Education Northwest, 2010). Rubrics are a form of formative assessment in that they can inform instruction. They are also a way to offer feedback to students. In a study by Troia, Lin, Cohen, and Monroe (2011) where the 6 + 1 writing traits rubric was used, the interrater reliability ranged from .76 to .89 for individual traits.

According to Spandel (2001, 2012), the traits are meant to enhance process writing, and can be used at elementary and secondary levels. They are a language to describe good writing, and can be used across narrative, informational and persuasive writing structures. Teachers can use good literature as exemplars of good writing; they can model the traits, and use them as part of focused lessons. When using the traits, teachers are encouraged to:

- Provide direct instruction on writing traits, one at a time, beginning with "ideas"
- Focus on the traits that have been taught
- Limit feedback on one or two traits during conferencing
- If the rubric score is low, explain to the student that you will score that trait when his or her writing gets stronger

Self-Regulation Strategies

Research has shown that self-regulation strategies are an important component for effective writing for all students. Self-regulation involves metacognition and the ability to plan, self-monitor ad self-evaluate learning. Relative to writing, self-regulation strategies are intended to help students set writing goals and manage writing tasks, as well as to increase motivation and independence. For example, POW, a strategy for elementary students, is a mnemonic for Pick your idea, Organize your notes, Write and say more. Self-Regulated Strategy Development (SRSD) was developed by Graham and Harris (1989) and is backed by more than 2 decades of research. Instruction using a variety of strategies within the SRSD framework has proved to be highly beneficial for struggling writers, and students with disabilities. More information on SRSD strategies can be found in the segment on Strategies for Writers with Disabilities.

STRATEGIES FOR MIDDLE AND HIGH SCHOOL WRITERS

The National Writing Project (NWP), which began in 1973, is a professional educator network committed to the improvement of writing. In 2003, Karl Nagin authored a book for the NWP called "Because Writing Matters" that looked at the condition of writing instruction in schools. Quoting Applebee's research in the 1980s, Nagin confirmed secondary students wrote infrequently within a narrow range of genres for limited purposes" (Nagin, 2003, p. 39). Applebee (2000) went on to state that most students' writing at that time consisted of fill in the blank and other types of short answer completion exercises that did not involve composing. By the late 1990s, more secondary teachers were reported to be using process writing along with skills-based instruction (Langer, 2001). Currently, with the convergence of less than stellar writing scores (National Center for Education Statistics, 2012), a sobering publication on adolescent literacy (Wise, 2009), and the release of the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010), there is renewed interest in secondary literacy instruction (Lesley, 2014). Wise's report (2009) highlights adolescent illiteracy rates, graduation rates that are lower than reported, and states that one third of students who enter college must take remedial courses.

Patterson and Duer (2006) conducted a large-scale survey of colleges and high schools to identify those skills that teachers perceive to be important in high school and college. Educators were asked to rank the importance of 73 writing skills. There was significant agreement across college and high school respondents, though colleges placed more importance on grammar.

The most significant finding, however, was that there were differences in instructional emphasis for non-college bound high school students. Students who were college-bound more often received instruction emphasizing formal and analytical writing (e.g., literary analysis, critiquing argumentative positions, emphasis on voice and audience, developing logical arguments, research), while the instructional emphasis for non-college bound students focused more often on basic writing (e.g., writing a how-to paper, grammar and punctuation). Today, there is more emphasis on writing genres and the attainment of complex writing across the secondary grades for all students.

Prior to entering middle school, students are expected to have established a strong foundation of writing skills in order manage more complex writing tasks. Calkins et al. (2012) state, "Once students become fast, fluent, structured, and proficient writers across a range of genres, it is easy to take those skills on the road, using writing as a tool for thinking across all disciplines" (p. 14). Wise (2009), however, states that policymakers have presumed that this strong foundation would carry students into the secondary years. Wise contends that ongoing literacy instruction at the secondary level is critical for all students and should not be relegated solely to English teachers, who are often not trained in the teaching of literacy.

Content Writing

Secondary writers are expected to continue to advance their writing skills across discipline-specific content areas in order to "write to learn" and be college and career ready. Writing across content area refers to the ability to "react to appropriate instructional materials in a given subject area" (Bean, Readence & Baldwin, 2011). Content writing enhances understanding of subject matter across disciplines such as science, social studies, history, English and math. Writing goals differ dependent on the subject matter. It is expected that college and career readiness writing standards will be incorporated across subjects using different text structures. For example, science lab experiments take on a different written format than writing about historical sources.

The history/social studies, science, and technical standards within the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010) are outlined by grade-level. Figure 3.16 briefly describes some of the expectations. A more complete description can be found at http://www.corestandards.org/ELA-Literacy/

Figure 3.16. Common Core State Standards for history/social studies, science, and technical subjects (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

Content Area	Expectations
History	Grades 6-8: Cite evidence from text from primary and secondary sources, determine central ideas, summarize, and identify steps of a process. Understand domain specific vocabulary, describe how text is presented, and identify points of view or purpose. Integrate visual information, distinguish fact, opinion and reasoned judgment, and analyze primary and secondary source relationships. Grades 9-10: All of the above with more attention to detail: dates, origins of information, key events, idea development, details within a series of events and how they relate. Analyze text structures, compare points of view, integrate quantitative, technical and qualitative analysis, compare and contrast using primary and secondary sources. Grades 11-12: All of the above plus connecting insights from readings, summary with relationships among key details and ideas, evaluate explanations relative to textual evidence. Integrate multiple sources; evaluate the author's premise, challenge information and discrepancies among sources.
Science and Technical Subjects	Grades 6-8: Cite textual evidence, determine central ideas and conclusions, summarize, and follow multistep procedures. Understand domain specific vocabulary, terms and symbols, analyze text structures, identify author's purpose. Incorporate quantitative or technical information into visual formats, distinguish facts and reasoned judgments based on research findings and speculation, compare and contrast information from multiple sources. Grades 9-10: All of the above with more attention to detail and more analysis: explanations, descriptions, processes, phenomenon, and concepts. Follow complex multistep procedures. Understand domain specific vocabulary, terms and symbols, analyze the structure of relationships in text, , analyze author's purpose. Translate quantitative or technical information into visual formats, assess whether reasoning and evidence support the author's claim, compare and contrast findings from multiple sources. Grades 11-12: All of the above with more attention to detail and more analysis relative to inconsistencies: central ideas, conclusions, and processes. Follow complex multistep procedures. Understand domain specific vocabulary, terms and symbols, analyze the structure of relationships among concepts in text, and analyze author's purpose and issues unresolved. Integrate and evaluate multiple sources of information from diverse formats and media, evaluate hypotheses, data, analyses and conclusions. Synthesize information from a range of texts coherently addressing conflicting information.

Kiuhara, Graham and Hawken (2009) conducted a national survey on high school writing assignments in English, science and social studies classes. Weekly tasks most often reported included short answer responses, worksheets, responses to summaries of reading material. Monthly journal entries and lists were also reported by a majority of respondents. Kiuhara et al. (2009) noted that most of these assignments involved "writing without composing." Also English language arts (ELA) teachers and social studies teachers more often assigned multiparagraph writing on a monthly basis rather than a weekly basis. The survey found that ELA teachers more often provided direct instruction on writing compared to other disciplines. Meltzer (2009) determined that college writing typically assigns multiparagraph writing compositions. Thus, given a lack of substantive writing, high school students are less likely to have the skills needed for college and careers.

Based on the reported research, Perin (2013) recommends the following best practices:

- Include extended writing tasks instead of just short answer writing across all content areas
- Provide explicit instruction on writing strategies
- Include disciplinary writing that is expected for college and the workplace across all content areas
- Content teachers, not just ELA teachers, should incorporate writing instruction into content classes and provide direct writing instruction.

Strategies for Planning

Not all students plan alike (Lassonde & Richards, 2013). Some may prefer to write while others draw their ideas or dictate ideas; some use graphic organizers, while some prefer outlines. Some prefer to fully plan their drafts, while others prefer to plan periodically as they write. There is no one-size-fits-all planning method, (Richards & Miller, 2005). As a result, students need to be exposed to a range of planning strategies for a range of purposes. Teachers need to model planning strategies that fit the genre and the purpose of the writing task. Unfamiliar genres may require more planning time (Lassonde & Richards, 2013). Students, who have not yet developed fluent transcription, are more likely to need planning strategies to preserve working memory in order to focus on the higher order skills of composing (Wong and Berninger, 2004).

There are a wide variety of possible planning strategies, which can be used as stand- alone strategies, or can be combined to meet the needs of the learner. Figure 3-17 provides suggestions.

Figure 3-17. Strategies for Planning (adapted from Lassonde and Richards, 2013)

Strategies	Examples
Teacher think-alouds	The teacher models the use of planning strategies
Thinking time	Providing uninterrupted time for students to think about a writing task
Inquiry	Students write down questions about main questions and subordinate questions about their topic. Use sources or interviews to seek additional information.
Journals	Students sketch or write about their topic
Graphic organizers	Visual representations in the form of concept maps, charts, timelines. Paper-based or digital graphic organizers
Quick writes	Free writing without concern for spelling or punctuation to generate ideas
Dictating	Dictating ideas into a tape recorder, digital recorder, or use speech to text on a mobile device
Note cards	Write ideas on separate cards or use electronic note-taking tools to generate and organize ideas; Cornell note-taking
Outlining	Paper-based or word processing outlining tools

Strategies for Summarizing

The ability to succinctly summarize is an important writing skill (Graham & Perin, 2007b, Graham & Perin, 2007c). Summarizing is not an easy task because it requires a level of metacognition. It involves the ability to decide what is important and how to condense it (Brown & Day, 1983). The first step, according to Graham and Harris (2005), is to understand that a summary contains only important information and to teach students this concept through modeling and guided practice.

The Cornell note-taking system is a structured approach to recording, analyzing and then summarizing notes. It uses a specific visual format to with three steps (Figure 3.18). The top row is for the student's name, date and topic. The student closely reads from his or her text or other sources and makes notes in the large column on the right, using abbreviations and skipping lines between ideas for ease of readability. After note-taking, the student reviews the notes, and in the left column, records main idea, key points and questions that correspond to the notes. The bottom row is where the student writes a summary of the topic. The summary should answer the question, "If I was going to explain this to someone, what would I say?"

Figure 3.18. Cornell Note-Taking System (adapted from Pauk, 2013).

Name: Topic:	Date:
(Main ideas, key points, and questions)	Notes: (phrases, use abbreviations, skip lines)
Summary:	

Many of the strategies previously described for elementary students are also applicable to secondary students such as process writing, writer's workshop, before-during- after scaffolds and self-regulations strategy development. The strategies described below (Figure 3.19) are aimed specifically at secondary students. These assume that students have developed foundational writing skills and are ready to tackle even higher-order writing tasks. Teachers are expected to have a clear assessment of their students' writing skills and to provide supplementary instruction as needed to bring students to grade level standards.

Honigsfeld and Dove (2013) have tied strategies for middle and high school writing expectations to the CCSS anchor standards (National Governors Association Center for Best Practices, Council of Chief State School Officers (2010)). Graham, McArthur and Fitzgerald's book (2013) pulls together a number of authors who provide research and perspectives on secondary writing strategies. Whether your school district adheres to the CCSS or not, it is still likely that the strategies listed in Figure 3.19 are appropriate across the secondary grades. The scope and sequence of the anchor standards reflect the current shift toward the advancement of writing skills for all students.

Figure 3.19. Strategies to Support College and Career Readiness Standards (adapted from Honigsfeld & Dove, 2013; Graham, MacArthur and Fitzgerald, 2013; and the CCSS (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010)).

Grade Level Expectations (CCSS)	Strategies
Anchor Standard 1: Write Arguments	

Grade 6: Students learn to identify claims.
Grade 7: Students learn to incorporate and oppose claims.
Grade 8: Differentiate alternate or opposing claims.
Grade 9-10: Develop claims and counter claims, acknowledging strengths and weaknesses of each.
Grade 11-12: Critically evaluate evidence for bias and values.
	Use argument tables and graphic organizers designed specifically:
	• Identify a claim, find a quote that support the claim, explain the quote
	• Gradually expand this to also include the student's stated opinion, reasons for the agreement or counterclaim, evidence from other sources to support the claim
	• Side-by-side list of multiple arguments and counterclaims
	• Venn diagrams
	• Students collaboratively develop surveys and questionnaires to prepare arguments.
	• Role playing
	• Real world contexts
	• Dialogic debate prior to writing
	• SRSD strategies for planning
	  • PLANS: Pick goals, List ways to meet goals, And make Notes, Sequence notes
	• SRSD strategies for opinion writing
	  • TREE: Topic clarity, Reasons, Explanations, Ending
	  • STOP and DARE: Suspend judgment, Take a side, Organize, Plan more; Develop topic sentence, Add details, Reject an argument, Ending

Anchor Standard 2: Write Informative/Explanatory Texts	
Grades 6-8: Select, organize and carefully analyze relevant content to convey ideas, concepts and information. Grades 9-10: Produce the above with more complex topics using an objective tone. Grade 11-12: Produce all of the above, incorporating metaphors, similes, analogies	• Close reading • Annotation • Timeline charts or graphic organizers • Building a bank of ideas • Summarizing charts or matrixes to categorize information and new ideas that arise out of readings • Collaboratively, students create index cards with facts on one topic per card
Anchor Standard 3: Write Narrative Text	
Grade 6: Establish a context, logically organize the event sequence, using narrative techniques, and transitional words, phrases and sentences. Grade 7: Establish a point of view and show relationships among experiences and events through transitions Grade 8: All of the above and use the conclusion to reflect on events Grade 9: -10: Multiple plot lines with strong details and multiple points of view Grad 11-13: All of the above to create a coherent piece with a tone that builds to the outcome	• Use story boards or story timelines • Use flow charts • Use sensory charts to develop precise language • Use graphic organizers to outline the plot structure (e.g., rising actions, climax and resolution, noting the setting, theme and conflict) • Character charts • SRSD strategies for planning • WWW, What = 2, How = 2 • Who, when, where, What does the and characters do, What happen then, How does it end, How do characters feel
Anchor Performance #4: Produce a written response the has grade appropriate organization and development	
6th -12th grade: Provide clear and coherent writing, organization and style appropriate to task, purpose, audience, based on grade specific expectations for anchor standards 1-3.	**To support disciplinary-specific writing:** • Provide a useful menu of sentence starters (e.g., Science or historical data analysis: *The evidence suggests that….)* • Paragraph frameworks or model essay models to help students understand the language structure of cause/effect, compare/ contrast/ cycles, etc.

Anchor Performance #5: Edit and Revise	
6th-12th grade: Develop and strengthen writing using planning, revising, editing, rewriting, or a new approach in keeping with Language Standards 1-3 for a given grade level.	• Teachers model writing using "think- alouds" • Mentor texts: Show and discuss examples of exemplary authors' text • Feed forward: anticipate students' needs and provide reminders during guided or independent writing time • Interactive editing: teacher and student share the editing pen and both check for needed edits and revisions and discuss this • Peer-editing in pairs or small groups with capture sheets that articulate what to examine • Self-reflection capture sheets • Rubrics and checklists
Anchor Standard #6: Using technology	
6th-12th grade: Use technology, including the internet, to produce and publish writing, to interact and collaborate with others. 6th grade: Command of keyboarding skills to type a minimum of 3 pages in a single sitting 7th grade: Linking and citing sources 8th grade: Show relationships between information and ideas 9th -10th grade: Update individual or shared writing products; use technology's capacity to link and dynamically display information 11th-12 grade: All of the above using feedback to include new arguments or information	• District-approved typing tutorial tools • Software and online tools to graphically organize ideas • File sharing tools (e.g., Dropbox) • Collaborative writing tools: (e.g., Google Docs) • Tools to check the format of citations • Web-based publishing tools (e.g., • Glogster, Wikis, StoryBird) • Password protected blogging sites • Assistive technology writing tools (e.g., SOLO, Write:OutLoud)

Anchor Standard # 7: Research	
6th-8th grade: Conduct short research projects 6th grade: Research to answer questions using several sources, changing the inquiry as needed 7th grade: Generating additional questions to research and investigate as needed 8th grade: All of the above to allow for multiple pathways of exploration 9-12th grade: Conduct short and sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden inquiry, synthesize multiple sources, demonstrate understanding of subject under investigation	• Collaborative small group research projects • Jigsaw writing: each student contributes a line of research or investigation • Web-based tools for collaborative writing
Anchor Standard # 8: Note-taking, organizing and evaluating information	
6th-8th grade: Gather relevant information from multiple print and digital resources, assess credibility, quote or paraphrase, avoid plagiarism 6th grade: Provide bibliographic information 7th -8th grades: Use search terms effectively, assess accuracy, follow standard formats for citations 9-10th grades: Gather relevant information from multiple authoritative print and digital sources, use advanced searches, assess usefulness of source for research questions, integrate information into text, maintain flow of ideas, avoid plagiarism, follow standard formats for citations 11th-12th grades: All of the above plus evaluate strengths and limitations of each source relative to task, purpose, and audience; avoid overreliance on any one source	• Scaffold note taking: guided notes or outlines with key words • Note-taking templates to organize information from each source • Graphic organizers that are geared to disciplinary writing and genres (e.g., flow maps, hierarchical maps, compare/contrast, timelines, etc.) • Web-based note-taking tools

Anchor Standard #9: Using evidence from informational or literary texts	
6th-12th grades: Use evidence from informational or literary texts to support analysis, reflection and research Use grade level CCSS Reading Standards to literature and literary nonfiction	• Checklists or rubrics to gauge the quality of the evidence • Question answer relationship charts (QAR) to analyze what is in the text, what the writer/ author is thinking, deductions based on the text and original ideas (Raphael, Highfield and Au (2006) • Small groups read segments of text and respond to the essential questions to collaboratively develop a summary • K-W-L strategy: Outlining what you know, what you want to know and what you learned. • SQ3R strategy: Survey the text, formulate questions about the text, read actively, Recite/write key ideas from the text, Review
Anchor Standard # 10: Range of writing	
6th-12th grades: Regularly write for extended and short time frames for a range of discipline-specific tasks, purposes and audiences	• Quick writes as a starting point for thinking and dialogue • Quick diagrams or sketches to represent ideas • Dialogue journaling to exchange ideas with a peer or teacher • Response journals to record ideas, opinions reflections. • 6 + 1 Writing Traits

Revising

The art of revising requires explicit instruction and feedback. The research suggests that instructional strategies aimed at revising can result in positive change, especially when the goals for revision are clearly articulated. In a study by Graham, MacArthur and Schwartz (1995), the results demonstrated that when students were given a clear goal to add more ideas to make their writing more interesting, students made more substantive revisions. Midgette, Haria and MacArthur (2008) found that when given a clear goal to consider an audience with opposing views, that upper elementary and middle school students improved persuasive essays. Self-evaluation using specific revising criteria also results in the improvement of writing quality, particularly when revisions are modeled by teachers, and when students are given opportunities to practice revisions (MacArthur, 2013).

MacArthur has long been an advocate of technology to support writing. Technology makes revising and editing easier and eliminates needless recopying. It also results in a clear final copy for sharing and publishing. However, research has demonstrated that using a word processor by itself does not improve written quality; technology must be combined with effective instruction to teach skills and knowledge (MacArthur, 2013).

Based on more than 80 studies, explicit instruction on sentence construction also reaps benefits (Saddler, 2013). While students in the elementary grades benefit from lessons on combining sentences, secondary students benefit from learning more about mature syntax, including how to effectively use phrases and clauses, to vary sentence patterns, and to use parallel structures.

Explicit Feedback and Self-Regulation

Explicit feedback is an important instructional component. In a research review, Graham, Harris and Hebert (2011) found that verbal feedback from teachers had a positive effect on student writing. Beach and Friedrich (2006) found that the nature of the feedback was critical. It must be supportive, it must clearly explain the problem, and it must make specific suggestions. Interactive peer revision integrated into writing instruction has also been found to be effective based on research (Graham et al., 2011; Graham and Perin, 2007a; Boscolo and Ascorti, 2004). In fact, research demonstrates that peer feedback benefits the student reviewer as well as the student receiving the feedback (MacArthur, Graham & Schwartz, 1991; Philippakos, 2012).

Self-regulation strategy instruction, also known as cognitive strategy instruction, supports the complex, cognitive processes of writing. Self-regulation strategies were designed for students with learning and behavioral issues. However, research consistently demonstrates the benefits for all students. (Englert et al., 1991; Graham 2006). More detailed information on self-regulation strategies will be presented in the following section on Writers with Disabilities.

STRATEGIES FOR WRITERS WITH DISABILITIES

Many instructional strategies for students with disabilities are based on the instructional research previously described in this section. Much of the research specific to students with disabilities was conducted to determine which practices support the unique needs of these students. Schumaker and Deshler (2009) chronicled 3 decades of instructional research specific to adolescents with learning disabilities (LD), and concluded that these students a) can learn and maintain complex writing skills, b) can apply them in general education settings, and c) can develop skills comparable to their peers. They caution, however, that students with LD must have sufficient opportunities to reach mastery for individual skills, and require individualized feedback when practicing new skills. Troia (2013) contends that strategy maintenance and generalization across writing contexts is often insufficient. Without such instruction, Warner, Schumaker, Alley, and Dechler (1980) found that students' writing abilities leveled off at around a 4th grade level throughout their high school years. Schumaker and Deshler (2009) decry the tutoring approach to students with LD commonly seen in secondary settings. More often this approach tends to support the completion of assignments and provide consultation to classroom teachers, but is less likely to provide the comprehensive, research-based instructional conditions that students with LD require.

Summarizing their survey research, Graham and Harris (2009) report that some primary teachers spent little time on writing instruction and around 40% of these teachers made few or no adaptations for struggling young writers. Students spent only 20 to 30 minutes per day writing, and rarely used computers and word processing at school. In a survey of English language arts (ELA), science and social studies teachers in 9th to 12th grades, they found that adaptations were applied infrequently, and writing assignments involved short answers, rarely involving multiple paragraphs. Science teachers taught writing the least, ELA teachers the most, but content classes overall did not teach a lot of writing. It is a common stance, that students with LD require more, not less, instruction compared to peers (Newcomer, Nodine and Berenbaum, 1988; Wong 1994).

Areas of Instructional Need

Throughout Section One of this publication, the research on writing and students with disabilities is described. In general, the research has shown that writers with LD tend to produce shorter, less complete, less organized, and weaker quality writing. (Englert & Raphael, 1988; MacArthur & Graham, 1987; Graham et al., 1995; Nodine, Barenbaum, & Newcomer, 1985). They tend to approach writing as a content generation task—a "knowledge telling" approach whereby they draw on memory to write an idea, which prompts the next idea (Bereiter & Scardamalia, 1987).

The research confirms that their compositions tend to contain more spelling, capitalization and punctuation errors, and handwriting is less legible— all of which interfere with the higher order processing needed for composing

(Graham and Weintraub, 1996; Bereiter & Scardamalia, 1987; Quinlan, 2004). Assessment and instruction is needed to address the linguistic knowledge that contributes to spelling development (Moats, 2010; Apel, Masterson, & Brimo, 2012), while structured lessons and self-monitoring strategies are needed to address conventions (Graham & Harris, 1987, 1993). Handwriting or an alternative means of transcription must reach a level of fluency that is functional (Russell, 2000, Christensen, 2004). Without this, writing content may be lost, because students have to spend an undue amount of effort on handwriting or keyboarding, or because handwriting or keyboarding cannot keep pace with their ideas (Graham and Harris, 2009). In general, students with LD tend to over-focus on form and mechanics, rather than on the writing process. For example, less proficient writers believe that good writers write neatly or spell correctly, whereas more proficient writers place more emphasis on ideas, organization and using interesting words (Saddler & Graham, 2007).

The research also indicates that students with disabilities do little planning in advance of writing (Graham, 1990, Graham & Harris, 2003). However, planning poses multiple problems for students with LD. While planning before writing can lessen the demands of working memory, rigid adherence to the plan can constrain new ideas (Hayes & Flower, 1980). Students need to learn a variety of planning strategies and learn that planning is an ongoing part of writing. Using computer-based tools, instead of paper-based plans, students can more easily revise their plans, thereby, fostering flexibility.

When students with disabilities write, they tend to produce less content than their peers or produce text that is redundant or unnecessary (Graham, 2006). This may be due to working memory issues or a lack of topic knowledge, or

they are unfamiliar with the writing genre (Englert & Raphael, 1988; Graham and Harris, 1997). Consequently, students need to set reasonable goals for their writing to increase the length and quality of their writing (Harris, Graham, Reid, McElroy & Hamby, 1994).

Significant research demonstrates that students with learning disabilities struggle with metacognitive awareness for writing tasks such as goal setting, the selection of writing strategies, and self-monitoring (Troia, 2002, 2006, Graham & Harris, 1989). Consequently, students with disabilities tend to overestimate their capabilities and undervalue the use of strategies (Ellis, 1986). Explicit instruction using self-regulation strategies has been show to be highly effective (Graham & Harris, 2003).

Motivation is also a concern, as students with disabilities tend to show less persistence, which in turn limits their learning opportunities, leading to less proficiency, subsequently decreasing their confidence over time as writers (Ellis et al. 1987; Wong 1994; Graham & Weiner, 1996). Educators working with these students will need strategies to address motivation and persistence, providing individualized conferences and feedback, collaborative writing opportunities, and strategies to track writing progress and on-task behavior (Pajares and Valiante, 2006; Graham and Harris, 2003, 2009). Additionally, it is crucial to use multiple means of engagement and allow for multiple means of expression, such as allowing students to select writing topics that they find engaging, as well as providing options for written expression. Technology-based accommodations can provide needed supports for struggling writers. For example, for students who struggle with handwriting and spelling, may be more motivated to write, when word processing and spelling supports are

routinely available. Writing tasks should be meaningful and challenging, just short of frustration. There is evidence that demonstrates that motivation predicts writing performance (Graham, Berninger & Fan 2007).

And lastly, writing instruction should allow for the use of accommodations, including the use of technology to surmount learning barriers. Small group instruction, individualized mini-lessons, customized scaffolds to support goal setting, to capture ideas, and to monitor progress can benefit struggling writers. Additionally, assistive technology should be considered to surmount transcription and spelling barriers and to free up cognitive resources needed for higher order thinking. (The research on assistive technology is provided in a subsequent segment of this section under the heading Technology-Based Strategies and Accommodations.) As stated by Troia (2006), students with disabilities need "a comprehensive writing program that contains just the right balance of basic writing skills instruction, composing strategies training, and suitable instructional adaptations embedded in a process writing framework that incorporated the best elements of writing workshop" (p. 333).

Self-Regulated Strategy Development

Self-Regulated Strategy Development (SRSD) refers to an instructional framework designed to help students set writing goals and manage writing tasks, as well as increase motivation and independence. SRSD stages do not reflect a scripted linear approach, but a recursive approach that can be "reordered, combined, revisited, modified, or deleted, based on student's needs" (Graham & Harris, 2009, p. 63). Most importantly, students move at their own pace, but mastery is essential before moving on to the next stage of

SRSD. There are multiple strategies offered within the SRSD framework that focus on setting goals, planning, generating writing, and revising.

There are six stages to the SRSD framework to guide teachers when introducing new self-regulation strategies (Figure 3.20).

Figure 3.20. Stages of Self-Regulated Strategy Development (Graham & Harris, 2005)

SRSD Stages	Description
Develop background knowledge	The teacher assesses the student's level of knowledge for the skill to be taught and introduces the new strategy.
Discuss it	The teacher discusses the benefits of the new strategy and helps students understand how the strategy will be beneficial. The student commits to using a new strategy.
Model it	The teacher models the new strategy using a think-aloud.
Memorize it	The student memorizes the mnemonic for the strategy.
Support it	Guided practice is used to helps students gain mastery of the strategy
Independent performance	The student is able to use the strategy to independently compose.

In an article that reflects on the evolution of self-regulated strategy development Graham and Harris (2009) focused first on struggling writers in 4th to 8th grade. While they were able to demonstrate the effectiveness of SRSD, they were struck by how many of these students disliked writing. Then, they focused on younger struggling students in 2nd and 3rd grade. Again, while they found SRSD to be effective, they also realized that it was easier to teach writing to 2nd graders because they still liked to write. The SRSD framework has been used successfully with students at secondary levels as well. Graham and Harris also came to understand that writing achievement for struggling writers of all ages

was related to how well teachers were prepared to teach writing, how much time was allocated to writing and writing instruction, and the effectiveness of the instructional strategies that were implemented.

Two meta-analyses have demonstrated SRSD effect sizes of 1.20 (Harris, Graham, Brindle, Sandmel (2009) and 1.34 (Graham, 2006) for writing quality. (effect sizes greater than 0.80 are considered large effects) Based on their research, Graham and Harris (2009) believe that SRSD is effective for typical students, as well as students with learning disabilities, attention deficits, behavioral disorders or Asperger's Syndrome. They affirm that the SRSD framework is beneficial for at-risk writers as young as 2nd grade on up through high school. They do caution that SRSD instruction is premature for students who struggle to write even one to two sentences.

A three-tiered model of early intervention referred to as "Response to Intervention" (RtI) is being used to provide the appropriate level of instructional intensity and monitor the progress of students. Tier 1 interventions are delivered class wide in the general education environment. Tier 2 interventions are often delivered to small groups of students. Tier 3 interventions consist of intensive, individualized strategies applied when Tier 2 interventions prove insufficient. Tier 3 instructions are supplementary and are provided in addition to instruction at Tiers 1 and 2. Most studies on SRSD have been conducted with students receiving Tier 2 or Tier 3 interventions. However, a 2012 study shows that SRSD effectiveness and fidelity can be achieved as a Tier 1 intervention to support narrative and opinion writing in twenty 2nd and 3rd grade general education classrooms (Harris, Lane, Graham, Driscoll, Sandmel, Brindle, and Schatschneider, 2012).

There are explicit strategies within the SRSD framework that are designed to address writing. Many of these strategies use mnemonics to help students recall the essential steps in the process. Some strategies provide broad writing support, some support writing genres, some support process writing, while others support goal setting and self-monitoring. (Graham & Harris, 2005). Figure 3.21 provides a sampling of Graham and Harris' strategies. For more detailed explanations of how to present these strategies within the SRSD framework, see the Educator Toolbox below.

Figure 3.21. Writing Strategies (Graham & Harris, 2005)

Strategy	Steps	Purpose
POW	**P**ick idea **O**rganize notes **W**rite and say more	Writing strategy suitable for 2nd and 3rd grade writers
PLEASE	**P**ick topic **L**ist ideas **E**valuate list, sequence and organize **A**ctivate topic sentence **S**upply sentences **E**nd with a concluding sentence	Paragraph writing strategy
PLANS	**P**ick goals **L**ist ways to meet goals **A**nd make **N**otes and **S**equence notes *Write and say more* *Check goals*	Goal setting strategy

Strategy	Steps	Purpose
STOP AND LIST	**S**top **T**hink **O**f **P**urposes **L**ist **I**deas **S**equence **T**hem	Goal setting, brainstorming and organizing strategy
www, What-2, How-2	**Think of a story** **W**ho, **W**hat, **W**here **W**hat do the character(s) want to do **W**hat happens with the characters **H**ow does the story end **H**ow does the character(s) feel *Make notes for each part* Write my story, add, elaborate, revise, make sense	Story writing planning strategy
SPACED	**S**etting **P**urpose **A**ction **C**onclusion **E**motions, add **D**etails	Story writing planning strategy

Strategy	Steps	Purpose
TREE	*Who will read my paper?* *Why am I writing this paper?* **T**opic sentence **R**easons **E**xamine reasons **E**nding *Write and say more*	Opinion writing strategy
STOP and DARE	**S**uspend judgment **T**ake a side **O**rganize ideas **P**lan more as you write **D**evelop topic sentence **A**dd supporting arguments **R**eject arguments for the other side **E**nd with a conclusion	Opinion writing strategy
POWER	**P**lan: Brainstorm and group ideas **O**rganize: Order explanations **W**rite draft **E**dit with peer **R**evise	Explanatory writing strategy that pairs with Think Sheets to scaffold steps
COPS	**C**apitalize: Have I capitalized first words and proper nouns? **O**verall appearance: How is the overall appearance? **P**unctuation: Have I used correct end punctuation, commas and semicolons **S**pelling: Do words look like they are spelled correctly? Can I sound them out or use a dictionary or speller checker?	Revision strategy

Educator Tool Kit

Books:

Temple, C. A., Nathan, R. & Temple, C. N. (2012). The Beginnings of Writing, 4th ed. Boston: Pearson.

Harris, K. R., Graham, S., Mason, L. H., & Friedlander, B. (2008). Powerful writing strategies for all students. Baltimore, MD: Brookes.

DVD on Self-Regulation Strategy Development:
Harris, K. R., Graham, S. & Deshler, D. Teaching Students With Learning Disabilities In The Regular Classroom (DVD And Online Facilitator's Guide)

Online examples of lessons plans using POW, TREE, WWW, What-2, How-2
http://kc.vanderbilt.edu/projectwrite/resources-srsd.html

Sentence Construction

Writing involves many component skills. Generative writing at the sentence level, involves learning to handwrite, spell, and construct sentences, as well as use appropriate grammar, punctuation, and capitalization. Young, developing writers construct simple sentences. Gradually, students learn how to use more compound and complex structures. Students with writing disabilities often struggle with the linguistics of sentence writing, using short choppy, and incomplete sentences (Weintraub & Graham, 1998; Nodine, Barenbaum, & Newcomer, 1985; MacArthur & Graham, 1987).

Direct instruction on sentence construction appears to have a positive influence on the writing of students with disabilities. In a 2007 meta-analysis of instructional writing strategies (Graham & Perin, 2007b), explicit instruction on sentence combining demonstrated moderately positive effect sizes. Furthermore, an extended meta-analysis by Graham and Harris (2009) examined experimental research, single subject design and qualitative writing

research and found that all three sources supported explicit instruction on sentence construction. In 2012, Datchuk and Kubina specifically examined peer-reviewed instructional research on the sentence-level writing of students with writing deficits and found similar positive effects.

Instructional strategies for sentence-level construction emerged in the 1960's. According to Saddler (2013), more than 80 studies have demonstrated that sentence combining, one approach to teaching sentence construction, helps student produce more syntactically mature sentences. He concludes that sentence writing instruction (combining, decombining, and recombining sentences) using mini-lessons, teacher modeling, and teacher/peer conferencing is an important component of a well-balanced writing program.

Saddler (2012), in the Teacher's Guide to Effective Sentence Writing, emphasizes that the goal of sentence-building instruction is not to write longer sentences, but to learn to write better sentences, progressing from the sentence level, to the paragraph level, and then to the multi-paragraph level. Saddler's sentence construction exercises, in the form of mini-lessons, follow a learn-see-do approach. Sentence construction activities are a component of writer's workshop. Mini-lessons can be selected based on needs demonstrated in student writing, with the objective of skill transfer to "real writing". Teacher modeling, scaffold practice, independent practice and peer coaching in a supportive environment are important components of instruction. Saddler recommends short sessions two to three times per week. Initially, this approach may require 30-minute sessions, but as students come to understand the process, it likely will require less time. Figure 3.22 provides a sample outline of sentence construction development, but readers are

encouraged to read Saddler's full text to understand the full range of sentence construction exercises and the instructional process.

Figure 3.22. Examples of Sentence Construction Exercises (Saddler, 2012).

Topics of Instruction	Examples
Sentence Basics	
• What is (and is not) a sentence	One or more complete thoughts *The leaves were falling* vs. *The leaves*
• Noun verb sentences	The cat napped.
• Expanded noun-verb sentences	The cat napped on the couch.
Sentence Combining	
• Compound structures with connectors: *and, for, nor, yet, so, but, or*	[Mary walked to town. Jose walked to town]. *Mary and Jose walked to town.* [They could travel by bus. They could travel by car] *They could travel by bus or car.*
• Adverb structures	[I ran home. I ran quickly.] *I quickly ran home.* [We walked to the movies. We went after dinner.] *We walked to the movies after dinner.* [Josh took a summer class. He is learning algebra. (to)] *Josh took a summer class to learn algebra.*
• Noun modifiers	[The flowers were purple. They were blooming.] The *purple* flowers were blooming. [I saw a big cat. It was black.] I saw a *big, black* cat. [Robert played on the basketball team. He lived next door. (who)] Robert *who lived next door* played on the basketball team. [The dog barked loudly. The dog's name was Rex.] The dog, *barking loudly*, was named Rex.

Topics of Instruction	Examples
Sentences with Multiple Elements and Multiple Solutions	
Multiple adjectives and adverbs	[Rebecca had blue eyes. She had curly hair. Her hair was brown.] *Rebecca had curly brown hair and blue eyes.*
Multiple prepositional phrases	[The deer grazed. They grazed in the open field. It happened in the evening.] *The deer grazed in the open field in the evening.*
Multiple Adjective Clauses	[Mike has a new surfboard. It is made of fiberglass. It is easy to carry.] *Mike's new surfboard, made of fiberglass, is easy to carry.*
Multiple adverb clauses	[The cyclist trained for many hours. It was extremely windy on the day of the race. He did not score in the top ten.] *Although the cyclist trained for many hours, he did not score in the top ten because of extreme winds on the day of the race.*

Sentence Constructions at a Paragraph-Level

Model paragraph from The Wizard of Oz (Baum, 2008). E-Text downloaded from Project Guttenberg.

1. **Dorothy got over her fright slowly.**
   Hour after hour passed.
   She felt quite lonely.
   The wind shrieked so loudly.
   The wind shrieked all about her.
   She nearly became deaf.

2. **First, she wondered.**
   Would she be dashed to pieces when the house fell again?

3. **The hours passed.**
   Nothing terrible happened.
   She stopped worrying
   She resolved to wait calmly.
   She waited to see what the future would bring.

Hour after hour passed away, and slowly Dorothy got over her fright; but she felt quite lonely, and the wind shrieked so loudly all about her that she nearly became deaf. At first she had wondered if she would be dashed to pieces when the house fell again. But as the hours passed and nothing terrible happened, she stopped worrying and resolved to wait calmly and see what the future would bring.

TECHNOLOGY-BASED STRATEGIES AND ACCOMMODATIONS

In this segment of Section Three, the technology that supports writing will be presented. The research providing evidence of the benefits of technology will be described.

Changing Technology Infrastructures

In the 1980s, the arrival of the microcomputer made it possible for computers to be used in school environments. There were too few computers to be included in every classroom, so computer labs emerged. As computers have become faster, smaller, more mobile, and less expensive, there has been a corresponding rise of computers in classrooms (McKenna, Labbo, Conradi, & Baxter, 2011). Most teachers have reported at least one computer and internet access in the classroom. Moreover, software available via central servers has increased the availability of applications across schools and classrooms (Gray, Thomas, & Lewis, 2010). Increasingly, technologies are becoming more mobile and ubiquitous such that teachers have more ways to integrate computer-related activities into instruction, through the use of interactive white boards, using computers as learning stations, or using laptops and mobile devices for composing. Ultimately, wireless broadband, bring-your-own-device policies, and more access to technology tools in classrooms may be what drive changes in instructional practices. Douglas Eyman states that "What is changing most rapidly are the literacy practices that we and our students are developing and deploying— practices made possible by a particular kind of technological infrastructure" (Walker, Blair, Eyman, Hart-Davidson, McLeod,

Grabill, Kemp, Palmquist, Purdy, Sorapure, Tulley, & Vitanza, 2011, p. 328). Renewed emphasis on daily writing as part of college and career readiness, as well as the shift toward national and state-level online testing, may result in changes in infrastructures that provide more technologies to support writing in the classroom.

Technology and the Changes to Instruction

Writing instruction now begins in the primary grades. In the secondary grades, it is not relegated to only language arts classes. Writing instruction is no longer a narrow focus on response to print-based readings, nor does it result only in a print-based product. Beach, Hull and O'Brien (2011) describe traditional school day instruction as uni-modal, non-digital, decontextualized, test-directed and teacher-centric, as compared to 21st century methods of accessing and producing knowledge using web 2.0 tools which are more often multi-modal, computer-based, interactive, socially networked, and student-centered. However, Luckin, Clark, Graber, Logan, Mee, & Olive (2009) found little evidence of the use of Web 2.0 tools to engage students in critical inquiry, nor evidence to produce or publish digital content outside of the school walls. Beach et al. (2011) state that students may not be making use of the full potential of Web 2.0 tools because their school's English language arts (ELA) curriculums may "remain organized around print-based paradigms that perceive digital tools as merely an add-on rather than as a transformation of ELA" (p. 163). Today, writing is not a pencil/paper task, nor just a word processing task. It also can take the form of gathering, posting and discussing information via the Internet and then producing online publications using text

and multimedia. Increasingly, teachers will need to incorporate technology across the curriculum, and across all content areas.

Computer technology and the Internet have changed the way writing is perceived, practiced and published. Consequently, the role of the teacher has shifted from "manager" to that of a writing coach. According to Kemp as quoted in Walker, et al. (2011), teachers will need to let go of practices where they tell students what to write.

Digital Writing and Multiple Literacies

The National Council of the Teachers of English (2007) state that print is no longer the dominant form of communication and expression. Digital text has rapidly become the leading form of writing. Digital writing is defined by DeVoss, Eidman-Aadahl, & Hicks (2010) as "compositions created with, and oftentimes for reading or viewing on, a computer or other device that is connected to the Internet" (p. 7). Digital writing requires new types of skills. Knobel and Wilber (2009) contend that in addition to reading, writing, listening and speaking, students in a digital age need to be able to review, critique, tag, record, remix and collaborate to generate work digitally. Multiple literacies that enable students to create and convey meaning today are listed below. However, Coiro and Castek (2011) remind us that the tools of tomorrow have yet to be invented. New technology tools typically outpace instructional methods, and educators need to be open to innovative technologies that support literacy development.

Digital writing tools

- E-mail
- Text messaging and tweets
- Social networking
- Multimedia wall posting
- Blogs, wikis and web pages
- Word processing and slide show software
- Networked enabled collaborative writing using cloud-based computing (Google docs, Dropbox)
- Digital story telling using multimedia (images, video, narration, animations, cartoons)
- Virtual posters
- Discussion forums (synchronous and asynchronous)
- Podcasting
- Concept mapping for planning
- E-portfolios

Accessible Technologies

The more mainstream digital tools are incorporated into the curriculum, the easier it is for students with disabilities to avail themselves of technology features that surmount learning barriers. Examples of this are listed below.

- Video content links in online encyclopedias to provide background or explanatory information.
- Annotation tools to make notes digitally
- Outlining, graphic organizers (e.g., SmartArt or web-based tools) to preplan and organize ideas
- Digital story telling or podcasting tools as way to present new knowledge
- Word-processing tools to check spelling; synonym tools to enhance written vocabulary
- Text-to speech features to help students reread and revise their work
- Smart phones to access reminder and calendar tools to track assignments
- Asynchronous discussion sites that allow slow writers to compose a response at their preferred rate of speed
- Online research using text-to-speech tools to help students locate facts, definitions and details to write explanatory text

- E-portfolios for students with poor handwriting to present their digitally produced written product without risk of bias

While mainstream tools present ways to motivate and enhance the work of students with disabilities, they also can create new challenges. Students will need instruction on how to use these mainstream tools effectively. For example, when doing online research for informational writing tasks, students will need to learn to identify search terms that match the purpose of their task, select relevant links, self-regulate their search efforts, evaluate the credibility of information, and categorize information (Beach et al., 2011).

ASSISTIVE TECHNOLOGIES

By definition, any strategy, tool or device that offers support to a student with an identified disability constitutes assistive technology. Mainstream tools become assistive technology when documented on an IEP or 504 plan. While more research is needed to pinpoint conditions of effectiveness, there are studies that support the use of assistive technology to improve writing. In this next section, the work of researchers who have studied the effects of technology tools to support writing is described.

Note-taking

Traditional note-taking in preparation for writing can take different forms. Horney, Anderson-Inman, Terrazas-Arellanes, and colleagues (2009) compared two types of digital note-taking in a 5th grade science classroom. Students used voice notes (using a microphone) or text notes (using a keyboard). Both forms of note-taking were found to be effective. In a study by Izzo (2008), teachers provided digital "guided notes. " Guided notes provide background information and key word outlines to guide students as they take notes when reading online content or listening to a teacher present information. The use of guided notes resulted in an increase in on-task behavior and improved scores on unit quizzes.

Anderson-Inman (2009) examined numerous studies on the use of supported e-text with students with disabilities. Many of the supported e-text resources listed were aimed at reading. Reading often precedes writing in order for students to gather information, or to view model writing. Notational e-text

resources are specific to taking notes while reading or marking text. Outlining tools, electronic highlighting, and electronic annotation tools such as sticky notes and margin notes provide ways for students to collect facts, details and definitions prior to writing. Many of these tools are integrated into software tools. For example, Adobe Acrobat (www.adobe.com), as well as text reader tools such as Read and Write Gold (www.texthelp.com) and Kurzweil (kurzweiledu.com), have annotation tools. SOLO (donjohnston.com/solo) allows students to take notes while reading and then use these notes to write their drafts. There are numerous annotation apps that can be used on mobile devices, as well as online subscription tools. Noodletools is an integrated online tool for note-taking, outlining, annotating and citing sources. It permits students to work collaboratively on research and writing projects (http://www.noodletools.com). Notational resources provide instructional scaffolding in that they help students perform note-taking skills that would ordinarily be difficult for them to perform.

Planning

Children with disabilities typically have difficulty planning and organizing ideas when writing. Students with learning disabilities often struggle to establish purposes for writing, to activate background knowledge, and generate topic specific information (Graham & Harris, 1993). Instead, they tend to write what comes to mind which results in text that lacks cohesion, and includes irrelevant and redundant information. Students with LD often lack knowledge of text structures—an understanding of the arrangement of ideas in text (Englert, Zhao, Dunsmore, Collings, & Wolbers (2007).

Sturm and Rankin-Erikson (2002) studied the effects of hand drawn and computer generated concept maps combined with strategies instruction as outlined by Graham and Harris (1993) on the expository writing of middle school students with learning disabilities. They defined concept mapping as "an instructional strategy used to categorize information into a graphic form, creating a visual representation of the text structure and associated personal knowledge within that display" (p. 125). Concept mapping software (Inspiration) and hand drawn concept maps were compared to no-map conditions. The results showed that essays were longer and of higher quality under both concept map conditions. Additionally, student attitudes were measured and found to be significantly more positive in the computer-mapping condition when compared to the no-mapping and hand-mapping conditions.

In an experimental study reported by MacArthur (2009b) by Klein, MacArthur & Najera (2007) with 5th grade children using Inspiration software (Inspiration Software, Inc.), students were randomly assigned to 3 groups: a control group, a group using a concept map template, and a group using a map template with an outline view. Both mapping groups received higher text structure scores than the control group; however, the differences in overall quality were not significant. The findings of this study underscore the importance of ample instruction in the use of planning software.

To address the need for instruction along with use of graphic organizers, Englert, et al. (2007) investigated the use of web-based concept maps that also included writing prompts to support expository (informational) writing structures for students ages 9 and 10. Twenty students with writing disabilities in the experimental condition were compared to 15 students in the control

group who used paper-based graphic organizers. Based on rubrics analyzing writing trait and convention scores, students in the experimental, web-based condition, produced longer texts and had higher ratings on writing rubrics. According to the researchers, these students included more facts and details, contained an introduction and conclusion, and were able to produce more topically coherent writing overall as compared to the control group. This study illustrates the importance of graphic organizers along with scaffolded writing instruction during the writing process.

A 2011 meta-analysis of the use of graphic organizers with upper elementary, middle and high school students with learning disabilities found moderate to large effect sizes in the ability of graphic organizers to increase vocabulary knowledge, comprehension, and inferential knowledge, as well as a moderate effect size for the maintenance of skills weeks later (Dexter & Hughes, 2011).

Concept maps graphically organize ideas using text and/or pictures. Draft:Builder software (donjohnston.com/draftbuilder) provides supports for the development of concept maps and outlines to generate sentences and paragraphs, while Clicker software (cricksoft.com) uses word and/or picture grids to help beginning writers build sentences. These programs can be customized to provide writing support for emergent writers. However, once students can spell more phonetically, they should be encouraged to generate words and sentences to express their ideas.

Multimedia Applications for Writing

There is a growing interest in multimedia environments for writing, though little research on the impact of this for students with disabilities. Zhang (2000) conducted year-long case studies of five 5th grade students with learning and behavioral disabilities, reading at 2nd and 3rd grade levels. Although intelligence quotients were within normal limits, these students often refused to write. The students used specially designed software using text, graphics, and sound to write personal narratives. Pre-service teachers provided individualized support to the students. Based on the use of a writing traits rubric (Spandel & Culham, 1994), all students demonstrated small but definite writing improvements. More importantly, the students were more engaged, and three of these very reluctant writers produced far more writing than they had ever produced in the past.

Rao, Dowrick, Yuen, and Boisvert (2009) examined the use of IntelliTools software with 25 high school students with LD and behavioral problems reading well below grade level (mean grade level of 4.2) in special education English language arts classes. Students worked in pairs using IntelliTools to write narratives (containing pictures, audio and text) three times per week for about eight weeks. A holistic writing traits rubric was used to measure the conveyance of meaning, clarity and conventions. Comparing the first and last stories written, there was a small but statistically significant mean increase in writing scores, however, the lower performing student dyads showed most of the improvement, possibly due to ceiling effects, in that the rubric did not allow for much improvement for the higher performing writers. Overall, teachers reported that students were more engaged, more self-directed, and

showed increased confidence in their ability to generate sentences. A study cited by Rao, et. al (2009) stated that Faux (2005) found similar changes in independence and engagement when using pictures, sound and text to create multimedia stories. None of these small studies used a control group such that it is difficult to isolate whether the technology, the nature of the instruction, or maturation was responsible for the changes cited. However, they all point to the promise of multimedia as a support for reluctant and struggling writers.

Word Processing

In a meta-analysis by Graham and Perin (2007a, 2007b), studies showed that, in general, the quality of students' writing was better when using word processing compared to handwriting. Russell and Plati (2001) demonstrated that typical students who wrote compositions on the computer produced longer responses and received higher grades as compared to students using pencil and paper on a state-mandated writing assessment. They also determined that word processing experience was a critical factor in that high school students who were experienced with word processing and had a 20 + word per minute keyboarding rate, performed substantially better when using word processing. A recent single subject (ABAB design) study of three middle school students with writing disabilities in the general education classroom compared academic work using paper/ pencil and word processing (Hetzroni & Shrieber, 2013). During the paper/pencil phase, students' work showed more spelling mistakes and lower quality of organization and structure when compared with the word processing phase.

Morphy and Graham (2012) conducted a careful meta-analysis of research findings on word processing specifically for weak writers. They describe the advantages of word processing:

- Easy to revise text
- Easy to add, modify, delete and move ideas
- Can be combined with software or hardware that provides writing supports
- Can include text formatting, planning and outlining features
- Includes spelling and grammar checkers
- Can be accompanied by text-to-speech to provide audio feedback on what was written
- Can be combined with speech recognition tools
- Letters can be typed quickly, results in a legible product
- Yields electronic text that can be shared with others via the web, allowing shared writing opportunities
- Can enhance motivation to write

From a pool of over 1200 papers, Morphy and Graham (2012) identified 27 peer reviewed articles and dissertations, published between 1984 to 2005, that examined word processing, which met their inclusion criteria for analysis. Students ranged from grades 1 to 12 with writing and reading weaknesses not related to motor, neurological or sensory impairment. The data found

significant effects that lend support to the premise that word processing enhance the writing of students experiencing difficulty with reading and writing. There were positive effects for length of writing, development/ organization, quality of text, reduction of mechanical errors, and student motivation. A strong correlation was found between length and quality, in that the more text and ideas were generated, the more this contributed to measured quality. The authors did not find significant effects for vocabulary or grammar, but contend that it is likely that students did not have access to or use features to support this. Unlike the 1993 Bangert-Drowns meta-analysis that looked at students across all levels of writing ability and found only small to moderate effect sizes for quality and length, Morphy and Graham (2012) found that word processing, in particular, enhanced writing in weak writers. They contend that word processing may be more motivating to students who typically struggle with composing by hand.

Additionally, Morphy and Graham's (2012) analysis included a breakdown of studies that used speech recognition, word processing alone, word processing plus instructional support, and word processing that utilized software features to support planning, drafting, or revision. When the authors converted effect sizes using the US Department of Education's National Assessment of Educational Progress (NAEP) matrixes, they were able to project those weak writers who used word processing alone, would have significantly improved their writing quality scores. And further, it was predicted that weak writers, who used software features that prompted planning, drafting and revising, and provided online feedback on the quality of text produced, would have exceeded the national average. In this review, based on 3 available studies, the benefits of speech recognition did not exceed the benefits of word processing.

Word Processing with Instruction

Overall, the research suggests that word processing had a moderately positive effect on writing processes for students with writing disabilities, especially when combined with effective instruction. In a study of narrative and essay writing with upper elementary grade students with learning disabilities compared to a control group of students with learning disabilities that did not receive instruction, MacArthur and colleagues found that word processing combined with instruction on planning, drafting, and revising resulted in greater improvements (MacArthur, Graham, Schwartz & Schafer, 1995). MacArthur (2009b) concludes that word processing should be combined with instruction to help struggling writers improve the quality of their work. He also maintains that having students handwrite their drafts on paper and then type them into the computer results in missed opportunities to learn to use the full range of features of word processing software.

Word Processing with Spell Checking

The spell checker feature in word processing software is the most commonly used word processing tool (MacArthur, 1999). Even skilled writers rely on spell checkers, auto correction features, and the red underline in Microsoft Word that cues writers to right click on a word to correct misspellings. Most basic spell checkers work by scanning the text, detecting misspelled words, and comparing each word to correctly spelled words in a dictionary. Spell checkers, however, will not be able to suggest spellings for words that are severely misspelled, nor will they correct words that are misused but spelled correctly (there/their/they're). Also, students need to be able to discriminate the word they intended to spell from the list of options.

The benefits of spell checkers for 106 students with learning disabilities in grades 4-12 were demonstrated in a study by Lewis, Ashton, Haapa, Kieley and Fielden (2000). In an earlier study, MacArthur, Graham, Haynes & De La Paz (1996) examined the effects of spell checkers on 27 students with learning disabilities in grades 6 to 8. They found that without a spell checker, students corrected 9% of their spelling errors. They increased their spelling error correction rate to 37% with the use of a spell checker. However, the researchers also found that spell checkers have their limitations. They determined that on average, the computer was able to suggest the correct spelling only 55% of the time. Of these correct spellings suggestions, students in this study were able to select the correct word 82% of the time.

Spell checkers do not eliminate the need for spelling instruction. Students need to have a certain baseline of spelling skills to use spell checkers effectively. For example, for students who write phonetically using only consonants to inventively spell, the spell checker may not be able to detect a conventional spelling. For students who are spelling at transitional levels, spell checkers will more often detect conventional spellings, but the student must be able to recognize the intended word.

A simple way to determine the effectiveness of the standard word processing spell checker for a given student is to transcribe a student's independently handwritten draft into a word processing program, count the total number of misspelled words (underlined in red) and calculate the percentage of incorrect spellings that had the potential to be self-corrected using the right click feature. Then have the student correct his or her misspellings using a spell checker to gauge the student's ability to select the correctly spelled words.

Today's conventional built-in spell checkers are more sophisticated and can make morphological suggestions (e.g., read, reads, reader, reading). However, a new breed of smart spell checker applications can make spelling suggestions based on a word's context within the sentence (e.g., Ginger software, www.gingersoftware.com; Ghotit , www.ghotit.com) and can detect misspelled words as well as misused words (e.g., homonyms).

Word Processing and Text-to-Speech

Word processing is often used in combination with text-to-speech, allowing text to be read aloud by increasingly sophisticated synthesized voices. Tools such as Write:OutLoud (donjohnston.com/writeoutloud) provide word processors with speech synthesis built in. Other products such as Snap&Read (donjohnston.com/snap-read) and NaturalReader (www.NaturalReader.com) are applications that float over the text and can read any word aloud. Other software applications provide access to a wide range of supportive tools that can be turned on or off, such as text-to-speech, word prediction, homophone detector and planning tools (e.g., SOLO, donjohnston.com/solo; Read&Write Gold, texthelp.com; Kurzweil, kurzweiledu.com). These tools assist reading, but can also assist writing. If the student misspells a word or there is a grammatical error, the student may pick up on this auditory cue when the sentence is spoken aloud. Hearing the words and sentences spoken aloud may assist the student with monitoring and revising their writing.

Word Processing and Word Prediction

Word prediction applications predict the word you are intending to type based on frequency, syntax and the first letters typed. Initially, it was used to help individuals with physical disabilities increase typing speed and decrease the number of keystrokes needed to complete a word, but it has also been found to be a useful tool for individuals with chronic spelling difficulties. Today's word prediction programs have algorithms that can make suggestions based on phonetic spellings, which is useful for younger struggling writers. Most word prediction programs use synthesized speech to help students with reading difficulties recognize their word from a list of suggested words. Additionally, most have the capacity to create personalized word banks for each user, and to learn the words students frequently write.

MacArthur(1999) cautions that mastering word prediction can be a challenge for students with working memory, attention and executive function issues because of the need to continually monitor the list of spelling options which changes with each letter typed. And though word prediction may improve the quality of text, it is also a slower mode of text entry. Lewis, Graves, Ashton & Kieley (1998) found that students using word prediction increased their spelling accuracy, but were only able to achieve 82 % of their handwriting speed. However, the students using word prediction with text to speech to read the spelling options, reached only 41 % of their handwriting speed, but reduced their spelling errors by half. Younger, slower writers may find the trade off acceptable, while older students who need to generate more text may find this frustrating and seek other tools such as smart spell checkers or speech-to-text.

Mirenda, Turoldo, and McAvoy (2006) used a survey and three 10-minute writing samples ("something you like to do") to compare writing across three conditions (handwriting, word processing and word processing with word prediction) (Co:Writer, donjohnston.com/cowriter). This study included 24 students (15 elementary, 1 middle school and 8 high school students) with physical disabilities with limited handwriting. Twenty students were in general education settings, while the remaining four were in classrooms for students with special needs. Writing samples were analyzed for total words written during the ten minute writing sessions, the percentage of legible words, words spelled correctly and correct word sequences, as well as on the mean length of consecutive correct word sequences. The results indicated that the students had a higher percentage of legible words, correctly spelled words and correct word sequences when using Co:Writer. None of the writing samples indicated a difference in the rate of text production. The survey results also showed that two thirds of the teachers and half of the students perceived that Co:Writer helped the students write faster and write more with less fatigue, though this was not evidenced by the data.

In a series of single subject design studies that alternated the use of handwriting, word processing and word prediction with nine and ten year old children with learning disabilities and severe spelling problems, six out of eight students showed dramatic differences in spelling and degree of legibility of writing when using word prediction compared to handwriting, increasing their percentage of both legible and correctly spelled words to the 90 to 100 % range (MacArthur, 2006). A study by Handley-More, Deitz, Billingsley and Coggins (2003) found similar results with improvements in the number and variety

of words, as well as in the percentage of legible and correctly spelled words for three students with learning disabilities in 4th and 5th grades. Their results indicated greater improvements for word processing with word prediction, as compared to handwriting, and word processing without word prediction, though no improvement was found in the speed of writing.

Cullen, Richards, and Frank (2008) used a modified, multiple baseline design to examine the effectiveness of text-to-speech with a spell checker for six weeks and in combination with word prediction software for an additional three weeks. The study was conducted with seven 5th grade students with mild cognitive or learning disabilities in general education classrooms. Five out of seven students produced more words when using text-to-speech with a spellchecker (Write:OutLoud, donjohnston.com/writeoutloud) and four out of seven showed further increases when Co:Writer was added (donjohnston.com/cowriter). For all seven students, the number of misspellings decreased from baseline when using Write:OutLoud or Co:Writer. Writing rubric scores increased the most overall in overall quality when using Co:Writer word prediction software. Using the same word prediction software with 24 children with physical disabilities affecting handwriting, Miranda, et al. (2006) demonstrated improvements in the percentage of correctly spelled words and word sequences.

Evmenova, Graff, Jerome and Behrmann (2010) investigated the use of word prediction programs that recognize phonetic level spelling using a changing condition's single subject design with six students with severe learning disabilities and poor handwriting affecting spelling and writing in grades 3 to 6. Evmenova and colleagues factored in keyboarding ability since there

is some concern that studies examining the benefits of word processing and word prediction can be confounded by slow typing speeds affecting the number of words produced. Using Type to Learn 3 (Sunburst Digital), students received enough intervention to reach a baseline typing speed of 6-10 WPM at the start of the study. (Based on Barnett and colleagues' 2009 data, this would be below expectation for students in grades 4 to 6. Students wrote journal entries for 20-minute periods using Microsoft Word without spelling or grammar supports in the baseline condition. The study then introduced three types of word prediction programs (WordQ, Co:Writer and WriteAssist). Though variable, most students demonstrated some improvement in the total number of words produced and rate of composing (in words per minute) when using at least one of the word prediction programs compared to word processing alone. On average, students increased their spelling accuracy from 58% to 96% across all programs. The authors found that CoWriter had more features, WordAssist had fewer word choices, and WordQ was easier for the younger children.

There are few assistive technology intervention studies with students who are culturally and linguistically diverse and have learning disabilities. Silio and Barbetta (2010) used a multiple baseline design for eight weeks with six 5th grade Hispanic boys with LD, no longer needing ELL services, to investigate the use of word processing alone, word processing with text-to-speech, word processing with word prediction (WordQ, www.goqsoftware), and word processing in combination with text-to-speech and word prediction. This study examined writing fluency, syntax, spelling accuracy and organization. Though results varied for individual students, overall results showed that word

prediction alone or in combination with text-to-speech had a positive effect on narrative compositions. Students wrote longer, more syntactically correct and better-organized compositions with fewer spelling errors. In contrast to Cullen et al. (2008), word processing with text-to-speech showed little to no improvement in this study.

Trials with word prediction and word processing programs with text-to-speech are necessary to determine which tool benefits which student. A practical approach would be to use similar writing prompts across handwriting, word processing without text-to-speech, word processing with text-to-speech, and word prediction and then compare results. Children with mild spelling difficulties may find they do not need the features of word prediction. These students can often rely on standard spell checking features. And word prediction programs may be challenging to students with attention deficits or executive functioning difficulties (MacArthur, 1999). While word prediction can be highly beneficial for students with physical disabilities, it can result in a slower method of text entry for students who use handwriting. Lewis et al. (1998) found that students with learning disabilities using word prediction reached 82% of their handwriting speed, and those who used the speech synthesis features in word prediction to read suggested words reached 41% of the handwriting speed. And yet those same students also increased their spelling accuracy, decreasing spelling errors by half. These outcomes suggest that educators will need to balance the benefits of improved spelling accuracy against slower productivity.

Speech Recognition

Speech recognition (SR) technology, sometimes called voice recognition, enables individuals to convert speech to text. It is fast becoming a more mainstream tool for transcription. Dragon Dictation, a speech recognition application, is available for the computer, tablets and even smart phones. Unlike a voice recorder, it allows the student to see the text as they dictate. And unlike dictation to an adult scribe, it is not dependent upon available human resources. For students with dyslexia who struggle with spelling and children who cannot physically access a keyboard, SR provides a way to write independently. However, word processing using speech recognition requires far more training and experience to use it for academic tasks. Children need to think, compose, speak, read and edit each sentence they write. Students who use SR software need to be able to monitor text on the screen, dictate punctuation and formatting, correct recognition errors, avoid discourse markers such as "uh" and "um," and have sufficient process writing skills (e.g., to plan, draft, revise, and proofread their work). This level of multi-tasking places demands on working memory. Ample training is required to learn software commands. A high quality microphone is needed that will not pick up background sounds. Using SR in the classroom can be distracting to other students so SR often is used more at home or in a separate environment. Students who are able to express their ideas verbally with consistent enunciation and appropriate syntax, and who demonstrate perseverance, good working memory, and the executive management skills to master an alternative method of writing, are good candidates for SR. Bromley (2010, p.102) states that going forward "the need for thinking skills will outweigh the need for skills in handwriting and keyboarding" but acknowledges that teachers need to

understand the processes involved in using SR in order to teach students to use it effectively. For a detailed guide to using SR with students, see Cochrane and Key's 2014 online manual available at www.bit.ly/srguide.

Higgins and Raskind (1995) conducted a study on the effects of using SR software with postsecondary students with LD affecting writing language under three conditions: 1) no assistance (using handwriting or word processing without spell checking), 2) dictation to an adult scribe, and 3) using SR. While this study used an older version of SR software (Dragon Dictate V.1.01), some findings are worth noting. Essays were scored by three evaluators using a holistic rubric with an inter-rater reliability rate of .93. Improvements in SR essays were statistically significant when compared to essays written without assistance. One reported finding is worth mentioning: The use of bigger words (7 or more letters) contributed significantly to the superior quality of SR essays. The authors reported that numerous students in the study mentioned that they tend to use smaller "baby words" in place of words they want to use but could not spell. Speech recognition software may contribute to a more sophisticated choice of words in that students can use SR to write words they can speak but not spell.

Garrett, Heller, Fowler, Alberto, Frederick, and O'Rourke (2011) conducted an alternating treatment design comparing word processing and speech recognition to write first drafts with five high school students with physical disabilities. The results showed greater results for fluency as measured by characters per minute, as well as greater length as measured by the overall number of words in the draft. Accuracy, however, as measured by the percentage of correct words, was lower and may have been affected by voice

quality.

MacArthur and Cavalier (2004) examined three writing conditions: handwriting, dictation to an adult scribe and dictation using Dragon Naturally Speaking speech recognition software (Nuance Communications, Inc.) with 31 students ages 15 to 16 with and without learning disabilities. Results showed that with SR, 68% of all students achieved 85% accuracy and 40% of the students achieved 90% accuracy following roughly 2 hours of training. Only three students produced less than 80% accuracy. Both conditions resulted in better quality essays compared to handwriting. The best essays by students with learning disabilities were produced when dictating to an adult scribe. The researchers contend that in this condition, the students did not have to attend to mechanics or control of the computer, which allowed for more concentration on content, organization and wording. Essays written using SR by students with LD ranked second in quality, and were superior to handwritten essays. For students with LD, both dictation conditions were statistically significant while no statistical differences were found for students without LD.

Quinlan (2004) conducted a study with 41 fluent and less fluent writers (identified by their level of transcription difficulties) ages 11 -14. The students wrote four narratives under four writing conditions: using handwriting, using SR, with advance planning, and without advance planning. Using handwriting, fluent writers' narratives were superior to less fluent writers in measures of length, quality and surface errors. Less fluent writers using SR to compose narratives produced significantly fewer errors and more words, compared to their handwritten products. SR did not improve the fluency or accuracy of fluent writers. Using advance planning strategies, both fluent and less fluent

writers spent more time writing. Quinlan suggests that advance planning strategies may support text generation, while SR reduces the impediments of transcription-related deficits. The results of this study and the previous study (MacArthur and Cavalier, 2004) suggest that SR reduced the effects of a student's disability with no differential boost to students without disabilities.

Summary of Current Evidence

While speech recognition can be challenging for students, it can be combined with other strategies to help lessen the cognitive load. The use of graphic organizers as part of preplanning can help students generate and organize their ideas. Oral rehearsal combined with word banks, a strategy recommended by the National Writing Project, was used as a strategy to help a student with learning disabilities Using this approach, Wetzel (1996) encouraged the student to think aloud about a topic, and then facilitated some dialogue about the topic by asking questions that prompted clarification and additional details. Thereafter, the student was asked to describe what he was about to write, while writing down keywords. Wetzel videotaped and transcribed each session using this strategy with a 6th grade student during twice weekly, 30-minute sessions. When introducing SR, he found that his student needed to pronounce words clearly to develop the voice files, in order to increase recognition. He also needed to master the correction procedure and self-monitor extraneous sounds. Using an early version of speech recognition software, this student progressed to 5.5 WPM after 14 sessions. Wetzel concluded that a student needs time to reach a recognition accuracy rate of 90% in order to not get "bogged down with the correction procedure," and to "allow a transcription rate that exceeds writing by pencil" (p. 377).

For students who are not yet ready to master voice recognition, voice recordings are an alternative. Applications for computers, tablets and smart phones are available to allow the user to voice record notes (e.g., Evernote, iAnnotate, Ghostwriter Notes). These apps do not convert speech to text, but are a more straightforward way of recording ideas and reminders. More advanced note takers such as the Livescribe Smartpen synchronize digital voice recordings to students' handwritten notes so that they can hear the recording while viewing what they wrote. For example, a teacher's recorded lecture can be synchronized to the student's note taking, or the student can handwrite a phrase as part of a prewriting outline, but voice record a more complete explanation of what they want to write. Apps such as AudioNote, and Notability synchronize voice recordings with handwriting, typing, or drawing on mobile devices.

Conclusion

Writing is the most complex skill for schildren to learn (Wendling & Mather, 2009), therefore strategies and technologies are indispensible to support and accommodate a wide range of students. The studies described above represent efforts to examine the effects of technology on writing. In a systematic review of research on technologies to support written productivity (Batorowicz, Missiuna & Pollock, 2012), 865 papers published between 1985 and 2012 were retrieved, but only 28 of these studies met the inclusion criteria for review. The more recent of these have been cited in this publication. The reviewers conclude that while the quality of the evidence available thus far is at a moderate to low level, trends suggest that technology has a positive influence on students' performance and behavior.

In a review of the research on technology for struggling writers, MacArthur (2009) provides sage advice. He asserts that when making decisions about AT tools, practitioners need to be mindful that while these tools can surmount writing obstacles, they can also impose new burdens and challenges. Also, the benefit of these tools is relative to the extent to which these tools are integrated into classroom activities.

Another important element is consulting with students directly to determine what technology works for them. In the study by Cullen et al. (2008), students were able to identify what was useful when using the software and what they learned while using it. Evmenova et al. (2010) discussed the concept of social validity, which is defined by Kennedy (2005) as "the estimation of the importance, effectiveness, appropriateness, and/or satisfaction various people

experience in relation to a particular intervention" (p. 219). It is essential to gauge student preferences with regard to the features of technology tools in order to minimize rejection of the technology. In the Evmenova et al. (2010) study, student interviews indicated that students were able to articulate how their writing was deficient and which programs and features were beneficial.

A summary of what the current evidence tells us about instructional handwriting interventions:

- Manuscript is easier than cursive for young writers.
- Fluency of handwriting is key, whether it is manuscript, cursive or a combination.
- Handwriting instruction should focus on letters similar in formation, but learning the names of each letter is also essential.
- Fine motor training influences letter formation, but not automaticity or fluency.
- Orthographic-motor integration shows gradual improvement well into the secondary grades.
- Handwriting speed develops over time as a consequence of writing connected text, not just repeatedly copying letters in isolation.
- Interventions of less than 20 sessions that do not include direct handwriting practice are ineffective.
- A combination of visual cues, plus writing letters from memory, plus composing were found to be more effective than copying and imitating adult modeling to improve handwriting legibility, automaticity and productivity.
- Individual and small group direct instruction on letter formation along with activities to promote speed and accuracy can improve handwriting and written expression
- Handwriting instruction focusing on accuracy and fluency when writing and naming letters of the alphabet, and copying connected text led to greater gains in compositional fluency, but not in overall story quality.

A summary of what the current evidence tells us about instructional keyboarding interventions:

- Overall access to computers has improved over time and children are using computers at earlier ages, but the digital divide is still an issue for home computer use and Internet access.
- More schools are including keyboarding instruction in the elementary grades.
- Opinions vary as to when typical children should begin keyboarding. The more popular view is for students to become familiar with the key locations in the primary grades, but learn touch typing somewhere between 3rd and 5th grade once they have the fine motor and literacy skills to take full advantage of 10 finger keyboarding, and have sufficient attention for keyboarding lessons.
- Older elementary students in grades 3-5 rather than younger students are more adept with touch typing.
- For keyboarding to be functional, it needs to be commensurate or exceed handwriting speeds.
- There appear to be three levels of keyboarding skills: 1) hunt and peck, 2) hunt and peck with less hunting, and 3) the touch method.
- There appear to be three stages of motor learning for keyboarding: the cognitive phase when keystrokes and ergonomics are introduced, the associative stimulus phase when practice exercises facilitate "kinesthetic memory traces," and the autonomous muscle response phase, when the individual is able to complete keyboarded writing tasks without thinking about finger movements.
- Motivation is a key variable. Keyboarding activities should be interesting, provide feedback on progress and match student skill levels.
- Currently there is no clear evidence of the superiority of the home-row method or the alphabetic method for teaching touch typing.
- Keyboarding software may be preferred, because most teachers do not have formal training in keyboarding instruction.
- Recommendations for the number of sessions per week and the length of the session vary.
- The number of keyboarding sessions should be based on the time it takes for students to reach functional speeds (i.e. equal or greater than handwriting speed).
- Keyboarding instruction should be structured, consistent and sequential to reach a level of automaticity.
- Sufficient generative writing time using the computer is also critical to maintain keyboarding speeds.

A summary of what the current evidence tells us about instructional keyboarding interventions:

- Students must move beyond copying using keyboarding software to composing using keyboarding in real world situations
- By middle school, it is expected that students are familiar with keyboard layouts and can begin to use keyboarding routinely for school-related assignments.
- By high school, the assumption is that students have achieved keyboarding automaticity with speeds approaching that of adult users.
- Average adult fast keyboarding speed is around 33 WPM
- Deciding on keyboarding as an accommodation should be based on comparative handwriting and keyboarding data.
- Touch typing fluency as measured by words per minute should be monitored regularly to determine the viability of using keyboarding as an educational accommodation.
- Spelling should also be monitored, as poor spelling contributes to keyboarding dysfluency.
- For students in the primary years with illegible or arduous handwriting, keyboarding (hunt and peck) should be used so that young students can actively engage in literacy learning to develop spelling and composing skills.
- When neither handwriting nor keyboarding automaticity is achieved after explicit instruction and practice, and/or when severe spelling deficits often associated with dyslexia persist, speech recognition is a form of transcription that should be evaluated.
- It is imperative that students have some form of fluent transcription (e.g. handwriting, keyboarding, speech to text) in order to reduce the cognitive load and allow for the development of higher-level writing skills.

A summary of what the current evidence tells us about instructional spelling interventions:

- With some exceptions, most good readers are good spellers and conversely, poor readers are poor spellers
- Instruction in phonics and reading instruction does not guarantee spelling development, explicit spelling instruction is necessary.
- Spelling is not just a visual-spatial skill. Spelling instruction has shifted away from memorizing high frequency word lists and moved toward linguistic approaches.
- Spelling involves more than memory such that one cannot expect students to learn to spell just by seeing words in text.
- Performance on weekly spelling tests (short term memorization) can mask students' lack of long-term retention and understanding of spelling patterns

A summary of what the current evidence tells us about instructional spelling interventions:

- Multi-linguistic approaches are more effective than traditional spelling instruction.
- Spelling instruction should be tailored to individualized needs. The Friday one-size-fits all spelling test is not individualized.
- Reducing the number of words on the weekly spelling test, re-teaching the words on the test, lessening spelling homework, or offering spelling aids are adaptations, not individualized instruction.
- Single grade-level spelling books and whole class instruction implies that one-size-fits-all approach.
- Individual student spelling assessment is key to instructional planning.
- Analyzing students' error patterns allows educators to evaluate students' current linguistic understandings and future instructional needs.
- Targeted word lists should be based on an assessment of the student's instructional level.
- Poor spellers in the intermediate and middle school grades continue to demonstrate difficulties with orthographic knowledge and that the gap between reading and spelling can widen over time.
- Spelling deficits for some students can be long term requiring individualized instruction supplemented by accommodations.
- Inventive spelling does not impact long term spelling development; rather, it helps children refine their understanding of sounds within words.
- Instruction should emphasize patterns in language (phoneme-grapheme, within word patterns, syllable patterns, morphological patterns).
- When providing spelling instruction, teachers should introduce a new concept or rule, model its use and provide guided practice until the student can independently apply the spelling concept.
- Systematic and explicit spelling instruction should transfer to generalization in independent writing.
- High frequency words may be unrelated by linguistic patterns and thus rely more on spelling memorization.
- Students develop mental graphic images of words over time to spell words quickly.
- he number of non-pattern (irregular) words taught at any one time should be limited, and corrective feedback on the spellings of irregular words is fundamental.
- The pretest-study- posttest-self correction" approach is an effective method, using a "look-say-cover-write-check" as a study strategy for irregular words.
- Students with severe phonological problems typically have the most difficulties with spelling.
- Young children and older poor spellers do not representing all the sounds within words will benefit from activities that help them segment sounds within words.
- Students who can spell phonetically, but show difficulties with orthographic patterns, are ready for word study instruction (word sorting, making words based on spelling patterns.
- Spelling skills for higher-level words develops well beyond 4th grade.

A summary of what the current evidence tells us about instructional spelling interventions:

- In the later elementary grades and into the secondary grades, instruction on multisyllabic words and morphological word study (word relatives).
- But for some students, particularly those with dyslexia and language disabilities, spelling problems persist even when reading improves.
- Students with dyslexia often have persistent difficulty with the retention of mental graphic images of words.
- Review and periodically retest previously mastered words.
- Handwriting and spelling deficits often co-occur. Spelling and handwriting instruction can be combined.
- The computer allows students with poor handwriting to devote more cognitive energy to spelling.
- Good word prediction programs are designed to be flexible enough to make spelling suggestions based on phonetic spellings, can speak suggested words, and make linguistic predictions based on the context of the word in the sentence (e.g., homonyms, suffixes).
- Speech language pathologists can incorporate multi-linguistic activities into therapy settings, or model this in the classroom.
- Occupational therapists serving students in classrooms should collaborate with teachers to identify what word patterns the student is learning and integrate handwriting instruction into a more multi-linguistic approach to word spelling and writing.
- Provide frequent positive feedback.

A summary of what the current evidence tells us about instruction that supports composition:

- Composition is a cognitive, sociolinguistic process that requires the integration of lower level transcription with the higher order skills of retrieving knowledge and then transforming this into written text across a variety of purposes for different audiences
- Writing is a tool for thinking
- Writing is multifaceted, and technology provides increasingly new ways to produce text.
- Writing begins with the development of foundational skills (handwriting, spelling, sentence construction, typing and word processing), followed by the gradual achievement of more complex and refined writing techniques.
- Reading and writing as well as writing and language are interrelated.
- You learn to write by writing regularly when given explicit instruction and clear feedback.
- Provide ample time to write daily.
- Provide models for various types of writing.
- The process writing approach is considered to be a foundation for composing
- Teach students strategies for planning, drafting, sharing, revising, editing, evaluating, and at times, publishing.
- Use pre-writing strategies to help students gather and organize ideas for compositions.

A summary of what the current evidence tells us about instruction that supports composition:

- Teach students to write increasingly more sophisticated sentences.
- Provide opportunities for students to work together to plan, draft, revise and edit their compositions.
- An over-emphasis on editing can be discouraging. The goal of process writing is not to create perfect papers, but to allow students to grow as writers.
- Revising strategies should not be presented until a student is producing more writing. Instruction on revising is introduced in stages: adding, replacing, reordering, removing.
- Self-regulation strategies that help students set writing goals, self-monitor their writing, and more effectively make revisions are highly effective.
- Utilize ongoing assessment to guide instruction.
- Emergent writing follows a developmental progression and must be respected as part of instruction. A watered-down kindergarten curriculum is not the starting point for emergent writers.
- In the elementary grades, students are expected to become increasing adept at grouping and linking ideas using words and phrases. Their work gradually shows more organizational structure, and they become more skilled at crafting introductions and conclusions.
- At the elementary level, provide direct instruction on writing traits, one at a time, beginning with "ideas".
- By the time students reach middle school, it is expected that foundational skills are in place, such that writing instruction can focus more on the nuances of writing across genres and content areas using precise language while skillfully managing writing transitions.
- Short answer responses, worksheets, responses to summaries of reading material, lists and journal entries, generally involve writing without composing. Extended writing tasks along with explicit writing instruction and ongoing feedback is vital across all content areas.
- Successful secondary teachers communicate high expectations, do not take over the writing of their students, and provide a great deal of help and support for students during the writing process.
- Highly effective secondary teachers go beyond the acquisition of skills and knowledge and beyond the achievement of instructional goals to engage students at a deeper level of understanding.
- Successful teachers of secondary students develop a community of writers who willingly shared ideas and drafts and engaged in inquiry-based learning.
- Secondary writers are expected to continue to advance their writing skills across discipline-specific content areas in order to "write to learn" and be college and career ready.
- Rubrics are a form of formative assessment in that they can inform instruction. Rubrics can be customized to address student goals. They are also a way to offer feedback to students.
- The tutoring approach to students with LD commonly seen in secondary settings tends to support the completion of assignments and provide consultation to classroom teachers, but is less likely to provide the comprehensive, research-based instructional conditions that students with LD require.

A summary of what the current evidence tells us about instruction that supports composition:

- Writing tasks should be meaningful and challenging, just short of frustration.
- Students with learning disabilities (LD) must have sufficient opportunities to reach mastery for individual skills, and they require individualized feedback when practicing new skills.
- Self-Regulated Strategy Development (SRSD) is an effective instructional framework designed to help elementary and secondary students with LD set writing goals and manage writing tasks, as well as increase motivation and independence.
- Assistive technology should be considered to surmount transcription and spelling barriers and to free up cognitive resources needed for higher order thinking

A summary of what the current evidence tells us about technology-based strategies and accommodations

- Computer technology and the Internet have changed the way writing is perceived, practiced and published. The role of the teacher has shifted from "manager" to that of a writing coach.
- Print is no longer the dominant form of communication and expression. Digital text has rapidly become the leading form of writing.
- New technology tools typically outpace instructional methods, and educators need to be open to innovative technologies that support literacy development.
- Students need to develop competencies using multiple literacies to construct and convey meaning when using the Internet and multimedia (e.g., social networking, web pages, discussion forums, podcasting, video content).
- Teachers at all grade levels need to incorporate technology across the curriculum, and across all content areas.
- As more mainstream digital tools are incorporated into the curriculum, it is easier students with disabilities to avail themselves of technology features that surmount learning barriers.
- Research trends suggest that technology has a positive influence on students' performance and behavior.
- Mainstream tools become assistive technology when documented on an IEP or 504 plan.
- Mainstream technology tools can create new challenges for students. Students with disabilities need instruction on how to use mainstream tools effectively.
- Word processing had a moderately positive effect on writing processes for students with writing disabilities, especially when combined with effective instruction
- Word processing enhances the writing of students experiencing difficulty with reading and writing affecting the length of writing, organization, quality of text, and student motivation.
- Students who handwrite their drafts on paper and then type them into the computer miss out on opportunities to learn to use the full range of features of word processing software.

A summary of what the current evidence tells us about technology-based strategies and accommodations

- Essays can be longer and of higher quality when there is ample instruction on the use of concept mapping.
- Spell checkers help students increase their spelling error correction rate. However, the researchers also found that spell checkers have their limitations, and do not eliminate the need for spelling instruction.
- Word processing combined with word prediction can improve the quality of text compared to handwriting as demonstrated by a higher percentage of legible words, correctly spelled words and correct word sequences.
- Word processing and word prediction can be confounded by slow typing speeds affecting the number of words produced.
- Educators need to balance the benefits of improved spelling accuracy against slower productivity when considering word prediction.
- For students with LD, essays written using an adult scribe or SR were superior to handwritten essays.
- Speech recognition (SR) technology, compared to the use of scribes, enables individuals to independently convert speech to text.
- SR appears to reduce the effects of a student's disability with no differential boost to students without disabilities.
- Students who are able to express their ideas verbally with consistent enunciation and appropriate syntax, and who demonstrate perseverance, good working memory, and the executive management skills to master an alternative method of writing, are good candidates for SR.
- Word processing using speech recognition requires more training and experience to use it for academic tasks. The multi-tasking required places demands on working memory.
- Speech recognition software appears to contribute to a more sophisticated choice of words in that students use SR to write words they can speak but not spell.
- Ample instruction on the use of concept mapping can result in essays that are longer and of higher quality.
- Using advance planning strategies along with SR, both fluent and less fluent writers spent more time writing.
- The benefit of technology tools is relative to the extent to which these tools are integrated into classroom activities.

CONCLUSIONS ON COMPREHENSIVE WRITING INSTRUCTION

Writing is indeed a complex process. No one method or tool is sufficient for any writer. The trick is to find the combination of methods or tools that support and engage each learner. To do this, assessment is step one, but no one assessment tool can do it all. A combination of assessment strategies will be needed to effectively pinpoint the strengths and weaknesses of writers at different levels of development. Once areas of need are identified and goals are identified, educators can assemble instructional plans to address these needs within the context of the curriculum and across all content areas. Tiered models of intervention are necessary to deliver the appropriate level of instructional intensity and differentiated instruction is an imperative. And finally, all the possible instructional strategies need to be delivered in an environment that is flexible to the needs of a wide range of students. Universal design for learning (UDL) provides a flexible framework for providing multiple means of engagement, representation and expression. When UDL is fully implemented in a classroom, all students have options for written expression, which creates more a natural environment for students who rely on technology, reducing any perceived stigma associated with assistive technology.

The Secretary of Education in the 2010 National Education Technology Plan refers to the need for "engaging and empowering personalized learning experiences for all learners of all ages" (USDOE, 2010, p. v). He calls for state-of-the-art technology and Universal Design for Learning concepts to make this happen. The national Common Core college and career readiness standards were not set out as a curriculum, and some experts claim that these standards

do not address the full range of writing issues (Troia, G. A., Olinghouse, N. G., Wilson, J., O'Shea, K., Mo, Y., Hawkins, L., et al. (2012). It is up to state and local districts to design a comprehensive curriculum around the standards to enable students to achieve literacy proficiency. In so doing, educators will need to be mindful of evidence-based strategies that support students with disabilities, including the use of accommodations and assistive technologies.

The DeCoste Writing Protocol is designed to be a tool to help educators and assistive technology (AT) specialists make informed decisions about technologies to support writing. To do this, professionals, first, need to understand the complexities of writing and what is needed to become proficient writers. Then they need a protocol for examining the issues that are most confounding for students with disabilities. And finally, they need to understand the context in which technology tools should be used in school environments. It is this author's sincere hope that the revised version of the DeCoste Writing Protocol will serve as a resource to teachers, AT providers, therapists and diagnosticians working with struggling writers, and as a "short course" on writing, and that it will provide a more complete picture of the evidence-based strategies that support these students.

REFERENCES

Abbott, A. J. (2000). Blinking out and having the touch: Two fifth-grade boys talk about flow experiences in writing. Written Communication, 17, 53-92

Alston, J. (1985). The handwriting of seven to nine year olds. British Journal of Special Educational Needs, 12(2), 68-72.

Alston, J., & Taylor, J. (1987). Handwriting: Theory, research and practice. New York: Nichols Publishing Company.

Atlemeier, L., Jones, J., Abbott, R. D., & Berninger, V. W. (2006). Executive functions in becoming writing readers and reading writers: Note taking and report writing in third and fifth graders. Developmental Neuropsychology, 29(1), 161-173.

American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders, (DSM-V), (5th ed.). Arlington, VA: American Psychiatric Association.

Anderson-Inman, L. (2009). Supported eText: Literacy scaffolding for students with disabilities. Journal of Special Education Technology, 24(3), 1-7.

Angelis, J. I. (2003). Conversation in the middle school classroom: Developing reading, writing and other language abilities. Middle School Journal, 34(3), 57-61.

Apel, K., & Lawrence, J. (2011). Contributions of morphological awareness skills to word-level reading and spelling in first-grade children with and without speech sound disorder. Journal of Speech, Language, and Hearing Research, 54, 1312-1327.

Apel, K., & Masterson, J. J. (2001). Theory-guided spelling assessment and intervention: A case study. Language, Speech, and Hearing Services in Schools, 32, 182-195.

Apel, K., Masterson, J. J. & Brimo, D. (2012). Spelling assessment and intervention: A multiple linguistic approach to improving literacy outcomes. In A. G. Kamhi & H. W. Catts, Language and reading disabilities, (pp. 226-243). Upper Saddle River, NJ: Pearson.

Apel, K., Masterson, J. J. & Hart, P. (2004a). Integration of language components in spelling: Instruction that maximizes students' learning. In E. R. Silliman & L. C. Wilkinson (Eds.), Language and Literacy learning in schools (pp. 292-315). NY: Guilford Press.

Apel, K., Masterson, J. J. & Niessen, N. L. (2004b). Spelling assessment frameworks. In C. A. Addison Stone, E. R. Silliman, B, J. Ehren, & K. Apel. Handbook of language and literacy: development and disorders, (pp. 644-660. NY: Guilford Press.

Apel, K., Wilson-Fowler, E.B., Brimo, D., & Perrin, N. A. (2012). Metalinguistic contributions to reading and spelling in second and third grade students. Reading and Writing, 25, 1283-1305.

Apel, K., Wolter, J. A., & Masterson, J. J. (2006). Effects of phonotactic and orthotactic probabilities during fast-mapping on five-year olds' learning to spell. Developmental Neuropsychology, 29, 21-42.

Applebee, A. N. (1981). Writing in the secondary school (NCTE Research Report No. 21). Urbana, IL: National Council of Teachers of English.

Applebee, A. N. (2000). Alternative models of writing development. In R. Indrisano & J. R. Squire (Eds.), Perspectives on writing: Research, theory and practice. Newark, DE: International Reading Association.

Ashburner, J., Ziviani, J., & Pennington, A. (2012, July). The introduction of keyboarding to children with autism spectrum disorders with handwriting difficulties: A help or hindrance? Australian Journal of Special Education, 36(1), 32-61.

Bailet, L. L. (2004). Spelling instructional and intervention frameworks. In C. A. Addison Stone, E. R. Silliman, B, J. Ehren, & K. Apel, Handbook of language and literacy: Development and disorders, (pp. 661-678). NY: Guilford Press.

Baker, S., Gersten, R., & Graham, S. (2003). Teaching expressive writing to students with learning disabilities: Research-based applications and examples. Journal of Learning Disabilities, 36(2), 109-124.

Balajthy, E. (1988). Keyboarding, language arts, and the elementary school child. Computing Teacher, 15(5), 40-43.

Bangert-Drowns, R. L. (1993). The word processor as an instructional tool: A meta-analysis of word processing in written instruction. Review of Educational Research, 63(1), 69-93.

Barnett, A., Henderson, S. E., Scheib, B., & Schulz, J. (2007). DASH: Detailed Assessment of Speed of Handwriting. London: Pearson.

Barnett, A. L., Henderson, S. E., Scheib, B., & Schulz, J. (2009). Development and standardization of a new handwriting speed test: The detailed assessment of speed of handwriting. In V. Connelly, A.L. Barnett, J. Dockrell, & A. Tolmie (eds.), Teaching and Learning Writing, (pp. 137-157), Leicester, Great Britain, British Psychological Society, (British Journal of Educational Psychology Monograph Series II, 6). (doi:10.1348/978185409X421129).

Barnett, A. L., Henderson, S. E., Scheib, B & Schulz, J. (2011). Handwriting difficulties and their assessment in young adults with DCD: Extension of the DASH for 17-to 25-year-olds. Journal of Adult Development, 18, 114-121.

Barnett , A., Stainthorp, R., Henderson, S., & Scheib, B. (2006). Handwriting policy and practice in English primary schools: An exploratory study. London: Institute of Education.

Bartholome, L. W. (1998). Typewriting/keyboarding instruction in elementary school. Utah State Office of Education. Retrieved from http://files.keyboardingonline.com/support-files/59026fd9abbd1-Keyboarding%20Instruction%20in%20Elementary%20Schools%20-%20Llyod%20W.%20Bartholome.pdf

Batorowicz, B., Missiuna, C. A., & Pollock, N. A. (2012, Oct.). Technology supporting written productivity in children with learning disabilities: A critical review. Canadian Journal of Occupational Therapy, 79(4), 211-224.

Beach, R., & Friedrich, T. (2006). Response to writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), Handbook of writing research (pp. 222-234). NY: Guilford Press.

Beach, R., Hull, G., & O'Brien, D. (2011). Transforming English Language Arts in a Web 2.0 World. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, 3rd Ed. (pp. 161-167). New York: Routledge.

Beal, C. (1993). Contributions of developmental psychology to understanding revision: Implications for consultation. School Psychology Review, 22, 643-656.

Bean, T. W. & Harper, H. (2011). The context of English language arts learning. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, 3rd Ed., (pp. 60-68). New York: Routledge.

Bean, T., Readence, J., & Baldwin, R. (2011). Content area literacy: An integrated approach (10th ed.). Dubuque, IA: Kendall Hunt.

Bear, D., Invernizzi, M., Templeton, S., & Johnston, F. (2000). Words their way: Word study for phonics, vocabulary, and spelling instruction (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Bear, D. R., Invernizzi, M. A., Templeton, S., & Johnston, F. (2011). Words their way: Word study for phonics, vocabulary, and spelling instruction (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Bear, D. R., & Templeton S. (1998). Explorations in developmental spelling: Foundation for learning and teaching phonics, spelling and vocabulary, The Reading Teacher, 52(3), 222-242.

Beery, K. E. (2004). The Beery-Buktenica developmental test of visual-motor integration (4th ed.). Minneapolis, MN: NCS Pearson.

Bereiter, C., & Scardamalia, M. (1987). The psychology of written composition. Hillsdale, NJ: Erlbuam.

Berenstein, B. E. (2008). Written expression learning disorder. Medscape. Retrieved from http://emedicine.medscape.com/article/1835883-overview

Bermin, R. A., & Nir, B. (2010). The language of expository discourse across adolescence. In M. Nippold & C. Scott (Eds.) Expository discourse in children, adolescents an adults (pp. 99-121). NY: Psychology Press.

Berninger, V. W. (1999). Coordinating transcription and text generation in working memory during composing: Automatic and constructive processes. Learning Disability Quarterly, 22, 99-112.

Berninger, V. W. (2000). Development of language by hand and its connections to language by ear, mouth, and eye. Topics in Language Disorders, 20, 65-84.

Berninger, V. W. (2009). Highlights of programmatic, interdisciplinary research on writing. *Learning Disability Research and Practice, 24,* 69-80.

Berninger, V. W., Abbott, R. D., Abbott, S. P., Graham , S., & Richards, T. (2002b). Writing and reading: Connections between language by hand and language by eye. Journal of Learning Disabilities , 35(1), 39-56.

Berninger, V. W., Abbott, R. D., Augsburger, A., & Garcia, N. (2009). Comparison of pen and keyboard transcription modes in children with and without learning disabilities. Learning Disability Quarterly, 32, 123-141.

Berninger, V. W., Abbott, R., Rogan, L., Reed, L., Abbott, S., Brooks, A., Vaughan, K., & Graham, S. (1998). Teaching spelling to children with specific learning disabilities: The mind's ear and eye beat the computer or pencil. Learning Disability Quarterly, 21, 106-122.

Berninger, V. W., & Amtmann, D. (2003). Preventing written expression disabilities through early and continuing assessment and intervention for handwriting and/or spelling problems: Research into practice. In H. L. Swanson, K. R. Harris & S. Graham (Eds.), Handbook of Learning Disabilities (pp 345-363). NY: Guilford Press.

Berninger, V. W., Cartwright, A. C., Yates, C. M., Swanson, H. L., & Abbott, R. D. (1994). Developmental skills related writing and reading acquisition in the intermediate grades. Reading and Writing: An Interdisciplinary Journal, 6, 161-196.

Berninger, V., & Fuller, F. (1992). Gender differences in orthographic, verbal, and compositional fluency: Implications for diagnosis of writing disabilities in primary grade children. Journal of School Psychology, 30, 363-382.

Berninger, V. W., & Graham, S. (1998). Language by hand: A synthesis of a decade of research on handwriting. Handwriting Review, 12, 11-25.

Berninger, V. W., Mizokawa, D. T., & Bragg, R. (1991). Theory-based diagnosis and remediation of writing disabilities. Journal of Educational Psychology, 29, 57-59.

Berninger, V. W. & Swanson, H. L. (1994). Modifying Hayes and Flower's model of skilled writing to explain beginning and developing writing. In E. C. Butterfield (Ed.), Children's writing: Toward a process theory of development of skilled writing (pp. 57-81). Hampton Hill: JAI Press.

Berninger, V. W., Vaughan, K. B., Abbott, R. D., Abbott, S., Brooks, A., Rogan, L. Reed, E. & Graham, S. (1997). Treatment of handwriting fluency problems in beginning writers: Transfer from handwriting to composition. Journal of Educational Psychology, 89(4), 652-666.

Berninger, V., Vaughan, K., Abbott, R. D., Begay, K., Coleman, K., Curtin, G., Hawkins, J., & Graham, S. (2002a). Teaching spelling and composition alone and together: Implications for the simple view of writing. Journal of Educational Psychology, 94, 291-304.

Berninger, V. W. & Winn, W. D. (2006). Implications of advancements in brain research and technology for writing development, writing instruction and educational evolution. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 96-114). NY: Guilford Press.

Berninger, V. W., & Wolf, B. J. (2009). Teaching students with dyslexia and dysgraphia: Lessons from teaching and science. Baltimore, MD: Paul H. Brooks.

Bissex, G. L. (1980). GNYS AT WRK: A child learns to read and spell. Cambridge, MA: Harvard University Press.

Bodrova, E., & Leong, D. J. (2006). Vygotskian perspectives on teaching and learning early literacy. In D. Dickinson & S. Neuman (Eds.), Handbook of Early Reading Research (Vol. 2), (pp. 243-256). NY: Guilford Press.

Boscolo, P., & Ascorti, K. (2004). Effects of collaborative revision on children's ability to write understandable narrative texts. In L. Allal, L. Chanqouy, & P. Largy (Eds.), Revision: Cognitive and instructional processes (Vol. 13) pp. 157-170. Boston: Kluwer.

Bourdin, B., & Fayol, M. (1994). Is written language production more difficult than oral language production—A Working-memory approach. International Journal of Psychology, 29(5), 591-620.

Brennemann, K., Massey, C., Machado, S., & Gelman, R. (1996). Notating knowledge about words and objects: Preschoolers' plans differ for "writing" and "drawing." Cognitive Development, 11, 397-419.

Bromley, K. (2006). From drawing to digital creations: Graphic organizers in the classroom. In D. S. Strickland & N. Roser (Eds.), Handbook on teaching literacy through the communicative and visual arts (Vol. 2), (pp. 349-354). Mahwah, NJ: Erlbaum.

Bromley, K. (2010). Picture a world without pens, pencils, and paper: The unanticipated future of reading and writing. Journal of College Reading and Learning, 41(1), 97-108.

Bromley, K. (2011). Best practices in teaching writing. In L. L. Morrow & L. B. Gamrell, Best Practices in Literacy Instruction (pp. 295-319). NY: Guilford Press.

Brossard-Racine, M., Majnemer, A., Shevell, M. Snider, L. & Belanger, S. A. (2011). Handwriting capacity in children newly diagnosed with attention deficit hyperactivity disorder. Research in Developmental Disabilities, 32, 2927-2934.

Brown, C. M. (1988). Human-computer interface design guidelines. Norwood, NJ: Ablex Publishing.

Brown, J. S., McDonald, J. L., Brown, T. L., & Carr, T, H, (1998). Adapting to processing demands in discourse production: The case of handwriting. Journal of Experimental Psychology: Human Perception and Performance, 14, 45-59.

Brown, A., & Day, J. (1983). Macro rules for summarizing text: The development of expertise. Journal of Verbal Learning and Verbal Behavior, 22, 1-14.

Bruck, M. (1992). Persistence of dyslexic's phonological awareness deficits. Developmental Psychology, 28, 874-886.

Bruning, R., & Horn, C. (2000). Developing motivation to write. Educational Psychologist, 35, 25-37.

Bullock, T. A. & Schmertzing, L. C. (2005). Instructional experiences of fifth grade students with keyboarding instruction. Retrieved August 12, 2013 from http://chiron.valdosta.edu/are/vol4no2/PDF/BullockA-AM-ARE.pdf

Calkins, L. (1986). The art of teaching writing. Portsmouth, NH: Heinemann.

Calkins, L., Ehrenworth, M., & Lehman, C. (2012). Pathway to the Common Core. Portsmouth, NH: Heinemann.

Cameron, C., Edmunds, G., Wigmore, B., Hunt, A., & Linton, M. (1997). Children's revision of textual flaws. International Journal of Behavioral Development, 20, 667-681.

Carlson, K. & Cunningham, J. (1990). Effect of pencil diameter on the graphomotor skills of preschoolers. Early Childhood Research Quarterly, 5(2) 279-293.

Carpenter, C. (2008, March/April). Do we really need cursive writing? Saturday Evening Post. 34-35, 81.

Carle, E. (1987). The very hungry caterpillar. New York, NY: Philomel Books.

Carreker, S. (2012). Beginning Handwriting, spelling and composition instruction. In M. C. Hougen & S. M. Smartt, Fundamentals of literacy instruction an assessment, pre-k-6 (pp. 93-110). Baltimore: Paul Brookes.

Case-Smith, J. (2002). Effectiveness of school-based occupational therapy interventions on handwriting. American Journal of Occupational Therapy, 56, 17-25.

Cassar, M., Treiman, R., Moats, L. .C., Pollo, T. C., & Kessler, B. (2005). How do the spellings of children with dyslexia compare with those of nondyslexic children? Reading and Writing: An Interdisciplinary Journal, 18, 27-49.

Chanquoy, L. (2001). How to make it easier for children to revise their writing: A study of text revision from 3rd to 5th grades. British Journal of Educational Psychology, 71, 15-41.

Chapman, M. (1994). The emergence of genres: Some findings from an examination of first-grade writing. Written Communication, 11, 348-380.

Chapman, M. (1995). The sociolinguistic construction of written genres in the first grade. Research in the Teaching of English, 29, 164-192.

Chapman, M. (2006). Preschool through elementary writing. In P. Smagorinsky (Ed.), Research on composition: Multiple perspectives on two decades of change (pp. 15-47). NY: Teachers College Press.

Christensen, C. A. (2004). Relationship between orthographic-motor integration and computer use for the production of creative and well-structured text. British Journal of Educational Psychology, 74, 551-564.

Christensen, C. A. (2005). The role of orthographic-motor integration in the production of creative and well structured written text for students in secondary school. Educational Psychology, 25(5), 441-453.

Christensen, C. A., & Jones, D. (2000). Handwriting: An underestimated skill in the development of written language. Handwriting Today, 2, 56-69.

Cioffi, G. (1984). Observing composing behaviors of primary-aged children: The interaction of oral and written language. In R. Beach & L. Bridwell (Eds.), New Directions in composition research (pp. 171-190). NY: Guilford Press.

Clay, M. (1975). What did I write? Auckland, NZ: Heinemann.

Clay, M. (1982). What did I write: Beginning writing behavior. Exeter, NH: Heinemann.

Cobb-Morrocco, C., Dalton, G., & Tivnan, T. (1992). The impact of computer supported writing instruction on fourth grade students with and without learning disabilities. Reading and Writing Quarterly: Overcoming Learning Difficulties, 8, 87-113.

Coiro, J. & Castek, J. (2011). Assessment frameworks for teaching and learning English language arts in a digital age. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, (3rd Ed.), (pp. 314-321). New York: Routledge.

Cooper, W. E. (1983). Cognitive aspects of skilled typewriting. NY: Sringer-Verlag.

Cochran-Smith, M. (1991). Word processing and writing in elementary classrooms: A critical review of related literature. Review of Educational Research, 61(1), 107-155.

Coker, D. L. (2013). Writing instruction in preschool and kindergarten. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, (2nd ed.), (pp. 26-47). NY: Guilford Press.

Connelly, V., Campbell, S., MacLean, M., & Barnes, J. (2006). Contribution of lower-order letter and word fluency skills to written composition of college students with and without dyslexia. Developmental Neuropsychology, 29(1), 175-196.

Connelly, V., Dockrell, J. E., & Barnett, J. (2005). The slow handwriting of undergraduate students constrains overall performance in exam essays. Educational Psychology, 25, 97-105.

Connelly, V., Dockrell, J. E., Walter, K., & Critten, S. (2012). Predicting the quality of composition and written language bursts from oral language, spelling, and handwriting skills in children with and without specific language impairment. Written Communication, 29(3), 278-302.

Connelly, V., Gee, D., & Walsh, E. (2007). A comparison of keyboarded and handwritten compositions and the relationship with transcription speed. British Journal of Educational Psychology, 77, 479-492.

Cornhill, H. & Case-Smith, J. (1996). Factors that relate good and poor handwriting. The American Journal of Occupational Therapy, 50(9), 732-739.

Crews, T., North, A., & Erthal, M. (2006). Elementary/middle school keyboarding strategies guide (3rd ed.). National Business Education Association: Reston, VA.

Cullen, J. Richards, S. B., & Frank, C. L. (2008). Using software to enhance the writing skills of students with special needs. Journal of Special Education Technology, 23(2), 33-44.

Cunningham, P. (2012). Phonics they use: Words for reading and writing (6th ed.). Boston: Pearson.

Cunningham, P. M. & Allington, R. L. (2011). Classrooms that work: They can all read and write. Boston: Pearson.

Cunningham, P., & Hall, D. (2008a). Making Words First Grade. Boston: Pearson.

Cunningham, P., & Hall, D. (2008b). Making Words Fifth Grade. Boston: Pearson.

Dahl, K., & Farman, N. (1998). Children's writing: Perspectives from research. Newark, DE/Chicago: International Reading Association/National Reading Conference.

Datchuk, S. M. & Kubina, R. M. (2012). A review of teaching sentence-level writing skills to students with writing difficulties and learning disabilities. Remedial and Special Education, 34(3), 180-192.

Dean, P., Odendahl, N., Quinlan, T., Fowles, M., Welsh, C., & Bivens-Tatum, J. (2008, Oct.). Cognitive models of writing: Writing proficiency as a complex integrated skill. Princeton, NJ: Educational Testing Service.

DeCoste, D. (August, 2000). Spelling and writing development in elementary students with severe speech and physical impairments. Proceedings of the International Society for Augmentative and Alternative Communication, 328-330.

DeCoste, D. & Wilson, L. B. (2012). Protocols for accommodations in reading. Volo, IL: Don Johnston. Retrieved from: donjohnston.com/par

De La Paz, S., & Graham, S. (2002). Explicitly teaching strategies, skills, and knowledge: Writing instructions in middle school classrooms. Journal of Educational Psychology, 94, 281-304.

Dellerman, P., Coirier, P., & Marchand, E. (1996). Planning and expertise in argumentative composition. In G. Rijlaarsdam, H. van den Bergh, & M. Couzijn (Eds.), Theories, models and methodologies in writing research (pp. 182-195). Amsterdam: Amsterdam University Press.

Dennee, J. (1989). Business teachers: The solution to problems of elementary keyboarding. *Business Education Forum, 43*(8), 12-14.

Dennis, J. L. & Swinth, Y. (2001). Pencil grasp and children's handwriting legibility during different length writing tasks. American Journal of Occupational Therapy, 55(2), 175-183.

DeVoss, D. N., Eidman-Aadahl, E., & Hicks, T. (2010). Because Digital Writing Matters. San Francisco: Jossey-Bass.

Dexter, D. D. & Hughes, C. A. (2011). Graphic organizers and students with learning disabilities: A meta-analysis. Learning Disability Quarterly, 34(1), 51-72.

Dobbie, L. & Askov, E. N. (1995). Progress of handwriting research in the 1980s and future prospects. Journal of Educational Research, 88(6), 339-351.

Donovan, C. (2001). Children's development and control of written story and informational genres: Insights from one elementary school. Research in the Teaching of English, 35, 394-447.

Donovan, C. A., & Smolkin, L. B. (2002). Children's genre knowledge: An examination of K-5 students' performance on multiple tasks providing differing levels of scaffolding. Reading Research Quarterly, 37, 428-465.

Donovan, C. A., & Smolkin, L. B. (2006). Children's understanding of genre and writing development. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), Handbook of Writing Research, (pp. 131-143). NY: Guilford.

Duke, N. (2000). 3.6 minutes per day: The scarcity of informational texts in first grade. Reading Research Quarterly, 35, 202-224.

Dunn, B. & Reay, D (1989). Word processing and keyboard: Comparative effects of transcription on achievement. Journal of Educational Research, 84, 237-245.

Dunsmuir S., & Blatchford, P. (2004). Predictors of writing competence in 4- to 7-year-old children. British Journal of Educational Psychology, 74, 461-483.

Duvall, B. (1985). Evaluating the difficulty of four handwriting styles used for instruction. Spectrum 3(3), 13-20.

Dyson, A. H. (2001). Donkey Kong in Little Bear country: A first grader's composing development in the media spotlight. Elementary School Journal, 101, 417-433.

Dyson, A. H. (1983). The role of oral language in early writing procceses. Research in the Teaching of English, 17, 1-30.

Dyson (1986). Transitions and tensions: Interrelationships between drawing, talking, and dictating of young children. Research in the Teaching of English, 20, 379-409.

Education Northwest (2014). 6 + 1 Traits Rubric. Retrieved October 4, 2014 from http://educationnorthwest.org/traits/traits-rubrics

Ehri, L. C. (2011). Teaching phonemic awareness and phonics in the language arts classroom. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts (3rd Ed., pp. 231-237). NY: Routledge.

Ehri, L. C., & Wilce, L. S. (1987). Does learning to spell help beginners learn to read words. Reading Research Quarterly, 22(1), 37-65.

Ellis, E. S. (1986). The role of motivation and pedagogy on the generalization of cognitive training by the mildly handicapped. Journal of Learning Disabilities, 19, 66-70.

Ellis, E. S., Lenz, B. K., & Sabornie, E. J. (1987). Generalization and adaptation of learning strategies to natural environments: Part 1. Critical agents. Remedial and Special Education, 8(1), 6-20.

Emig, J. (1971). The composing processes of twelfth graders. Urbana, Il: National Council of Teachers of English.

Engel-Yeger, B., & Rosenblum, S. (2010). The effects of protracted graphomotor tasks on tripod pinch strength and handwriting performance in children with dysgraphia. Disability and Rehabilitation, 32(21), 1749-1757.

Englert, C. S., & Raphael, T. E. (1998). Constructing well-formed prose: Process, structure and metacognitive knowledge. Exceptional Children, 54, 513-520.

Englert, C. S., Raphael, T. E., Anderson, L. M., Anthony, H. M., Stevens, D. D., & Fear, K. L. (1991). Making writing strategies and self-talk visible: Cognitive strategy instruction in regular and special education classrooms. American Educational Research Journal, 28, 337-372.

Englert, C. S., Raphael, T. E., & Anderson, L. M. (1992). Socially mediated instruction: Improving students' knowledge and talk about writing. The Elementary School Journal, 92, 411-449.

Englert, C. S., Zhao, Y., Dunsmore, K., Collings, N. Y., & Wolbers, K. (2007). Scaffolding the writing of students with disabilities through procedural facilitation: Using an Internet-based technology to improve performance. Learning Disability Quarterly 30, 11-29.

Erthal, M. J. (2003). Who should teach keyboarding and when should it be taught? Business Education Forum, 53(1), 36-37.

Eunice Kennedy Shriver National Institute of Child Health and Human Development, NIH, DHHS. (2000). Report of the National Reading Panel: Teaching Children to Read (00-4769). Washington, DC: U.S. Government Printing Office.

Evmenova, A. S., Graff, H. J., Jerome, M. K., & Behrmann, M. M. (2010). Word prediction programs with phonetic spelling support: Performance comparisons and impact of journal writing for students with writing difficulties. *Learning Disabilities Research, 25*(4), 170-182.

Faigley, L., & Witte, S. (1981). Analyzing revision. *College Composition and Communication, 32*, 400-414.

Faux, F. (2005). Multimodality: How students with special educational needs create multimedia stories. *Education, Communication and Information, 5*, 167-181.

Fayol, M., Zorman, M., & Lete, B. (2009). Associations and disassociations in reading and spelling French: Unexpectedly poor and good spellers. In V. Connelly, A. L. Barnett, J. Dockrell & A. Tolmie (Eds.). Teaching and Learning Writing (pp. 63-75). British Journal of Educational Psychology Monograph Series II.

Feder, K. P., & Majnemer, A. (2007). Handwriting development, competency, and intervention. Developmental Medicine and Child Neurology, 49(4), 312-317.

Feder, K. P., Majnemer, A., Bourbonnais, D., Platt, R., Blayney, M., & Synnes, A. (2005). Handwriting performance in preterm children compared with term peers at age 6 and 7 year. Developmental Medicine and Child Neurology, 47, 163-170.

Ferrier, J., Horne, J., & Singleton, C. (2013, January). Factors affecting the speed of free writing. Journal of Research in Special Education Needs, 13(1), 66-78.

Ferretti, R. P., & Lewis, W. E. (2013). Best practices in teaching argumentative writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 113-140). NY: Guilford Press.

Ferroli, L., & Shanahan, T. (1987). Kindergarten spelling: Explaining its relationship to first grade reading. In J. E. Readence & R. S. Baldwin (Eds.), Research in literacy: Merging pespectives, 36th Yearbook of the National Reading conference (pp. 93–99). Rochester, NY: National Reading Conference.

Fitzgerald, J., & Shanahan, T. (2000). Reading and writing relations and their development. Educational Psychologist, 35, 39-50.

Flower, L., & Hayes, J. R. (1980). The dynamics of composing: Making plans and juggling contraints. In L. W. Gregg & E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 31-50). Hillsdale, NJ: Erlbaum.

Fountas, I. C., & G. S. Pinnell (2001). Guiding Readers and Writers: Grades 3-6. NH: Heineman.

Fountas, I. C., & G. S. Pinnell (2011). Literacy Beginnings: A prekindergarten handbook. Portsmouth, NH: Heineman.

Freedman, S. W. (1987). Response to student writing (NCTE Research Report NO. 23), Urbana, IL: National Council of Teachers of English.

Freeman, M. S. (1998). Teaching the youngest writers: A practical guide. Gainesville, FL: Maupin House.

Freeman, A. R., MacKinnon, J. R., & Miller, L. T. (2005). Keyboarding for students with handwriting problems: A literature review. Physical and Occupational Therapy in Pediatrics, 25(1/2), 119-147.

Fuentes, C. T., Mosotofsky, S. H., & Bastian, A. J. (2009). Children with autism show specific handwriting impairments. Neurology, 73(19). 1532-1537.

Garrett, J. T., Heller, K. W., Fowler, L. P., Alberto, P. A., Frederick, L. D., & O'Rourke, C.M. (2011). Using speech recognition software to increase writing fluency for individuals with physical disabilities. Journal of Special Education Technology, 26(1), 25-41.

Gentry, J. R. (1982). An analysis of developmental spelling in GNYS AT WRK. The Reading Teacher, 36, 192-200.

Gersten, R., & Baker, S. (2001). Teaching expressive writing to students with learning disabilities: A meta-analysis. The Elementary School Journal, 101, 251-272.

Golder, C., & Coirier, P. (1994). Argumentative text writing: Developmental trends. Discourse Processes, 18, 187-210.

Grabowski, J. (2005). Speaking, writing, and memory span performance: Replicating the Bourdin and Fayol results on cognitive load in German children and adults. In L. Allal & J. Dolz (Eds.), Proceedings Writing 2004. Geneva (CH): Adcom Productions.

Graham, S. (1990). The role of production factors in learning disabled students' compositions. Journal of Educational Psychology, 82, 781-791

Graham, S. (1999). Handwriting and spelling instruction for students with learning disabilities: A review. Learning Disability Quarterly, 22(2), 78-98.

Graham, S. (2006). Strategy instruction and the teaching of writing: A meta-analysis. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 187-207). NY: Guilford Press.

Graham, S. (2010). Want to improve children's writing? Don't neglect their handwriting. The Education Digest, 76(1), 49-55.

Graham, S., Berninger,V. W., Abott, R. D., Abott, S.P., & Whitaker, D. (1997). Role of mechanics in composing of elementary school students: A new methodological approach. Journal of Educational Psychology, 89, 170-182.

Graham, S., Berninger, V., & Fan, W. (2007). The structural relationship between writing attitude and writing achievement in young children. Contemporary Educational Psychology, 32, 516-536.

Graham, S., Berninger, V., Weintraub, N. & Schafer, W. (1998). Development of Handwriting speed and legibility in grades 1-9. Journal of Educational Research, 92(1), 42-52.

Graham, S., Bollinger, A., Booth Olson, C., D'Aoust, C., MacArthur, C., McCutchen, D., & Olinghouse, N. (2012). Teaching elementary schools students to be effective writers: A practical guide (NCES 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, S., & Harris, K. R. (1989). Improving learning disabled students' skills at composing essays: Self-instructional strategy training. Exceptional Children, 56, 201-214.

Graham, S., & Harris, K. R. (1993). Self-regulated strategy development: Helping students with learning problems develop as writers. Elementary School Journal, 94, 169-181.

Graham, S., & Harris, K. R. (1996). Teaching writing strategies within the context of a whole language class. In E. McIntyre & M. Pressley (Eds.), Balanced Instruction: Strategies and Skills in Whole Language (pp. 155-175). NY: Christopher-Gordon.

Graham, S., & Harris, K. R. (1997). It can be taught, but it doesn't develop naturally: Myths and realities in writing instruction. School Psychology Review, 26, 414-424.

Graham, S., & Harris, K. R. (2003). Students with learning disabilities and the process of writing: A meta-analysis of SRSD studies. In L. Swanson, K. R. Harris & S. Graham (Eds.), Handbook of learning disabilities (pp. 383-402). NY: Guilford.

Graham, S., & Harris, K. R. (2005). Writing better: Effective strategies for teaching students with learning difficulties. Baltimore, MD: Brookes Publishing.

Graham, S., and Harris, K. R. (2006, May/Jun). Preventing writing difficulties: Providing additional handwriting and spelling instruction to at-risk children in first grade. Teaching Exceptional Children, 38(5), 64-66

Graham, S., & Harris (2009). Evidence-based writing practices: Drawing recommendations from multiple sources. In V. Connelly, A. L. Barnett, J. Dockrell & A. Tolmie (Eds.). Teaching and Learning Writing (pp. 95-111). British Journal of Educational Psychology Monograph Series II.

Graham, S., & Harris, K. R. (2009). Almost 30 years of writing research: Making sense of it all with the Wrath of Khan. Learning Disabilities Research and Practice, 24, 58-68.

Graham, S., Harris, K. R., & Hebert (2011). Informative writing: The benefits of formative assessment. Washington, DC: Alliance for Excellent Education.

Graham, S., Harris, K. R., & Fink, B. (2000). Is handwriting causally related to learning to write? Treatment of handwriting problems in beginning writers. Journal of Educational Psychology, 92(4), 620-633.

Graham, S., Harris, K. R., & Chorzempa, B. F. (2002). Contributions of spelling instruction to the spelling, writing, and reading of poor spellers. Journal of Educational Psychology, 94, 669-686.

Graham, S., & Hebert, M. A. (2010). Writing to read: Evidence for how writing can improve reading. A Carnegie Corporation Time to Act Report. Washington, DC: Alliance for Excellent Education.

Graham, S, MacArthur, C. A., & Schwartz, S. S. (1995). The effects of goal setting and procedural facilitation on the revising behavior and writing performance of students with writing and learning problems. Journal of Educational Psychology, 87, 230-240.

Graham, S., & Miller, L. (1980). Handwriting research and practice: A unified approach. Focus on Exceptional Children, 13, 1-16.

Graham, S., Morphy, P., Harris, K., Fink-Chorzempa, B., Saddler, S., & Mason, L. (2008). Teaching spelling in the primary grades: A national survey of instructional practices and adaptations. American Educational Research 4(3), 796-825.

Graham, S., & Perin, D. (2007a). A meta-analysis of writing instruction for adolescent students. Journal of Educational Psychology, 99, 445-476.

Graham, S., & Perin, D. (2007b). Writing next: Effective strategies to improve writing of adolescents in middle and high schools: A report to the Carnegie Corporation of New York. Washington DC: Alliance for Excellent Education.

Graham, S., & Perin, D. (2007c). What we know, what we still need to know: Teaching adolescents to write. Scientific Studies in Reading, 11, 313-336.

Graham, M. Struck, M., Santoro, J., & Berninger, V. W. (2006). Dimensions of Good and Poor handwriting legibility in first and second graders: Motor programs, visual-spatial arrangement and letter formation parameter setting. Developmental Neuropsychology 29(1), 43-60.

Graham, S., & Weiner, B. (1996). Theories and principles of motivation. In D. C. Berliner & R. C. Calfee (Eds.) Handbook of educational psychology (pp. 63-84). New York: Simon & Schuster/Macmillan.

Graham, S., & Weintraub, N. (1996). A review of handwriting research: Progress and Prospects from 1980-1994. Educational Psychology Review, 8, 7-87.

Graham, S., Weintraub, N., & Berninger, V. (1998). The relationship between handwriting style and speed and legibility. Journal of Educational Research, 91(5), 290-296.

Gray, L., Thomas, N., & Lewis, L. (2010). Teachers' use of educational technology in U.S. public schools: 2009 (NCES 2010-040. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U. S. Department of Education.

Gutierrez, K. (1994). How talk, context, and script shape contexts for learning: A cross-case comparison of journal sharing. Linguistics and Education, 5, 335, 365.

Hammill, D. D., & Larsen, S. C. (2009). Test of Written Language, 4th edition. Austin, TX: ProEd.

Hamstra-Bletz, L., & Blote, A. (1993). A longitudinal study of dysgraphic handwriting in primary school. Journal of Learning Disabilities, 26, 689-699.

Handley-More, D., Deitz, J., Billingsley, F. F., & Coggins, T. E. (2003). Facilitating written work using computer word processing and word prediction. American Journal of Occupational Therapy, 57, 139-151.

Hanna, P.R., Hanna, J.S., Hodges, R.E., & Rudorf, H. (1966). Phoneme-grapheme correspondences as cues to spelling improvement. Washington, DC: United States Office of Education Cooperative Research.

Hansen, J., & Kissel, B. (2011). K-12 students as writers. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, 3rd ed., (pp. 271-277). New York: Routledge.

Harris, K. R., & Graham, S. (1996). Constructivism and students with special needs: Issues in the classroom. Learning Disabilities: Research and practice, 11, 133-137.

Harris, K. R., & Graham, S., Brindle, M., & Sandmel, K. (2009). Metacognition and children's writing. In D. Hacker, J. Dunloskly, & A. Graesser (Eds.), Handbook of metacognition in education (pp. 131-153). Mahwah, NJ: Erlbaum.

Harris, K. R., & Graham, S., Reid, R., McElroy, K., & Hambry, R. (1994). Self-monitoring of attention versus self-monitoring of performance: Replication and cross-task comparison studies. Learning Disability Quarterly, 17, 121-139.

Harris, K. R., Lane, K. L., Graham, S., Driscoll, S. A., Sandmel, K., Brindle, M., & Schatschneider, C. (2012). Practice-based professional development for self-regulated strategies development in writing: A randomized controlled study. *Journal of Teacher Education, 63*(2), 103-119.

Hart, P., Scherz, J, Apel, K., & Hodson, B. (March, 2007). Analysis of spelling error patterns of individuals with complex communication needs and physical impairments. *Augmentative and Alternative Communication*, 23(1), 6-29.

Harvey, C., & Henderson, S. (1997). Children's handwriting in the first three years of school: Consistency over time and its relationship to academic achievement. *Handwriting Review, 11*, 8-25.

Hayes, J. R. (2006). New directions in writing theory. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), *Handbook of writing research*. NY: Guilford Press.

Hayes, J. R., & Flower, L. (1980). Identifying the organization of writing processes. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in Writing: an interdisciplinary approach* (pp. 3-30). Hillsdale NJ: Erlbaum.

Hedderly, R. (1995). The assessment of SpLD pupils for examination special arrangements. *Dyslexia Review, 7*, 2-19.

Hellincix, T., Roeyers, H., & Van Waelvelde, H. (2013). Predictors of handwriting in children with autism spectrum disorder. Research in Autism Spectrum Disorders, 7, 176-186.

Henderson, E. H., & Beers, J. W. (Eds.). (1980). *Developmental and cognitive aspects of learning to spell: A reflection of work knowledge.* Newark, DE: International Reading Association.

Henderson, S. E, Sugden, D. A., & Barnett, A. L. (2007). *Movement assessment battery for children*, 2nd ed. (MABC-2). Available at http://www.pearsonclinical.co.uk/

Hetzroni, O. E., & Shrieber, B. (2013). Word processing as an assistive technology tool for enhancing academic outcomes of students with writing disabilities in the general classroom. *Journal of Learning Disabilities, 37*(2), 143-154.

Hidi, S., & Boscolo, P. (2006). Motivation and writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), *Handbook of writing research* (pp. 144-157). NY: Guilford Press.

Hidi, S., & Hildyard, A. (1983). The comparison of oral and written productions in two discourse types. *Discourse Processes, 6*, 91-105.

Higgins, E. L., & Raskind, M. H. (1995). Compensatory effectiveness of speech recognition on the written composition performance of postsecondary students with learning disabilities. Learning Disability Quarterly, 18, 159–174. doi:10.2307/1511202

Hill, D. (1982). Variables affecting transition from widespread to normal-spaced paper for manuscript handwriting. The Journal of Educational Research, 76(1), 50-53.

Hillocks, G. (2002). The Testing trap: How states writing assessments control learning. New York: Teachers College Press.

Hillocks, G. (2006). Middle and high school composition. In P. Smagorinsky (Ed.), Research on composition: Multiple perspectives on two decades of change, (pp. 48- 77). NY: Teachers College Press.

Honigsfeld, A., & Dove, M. G. (2013). Common core for the not so common learner: English language arts strategies graded 6-12. Thousand Oaks, CA: Corwin .

Hooper, S. R., Roberts, J. E., Nelson, L. Zeisel, S., & Kasambira Fannin, D. (2010). Preschool predictors of narrative writing skills in elementary school children. School Psychology Quarterly, 25(1), 1-12.

Hopkins, G. (2012). Keyboarding skills: When should they be taught? Education World. Retreived from http://www.educationworld.com/a_curr/curr076.shtml.

Horne, J., Ferrier, J., Singleton, C., & Read, C (2011). Computerized asssessment of handwriting and typing speed. Educational and Child Psychology, 28(2), 52-66.

Horney, Mark A., Anderson-Inman, L., Terrazas-Arellanes, F., Schulte, W., Mundorf, J., Wiseman, S., Smolkowski, K., Katz-Buonincontro, J., & Frisbee, M. L. (2009). Exploring the effects of digital note taking on student comprehension of science texts. Journal of Special Education Technology, 24(3), 45-61.

Hoy, M. P., Egan, M. Y., & Feder K. P. (2011). A systematic review of interventions to improve handwriting. Canadian Journal of Occupational Therapy, 78(1), 13-25.

Hruby, G. G., Read, S., & Landon-Hays, M. (2011). Tracing instructional tensions in the teaching of English language arts: A primer. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, (3rd ed.), (pp. 211-217). NY: Routledge.

Izzo, M. V. (2008). Preparing teachers for UDL implementation: Lessons from research and practice. Paper presented at the annual meeting of the Council for Exceptional children, Boston.

Jacobs, G. (2008). We learn what we do: Developing a repertoire of writing practices in an instant messaging world. Journal of Adolescent & Adult Literacy, 52(3), 203-211.

Jimenez, R., & Teague, B. (2009). Language, literacy, and content: Adolescent English language learners. In L. Morrow, R. Reuda, & D. Lapp (Eds.),The handbook of research on literacy and diversity (pp. 114-136). NY: Guilford Press.

Johnson, T. S., Smagorinsky, P., Thompson, L., & Fry, P. (2003). Learning to teach the five-paragraph theme. Research in the Teaching of English, 38(2), 136-176.

Johnson, R. S., & Watson, J. E. (2006). The effectiveness of synthetic phonics teaching in developing reading and spelling skills in English-speaking boys and girls. In R. M. Joshi & P. G. Aaron (Eds.), Handbook of Orthography and literacy (pp. 679-691). Mahwah, NJ: Erlbaum.

Jones, D., & Christensen, C. A. (1999). Relationship between automaticity in handwriting and students' ability to generate written text. Journal of Educational Psychology, 91(1), 44-49.

Kamhi, A. G., & Hinton, L. N. (2000). Explaining individual differences in spelling ability. Topics in Language Disorders, 20(3), 37-49.

Khan, E. A. (2000). A case study of assessment in a grade 10 English course. Journal of Educational Research, 93(5), 276-286.

Kahn, J., & Freyd, P. (1990). A whole language perspective on keyboarding (Online). Language Arts, 67(1), 84-90.

Kaiser, M. L., Albaret, J. M., & Doudin, P. A. (2009). Relationship between visual-motor integration, eye hand coordination and quality of handwriting. Journal of Occupational Therapy, Schools, and Early Interention, 2(2), 87-95.

Karlsdottir, R., & Stefansson, T. (2002). Problems in developing functional handwriting. Perceptual and Motor Skills Monograph 94(1), 623-662.

Karlsdottir, R., & Stefansson, T. (2003). Predicting performance in primary school subjects. Perceptual and Motor skills, 97(3), 1058-1060.

Katusic, S. K., Colligan, R. C., Weaver, A. L., & Barbaresi, W. J. (2009). The forgotten learning disability: Epidemiology of written-language disorder in population-based cohort (1976-1982), Rochester MN. Pediatrics, 123(5), 1306-1313.

Kavak, S. T., & Eliasson, A. C. (2011). Development of handwriting skills in children with unilateral cerebral palsy. Disability and Rehabilitiation, 33(21-22), 2084-2091.

Kellman, M., & Apel, K. (2004). Effects of a multilinguistic and prescriptive approach to spelling instruction. Communication Disorders Quarterly, 25(2), 56-66.

Kennedy, C. H. (2005). Single-case designs for education research. Boston: Allyn and Bacon.

Kiuhara, S. A., Graham, S., & Hawken, L. S. (2009). Teaching writing to high school students: A national survey. Journal of Educational Psychology, 101, 136-160

Klein, S., Erickson, L., James, K., Perrott, C., Williamson, H. & Zacharuk, L. (2008). Effectiveness of computer skills program to improve written communication in children with developmental coordination disorder. Physical and Occupational Therapy in Pediatrics, 28(1), 5-23.

Klein, S., Guiltner, V., Sollereder, P., & Cui, Y. (2011). Relationship between fine-motor, visual-motor, and visual perceptual scores and handwriting legibility and speed. Physical and Occupational Therapy in Pediatrics, 31(1), 103-114.

Klein, R., MacArthur, C. A., & Najera, K. (2007). The effects of concept mapping on middle school students' writing (unpublished manuscript).

Klein, P. D., & Yu, A. M. (2013). Best practices in writing to learn. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd Ed. (pp. 166-189). NY: Guilford Press.

Knobel, M., & Wilbur, D. (2009). Let's Talk 2.0. Educational Leadership, 66, 20-24.

Kroll, B. (1981). Developmental relationships between speaking and writing. In B. Roll & R. Vann (Eds.), Exploring speaking-writing relationships: Connections and contrasts (pp. 35-54). Urbana, Il: National Council of Teachers of English.

Kushki, A., Chau, T., & Anagnostou, E. (2011). Handwriting difficulties in children with Autism Spectrum Disorders: A scoping review. Journal of Austim and Developmental Disorders, 41, 1706-1716.

La Berge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing. Cognitive Psychology, 6, 283-323.

Langer, J. A. (1986). Children reading and writing. Norwood, NJ: Ablex

Langer, J. A. (2001) Beating the odds: Teaching middle and high school students to read and write well. American Educational Research Journal, 38, 837-880.

Lassonde, C., & Richards, J. C. (2013). Best practices in teaching planning for writing. In S. Graham, C. A. MacArthur, & J. Fitzgerald, Best Practices in Writing Instruction, 2nd ed. (pp. 193-214.). NY: Guilford Press.

Lavine, L. (1972). The development of perception of writing in pre-reading children: A cross-cultural study. Ph.D. dissertation, Cornell University, Xerox University Microfilms, 73-6657.

Larsen, S. C., & Hammill, D. D. (1989). Test of legible handwriting. Austin TX:Pro-Ed.

Larsen, S., Hammill, D., & Moats, L. (1999). Test of Written Spelling, 4th ed. (TWS-4). Austin,TX: Pro-Ed.

Lennox, C., & Siegel, L. S. (1996). The development of phonological rues and visual strategies in average and poor spellers. Journal of Experimental Child Psychology, 62, 60-83.

Lensmire, T. (2000). Powerful writing, responsible teaching. New York: Teachers College Press.

Levine, M., Oberklaid, F., & Meltzer, L. (1981). Developmental output failure: A study of low productivity in school-age children. Pediatrics, 67, 18-25.

Lewis, R., Ashton, T., Haapa, B., Kieley, C., & Fielden, C. (2000). Improving the writing skills of student with learning disabilities: Are word processors with spelling and grammar checkers useful? Learning Disabilities, 9, 87-98.

Lewis, R., Graves, A., Ashton, T., & Kieley, C. (1998). Word processing tools for students with learning disabilities: Are word processors with spelling and grammar checkers useful? Learning Disabilities, 9, 87-98.

Lin, S., Monroe, B., & Troia, G. A. (2007). Development of writing knowledge in grades 2-8: A comparison of typically developing writers and their struggling peers. Reading and Writing Quarterly, 23, 207-230.

Lindamood, P. (1994). Issues in researching the link between phonological awareness, learning disabilities, and spelling. In G. R. Lyon (Ed.), Frames of reference for the assessment of learning disabilities: New views on measurement issues (pp. 351-373). Baltimore: Brookes.

Luckin, R., Clark, W., Graber, R., Logan, K., Mee, A., & Olive, M. (2009). Do web 2.0 tools really open the door to learning? Practices, perceptions and profiles of 11-16- year-old students. Learning, Media and Technology, 34(2), 87-104.

MacArthur, C. (1996). Using technology to enhance the writing processes of students with learning disabilities. Journal of Learning Disabilities, 29, 344-354.

MacArthur, C. A. (1999). Word prediction for students with severe spelling problems. Learning Disability Quarterly, 22, 158-172.

MacArthur, C. A. (2006). The effects of new technologies on writing and writing processes. In C. MacArthur, S. Graham, & J. Fitzgerald (Eds.), Handbook of writing research (pp. 248-262). New York: Guilford Press.

MacArthur, C. A. (2009a). Reflections on research on writing and technology for struggling writers. Learning Disabilities Research and Practice, 24, 93-103.

MacArthur, C. A. (2009b). Technology and struggling writers: A review of research. In V. Connelly, A. L. Barnett, J. Dockrell & A. Tolmie (Eds.). Teaching and Learning Writing (pp.159-175). British Journal of Educational Psychology Monograph Series II.

MacArthur, C. A. (2013). Best practices in teaching evaluation and revision. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd Ed. (pp. 215-237). NY: Guilford Press.

MacArthur, C. A., & Cavalier, A. (2004). Dictation and speech recognition as test accommodations. Exceptional Children, 71, 43-58.

MacArthur, C. A., & Graham, S. (1987). Learning disabled students' composing with three methods: Handwriting, dictation, and word processing. Journal of Special Education, 21, 22-42.

MacArthur, C. A. , Graham, S., & Fitzgerald, J. (Eds.) (2006). Handbook of writing research. NY: Guilford Press.

MacArthur, C., Graham, S., Haynes, J., & De La Paz, S. (1996). Spelling checkers and students with learning disabilities: Performance comparisons and impact on spelling. Journal of Special Education, 30, 35-57.

MacArthur, C. A., Graham, S., & Schwartz, S. (1991). Effects of reciprocal peer revision strategy in special education classrooms. Learning Disabilities Research and Practice, 6, 201-210.

MacArthur, C., Graham, S., Schwartz, S., & Schafer, W. (1995). Evaluation of a writing instruction model that integrated a process approach, strategy instruction, and word processing. Learning Disability Quarterly, 18, 278-291.

Many, J. E., Ariail, M. & Fox, D. L. (2011). Language arts learning in the middle grades. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, 3rd Ed., (pp. 53-59). New York: Routledge.

Manning, M., Maning, G., & Hughes, J. (1987). Journals in first grade: What children write. The Reading Teacher, 41, 311-315.

Marr, D., & Cermark, S. A. (2002). Predicting handwriting performance of early elementary students with the developmental test of visual-motor integration. Perceptual and Motor Skills, 95, 661-669.

Masterson, J. J., & Apel, K. (2006). The effect of modality on spelling words varying in linguistic demands. Developmental Neuropsychology, 29(1),261-277.

Masterson, J. J., & Apel, K. (2010). The spelling sensitivity score: Noting developmental changes in spelling knowledge. Assessment for Effective Intervention, 36(1), 35-45.

Masterson, J. J., Apel, K., & Wasowicz, J. (2006). SPELL-2 Spelling Performance Evaluation for Language and Literacy (2nd ed.) [Computer software]. Evanston, IL: Learning By Design. www.learningbydesign.com

Masterson, J. J., & Mooney, R. (2006, February). Criterion validity of the spelling performance evaluation for language and literacy (SPELL). Poster presented at the Annual Pathways to Communication Conference, Missouri State University, Springfield, MO.

Maughan, B., Messer, J., Collishaw, S., Pickles, A., Snowling, M., Yule, W., & Rutter, M. (2009). Persistence of literacy problems: Spelling in adolescence and at mid-life. Journal of Child Psychology and Psychiatry, 50(8), 893-901.

Mayes, S., & Calhoun, S. (2006). Frequency of reading, math, and writing disabilities in children with clinical disorders. Learning and Individual Differences, 16(2), 145-157.

McCann, T. M. (1989). Student argumentative writing: Knowledge and ability at three grade levels. Research in the Teaching of English, 23, 62-76.

McCormick, C. B., Busching, B. A., & Potter, E. F. (1992). Children's knowledge about writing: The development and use of evaluative criteria. In M. Pressley, K. R. Harris, & J. T. Guthrie (Eds.), Promoting academic competence and literacy in schools (313-336). Orlando, FL: Academic Press.

McCarthey, S. (2001). Identity construction in elementary readers and writers. Reading Research Quarterly, 36, 122-151.

McCutchen, D., Covill, A., Hoyne, S. H., & Mildes, K. (1994). Individual differences in writing: implications of translating fluency. Journal of Educational Psychology, 86, 256-266.

McCutchen, D., Francis, M., & Kerr, S. (1997). Revising for meaning: Effects of knowledge and strategy. Journal of Educational Psychology, 89, 667-676.

McCutchen, D. (2006). Cognitive factors in the development of children's writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 115-130). NY: Guilford Press.

McGillivray, L. (1994). Tacit shared understandings of a first grade writing community. Journal of Reading Behavior, 26, 245-266.

McHale, K., & Cermak , S. A. (1992). Fine motor activities in elementary school: Preliminary findings and provisional implications for children with fine motor problems. American Journal of Occupational Therapy, 46, 892-898.

McKenna, M. C., Labbo, L. D., Conradi, K., & Baxter, J. (2011). Effective uses of technology in literacy instruction. In L. L. Morrow & Gamrell, L. B., *Best Practices in Literacy Instruction* (pp. 361-394). NY: Guilford Press.

McKeough, A. (2013). A developmental approach to teaching narrative composition. In C. A. MacArthur, S. Graham & J. Fitzgerald, (Eds.), *Handbook of writing research* (pp. 73-112). NY: Guilford Press.

McMaster, K., & Espin, C. (2007). Technical features of curriculum-based measurement in writing: A literature review. *Journal of Special Education,41*, 68-84.

Medwell, J. Strand, S. & Wray, D. (2009). The links between handwriting and composing for Y6 children. *Cambridge Journal of Education, 39*(3), 329-344.

Medwell, J., & Wray, D. (2007). Handwriting: what do we know and what do we need to know. *Literacy, 41*(1), 10-15.

Mehta, P. D., Foorman, B. R., Branum-Martin, L., & Taylor, W. P. (2005). Literacy as a unidimensional multilevel construct: Validation, sources of influence, and implications in a longitudinal study in grades 1 to 4. Scientific Studies of Reading, 9(2), 85-116.

Melzer, D. (2009). Writing assignments across the curriculum: A national study of college writing. College Composition and Communication, 61, W240-W261.

Midgette, E. , Haria, P., & MacArthur, C. A. (2008). The effects of content and audience awareness goals for revision on the persuasive essays of fifth and eighth-grade students. Reading and Writing , 21, 131-151.

Mirenda, P., Turoldo K., & McAvoy, C. (2006). The impact of word prediction software on the written output of students with physical disabilities. Journal of Special Education Technology, 21(3), 5-12.

Moats, L. C. (1996). Phonological spelling errors in the writing of dyslexic adolescents; Reading and Writing: An Interdisciplinary Journal, 8, 105-119.

Moats, L. C. (Winter 2006,). How spelling supports reading: And why it is more regular and predictable than you may think. American Educator, 6, 12-22, 42-43.

Moats, L. C. (2010). Teaching spelling to students with language and learning disabilities. In G. Troia (Ed.), *Instruction and assessment for struggling writers* (pp. 269-289). NY: Guilford.

Moats, L. C., Foorman, B. R., & Taylor, W. P. (2006). How quality of writing instruction impacts high-risk fourth graders' writing. Reading and Writing: An Interdisciplinary Journal, 19, 363-391.

Mogey, H., Haywood, S. G., van Heynigen , S., Dewhurst, D., Hounsell, D., et al (2008). The end of handwriting? Using computers in traditional essay examinations. Journal of Computer Assisted Learning, 24, 39-46.

Monaghan, E. J., & Hartman, D. K. (2011). Integrating the elementary language arts: An historical perspective. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, 3rd Ed., (pp. 113-119). New York: Routledge.

Moore, D. W., Moore, S. A., Cunningham, P. M., & Cunningham, J. W. (2011). Developing readers and writers in the content areas K-12. Boston: Allyn Morin, M. F., La Voie, N., & Montesinos, I. (2012). The effects of manuscript, cursive and manuscript/cursive styles on writing development in grade 2. Language and Literacy, 14(1), 110-124.

Morphy, P., & Graham, S. (2012). Word processing programs and weaker writers/readers: A meta-analysis of research findings. Reading and Writing, 25, 641-678.

Morris, D., Blanton, L., Blanton, W. E., Nowacek, J., & Perney, J. (1995). Teaching low-achieving spellers at their "instructional level". Elementary School Journal, 96, 163-177.

Morris, M. A., Schraufnagel, C. D., Chudnow, R. S., & Weinberg, W. A. (2009). Learning disabilities do not go away: 20 to 25 year study of cognition, academic achievement, and affective illness. Journal of Child Neurology, 24, 323-332.

Morrow, L. M., Tracey, D. H., & Del Nero, J. R. (2011). Best practices in early literacy: preschool, kindergarten, and first grade. In L. M. Morrow, & L. B. Gambrell (Eds.), Best practices in literacy instruction, 4th ed., (pp. 67–95). New York, NY: Guilford.

Moss, R, K. , (1989). Big pencils for small writer. Journal of Teaching and Writing, S(1), 77-83.

Nagin, C. (2003). Because writing matters: Improving student writing in our schools. San Francisco, CA: Wiley.

National Center for Education Statistics (2012). The Nation›s Report Card: Writing 2011 (NCES 2012–470). Institute of Education Sciences, U.S. Department of Education, Washington, D.C.

Naucler, K., & Magnusson, E. (2002). How do preschool language problems affect language abilities in adolescence? In F. Windsor & M. L. Kelly (Eds.) Investigations in clinical phonetics and linguistics (pp. 99-114). Mahwah, NJ: Erlbaum.

National Center for Education Statistics (NCES) (2012). The Nation's Report Card: Writing 2011. (NCES 2012-470). Institute of Education Sciences, U. S. Department of Education, Washington D.C. Retreived from http://nationsreportcard.gov/writing_2011/writing_2011_report/

National Commission on Writing (2005, July). Writing: A powerful message from state government. Retrieved from http://www.nwp.org/cs/public/print/resource/2541

www.writingcommission.org/report/html see graham and perin meta analysis

National Council of the Teachers of English (NCTE)(2004). NCTE beliefs about the teaching of writing. Retreived from http://www.ncte.org/positions/statements/writingbeliefs

National Council of Teachers of English (NCTE) (2008). Writing now: A policy brief. Urbana, Illinois: NCTE.

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). Common Core State Standards, College and Career Readiness Anchor Standards for Writing).National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington D.C.

Newcomer, P., Nodine, B., & Berenbaum, E. (1988). Teaching writing to exceptional children: Reaction and recommendations. Exceptional Children, 54, 559-564.

Newkirk, T. (1987). The non-narrative writing of young children. Research in the Teaching of English, 21, 121-144.

National Reading Panel (2000). Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction [online]. Retrieved from http://www.nichd.nih.gov/publications/nrp/report.cfm

Newell, G. E., VanDerHeide, J., & Wilson, M. (2013). Best practices in teaching informative writing from sources. In S. Graham, C. A. MacArthur & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd Ed. (pp. 141-165). NY: Guilford Press.

Nichols, L. M. (1995). A comparison of two methods for teaching keyboarding in the elementary school. Computers in the Schools, 11(4), 15-25.

Nieman, P. (1996). Introducing early keyboard skills: Who, what, where, and how? Business Education Forum, 51(1), 27-30.

Nies, K. A., & Belfiore, P. J. (2006). Enhancing spelling performance in students with learning disabilities. Journal of Behavioral Education, 15, 163-170.

Nistler, R. (1990). A descriptive analysis of good readers' and writers' concepts of authorship at grades one, three, and five. In J. Zutell & S. McCormick (Eds.), Literacy theory and research: Analyses from multiple paradigms: Thirty-ninth

yearbook of the National Reading Conference (pp. 359-368). Chicago: National Reading Conference.

Nodine, B., Barenbaum, E., & Newcomer, P. (1985). Story composition by learning disabled, reading disabled, and normal children. Learning Disability Quarterly, 8, 167-181.

Nystrand, M. (1982). Rhetoric's audience and linguistics speech community: Implications for understanding writing, reading, and text. In M. Nystrand (Ed.), What writer's know: The language, process and structure of written discourse (pp. 1-28). New York: Academic Press.

Nystrand, M. (2006). The social and historical context for writing research. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 11-27). NY: Guilford Press.

No Child Left Behind Act of 2001, Pub. L. 107–110, 115 Stat. 1425 (2002).

O'Brien, D. (2006). Struggling adolescents' engagement in multimediating: Countering the institutional construction of incompetence. In D. E. Alvermann, D. W. Moore, S. F. Phelps & D. R. Wolf (Eds.), Reconceptualizing the literacies in adolescents' lives, 2nd ed. (pp. 29-46). Mahwah, NJ: Erlbuam.

O'Brien, D., Beach, R., & Scharber, C. (2007). "Struggling" middle schoolers: Engagement and literate competence in a reading writing intervention class. Reading Psychology, 28(1), 51-73.

O'Connor, R. E., & Jenkins, J. R. (1995). Improving the generalization of sound/symbol knowledge: Teaching spelling to kindergarten children with disabilities. The Journal of Special Education, 29, 255-275.

O'Donnell, R. C., Griffin, W. J., & Norris, R. C. (1967). Syntax of kindergarten and elementary school children: A transformational analysis. Urbana, IL: National Council of Teachers of English.

Olinghouse, N. G., & Wilson, J. (2012). Strategic, meaningful, and effective writing instruction for elementary students. In M. C. Hougen & S. M. Smartt (Eds.), Fundamentals of literacy instruction and assessment, pre-K-6. Baltimore: Paul Brookes.

Olive, T., & Kellogg, R. T. (2002). Concurrent activation of high-and low-level production processes in written composition. Memory and Cognition, 30, 594-600.

Olson, V. (1990). The revising processes of sixth-grade writers with and without peer feedback. Journal of Educational Research, 84, 84-106.

Olson, R. K. (2006). Genes, environment, and dyslexia. Annals of Dyslexia, 56, 205-238.

O'Mahoney, P., Dempsey, M., & Killeen, H. (2008). Handwriting speed: Duration of testing period and relation to socio-economic disadvantage and handedness. Occupational Therapy International, 15(3), 165-177.

Overvelde, A., & Hulstijn, W. (2011). Handwriting development in grade 2 and grade 3 primary school children with normal, at risk, or dysgraphic characteristics. Research in Developmental Disabilities, 32(2), 540-548.

Pacton, S., Fayol, M., & Perruchet, P. (2005). Children's implicit learning of graphotactic and morphological regularities. Child Development, 76, 324-339.

Pajares, F., & Valiante, G. (2006). Self-efficacy beliefs and motivation in writing development. In C. A. MacArthur, S. Graham & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 158-179). NY: Guilford Press.

Paterson, J. P. & Duer, D. (2006). High school teaching and college expectations in writing and reading. English Journal, 95(3), 81-87.

Pauk, W. (2013). How to study in college, 11th Ed. Cengage Learning.

Perin, D. (2013). Teaching writing for college and career readiness. In S. Graham, C. A. MacArthur & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd Ed. (p.48-70). NY: Guilford Press.

Peverly, S. T. (2006). The importance of handwriting speed in adult writing. Developmental Neuropsychology, 29, 197-216.

Peverly, S. T. (2013). The relationship of handwriting speed, working memory, language comprehension and outlines to lecture note-taking and test-taking among college students. Applied Cognitive Psychology, 27(1), 115-126.

Peverly, S. T., Ramaswamy, V. , Brown, C. ,Sumowski, J. , Alidoost, M., & Garner, J., (2007). What predicts skill in lecture note taking? Journal of Educational Psychology, 99, 167-180.

Philippakos, Z. A. (2012). Effects of reviewing on fourth and fifth-grade students' persuasive writing and revising. Ph.D. dissertation, University of Delaware.

Piaget, J. (1962). The Language and thought of the child. London: Routledge & Kegan Paul.

Piaget, J. (1969). The psychology of the child. NY:Basic Books.

Pinell, G. S., & Fountas, I. C. (2008). Guiding readers and writers: Teaching comprehension, genre and content literacy. Portsmouth, NH: Heinemann.

Pinnell, G. S., & Fountas, I. C. (2011). Literacy Beginnings: A prekindergarten handbook. Portsmouth, NH: Heinemann.

Pisha, B. (1993). Rates of development of keyboarding skills in elementary school age children with and without identified learning disabilities. Doctoral Thesis: Harvard University. Retrieved from http://4.17.143.133/udl/DevelopmentofKeyboardingSkills353.cfm

Pritchard, R. J., & Honeycutt, R. L. (2006). The process approach to writing instruction. In C. A. MacArthur, S. Graham & J. Fitzgerald, (Eds.), Handbook of Writing Research, (pp. 275-290), NY: Guilford.

Plester, B., Wood, C., & Bell, V. (2008). Txt msg n school literacy: Does texting and knowledge of text abbreviations adversely affect children's literacy attainment? Literacy, 42(3), 137-144.

Preminger, F., Weiss, Pl L., & Weintraub, N. (2004). Predicting occupational performance: Handwriting versus keyboarding. American Journal of Ocupational Therapy, 58, 193-201.

Quinlan, T. (2004). Speech recognition technology and students with writing difficulties: Improving fluency. Journal of Educational Psychology, 96, 337-346.

Rao, K., Dowrick, P. W., Yuen, J. W., & Boisvert, P. C. (2009). Writing in a multimedia environment: Pilot outcomes for high school students in special education. Journal of

Special Education Technology, 24(1), 27-38.

Raphael, T. E., Highfield, K., & Au, K. H. (2006). QAR now: A powerful and practical framework that develops comprehension and higher level thinking in all students. NY: Scholastic Professional Books.

Raphael, L. M., Pressley, M., & Mohan, L. (2008). Engaging instruction in middle school classrooms: An observational study of nine teachers. The Elementary School Journal, 109(1), 61-81.

Read, S. (2001). "Kid mice hunt for their selfs": First and second graders writing research. Language Arts, 78, 333-342.

Richards, T., Berninger, V., Stock, P., Altemeier, L., Trivedi, P., & Maravilla, K. (2011). Differences between good and poor child writers on fMRI contrasts for writing newly taught and highly practiced letter forms. Reading and Writing, 24(5), 493-516.

Richards, J. R., & Miller, S. (2005). Doing academic writing: Connecting the personal and the professional. Mahwah, NJ: Erlbaum.

Roberts, T. A., & Meiring, A. (2006). Teaching phonics in the context of children's literature or spelling: Influences on first-grade reading spelling, and writing and fifth-grade comprehension. Journal of Educational Psychology, 98(4), 690-713.

Rogers, J. & Case-Smith, J. (2002). Relationships between handwriting and keyboarding performance of sixth-grade students. American Journal of Occupational Therapy, 56, 34-39.

Rogers, H., Laehn, J., Lang, A., O'Leary, D., & Sommers, M. (2003). The status of elementary keyboarding-A longitudinal study. Retrieved from http://facstaff.uww.edu/rogersh/keyresearch/elemKeyStatusManu.pdf

Rogers, L., & Graham, S. (2008). A meta-analysis of single subject design writing intervention research. Journal of Educational Psychology, 100, 879-906.

Rosenblum, S., Aloni, T., & Josman, N. (2010). Relationships between handwriting performance and organizational abilities among children with and without dysgraphia: A preliminary study. Research in Developmental Disabilities, 31, 502-509.

Rosenblum, S., Weiss, P. L., & Parush, S. (2003). Computerized temporal handwriting characteristics of proficient and non-proficient handwriters. American Journal of Occupational Therapy, 57, 129-138.

Rubin, N., & Henderson, S. E. (1982). Two sides of the same coin: Variations in teaching methods and failure to learn to write. Special Education: Forward Trends, 9(4), 17-24.

Russell, M. (2000). It's time to upgrade: Test and administration procedures in the new millennium. National Board on Educational Testing and Public Policy. Boston College, MA: Center for the Study of Testing, Evaluation, and Educational Policy.

Russell, D. (2006). Historical studies of compostion. In P. Smagorinsky (Ed.), Research on composition: Multiple perspectives on two decades of change. NY: Teachers College Press.

Russell, M., & Plati, T. (2001). Effects of computer versus paper administration of a state-mandated writing assessment. Teachers College Record, Retrieved at www.tcrecord.org, ID No. 10709.

Saddler, B. (2013). Best practices in sentence construction skills. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd Ed. (pp. 238-256). NY: Guilford Press.

Saddler, B., & Graham, S. (2007). The relationship between writing knowledge and writing performance among more or less skilled writers. Reading and Writing Quarterly, 23, 231-247.

Sassoon, R. (1993). The Art and Science of Handwriting. Oxford: Intellect.

Scardamalia, M., & Bereiter, C. (1986). Written composition: In M. Wittrock (Ed.), Handbook of research on teaching, 3rd ed., (pp. 778-803). NY: Macmillan.

Scardmalia, M., Bereiter, C., & Goelman, H. (1982). The role of production factors in writing ability. In M. Nystrand(Ed.), What writers know: The language, process and structure of written discourse. New York: Academic Press.

Schlagal, B. (2013). Spelling and handwriting. In S. Graham, C. A. MacArthur & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd Ed. (pp. 257-283).NY: Guilford Press.

Schneck, C. (1991). Comparison of pencil-grip patterns in first graders with good and poor writing skills. American Journal of Occupational Therapy, 45(8), 701-706.

Schoemaker, M. M., Schellekens, J. M. H., Kalverboer, A. F., & Kooistra, L. (1994). Pattern drawing by clumsy children: A problem of movement control. In M. L. Simner, W. Hulstujin & P. Girouard (Eds.), Contemporary issues in the forensic, developmental and neurological aspects of handwriting, Monograph of the Association of Forensic Document Examiners, Vol. 1. (pp. 43-64). Toronto, Ontario, Canada: Association of Forensic Document Examiners.

Schumaker, J. B., & Deshler, D. D. (2009). Adolescents with learning disabilities as writers: Are we selling them short? Learning Disabilities Research and Practice, 24(2), 81-92.

Schwellnus, H., Carnahan, H., Kushki, A., Polatajko, H., Missiuna, C., & Chau, T. (2012). Effect of pencil grasp on speed and legibility of handwriting in children. American Journal of Occupational Therapy, 66, 718-726.

Scott, C. M. (2000). Principles and methods of spelling instruction: Applications for poor spellers. Topics in Language Disorders, 20(3), 66-82.

Scott, C. M. (2012). Learning to Write. In A. G. Kamhi & H. W. Catts (Eds.), Language and Reading Disabilities, 3rd ed., (pp. 244-268). Upper Saddle River, NJ: Pearson.

Scott, C., & Windsor, J. (2000). General language performance measures in spoken and written narrative and expository discourse in school-age children with language learning disabilities. Journal of Speech, Language, and Hearing Research, 43, 324-339.

Shanahan, T. (2006). Relations among oral language, reading and writing development. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research, (pp. 171-183). NY: Guilford Press.

Shanahan, T. (2009). Connecting reading and writing instruction for struggling readers. In G. Troia (Ed.), Instruction and assessment for struggling writers (pp.113-131). NY: Guilford.

Shatil, E., Share, D.C., & Levin, I. (2000). On the contribution of kindergarten writing to grade one literacy: A longitudinal study in Hebrew. Applied Psycholinguistics, 21, 1-21.

Shaughnessy, M. (1977). Errors and expectations. London: Oxford University Press.

Shaywitz, S., Fletcher, J., Holahan, J. M., Shneider, A., Marchione, K. E., Stuebing, K., Francis, D. J., Pugh, K. R., & Shaywitz, B. A. (1999). Persistence of dyslexia: The Connecticut Longitudinal Study of Adolescence. Paediatrics, 104, 1351-1359.

Sheils, M. (1975). Why Johnny can't write. Newsweek, 92(8), 58-65.

Siegel, L. S. (2008). Morphological awareness skills of English language learners and children with dyslexia. Topics in Language Disorders, 28, 15-27.

Silio, M. C. and Barbetta, P. M. (2010). The effects of word prediction and text-to-speech technologies on the narrative writing skills of Hispanic students with specific learning disabilities. Journal of Special Education Technology, 25(4), 17-32.

Shuller, S. (1989). Keyboarding in elementary schools: Curricular issues. Retrieved from http://www.stager.org/omaet/keyboarding.html

Simner, M. (1982). Printing errors in kindergarten and the prediction of academic performance. Journal of Learning Disabilities, 15(3), 155-159.

Singer, B. D., & Bashir, A. S. (2004). Developmental variations in writing composition skills. In C. A. Stone, E. R. Silliman, B. J. Ehren, & K. Apel (Eds.), Handbook of language and lieracy (pp. 559-582). NY: Guilford.

Smagorinsky, P., & Smith, M. W. (1992). The nature of knowledge and the writing process: A protocol analysis. Research in the Teaching of English, 25, 339-364.

Smith-Lock, K. M. (1995). Morphological usage and awareness in children with and without specific language impairment. Annals of Dyslexia, 45,163-185.

Smits-Engelsman, B., Niemeijer, A., van Galen, G. (2001). Fine motor deficiencies in children diagnosed as DCD based on poor grapho-motor ability. Human Movement Science, 20(1-2), 161-182.

Snowling, M. J., & Hulme, C. (2008). Reading and other specific learning difficulties. In M. Rutter, D. Bishop, D. Pine, S. Scott, J. Stevenson, E. Taylor & A. Thapar (Eds.), Rutter's Child and Adolescent Psychiatry (5th ed.). Oxford: Blackwell.

Snyder, T.D., and Dillow, S.A. (2013). Digest of Education Statistics 2012 (NCES 2014-015). National Centerfor Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Sormunen, C. (1988). A comparison of speed achievement of students in grades 3-6 who learn keyboarding on the microcomputer. The Delta Pi Epsilon Journal, 30(2), 47-57.

Sormunen, C. (1991). Elementary school keyboarding: A case for skill development. Buisiness Education Forum, 45(6), 28-30.

Sovik, N., Arntzen, O., & Thygesen, R. (1987). Writing characteristics of "normal," dyslexic and dysgraphic children. Journal of Human Movement Studies, 31, 171-187.

Spandel, V. (2001). Creating writers through 6-trait writing assessment and instruction (3rd ed.). NY: Addison Wesley Longman.

Spandel, V. (2006). In defense of rubrics. English Journal, 96(1), 19-22.

Spandel, V. (2012). Creating young writers: Using the six traits to enrich writing process in primary classrooms, 3rd ed. NY: Pearson.

Spandel, V., & Culham, R. (1994). The student friendly guide to working with traits. Portland, OR: Northwest Regional Educational Laboratory.

Sperling, M., & Woodlief, L. (1997). Two classrooms, two writing communities: Urban and suburban tenth-graders learning to write. Research in the Teaching of English, 31, 205-230.

Stecher, B. M. Barron, S. L. Chun, T., & Ross, K. (2000). The effects of Washington state education reform on schools and classrooms (RAND Report DRU-2263). Santa Monica, CA: Rand Corp.

Straub, C., & Alias, A. (2013). Next generation writing at the secondary level for students with learning disabilities. Teaching Exceptional Children, 46(1), 16-24.

Strickland, D., & Townsend, D. (2011). The development of literacy in the elementary school. In D. Lapp & D. Fisher, Handbook of research on teaching the English language arts, (3rd ed.), (pp. 46-52). NY: Routledge.

Sturm, J. M., & Rankin-Erickson, J. L. (2002). Effects of hand-drawn and computer-generated concept mapping on the expository writing of middle school students with learning disabilities. Learning Disabilities Research and Practice, 17(2), 124-139.

Sulzby, E. (1985). Kindergartners as writers and readers. In M. Farr (Ed.), Advances in writing research, Vol. 1: Children's early writing development (pp. 127-199). Norwood, NJ: Ablex.

Sulzby, E. (1996). Roles of oral and written language in children approaching conventional literacy . In C. Pontecorvo, M. Orsolini, B. Burge, & L. Resnick (Eds.), Early Text Construction in Children (pp. 25-46). Hillsdale, NJ: Erlbaum.

Sumner, E., Connelly, V., & Barnett, A. L. (2013). Children with dyslexia are slow writers because they pause more often and not because they are slow at handwriting execution. Reading and Writing, 26(6). 991-1008.

Teale, W., & Sulzby, E. (1986). Emergent literacy: Writing and reading. Norwood, NJ: Ablex.

Temple, C. A., Nathan, R. & Temple, C. N. (2012). The Beginnings of Writing, 4th ed. Boston: Pearson.

Temple, C., R. Nathan, F. Temple, and N. Burris. (1993). The Beginnings of Writing, 3rd Ed. Boston: Allyn and Bacon.

Templeton, S. (2002, February). Spelling: Logical, learnable, and critical. The ASHA Leader (pp.4-5, 12). Rockville, MD: American Speech-Language-Hearing Association.

Templeton, S., & Morris, D. (2000). Spelling. In M. L. Kamil, P. B. Mosenthal, D. P. Pearson & R. Barr (Eds.), Handbook of Reading Research (Vol. 3, pp. 525-543). Mahway, NJ: Erlbaum.

Torrance, M. & Baker, A. (1998, July). The processing demands of handwriting, word processing and speech input word processing. Paper presented at the European Writing Conference, Poitiers, France.

Torrance, M., & Galbraith, D. 2006). The processing demands of writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research, (pp. 67-79). NY: Guilford Press.

Tolchinsky, L. (2001). The cradle of culture and what children know about writing and numbers before being taught. Mahway, NJ: Erlbaum.

Tolchinsky, L. (2006). The emergence of writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald, (Eds.), Handbook of writing research (pp. 83-95). NY: Guilford Press.

Tolchinsky, L., & Teberosky, A. (1998). The development of word segmentation and writing in two scripts. Cognitive Development, 13, 1-21.

Trap-Porter, J. (1983). Space size and accuracy of second and third grade students' cursive handwriting. The Journal of Educational Research, 76(4), 231-233.

Troia, G. A. (2002). Teaching writing strategies to children with disabilities: Setting generalization as the goal. Exceptionality, 10, 249-269.

Troia, G. A. (2006). Writing instruction for students with learning disabilities. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), Handbook of writing research (pp. 324-336). NY: Guilford Press.

Troia, G. A. (2013). Writing instruction within a response-to-intervention framework: Prospects and challenges for elementary and secondary classrooms. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), Best Practices in Writing Instruction, 2nd ed. (pp. 403-427). NY: Guilford Press.

Troia, G. A., Lin, S. C. Cohen, S., & Monroe, B. W. (2011). A year in the writing workshop: Effects of professional development on teachers' writing instruction. Elementary School Journal, 112(1), 155-182.

Troia, G. A., Olinghouse, N. G., Wilson, J., O'Shea, K., Mo, Y., Hawkins, L., et al. (2012, April). The Common Core writing standards and state adoptions: Are we moving in the right direction. In C. F. Vanover (Chair), The question of coherence: Perspectives on curriculum coordination and alignment. American Educational Research Association, Vancouver, BC, Canada.

Tseng, M. H., & Chow, S. M. K. (2000). Perceptual-Motor Function of school-age children with slow handwriting speed. American Journal of Occupational Therapy, 54(1), 83-88.

Tseng, M. H., & Murray, M. A. (1994). Differences in perceptual-motor measure in children with good and poor handwriting. The Occupational Therapy Journal of Research, 14(1), 19-36.

Tucha, O., Tucha, L., & Lange, K. W. (2008), Graphonomics, automaticity and handwriting assessment. Literacy, 42(3), 145-155.

U.S. Department of Education (USDOE), Office of Educational Technology (2010). Transforming America Education: Learning Powered by Technology. Washington, DC. USDOE.

Vandervelden, M. C., & Siegel, L. S. (1997). Teaching phonological processing skills in early literacy: A developmental approach. Learning Disability Quarterly, 20, 63-81.

Vaughn, S., & Bos, C. S. (2009). Strategies for teaching students with learning and behavior problems (7th ed.). Upper Saddle River, NK: Pearson.

Vaughn, S., Schumm, J. S., & Gordon, J. (1992). Early spelling acquisition: Does writing really beat the computer? Learning Disability Quarterly 15, 223-228.

Vaughn, S., Schumm, J. S., & Gordon, J. (1993). Which motoric condition is most effective for teaching spelling to students with and without learning disabilities? Journal of Learning Disabilities, 26, 191-198.

Van Hoorn, J. F., Maathuis, C., Peters, L., & Hadders-Algra, M. (2010). Handwriting, visuomotor integration, and

Neurological conditions at school age. Developmental Medicine and Child Neurology, 52, 941-947.

Van Waelvelde, H., Hellinckx, T., Peersman, W., & Smits-Engelsman, B, C. M. (2012). SOS: A screening instrument to identify children with handwriting impairments. Physical and Occupational Therapy in Pediatrics 32(3), 306-319.

Vasudevan, L., & Wissman, K. (2011). Out-of-school literacy contexts. In D. & D. Fisher, Handbook of Research on Teaching the English Language Arts, 3rd ed., (pp. 97-103). NY: Routledge.

Volman, M. J., van Schendel, B. M., & Jongmans, M. J. (2006). Handwriting difficulties in primary school children: a search for underlying mechanisms. American Journal of Occupational Therapy, 60, 451-460.

Vygotsky, L. (1978). Mind in society: The development of higher psychological processes. Cambridge: MA: Harvard University Press.

Waber, D. P. (2010). Rethinking learning disabilities: Understanding children who struggle in school. NY: Guildford Press.

Wallen, M., Bonney M. A., & Lennox, L. (1996). The Handwriting speed test. Adelaide: Helios.

Walker, J. R., Blair, K. L., Eyman, D., Hart-Davidson, B., McLeod, M., Grabill, J., Kemp, F., Palmquist, M., Purdy, J. P., Sorapure, M., Tulley, C., & Vitanza, V. J. (2011). Computers and composition 20/20: A conversation piece, or what some very smart people have to say about the future. Computers and Composition, 28, 327-346.

Warner, M. M., Schumaker, J. B., Alley, G. R., & Deshler, D. D. (1980). Learning disabled adolescents in the public schools: Are they different from other low achievers? Exceptional Education Quarterly, 1(2), 27-35.

Wasowicz, J. (2007). What do Spelling Errors Tell Us About Language Knowledge? Learning By Design: Evanston, IL. Manuscript prepared for on-line professional development training, text-based course, http://www.speechpathology.com

Wasowicz, J., Apel, K., Masterson, J. J., & Whitney, A. (2004). SPELL-Links to Reading and Writing. Evanston, IL: Learning by Design.

Weintraub, N., Gilmour-Gill, N. & Weiss, P. L. (2010). Relationships between handwriting and keyboarding performance among fast and slow adult keyboarders. American Journal of Occupational Therapy, 64, 123-132.

Weintraub, N., & Graham, S. (1998). Writing legibly and quickly: A study of children's ability to adjust their handwriting to meet common classroom demands. Learning Disabilities Research and Practice, 13, 146-152.

Weintraub, N., & Graham, S. (2000). The contribution of gender, orthographic, finger function, and visual-motor processes to the prediction of handwriting status. The Occupational Therapy Journal of Research, 20(2), 121-140.

Wendling, B. J., & Mather, N. (2009). Essentials of evidence-based academic interventions. Hoboken, NJ: John Wiley and sons.

Westby, C. E. (2012). Developing knowledge and skills for writing. In A. G. Kamhi & H. W. Catts (Eds.), Language and Reading Disabilities, 3rd ed. (pp. 269-296). Upper Saddle River, NJ: Pearson.

Wetzel, K. (1985). Keyboarding skills: Elementary, my dear teacher? The Computing Teacher, 12(9), 15-19.

Wetzel, K. (1996). Speech-recognizing computers: A written-communication tool for students with learning disabilities? Journal of Learning Disabilities, 29(4), 371-380.

Whithaus, C., Harrison, S. B., & Midyette, J. (2008). Keyboarding compared with handwriting on a high-stakes writing assessment: Student choice of composing medium, raters' perceptions, and text quality. Assessing Writing, 13, 4-25.

Wise, B. (2009). Adolescent literacy: The cornerstone of student success. Journal of Adolescent and Adult Literacy, 52(5), 369-375.

Wolter, J.A. (2009). A systematic research review of word study treatment practices for the speech-language pathologist. Evidence-Based Practice Briefs, 3, 43-58.

Wolter, J. A., & Apel, K (2010). Initial acquisition of mental graphemic representations in children with language impairment. Journal of Speech, Language, and Hearing Research, 53, 179-195.

Woodcock, R. (1997). Woodcock Diagnostic Reading Battery. Itasca, IL: Riverside Publishing.

Woodcock, R., McGrew, K., & Mather, N. (2007). Woodcock-Johnson III. Itasca, IL: Riverside.

Wong, B. Y. L. (1994). Instructional parameters promoting transfer of learned strategies in students with learning disabilities. Learning Disability Quarterly, 17, 110-120.

Wong, B. Y. L., & Berninger, V. W. (2004). Cognitive processes of teachers in implementing composition research in elementary, middle, and hight school classrooms. In C. A. Stone, E. R. Silliman, B. J. Ehren & K. Apel (Eds.), Handbook of language and literacy (pp. 600-624). NY: Guilford.

Wong, B. Y. L., Butler, D. L., Ficzere, S. A., & Kuperis, S. (1996). Teaching low achievers and students with learning disabilities to plan, write, and revise opinion essays. Journal of Learning Disabilities, 29, 197-212.

Wright, R. E., & Rosenberg, S. (1993). Knowledge of text coherence and expository writing: A developmental study. Journal of Educational Psychology, 85, 152-158.

Yakey, B., Wilkerson, L., & Throneburg, R. (2006, November). Language-based spelling instruction for children who are hard of hearing. Poster presented at the annual conference of the American Speech, Language, and Hearing Association, Miami, FL.

Yancy, K. B. (2000). Using multiple technologies to teach writing. Educational Leadership, 62, 38-40.

Yancy, K. B. (2009). Writing in the 21st Century. Urbana, IL: National Council of Teachers of English.

Yeh, S. S. (1998). Empowering education: Teaching argumentative writing to cultural minority middle-school students. Research in the Teaching of English, 33(1), 49-83.

Young, K. (2007). Developmental stage theory of spelling: Analysis of consistency across four spelling-related activities. Australian Journal of Language and Literacy, 30, 203-220.

Zeitz, L. E. (2008). A New Look @ Research-Based Keyboarding Instruction [White paper]. Retrieved from http://keyboarding.wordpress.com/tag/keyboarding-instruction/

Zhang, Y. (2000). Technology and the writing skills of students with learning disabilities. Journal of Research on Computing in Education, 32(4), 467-478.

Zimmerman, B. J., & Kitsantas, A. (1999). Acquiring writing revision skill: Shifting from process to outcome self-regulatory goals. Journal of Educational Psychology, 91, 241-250.

Ziviani, J. & Elkins, J. (1984). An evaluation of handwriting performance. Educational Review, 36, 249-261.

Ziviani, J. & Watson-Will, A. (1998). Writing speed and legibility of 7-14 year old school students using modern cursive script. Australian Occupational Therapy Journal, 45, 59-64.

APPENDIX

Directions for Printing the Appendices

The instructions and materials that you will need to administer the DeCoste Writing Protocol are all located in the Appendices to make it easier for you to print. Once printed, you can store them in an accordion folder or notebook.

Materials	Directions
Writing Protocol: Background Information	• Print and make multiple copies
Writing Protocol Data Form	• Print and make multiple copies
Evaluator Instructions For Administering The DeCoste Writing Protocol	• Print one copy per examiner
Likert Graphic	• Print one copy (preferably in color) and laminate for reuse
Sentences for Best and Fast Sentence Copying Tasks	• Print one copy of the table matching sentences to grade level • Print and cut sentence strips
Sentences to be Dictated	• Print one copy of the sentences with graded core words
Spelling Word Lists	• Print one copy
Topics for the Extended Writing Task	• Print one copy • Print and cut prompts
Extended Writing Graphic Organizer	• Print and make multiple copies
6 + 1 Traits ©	Download the latest version of 6 + 1 Traits using the link provided in the appendices. Make 1 copy per examiner.
Common Core Standards for English Language Arts: Writing Standards 1-10 for each grade Common Core Standards for English Language Arts: Language Standards 1-3	Using the website link provided in the appendices. Make 1 copy per examiner. If your district is not using Common Core Standards, be sure to have a copy of your district's grade level writing standards

EVALUATOR INSTRUCTIONS FOR ADMINISTERING THE DECOSTE WRITING PROTOCOL

The following section details the four part process for documenting the lower and higher order skills that contribute to written productivity. This process examines handwriting, keyboarding, spelling and composition.

Figure 2.12. Using Handwriting

	Examiner	To Student
1	In a quiet space, arrange materials, e.g., timer, pencil (no eraser) or pen, paper, instructions, sentences to copy, dictation sentences, spelling word lists, extended writing prompts, graphic organizer, and scoring sheets.	
2	Tell the student:	"Today we're going to find out about the ways that you write best. First you're going to do some handwriting and keyboarding tasks, then some spelling and writing tasks."
3	Be prepared to note the following: Pencil grip, posture, attitude, frustration, refusals, anxiety, persistence, self-monitoring strategies, background knowledge and overall engagement.	
4	**Timed Alphabet Writing:** The timed alphabet writing task is recognized as a valid measure of orthographic-motor integration. Instruct the student to use lower case letters to write the alphabet. The student is encouraged to <u>not</u> spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keep writing. Start timing the task once the student begins to write the first letter. Tell the student to stop at the 1-minute mark. In cases where the student completes the task in less than one minute, the student is instructed to write the alphabet again until you've reached one minute.	Write the letters of the alphabet in the correct order until I say "stop". Use lower case letters. If you get to the end of the alphabet, just start again until I say "stop". "If you make a mistake, just cross it out and keep going."

	Examiner	To Student
	Count the number of discernible, correctly sequenced letters produced in one minute. For example, in the sequence 'abcdfeghi' , the 'e' would not count. In the sequence 'adcbefgh', the 'd' and 'b' would not count. No penalty for missing letters. Record the number of letters written in one minute.	
5	**Best Sentence copying:** Select the sentence to be copied based on the student's grade level (Appendix). For an older student with moderate cognitive impairments, you may want to select the sentence based on reading level. The student is instructed to copy the sentence using his or her best handwriting. The student is encouraged to not spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keep writing. Start timing when the student begins to handwrite. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the fully copied sentence, you can allow the student to finish the task, but do not count those letters. In cases where the student completes the copying task in less than 1-minute, the student is instructed to begin the task again. **Scoring:** Count all discernible letters even if poorly formed for the one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute.	"Keep writing this sentence using your best handwriting until I say "stop". If you get to the end of the sentence, then write the sentence again until I say 'stop'. " "If you make a mistake, just cross it out and keep going." "Stop writing now."
6	**Dictation Sentence Writing:** Select a dictation sentence that would be typical for the grade-level of the student (Appendix). The sentence should not be too difficult for the student, but should also include some words that provide a reasonable spelling challenge.	"Now I want you to write a sentence that I will read to you. Do your best to write each word in the sentence. "If you make a mistake, just cross it out and keep going."
	Read the dictation sentences to the student. Then speak each word of the sentence carefully one word at a time, keeping pace with the student's handwriting. When he or she has completed a word, supply the next word in the sentence.	"First listen to the full sentence." [Read the dictation sentence]

	Examiner	To Student
6	Do not provide a visual model of the sentence. Do not stretch or over articulate words such that the word is phonetically disassembled. The student is encouraged not to spend time erasing (you may want to use a pencil without an eraser), and instead, cross out errors and keeps writing. Start timing once the student begins to write the first letter of the first word. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the complete dictation sentence, you can allow the student to finish the task, but do not count these letters. In cases where the student completes the dictation task in less than 1-minute, repeat the sentence until you've reached one minute. **Scoring** Count all discernible letters even if poorly formed that were written in the one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute.	"Now you can write each word I say in the sentence." [Say the first word in the dictation sentence]
7	**Fast Sentence Copying:** Select a different sentence to be copied at the student's grade level (Appendix). For older students with moderate cognitive impairments, you may want to select the sentence based on reading level. Instruct the student to write the sentence as quickly as possible without making mistakes. Start timing when the student begins to handwrite. Stop timing at the 1-minute mark and note the last letter in the word that was written. If you want to see the fully copied sentence, you can allow the student to finish the task, but do not count these letters. In cases where the student completes the dictation task in less than 1-minute, the student is instructed to copy the sentence again until you've reached one minute.	"Write this sentence as quickly as you can without making mistakes, but make sure I can read each word. If you finish the sentence, just start again, until I say 'stop'." "If you make a mistake, just cross it out and keep going." "Stop writing now."

	Examiner	To Student
7	**Scoring:** Count all discernible letters even if poorly formed that were written in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written in one minute.	
8	**Composed Text:** Casually engage the student in a conversation that is of interest to the student. After 1 to 2 minutes, ask the student to write about what was discussed. Do not visually or verbally model sentences for the student. Encourage the student to write as many sentences as he or she can. Start timing when the student begins to handwrite. Note the last letter in the word that was written at one-minute intervals until the student has completed the task. **Scoring:** Count all discernible letters even if poorly formed. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters written for each one full minute interval.	"Write some sentences about what we just talked about." "What else can you write about?"
9	**Likert Scale** Use the Likert graphic to ask the student how he/she likes to write by hand. Be sure the student is not responding to the content of each task, but to the use of handwriting.	"Tell me how you feel about handwriting?"

Using Keyboarding

	Examiner	To Student
1	Using the keyboard that is most often used by the student in the classroom (e.g., computer keyboard, portable word processor, tablet). Open a word processing document. Save the file with the student's name and date. (keyboard_smith_9_16_14)	
2	Tell the student:	"Now we're going to find out about the ways that you use a keyboard best."
3	Be prepared to note the following: Style of keyboarding (use of one or two hands, fingering, use of vision), comfort level with computer functions, attitude, frustration, refusals, anxiety, persistence, self-monitoring strategies, and overall engagement.	
4	**Timed Alphabet Writing:** Instruct the student to type the alphabet in the correct order. Start timing the task once the student begins to type the first letter. Tell the student to stop at the one-minute mark. In cases where the student completes the task in less than one minute, the student is instructed to write the alphabet again until you've reached one minute. **Scoring:** Count the number of correctly sequenced letters. No penalty for missing letters. For example, in the sequence abcdfeghi' , the 'e' would not count. In the sequence 'adcbefgh', the 'd' and 'b' would not count. Record the number of letters typed in one minute. Save the file.	"Type the letters of the alphabet in the correct order until I say "stop". Use lower case letters. If you get to the end of the alphabet, just start again until I say "stop". "Stop writing now."
5	**Best Sentence Copying:** Use the sentence that was used for "best copying" when handwriting. Start timing when the student begins to type. Stop timing at the 1-minute mark and note the last letter in the word that was typed. You can allow the student to finish the sentence, but do not count those letters. In cases where the student completes the task in less than one minute, the student is instructed to type the alphabet again until you've reached one minute.	"Keep typing this sentence using your best keyboarding until I say "stop". If you get to the end of the sentence, then type the sentence again until I say 'stop'. "

	Examiner	To Student
5	**Scoring:** Count all letters typed. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed in one minute. Save the file.	"Stop typing now."
6	**Dictation Sentence Writing:** Use the same dictation sentence that was used when handwriting. The sentence should not be too difficult for the student, but should also include some words that provide a reasonable spelling challenge. When using a word processor, turn off auto correct and the spell checker, or instruct the student not to use the spell checker. Read the dictation sentence to the student. Then speak each word of the sentence carefully one word at a time, keeping pace with the student's typing. When he or she has completed a word, supply the next word in the sentence. Do not provide a visual model of the sentence. Do not stretch or over articulate words such that the word is phonetically disassembled. Start timing once the student begins to type the first letter of the first word. Stop timing at the one-minute mark and note the last letter in the word that was written. You can allow the student to finish the sentence, but do not count these letters. In cases where the student completes the dictation task in less than one-minute, repeat the sentence until you've reached one minute. **Scoring:** Count all the letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed in one minute. Save the file	"Now I want you to write a sentence that I will read to you. Do your best to write each word in the sentence. Do not use the spell checker." First listen to the full sentence. [Read the dictation sentence] "Now you can type each word I say in the sentence." [Say the first word in the dictation sentence]
7	**Fast Sentence Copying:** Use the sentence that was used for "fast copying" when handwriting. Instruct the student to type the sentence as quickly as possible without making mistakes.	Type this sentence again as quickly as you can without making mistakes. If you finish the sentence, just start again, until I say 'stop'." "Stop typing now."

	Examiner	To Student
7	Start timing when the student begins to type the first letter. Stop timing at the one-minute mark and note the last letter in the word that was typed. You can allow the student to finish the task, but do not count these letters. In cases where the student completes the fast copying task in less than one-minute, the student is instructed to copy the sentence again until you've reached one minute. **Scoring:** Record the number of letters typed in one minute. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Save the file.	
8	**Composed Text:** Casually engage the student in a new conversation that is of interest to the student. After 1 to 2 minutes, ask the student to write some sentences about what was discussed. Do not visually or verbally model sentences for the student. Start timing when the student begins to type the first letter. Encourage the student to write as many sentences as he or she can. Note the last letter in the word that was written at each one-minute interval. **Scoring:** Count all letters typed within each one-minute interval. Do not count spaces or punctuation marks, nor penalize the student for omitted or incorrect letters. Record the number of letters typed for each one full minute interval. Save the file.	"Write some sentences about what we just talked about." "What else can you write about?"
9	Use the Likert graphic to ask the student how he/she likes to write using a keyboard. Be sure the student is not responding to the content of each task, but to the use of a keyboard.	"Tell me how you feel about writing using a keyboard."

Using the Spelling Word List

1	This is an untimed task. Open a new word processing document. Turn off spell check and autocorrect in the word processing program, or instruct the student to not use right click, nor spell check. Save the file with the student's name and date. (spelling_jones_9_16_14). Using a keyboard and word processing program allows you to gauge the number of words that can be detected by a spell checker once the student has completed the task. If the student is unfamiliar with the keyboard, the student can handwrite the spelling words. Hold the list of spelling words in a way that the student cannot see the words. Use the words at the grade appropriate level.	
2	Tell the student:	"Now you will type some spelling words." I'll say each word out loud for you to type."
3	Say the targeted spelling word clearly. Then use the word in the context of a sentence. Then say the word again. Save the file. Scoring: After completing the DeCoste Writing Protocol, analyze the spelling errors using the charts in Figure X. Then copy and paste the student's spelling into a new word processing file. Calculate the percentage of correctly spelled words. You can also determine the percentage of words that could be spell checked using "right click".	[Example: "Their. It was their first trip on an airplane. Their."]
4	Use the Likert graphic to ask the student how he or she feels about spelling.	"Tell me how you feel about spelling."

Using the Extended Writing Task

1	Use the student's mode of writing that is most fluent based on the overall WPM speed obtained in step 1 (handwriting) and step 2 (keyboarding). All things being relatively equal, let the student choose between handwriting or keyboarding. Open a new word processing file. Be sure auto correct is turned off. Save the file with the student's name and date. (writing_jones_9_16_14) Select the appropriate type of writing and writing prompt at the elementary or secondary level (Appendix).	
2	**Extended Writing Task:** Tell the student the writing topic and engage the student in some discussion on the topic. It is important that the student has a sufficient number of ideas to write an extended period. Do not tell the student what to write, but encourage him or her to generate ideas. The student is given about one minute to plan what he or she will write. For students in grades 3 or above, provide them with the graphic organizer to plan his or her writing. (Appendix) Have the student write the title topic in the center. Then the student can begin planning For students in grades 2 or under, students who are reluctant writers or reading below 2nd grade, you can use questions to prompt ideas. You can help the student as needed to transcribe his or her ideas onto the graphic organizer or draw a picture on the graphic organizer to represent the student's idea. Start the timer once the student begins to write the first letter of his or her first word. Prompt the student to keep writing.	"Now you will write on a topic for about 10 minutes. After you finish writing, I'll have you read what you wrote." Your topic is _____. Let's talk about this topic first. What are some of your ideas about this topic?" "What else do you know about this topic?" "Before you start to write, you will have 1 minute to plan what you want to write. Let's write the title here [on the graphic organizer]. Now you can begin planning what you will write." "You can start writing now." "Write more about your topic." "What else can you add?"

Using the Extended Writing Task

	Make a note of the word that was written at the end of each 1-minute interval. You can allow the student to finish his or her sentence, but do not count the words completed beyond 10 minutes. Once the student stops writing for one full minute, end the writing task and have the student read his or her writing. If the student is still writing after nine minutes, give the student one more minute to finish his or her writing Save the file. Have the student read aloud what he or she wrote. The examiner matches the students reading to written words that are unclear in order to appropriately score the writing and spelling. Scoring: To score WPM speeds, count and record the number of words for each one-minute interval, including misspelled words, crossed out words, and partial words. After completing the DeCoste Writing Protocol, count the total number of words written and divide by the number of one-minute intervals to get a mean WPM score. Use the 6 + 1 Writing Traits rubric specified in Appendix to gauge the quality of the students writing abilities. This data combined with data from classroom writing tasks is intended to help identify instructional writing needs. Optionally, you can also examine spelling in the context of generative writing. You can calculate the percentage of misspelled words. You can also analyze linguistic knowledge based on misspellings.	 "You have about 1 more minute to finish your writing." After an additional minute, say, *"You can stop writing now."* *"Now I'd like you to read what you wrote out loud."*
3	Use the Likert graphic to ask the student how he or she feels about writing. Be sure the student is reflecting on writing to express ideas, and not on the topic alone.	"Tell me how you feel about writing."

Using Optional Writing Conditions

You may want to consider writing under different conditions or using different writing modalities. Instructions will vary depending upon the modality or conditions you are exploring. Minimally, you will want to use the Best Copying task and the Composing Text task. Under some conditions (i.e., the text-to-speech and the word prediction task), the Alphabet Writing task in not useful. You can use the Likert scale to ask students how they felt about different methods of writing.

On-Screen Keyboarding

Set up for on-screen keyboarding using a computer or tablet.
Use a variation of the keyboarding instructions, but alter the introductory instructions:
"Now we're going to find out about how you use on-screen keyboarding."

Text-to-Speech with Word Processing

Open the text-to-speech application and check the settings to set basic parameters, or those settings familiar to the student.
Note these settings on you the form you use to record results.
Use a variation of the keyboarding instructions, but alter the introductory instructions to:
"Now we're going to find out whether having the text read aloud as you write is useful to you."

Speech to Text

Open the appropriate software, and check the settings to set basic parameters, or those settings familiar to the student. Note these settings on you the form you use to record results.
Use a variation of the keyboarding instructions. (Skip the Alphabet Writing Task.) Alter the introductory instructions to: **"Now we're going to find out about the ways that you use your voice to write."**

Word Prediction

Open the appropriate software, and check the settings to set basic parameters, or those settings familiar to the student. Note these settings on you the form you use to record results.
Use a variation of the keyboarding instructions. (Skip the Alphabet Writing Task.) Alter the introductory instructions:
"Now we're going to find out about the ways that you use word prediction to help you write."

Overall Response to Writing Modalities

1	Ask the student to state which overall method(s) he or she preferred.	What works best for you when you are writing?" [Handwriting, Keyboarding, other modalities]

Calculating Words Per Minute

Dividing the number of characters by 5 to reach a WPM score is a common formula (Dunn & Reay, 1989; Pisha, 1993; Rogers & Case-Smith, 2002), as the mean written word length in general news publications is five letters.

Writing Protocol Background Information

Student:	Date:
School:	Person completing form:
Identified disabilities:	Reading proficiency level:

	YES	NO
Does the student routinely demonstrate difficulty with written work?		
Is handwriting legible to an unfamiliar reader?		
Is handwritten work completed in the same time frame as peers?		
Has the student received formal keyboarding instruction?		
Is the student able to type using a keyboard similar to that of peers?		
Is the student's spelling ability similar to that of peers?		
Is the student able to compose well-formed sentences independently similar to that of his peers?		
Is the student performing at the grade level on writing standards		

What is the student's primary means of written communication?

___Manuscript ___Cursive ___Keyboarding ____Other:

Check the type of written assignments that the student is able to complete successfully.

___Worksheets ___Short answers ___Multiple paragraphs ___Note taking
___Narrative ___Informative ___Opinion/argument

Does the student receive related services? If so, describe:

Check the type of tools/ accommodations the student uses on a regular basis:

___Word processor ___Spell check ___ Word prediction ___Graphic organizers
___Speech-to-text ___ Extra time ___Scribe ___Other:

Check issues that affect performance on writing tasks?

___motivation ___perseverance ___attention ___non-compliance ___other:

Writing Protocol Data Form

Student Name:	D.O.B.
School:	Grade:
Evaluator:	Date of Assessment

1. Handwriting Assessment **LPM** **WPM**

Alphabet			Notes/Observations:
Best Sentence Copy			
Dictated Sentence			
Fast Sentence Copy			
Composed Text			
Handwriting Likert Rating:	1 2 3 4		

2. Keyboarding Assessment **LPM** **WPM**

Alphabet			Notes/Observations:
Best Sentence Copy			
Dictated Sentence			
Fast Sentence Copy			
Composed Text			
Keyboarding Likert Rating:	1 2 3 4		

Writing Protocol Data Form

3. Spelling World List

Linguistic Analysis of Spelling Errors	**Number of misspellings that may reflect a deficit within each of these five areas**	Notes/Observations:
• Phonological Awareness		
• Orthographic Knowledge		
• Vocabulary Knowledge		
• Morphological Knowledge		
• Mental Graphemic Representation		
Total number of words on the spelling list		
Number of misspelled words that could be corrected using spell check		
Spelling Likert Rating: 1 2 3 4		

4.a. Extended Writing

	Number of Words Per 1-Minute Interval	**Number of Misspelled Words**	**Misspelled Words**	**Linguistic Analysis**
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
	Total # of words: Average WPM:	**Total # of misspellings:**		

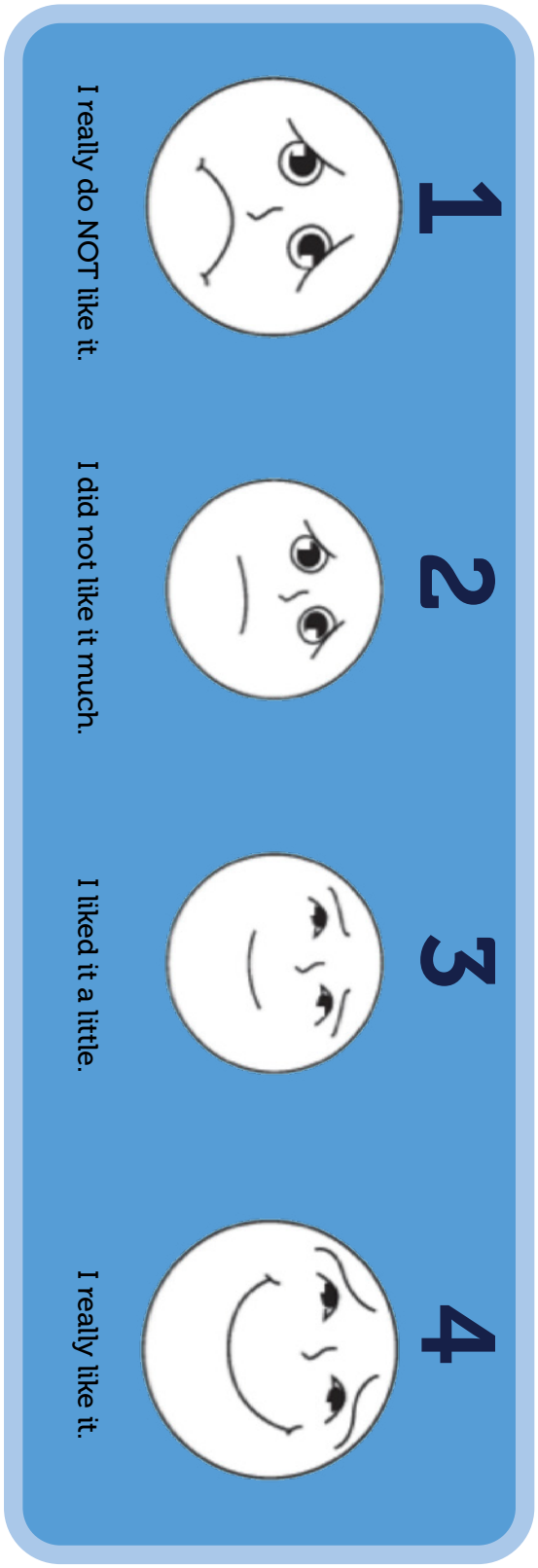
Writing Protocol Data Form

Speech-to-Text	**LPM**	**WPM**	Notes/Observations:
Fast Sentence Copy			
Composed Text			
Likert Rating:	1 2	3 4	

Summary:

Recommendations:

Likert Graphic



Sentences for Best and Fast Sentence Copying Tasks

Sentences for Copying Tasks	Grade Levels
The quick brown fox jumps over the lazy dog. *(33 letters)*	1-3
The five boxing wizards jump quickly. *(31 letters)*	2-4
Six big juicy steaks sizzled in a pan as five workmen left the quarry. *(56 letters)*	3-5
A mad boxer shot a quick, gloved jab to the jaw of his dizzy opponent. *(54 letters)*	5-8
The public was amazed to view the quickness and dexterity of the juggler. *(60 letters)*	6-8
While making deep excavations we found some quaint bronze jewelry. (56 letters)	8-12
No kidding, Lorenzo called off his trip to visit Mexico City just because they told him the conquistadores were extinct. (99 letters)	10-11

Pangrams Source: http://www.rinkworks.com/words/pangrams.shtml

Copying Sentences: Cut into strips

The quick brown fox jumps over the lazy dog.

The five boxing wizards jump quickly.

Six big juicy steaks sizzled in a pan as five workmen left the quarry.

A mad boxer shot a quick, gloved jab to the jaw of his dizzy opponent.

The public was amazed to view the quickness and dexterity of the juggler.

Copying Sentences: Cut into strips

While making deep excavations we found some quaint bronze jewelry.

No kidding, Lorenzo called off his trip to visit Mexico City just because they told him the conquistadores were extinct.

SENTENCES TO BE DICTATED

Grades K-2 Dictation Sentences

Words	Pre	Grade 1	Grade 2

1. My dog is black and white. (6 words -- Pre: 3, G1: 3)

2. She is my best friend. (5 words -- Pre: 2, G1: 3)

3. I ran all the way up the hill. (8 words -- Pre: 4, G1: 4)

4. All that running made me tired. (6 words -- Pre: 1, G1: 4; G2: 1)

5. She went to buy new shoes at the store. (9 words -- Pre: 3, G1: 6)

6. Her old shoes are too small. (6 words -- G1: 5, G2: 1)

7. The boy got up late this morning. (7 words -- Pre: 3, G1: 3, G2: 1)

8. He was almost late for school. (6 words -- Pre: 2, G1: 2, G2: 2)

9. I have the best teacher in the school. (8 words -- Pre: 5, G1: 2, G2: 1)

10. We read and write every day. (6 words -- Pre: 2, G1: 3, G2: 1)

Grades 3-5 Dictation Sentences

Words	Grade 3	Grade 4	Grade 5

1. The talented acrobats amazed the crowd with their exciting and dangerous leaps and flips through flaming hoops. (17 words – G3: 4, G4: 3, G5: 2)

2. Observers were astonished when the magician appeared to make a volunteer from the audience vanish into thin air. (19 words – G3: 3, G4: 2, G5: 3)

3. The English soldiers could not avoid defeat and capture once they ran out of ammunition following a heated battle. (19 words – G3: 2, G4: 4, G5: 2)

4. The tourists flung their coins into the ancient fountain hoping their dreams of travel and adventure might come true. (20 words – G3: 3, G4: 2, G5: 3)

5. The early astronauts are considered to be the first pioneers to explore the mysterious spaces beyond the atmosphere of Earth. (20 words – G3: 2, G4: 4, G5: 2)

Grades 6-8 Dictation Sentences

Words	Grade 6	Grade 7	Grade 8

1. Her enthusiastic attitude and professional appearance made the job applicant an attractive candidate for the job. (16 words – G6: 4, G7: 1, G8: 1)

2. It was the distinct misfortune of high seas travelers to stumble across the path of the notorious and violent pirate, Captain Cook. (22 words – G6: 2, G7: 1, G8: 1)

3. The exploration and protection of the artifacts left behind by primitive civilizations is an interesting and admirable profession. (18 words – G6: 4, G7: 1, G8: 1)

4. My favorite actress recently received recognition for her outstanding performance as a loving and resourceful single mother. (17 words – G6: 3, G7: 1, G8: 1)

5. The surgeon gazed with amazement at the bravery and determination his patient displayed while learning to walk using his new artificial leg. (22 words – G6: 4, G7: 1, G8: 1)

Grade 9-12 Dictation Sentences

Words	Grade 9	Grade 10	Grade 11	Grade 12

1. All Olympic gymnasts must incorporate a number of compulsory moves in their gymnastic routines. (14 words; 2 derivational, 1 Grade 9, 1 Grade 10)
2. Air pollution and global warming are only two of the possible consequences of our dependence on fossil fuels. (18 words; 2 derivational, 1 Grade 10)
3. The composition of the rock layer includes mineral and organic sediments that predate the time of the dinosaurs. (18 words; 2 derivational, 2 Grade 10)
4. Teens with an addiction to video gaming become so immersed in their games that have very little social interaction with friends and family. (23 words; 2 Grade 11 that are also derivational)
5. The usual drugs and treatments were mostly ineffectual against the highly infectious disease sweeping across the country. (17 words; 2 Grade 12 words that are also derivational)

Spelling Word List

Mentioned on Page 175

Primary Grade (K-2) Spelling Words	Upper Elementary (3-5) Spelling Words	Middle and High School Spelling Words
hen	fruit	trounce
jog	place	enough
was	city	distinct
thing	knife	whistling
choke	flavor	appealing
raid	bottle	statue
call	grudge	misheard
where	caught	spectator
truck	their	criticize
switch	climbed	changeable
bushes	calves	reinforcement
shopping	squinting	indefinite
cries	voyage	edition
biked	measure	chlorinated
said	misspell	irreversible
	guilty	predetermination
	friendliest	permissibility
	magician	disciplinary
	majority	commercialism
	continuous	expeditious

See the section on "Error Analysis Using Spelling Word Lists" to understand a student's current linguistic knowledge as reflected by spelling abilities using the above word lists. Page 86 (that's where they can find Error Analysis Using Spelling Word Lists)

Topics for the Extended Writing Task

Elementary		
Type of Writing:	**Topic Titles**	**Prompt**
Narrative	My life at home	Tell about an important event that happened to you at home.
	My life at school	Tell about an important event that happened to you at school.
	My community	Tell about an important event that happened to you out in your community.
Opinion	Should kids have chores?	Provide facts and reasons to support your opinion on this topic
	Should kids have homework?	Provide facts and reasons to support your opinion on this topic
	Should kids have recess everyday at school?	Provide facts and reasons to support your opinion on this topic
Informative	All about sports or hobbies	Describe a sport or hobby that you know a great deal about. Provide facts, definitions, and details that would help someone new to this sport or hobby learn more about it.
	All about animals	Describe an animal that you know a great deal about. Provide facts, definitions, and details that would help someone who is not an expert with the animal learn more about it.
	All about a special place	Describe a place or location that you know a great deal about. Provide facts, definitions, and details that would help someone who has never visited this location learn more about it.

Middle and High School Grades		
Type of writing:	**Topic Titles**	**Prompt**
Narrative	A perfect day	Describe your perfect day. Include well-chosen details that help describe the events of the day and why it was so perfect.
	My worst day	Describe your worst day. Include well-chosen details that help describe the events of the day and why it was so awful.
	A day in the life	Describe a day in the life of your pet (or someone else's). Include well-chosen details that help describe the events of the day from the animals' perspective.
Argument	Dress codes	Do you believe that schools should have a dress code? Why or why not? Provide facts and reasons to support your stand on this.
	Snacks at school	Do you believe that schools should sell sodas and sugary snacks at lunch or after school? Why or why not? Provide facts and reasons to support your stand on this.
	Mobile phones at school	Should students be able to use mobile phones in school? Why or why not? Provide facts and reasons that support your stand on this.
Informative	School activities	A new student has come to your school. Describe the types of extra-curricular activities that they can get involved in. Provide facts and details that would help them choose some clubs or groups to join.
	A pet for the family	Your family wants to get a pet. Describe some options for pets that they might want to consider. Provide facts and details that will help them choose one.
	My town	Your hometown is being featured in a magazine. Describe your town to the magazine editors. Provide facts and details that will allow them to learn about your town before they come to visit it.

Elementary Extended Writing Prompts: Cut in strips

N

My life at home

Tell about an important event that happened to you at home.

N

My life at school

Tell about an important event that happened to you at school.

N

My community

Tell about an important event that happened to you out in your community.

O

Should kids have chores?

Provide facts and reasons to support your opinion on this topic.

O

Should kids have homework?

Provide facts and reasons to support your opinion on this topic.

Elementary Extended Writing Prompts: Cut in strips

O

Should kids have recess everyday at school?

Provide facts and reasons to support your opinion on this topic.

I

All about sports or hobbies

Describe a sport or hobby that you know a great deal about. Provide facts, definitions, and details that would help someone new to this sport or hobby learn more about it.

I

All about animals

Describe an animal that you know a great deal about. Provide facts, definitions, and details that would help someone who is not an expert with the animal learn more about it.

I

All about a special place

Describe a place or location that you know a great deal about. Provide facts, definitions, and details that would help someone who has never visited this location learn more about it.

Secondary Extended Writing Prompts: Cut in strips

N

A perfect day

Describe your perfect day. Include well-chosen details that help describe the events of the day and why it was so perfect.

N

My worst day

Describe your worst day. Include well-chosen details that help describe the events of the day and why it was so awful.

N

A day in the life

Describe a day in the life of your pet (or someone else's). Include well-chosen details that help describe the events of the day from the animals' perspective.

Secondary Extended Writing Prompts: Cut in strips

A

Dress codes

Do you believe that schools should have a dress code? Why or why not? Provide facts and reasons to support your stand on this.

A

Snacks at school

Do you believe that schools should sell sodas and sugary snacks at lunch or after school? Why or why not? Provide facts and reasons to support your stand on this.

A

Mobile phones at school

Should students be able to use mobile phones in school? Why or why not? Provide facts and reasons that support your stand on this.

Secondary Extended Writing Prompts: Cut in strips

I

School activities

A new student has come to your school. Describe the types of extra-curricular activities that they can get involved in. Provide facts and details that would help them choose some clubs or groups to join.

I

A pet for the family

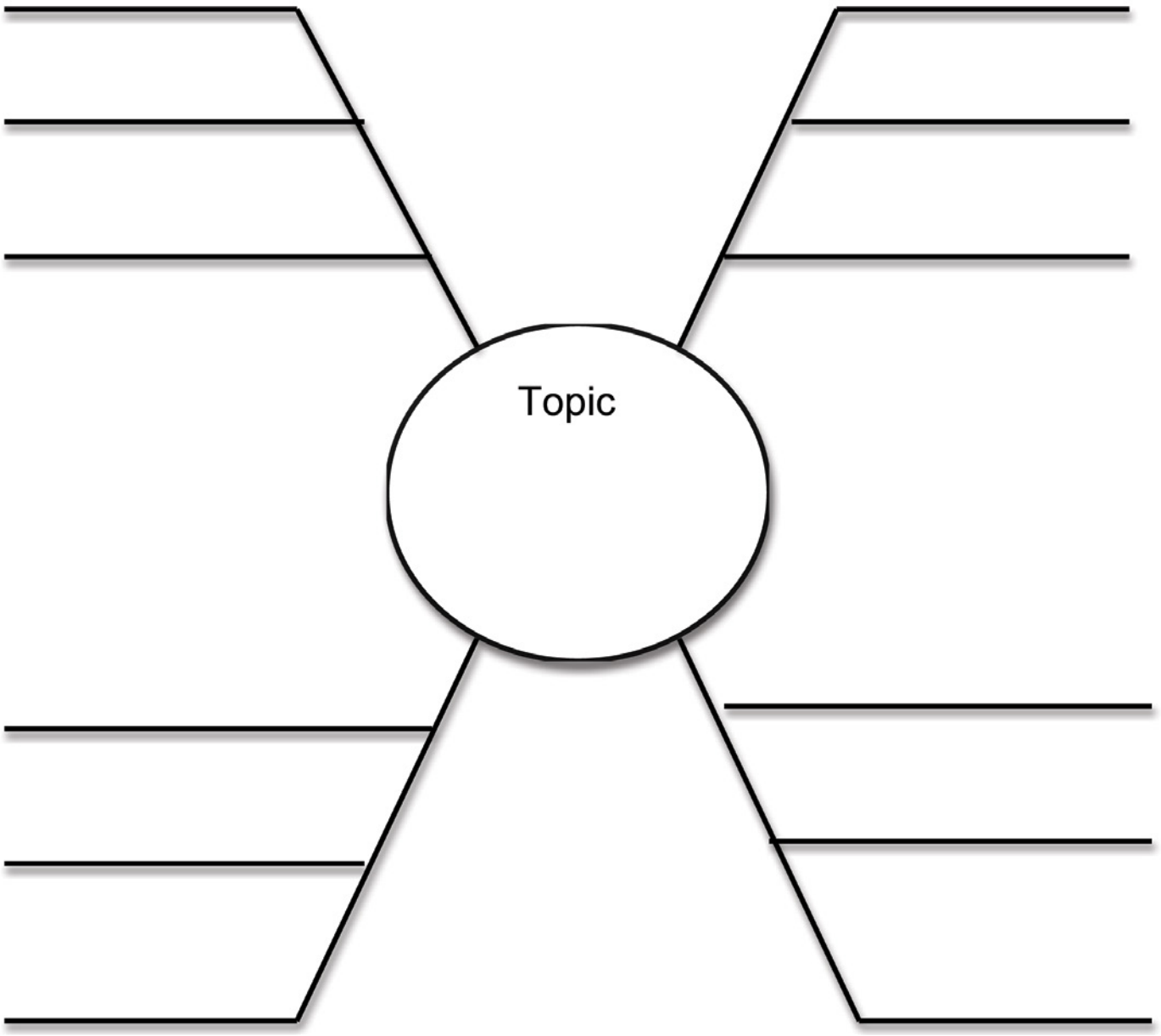
Your family wants to get a pet. Describe some options for pets that they might want to consider. Provide facts and details that will help them choose one.

I

My town

Your hometown is being featured in a magazine. Describe your town to the magazine editors. Provide facts and details that will allow them to learn about your town before they come to visit it.

Extended Writing Graphic Organizer



6 + 1 Writing Traits Rubric

The latest edition of the 6 + 1 Traits Rubric for grades can be downloaded from the Education Northwest website at:

http://educationnorthwest.org/traits/traits-rubrics

You may need to register first for this free resource.
Download the rubric for:

- Grades 3-12
- Grades K-2

For scoring information and practice using the writing traits rubric, and to view scored examples at selected grade levels, refer to the Education Northwest website at:
http://educationnorthwest.org/traits/61-trait-writing-scoring-practice

For information on how the Common Core State Standards intersect with 6 + 1 Writing Traits, refer to:
http://educationnorthwest.org/traits/traits-and-common-core

Download the Common Core State Standards for English Language Arts

The Common Core State Standards for English language arts are available at http://www.corestandards.org/ELA-Literacy/

It is recommended that you be familiar with:

- The 10 Writing Standards
- Language Standards 1 to 3

Download The Writing Traits Rubric: Grades 3-12

The latest edition of the 6 + 1 Traits rubric for grades 3-12 can be downloaded from the Education Northwest website at http://educationnorthwest.org//traits/scoring

Download The Writing Traits Rubric: Grades K-2

The latest edition of the 5-Point Beginning Writer's Rubric for K-2, which can be found at http://educationnorthwest.org/resource/464

For scoring information and practice using the writing traits rubric, and to view scored examples at selected grade levels, refer to the Education Northwest website at http://educationnorthwest.org//traits/scoring

For information on how the Common Core State Standards intersect with 6 + 1 Writing Traits, refer to http://educationnorthwest.org/traits/ccss

DON·JOHNSTON
Human Learning Tools

26799 W. Commerce Drive Volo, IL 60073
800.999.4660 FAX 847.740.7326

donjohnston.com