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The Impact of Executive Function Skills on Writing: A Comparison of Fifth-Grade
Students with Learning Disabilities and Students with Typical Development

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Abstract

This study explored the relationship between verbal fluency skills and writing skills in developing writers. There were three research questions addressed: 1) Was there a difference between fifth-grade students who have a learning disability (LD) in written language and fifth-grade students with typical development (TD) on the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001) Verbal Fluency Tests (letter fluency, category fluency, category switching number correct, category switching accuracy)? 2) Was there a relationship between scores on the D-KEFS Verbal Fluency Tests and the composite writing score on the State Proficiency Examination Program (SPEP) Fifth-Grade Writing Assessment 3) Do reading level and verbal fluency executive function skills predict the composite writing score on the SPEP Fifth-Grade Writing Assessment? Results showed that students with TD scored higher on the D-KEFS Verbal Fluency Tests than students with LD. For students with LD, letter fluency and category switching accuracy tests were significantly correlated with the composite writing score on the SPEP Fifth-Grade Writing Assessment. For students with TD, there were no statistically significant correlations between the D-KEFS tests and the composite writing score on the SPEP Fifth-Grade Writing Assessment. For students with LD, reading and the verbal fluency executive function skills predicted the composite writing score on the SPEP Fifth-Grade Writing Assessment.

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CHAPTER I

INTRODUCTION

Graham and Harris (2003) overheard two children exchanging a joke about the difficulties of writing. Student one, pretending to be a teacher, asked student two, “Why is it that everyone else has a five-page report and your paper is only one-page long?” Student two replied, “I was writing about condensed milk.” The “joke” in fact describes the difficulty students with disabilities have with writing. That is, what they write and how they write is condensed (Graham & Harris, 2003).

Over 5 million children ages 6 through 21 years receive special education and related services each year in the United States (National Dissemination Center for Children with Disabilities, 2007). Children are eligible for services when they meet the eligibility criteria for one of 13 disability categories specified by the federal law guiding special education services, the Individuals with Disabilities Education Improvement Act (IDEIA, 2004). According to IDEIA, the 13 categories are autism, deafness, deaf-blindness, hearing impairment, mental retardation, multiple disabilities, orthopedic impairment, other health impairment, serious emotional disturbance, specific learning disability, speech or language impairment, traumatic brain injury, and visual impairment, including blindness. The majority of children who receive special education services are eligible under the specific learning disability (SLD) category. The National Institutes of Health have reported that 15% of the United States (U.S.) population, or one in seven Americans, has some type of learning disability. Difficulty with basic reading and language skills is the most common learning disability (LD Online: *Facts about learning disabilities*).

Definition of Specific Learning Disability

The federal definition of specific learning disability (SLD) was initially put forth in 1975 when PL 94-172, the Education for All Handicapped Children Act (EHA), was signed into law. There have been a number of reauthorizations of EHA, and the 1990 amendments to the law retroactively changed the name to Individuals with Disabilities Education Act (IDEA). Through all of the reauthorizations of IDEA, the federal definition of SLD has remained the same. The most recent revision, IDEIA 2004, continues to define SLD in Title 20 U.S. Code Section 1401(3) [cited as 20 USC 1401(30)] as the following:

(30) Specific Learning Disability

(A) In General. The term ‘specific learning disability’ means a disorder in 1 or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think, speak, read, write, spell or do mathematical calculations.

(B) Disorders Included. Such term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

(C) Disorders Not Included. Such term does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage.

Since the term learning disabilities was first introduced by Samuel Kirk in 1963, language comprehension and expression difficulties have always been included as part of the characteristics of LD. In fact, many argue that a language disorder is at the core of learning disabilities (LD Online: *The relationship between language and learning disabilities*). It follows that in the long-standing federal definition of SLD, a child's language skill development, whether spoken or written, can negatively impact his/her learning process and the ability to be successful in the school setting.

Interconnection of Language Skills

The development of language skills is interrelated (Bain, Bailet, & Moats, 2001; Bear, 1991). A language hierarchy developed by Mykelbust (1965) and subsequently modified by Johnson (D. Johnson, personal communication, July 10, 2006) as shown in Figure 1, typifies the interrelationship of all language skills. The arrows are two-directional to indicate that the acquisition of each language skill enhances all language skills, and the interaction among the language skills is reciprocal. For example, good reading ability is influenced by prior literacy experiences (Lyon, 1998). Similarly, in the process approach to writing, teachers ask children to write about their own experiences and what they know (Temple, Nathan, Temple, & Burris, 1993). If a child has had minimal exposure outside the home, there is a lack of underlying experience to be able to put words on paper to describe those experiences. Likewise, if a child has not been exposed to poetry, the child will be unable to produce a poem. A child who does not recognize what sound "th" represents will not be able to correctly spell words such as thunder and thick (Moats, 2006). Johnson (1993) noted that if children have difficulty understanding spoken words, grammatical relationships, temporal concepts (e.g., later),

spatial concepts (e.g., above), and relational words (e.g., likewise, however), their writing may lack cohesion, contain limited vocabulary, include misuse of words they do not understand, and have errors with prefixes, suffixes, and word endings. Moreover, with the reciprocity of all language skills in the hierarchy, good writers have stated that writing has improved their thinking skills (Johnson, 1982).

In evolutionary terms, reading and writing are relatively recent achievements for human beings, since writing was invented between 5,000 and 10,000 years ago (Feifer & De Fina, 2000; Moats, 2006). Consequently, human brains are not as fully evolved for processing of written language (reading and writing) as they are for processing oral language. As a result, learning to read and write are far more challenging than learning to speak (Moats). Thus, similar to reading, written language is at the top, as can be seen in the hierarchical sequence in Figure 1, which suggests that it requires acquisition and success with all of the preceding skills. Furthermore, all of the language skills in the hierarchy underlie written language (D. Johnson, personal communication, July 10, 2006).

Throughout school, reading and writing are interconnected (Catts & Kamhi, 2005; Lerner, 1997). For example, young children are asked to read what they have written, and high school students read to decide what to write and then to write to demonstrate their knowledge (Catts & Kamhi). Since writing requires the attainment of the preceding language skills for success, as demonstrated in Figure 1, it then follows that students who have difficulty reading will have difficulty with all academic skills, including writing (Levine & Reed, 1999; Salvia & Ysseldyke, 1988). Failure to read will undermine the ability to write (Moats, 2006). Furthermore, the majority of students with reading

disabilities also demonstrate difficulties with writing skills (Catts & Kamhi). Thus, difficulty in reading appears to hinder a child's ability to write.

The Importance of Reading

As demonstrated in Figure 1 and described above, reading and writing are interrelated skills that are subsumed under the category of language skills. Figure 2 further demonstrates that language skills encompass a wide variety of skills (D. Johnson, personal communication, July 10, 2006). For example, a language skill that is auditory (information taken in through one's ears) and receptive (understanding information) is categorized as listening comprehension; a language skill that is auditory and expressive (oral use of language) is considered oral expression; a language skill that is visual (information taken in through one's eyes) and receptive is defined as reading; and a language skill that is visual and expressive is labeled written expression.

Modality	Receptive	Expressive
Auditory	Listening Comprehension	Oral Expression
Visual	Reading	Written Expression

Figure 2. Language modality key.

In classrooms today, there is an emphasis on the importance of early acquisition of reading skills, as the benefits of knowing how to read have been well documented in the research literature. Studies have shown that children who have early reading problems often become less motivated to read, develop lower expectations of their abilities, and gain less practice reading than do good readers. Consequently, they may fall farther behind their peers in reading and academic achievement (Catts, 1997). Stanovich (1986)

has described this as the “Matthew effects” after the Gospel according to Matthew: “For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath” (XXV: 29). Stanovich noted that the children who read well and have good vocabularies will in turn read more, learn more word meanings, and hence read even better. Children with poor vocabularies and who read slowly and less often will have slower development of vocabulary knowledge that inhibits vocabulary growth. The Matthew effects indicate that “the rich get richer” and the “poor get poorer.”

The Matthew effects are further described in a research study that indicated that when a child in the early elementary school years is not able to read well, it is difficult for that child to “catch up” to peers (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996). The longitudinal study highlighted the development of reading in kindergarten through ninth grade, and showed that 74% of children in the third grade who were poor readers remained poor readers in ninth grade. Remaining poor readers through school will have a deleterious effect on a child’s ability to learn. Children who have difficulty reading may lose self-confidence and the ability to be successful, and, as a result, can become passive learners because of repeated experiences with failure. Over time, repeated experiences with failure generate increased negative attitudes, beliefs, and expectations (Webre, 2005).

Learning to read is not only important for school success but also beneficial to a child’s overall well being. A child who is unable to read will not only have great difficulties in school but also be at risk for being non-productive outside of school (Lyon, 1998). Webre (2005) pointed out that reading skills contribute to a child’s self-confidence

and motivation to learn. In addition, students with poor reading skills not only have greater high school drop-out rates than students without reading difficulties but also exhibit significantly more suicidal ideation and suicide attempts than peers with typical reading abilities (Daniel, Walsh, Goldston, Arnold, Reboussin, & Wood, 2006).

The Importance of Writing

Writing has been defined as a type of communication (Catts & Kamhi, 2005). Nystrand (1989) viewed writing as a social interactive process that is fundamentally an interaction of the minds of the writer and reader. Writing is also described as a learning tool. That is, by writing about a topic, one comes to understand the topic in a different or deeper way (Bereiter & Scardamalia, 1987). When students learn to write, especially in the expository and argument (persuasion) genres, they acquire new avenues of making meaning of what they have learned (Catts & Kamhi). Teachers should therefore be aware that not only is reading an important skill for school success, but writing, as well, is a critical skill necessary for school success.

There are numerous ways in which the practice of writing benefits students. For example, Johnson noted that teachers should never have a reading lesson without a writing lesson because writing makes children more analytic (D. Johnson, personal communication, July 12, 2006). Furthermore, writing can put one in touch with one's own thoughts by writing in personal journals and diaries and is a means to demonstrate creativity such as with stories or narratives. Also, writing is a method to share information or explain something like how to ride a horse or clarify why one likes to swim (Temple et al., 1993). Graves (1985) described writing as a communication tool in which people impart information to others and themselves. Graves noted that when

writing his thoughts on paper, he “writes to learn what I know because I don’t know fully what I mean until I order the words on paper” (p. 171). Thus, writing is a tool to clarify, categorize, and expand one’s thoughts. Similarly, in the classroom, writing is a way for students to synthesize (e.g., organize, explore, refine) their ideas about a subject matter as well as demonstrate their knowledge about a particular area in order to achieve mastery (Graham & Harris, 2005).

Writing is Difficult For Students Who Receive Special Education Services

Not only is reading an important skill for students to master, but writing is a crucial skill as well. Writing is a difficult skill for students who have learning disabilities because overall they tend to produce written work that is less polished, contains fewer words per composition, is less expansive, has fewer sentences, and provides a more limited vocabulary than students without learning disabilities (Harris, Graham, & Mason, 2003; Newcomer, Barenbaum, & Nodine, 1989; Vallecorsa & Garriss, 1991). Specifically, students with a learning disability (LD) typically lack important knowledge of the writing process, and generally do little or no planning before starting to write. They usually rely on a composing process in which they generate words to put on paper. The students with LD retrieve from their memory a pertinent idea, write it down, and use each preceding phrase or sentence to stimulate the next idea. Little effort is made to evaluate or revise these ideas or to consider the constraints imposed by the topic, the needs of the audience, or the organization of the text. The resulting composition is generally a list of topic-related ideas rather than a coherent discussion or examination of the topic (Graham & Harris, 2003). Consequently, the planning and composing procedure for students with LD is dominated by an unorganized content generation process, which in turn is

relatively unproductive. Their papers are extremely short and contain little elaboration or detail (Graham, Harris, MacArthur, & Schwartz, 1991). In addition to having difficulty with higher level composing skills of organization, revising, and generating text, children with LD also have difficulty with the lower-level skills of spelling, punctuation, and grammar (Catts & Kamhi, 2005). In summary, students with LD often have significant difficulty with writing skills which is often manifested by writing that is unorganized, minimal in length, and contains spelling, punctuation, and grammar errors.

Writing is Difficult For General Education Students

The research described above has demonstrated that writing is difficult for children with LD. However, written expression is the last linguistic skill to develop in children (Feifer & De Fina, 2002) as exemplified in Figure 1. Writing has also been shown to be difficult for students in the general education population (Catts & Kamhi, 2005; Harris et al., 2003; Hooper & Montgomery, 1993). In a study of 139,000 fourth-grade special education and general education students across the U.S., the National Center for Education Statistics reported in 2002 that only about 28% of fourth graders could write at a proficient level or above, 58% wrote at a basic level, and 14% wrote below the basic level. At the fourth-grade level, only 2% of students were able to write at an advanced level (National Center for Education Statistics).

Writing is a skill that cannot be categorized as “acceptable” or “not acceptable.” Rather, writing abilities continue along a continuum, and difficulties are more a matter of degree than a defined disability (Catts & Kamhi, 2005). Writing is a complex mental process that is viewed as a problem-solving task (Bereiter & Scardamalia, 1987; Hayes & Flower, 1980). All beginning writers, just like beginning readers, tend to be disfluent.

Children in this stage have difficulty putting their thoughts on paper because they are consumed with how to spell words correctly (Bear & Barone, 1998). Children who have a lack of exposure to written language may experience difficulty with writing (Bear & Barone; Moats, 2006; Myklebust, 1965). Most children who enter elementary school are proficient at oral language. However, these same children may take many years before they can approach the same proficiency in writing. As children mature, composition does not get easier. Instead, the children tackle harder problems as they work on more complex levels of composition (Bereiter & Scardamalia). Consequently, written language is a complex task that can be difficult for all children to master.

Definition of Terms

The development of language skills is interrelated (Bain et al., 2001; Bear, 1991), and a deficit in one area, such as reading, may contribute to difficulties in another language area, such as writing (Moats, 2006). In the development of language skills, writing is at the top of the development hierarchy, which indicates that this skill is the most difficult of language skills to achieve (Moats). One of the reasons that writing is a difficult language skill to accomplish is that, in evolutionary terms, human brains are not fully evolved for the processing of written language (reading and writing) as they are for processing oral language (Moats). Consequently, writing has been shown to be difficult not only for children who receive special education services (Harris et al., 2003; Newcomer et al., 1989; Vallecorsa & Garriss, 1991), but also for children in the general education classrooms (Catts & Kamhi, 2005; Harris et al., 2003; Hooper & Montgomery, 1993). The following terms are pertinent to the current study on written language skills of fifth-grade students in a large school district in a western state:

Criterion Referenced Test-Reading: (CRT-Reading): school district-wide reading assessment that is administered to all students in Grades 3 through 8. The reading CRT includes four types of reading passages: literary, informational, functional, and persuasive (only at Grades 6 and 7). The test is in a multiple choice format in which students “bubble in” the correct answer (State Department of Education: *Criterion Referenced Tests*).

Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001) Verbal Fluency Tests: The D-KEFS is composed of three verbal fluency tests:

1. Letter Fluency (LF): The student generates words that begin with a particular letter in three trials of 60 seconds (s) each.

2. Category Fluency (CF): The student generates words that belong to a designated semantic category (e.g., animals) for two trials of 60 s each.

3. Category Switching Condition: The student alternates saying words from two different semantic categories (e.g., fruit, furniture) for one trial of 60 s. Category Switching Number Correct (CS# Corr) indicates the number of correct categories named and Category Switching Accuracy (CS Acc) specifies the number of accurate switches made between categories.

Executive Function Skills: cognitive processes that involve goal-directed activities (Meltzer, 2007).

Hayes and Flower Model of Writing: consists of three recursive processes (Hayes & Flower, 1980):

Planning: Making a plan about the writing assignment

Translating: Putting words on paper

Reviewing: Improve the quality of the written product

Individuals with Disabilities Education Improvement Act, 2004: (IDEIA, 2004):

Federal law regarding special education services for children enrolled in the public school system.

Neuropsychology: a branch of psychology that combines both the medical model and the psychological model of human functioning to examine brain-based relationships (Feifer & De Fina, 2000).

State Proficiency Examination Program (SPEP) Fifth--Grade Writing

Assessment: school district-wide writing assessment that is administered to all fifth-grade students. The SPEP consists of one prompt from narrative, expository, or persuasive genre (State Department of Education: *Writing Assessment*).

Specific Learning Disability (SLD): In general terms, IDEA defines SLD in Title 20 U.S. code Section 1401(3) [cited as 20 USC 1401(30)] as a “disorder in 1 or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think, speak, read, write, spell or do mathematical calculations.”

Verbal Fluency: the “speed and ease of verbal production” (Lezak, Howieson, & Loring, 2004, p. 518).

Written Language: visual-expressive skills (D. Johnson, personal communication, July 10, 2006) that are used as a type of communication tool (Catts & Kamhi, 2005). It is a complex mental process viewed as a problem-solving process (Bereiter & Scardamalia, 1987; Hayes & Flower, 1980).

Summary

Over 5 million children ages 6 through 21 years receive special education and related services each year in the U.S. (National Dissemination Center for Children with Disabilities, 2007). Furthermore, the majority of children who receive special education services are eligible under the LD category. There are different types of learning disabilities, such as a math disability. However, difficulty with basic reading and language skills is the most common learning disability (LD Online: *Facts about Learning Disabilities*).

Research has demonstrated that writing skills are difficult not only for children who have a learning disability (Harris et al., 2003) but also for children who have typical development (Catts & Kamhi, 2005). Consequently, the purpose of this study was to investigate the differences in writing skills between students with a learning disability in written language and students with typical development. More specifically, the intent of this study was to (a) determine if there were differences in the executive function skill of verbal fluency between students in the fifth grade with a learning disability in written language and students in the fifth grade with typical development, (b) examine the relationship between verbal fluency measures and scores on the SPEP Fifth-Grade Writing Assessment, and (c) investigate reading level and verbal fluency executive function skills as predictors of writing scores on the SPEP Fifth-Grade Writing Assessment.

The following chapter will discuss executive function skills generally and then specifically as they apply to written language skills. In addition, the major

neuropsychological models of written language will be presented and will be followed by research on specific interventions to address writing deficits.

CHAPTER II

LITERATURE REVIEW

This chapter will review executive function skills and brain development generally and discuss the specific executive function skills that impact written language. In addition, the major cognitive/neuropsychological models of written language will be explored. There are a number of overlapping constructs common to the theories, including the interdependence of reading and writing skills. Finally, empirical research on writing will be presented together with specific writing strategies that have proven to be successful.

Brain Development and Executive Function Skills

Neuropsychology is a branch of psychology that combines both the medical model and the psychological model of human functioning to examine brain-based relationships. The underlying construct is that the brain is the center of all behavior so that knowledge of cerebral cortical connections and organization will reveal information about the process of cognitive tasks (Feifer & De Fina, 2000). Consequently, neuropsychological research has focused on the neural networks and anatomical circuitry that are involved in cognitive processes, such as memory, attention, language, and so on (Feifer & De Fina, 2002).

Research has indicated that the human brain has been evolving for approximately 5 million years (Feifer & De Fina, 2000), during which the brain has matured to consist of four major lobes, with each lobe having a designated function: occipital (visual processing), temporal (language and memory functions), parietal (sensory and spatial information), and frontal (executive functions; Feifer & De Fina, 2002). The frontal lobes

were the most recent discovery in the human brain and largely separate humans from other species (Feifer & De Fina; Stuss & Benson, 1986). In Luria's 1973 model of neurodevelopmental stages of brain development, the lower level processes, such as motor skills, have developed earlier than higher order processes, such as executive function skills. The prefrontal region of the frontal lobe, which is the anterior part of the frontal lobe and is also called the prefrontal cortex, is where the executive functions primarily occur, and this area accounts for approximately one-fourth of the total mass of the human brain (Feifer & De Fina; Goldberg, 2001; Luria, 1973). The executive functions were among the most significant of human frontal lobe accomplishments (Stuss & Benson). The knowledge that the frontal lobes were responsible for complex forms of behavior began in the late 1800s with research on animals. When the frontal lobes were removed, researchers found that sense, visual, and kinesthetic abilities were intact. However, highly distractible behavior and rational goal-directed behavior were disrupted. Thus, it was hypothesized that the frontal lobes were responsible for the more complex forms of active behavior (Luria).

The distinguishing feature of the prefrontal cortex is that it has an abundant system of neural pathways with virtually all other parts of the brain. This exclusive connectivity makes the frontal lobes solely suited for coordinating and integrating the work of all the other brain structures (Feifer & De Fina, 2000; Goldberg, 2001; Luria, 1973; Stuss & Benson, 1986). Consequently, all of the functions of the prefrontal lobes, that is, executive function skills, are seen as metacognitive in nature instead of cognitive because they do not refer to one particular mental skill like memory, but rather they provide the organization for all the skills (Goldberg). To illustrate the work of the

prefrontal lobes, the executive function skills have been compared to the conductor of an orchestra (Feifer & De Fina, 2000; Goldberg) and a company executive (Hale & Fiorello, 2004). In this way the frontal lobes can be seen as the overseer or manager of the workers that are responsible for the final product. That is, the frontal lobes do not perform the work but instead are responsible for supervising the work being accomplished. Luria (1973) reported that the prefrontal lobes do not begin to become prepared for action until the child is between the ages of 4 and 7 years. However, it is believed that executive functioning skills begin developing at approximately 9 months old and continue to develop through an individual's early forties (Denckla, 2007).

Executive function skills are essentially a domain with many subcomponents like the area of language, which includes auditory, memory, and visual skills (Denckla, 1994). The multiple components of the executive functioning system make it difficult to narrow the definition into a single concept (Borkowski & Burke, 2005). Consequently, researchers do not agree on a universal definition. Nevertheless, there is agreement that executive functioning is an umbrella term for cognitive processes that involve goal-directed activities (Meltzer, 2007). Essentially, executive functioning skills are control or managerial processes that involve reciprocal interaction with other cognitive domains (Denckla, 2005). For example, if one would like to cook a meal, just gathering the ingredients and reading the recipe will not produce a cooked meal. Just as one must take action to complete the cooked meal, executive functions are worthless without reciprocal interaction with other cognitive and motor domains (Denckla, 2007). The following are considered executive function skills in the current neuropsychological major theories: Planning/Organizing, Initiating/Volition, and Inhibiting/Delaying Response (Denckla,

2005; Feifer & De Fina, 2000, 2002; Hale & Fiorello, 2004; Lezak, 1983; Luria, 1973). Additional executive function skills include shifting/flexibility (Feifer & De Fina, 2002; Hale & Fiorello), attention/memory (Barkley, 2005; Luria), monitoring and use of feedback (Stuss & Benson, 1986).

Specific Executive Function Skills That Impact Written Language

Written language is more of an executive function skill than other skills because it requires formulating ideas, organizing the ideas into sentences and paragraphs, using words to convey meaning and link ideas, using graphomotor skills to write and spell words, evaluating the accuracy of the output, and editing as needed (Berninger, 2002; Feifer & De Fina, 2002; Hale & Fiorello, 2004). It is the executive function demands that set written language apart from all other achievement activities because with certainty the development of writing skills depends on high levels of executive functioning skills (Feifer & De Fina, 2002; Hale & Fiorello). Graham, Harris, and Olinghouse (2007) stated that writing entails all of the following characteristics defined in their definition of executive functioning:

Executive functioning involves the conscious, purposeful, and thoughtful activation, orchestration, monitoring, evaluation, and adaptation of strategic resources, knowledge skills, and motivational states to achieve a desired goal. This involves analysis (e.g., sizing up the demands of the situation), decision making and planning (e.g., selecting or devising a plan of action), attentional control (focusing and maintaining attention as well as inhibiting interfering behaviors), coordination of cognitive resources, and flexible application (e.g., adjusting plans and goals to meet changing situations. (p. 217)

The following seven executive function skills demonstrate the significance of the above definition of executive functioning with respect to written language:

1. *Initiating* involves starting a writing task. In this domain, children may have difficulty with generating ideas and maintaining focus.
2. *Sustaining* involves persistence on a particular assignment. In this domain, children may lose track of their thoughts, not complete activities, and write discourse that is disorganized and has poor syntax.
3. *Inhibiting* involves problems with halting a thought on paper. In this domain, children may present as impulsive and distractible. Also, children may add extra letters to words.
4. *Shifting* involves switching from one topic to another in writing. In this domain, children may perseverate on a topic in print and not be able to write on more than one topic area.
5. *Organizing* involves organizing the discourse in the proper format, such as a narrative, expository, or poetic design. In this domain, children may have many erasures on the page and forget the main idea. In addition, the content of the writing may be disjointed and contain inadequate transitions between sentences.
6. *Planning* involves predicting various situations or events. In this domain, children may exhibit poor verbal fluency, inaccurate spacing of words and letters, lack of cohesive ties between sentences, and deficient use of lines on paper when forming words.
7. *Self-monitoring* involves recognizing strengths and weaknesses in writing. In this domain, children may be unaware of incorrect spelling, punctuation, and

grammar. Children may think, contrary to the written product, that the writing is good. Moreover, children may exhibit sloppy handwriting and make careless errors (Feifer & De Fina, 2002).

In a study investigating the effects of the specific executive function skills of initiation, set shifting, sustaining, and inhibition/stopping on written language, Hooper, Swartz, Wakely, de Kruif, and Montgomery (2002) studied the narrative writing skills of 55 fourth- and fifth-grade students. After analyzing two narratives written by each student, the authors divided the students into two groups: poor writers and good writers. The students were then administered tasks tapping the four executive functions skills noted above. The authors reported that executive functions tapping initiation, set shifting, and possibly sustaining significantly separated good writers from poor writers. The researchers further noted that significant differences had small effect sizes, which indicated that there was much more variance to be explained than was accounted for by these executive function domains. These findings suggest that other variables may be at least as important as executive function skills if not more so at this developmental level. The authors argued for additional research in this new domain area.

Major Cognitive/Neuropsychological Models of Written Language

In the following major cognitive/neuropsychological models of written language, the most salient executive function processes are posited with respect to writing.

Hayes and Flower model. With a focus on the higher level cognitive and linguistic processes involved in writing, Hayes and Flower (1980) proposed the most influential theory of cognitive skills involved in composing (Abbott & Berninger, 1993). One of the reasons why the Hayes and Flower model has played a prominent role is that

it provides a workable example that accounts for individual differences in how writers compose (Graham, 2006). This model moved the view of writing from one of sequential processing to a recursive processing model with reciprocal interactions among the processes. The theory was based on research regarding competent adult writers and consists of three major processes: (a) Task environment, which involves everything outside the writer's purview that influences the writing performance, such as the writing assignment and audience; (b) long-term memory, which includes the information the writer has stored in memory about the topic and knowledge about the structure of the particular writing assignment; (c) the writing process, which has three subcomponents: planning, in which the goal is to take the information from the task environment and long-term memory to set writing goals and make a plan about completing the writing assignment; translating, which entails putting the words on the paper; and reviewing, in which the goal is to improve the quality of the writing product (Hayes & Flower). The theory was subsequently revised to reflect the current research and updated terminology (Hayes, 1996). In contrast to the original model, the updated model consists of two processes: Individual and Task Environment. The major changes in the newest model include the following:

1. There is a new emphasis on the crucial role of the working memory in writing.
2. The model includes visual-spatial representations due to the importance of an individual's ability to read graphs, tables, and pictures in addition to words (linguistic).
3. Motivation and affect have been elevated to play a major role.

4. Cognitive processes have been restructured to include the following: (a) Revision has been replaced by text interpretation, (b) planning has been subsumed under the more general category of reflection, and (c) translation has been subsumed under the more general category of text production process. (Hayes, 1996)

Simple View of Writing model. In the Simple View of writing (Juel, 1988), writing consists of two basic factors: spelling and ideation. Although both spelling and ideation are complex processes with subcomponents, in the Simple View, spelling and ideation are considered the two components that best characterize the writing process. Spelling entails phonemic awareness skills and ideation involves the ability to generate and organize ideas (Juel; Juel, Griffith, & Gough, 1986). Represented by a triangle, the top of the triangle is the writing product and the two bottom corners of the triangle are the factors of ideas and spelling. In the initial study of Simple View, Juel et al. (1986) defined literacy as “acquiring the ability to both comprehend and produce written text” (p. 243). Since the aforementioned definition of literacy involves both reading (comprehending written text) and writing (producing written text), the researchers also proposed the Simple View of Reading. The purpose of the research was to confirm or refute the Simple View model. The participants were 80 children in first and second grades in a lower middle class school district in Austin, Texas. They were administered tests tapping the following skills: IQ, oral language, listening comprehension, decoding, spelling, word recognition, reading comprehension, writing, and ideas. For writing, the subjects were presented with a picture of animals in a schoolroom setting and were asked to write a story about what may be going on in the picture. The stories were graded

“holistically.” To measure the idea trait, at a later time children were asked to orally tell a story about the animal picture. In this way, the children’s story ideas would be separate from the mechanics of writing. The researchers confirmed the Simple View of Reading and Writing. Since reading is not the focus of this paper, only the results for writing will be discussed. In both first and second grades, spelling and ideas made a significant contribution to writing. It is interesting to note that in first grade spelling was the dominant influence, and in second grade, ideas were the dominant influence on writing. The authors surmised that the reason for the shift in influence is that in second grade, spelling and decoding skills become more automatic than they were in first grade, which frees a child to focus on higher level skills such as generating ideas.

Since the Juel et al. (1986) study confirmed the model of literacy only for first- and second-grade students, Juel (1988) completed a similar study on children in first through fourth grades. In this later study, 54 children from a low social economic status school in Austin, Texas, were followed as they progressed from first through fourth grades. The same measures used in the previous study were used in this study. However, three new measures were added. First, the fourth-grade children were given an additional story to write. Second, two qualitative measures were added in which children were asked about (a) what they read at home and (b) their attitude toward reading. The results further confirmed the Simple View of writing. Poor writers were deficient in either spelling or the generation of ideas or both factors. The author was surprised to discover that poor readers did not grow as much as good readers in their ability to generate an oral story. The author noted the reason may be that children who do not read much will not increase their vocabulary skills as much as the children who are considered prolific

readers. In addition, without much exposure to print, the former group may not develop knowledge about the components of a good story.

Abbott and Berninger neuropsychological model. Abbott and Berninger (1993) presented a neuropsychological model that involved three major factors: Oral Language/Verbal Reasoning, Reading, and Compositional Fluency. The participants in the study were 600 children, 50 boys and 50 girls in each grade level from Grades 1 through 6. The authors investigated the relationships among individual differences in developmental skills that children bring to the task of beginning writing, individual differences in component writing skills, and the changing of the relationships over a span of development. The latent factors that were measured were the following domains: orthographic coding, motor, handwriting, phonological coding, spelling, oral language/verbal reasoning, reading, composition fluency, and composition quality. The researchers found that tests administered for each factor corresponded to the intended factor. The path of orthographic coding, but not phonological coding, to spelling was significant for all grades. Likewise, the path from orthographic coding, but not motor skills, to handwriting was significant for all grades. The path from oral language/verbal reasoning to composition fluency was not statistically significant in first grade and was much larger and statistically significant in second and third grades. The path from reading to composition fluency was larger in first grade than in second or third grade. In Grades 4 through 6, the oral language/verbal reasoning and reading factors were found to significantly covary, but neither factor was significantly associated with composition fluency paths. With regard to composition quality, in first grade, oral language/verbal reasoning and reading were significantly related. In the second and third grades, only

reading was significantly related to composition quality. Oral language/verbal reasoning and reading were highly correlated to composition quality in Grades 4 through 6. Due to the high correlation of the factors, the researchers were not able to distinguish the contributions of each.

The writing models described above involve a number of processes, including all of the previously described seven executive function skills that influence writing. The important parts of each model entail generating ideas (initiating) and writing coherent and organized sentences and paragraphs around a topic (sustaining, inhibiting, shifting, organizing, planning, and self-monitoring). Moreover, all the models included reading as a component, since one must read and understand what has been written. In fact, research has shown that there is a strong developmental correlation between reading and writing.

Interdependence of Reading and Writing Skills

Reading and writing skills are highly correlated and interdependent on one another (Catts & Kamhi, 2005; Temple et al., 1993). Bear and Barone (1998) have posited the synchrony model of literacy development. In this model reading, spelling, and writing are developmentally integrated with connections among the literacy skills present at every level. With the integrated approach to reading and writing skills, in the synchrony model, if a child is an emergent reader, he/she will have matching writing and spelling skills. For example, a child with emergent reading skills will understand directionality and that text is read from left to right, but will not have the skills to read isolated words in text. Correspondingly, an emergent writer will understand that marks on paper have meaning but will not have the skills to write words and will scribble if asked to write a story. Consequently, it is not surprising that research has indicated that the

majority of students with reading disabilities will also demonstrate difficulties with writing skills (Westby & Clauser, 1999).

With the synchrony of reading-writing skills, reading has been shown to be a crucial part of the writing process. (Noyce & Christie, 1989). Moreover, poor readers appear to become poor writers (Juel, 1988). To be a skillful writer, writers have to be “skillful readers of their own evolving drafts and insightful readers of the masters who can teach them how to develop craft,” (Murray, 1999, p. 44). The reading-writing relationship is multidirectional in that reading helps to improve writing by providing students with models to imitate (Mayo, 2000).

Vygotsky (1986) noted that just as thought and language are virtually inseparable, the process of comprehending (reading) and composing (writing) are similar if not identical. Both reading and writing entail a complex set of skills that develop during childhood. Both require the maintenance of a topic over several sentences and possibly develop as an extension of the ability to hold a conversation with another person (Garton & Pratt, 2004). Moreover, the “why,” “how,” and “what” of both reading and writing are similar. For example, good readers have definite goals in mind at the beginning of their reading (why; Glenn, 2007). Likewise, good writers create a written plan outlining goals prior to writing (why; Graham et al., 1992; Saddler & Graham, 2005). In addition, during reading, good readers construct and revise meaning (how; Glenn). Similarly, expert writers spend time generating and revising their texts (how; McCutchen, 2006). Lastly, excellent readers evaluate the text quality (Glenn) just as first-rate writers evaluate and review the quality of the text previously written (what; Hayes & Flower, 1980).

In a study on writing development, Barrs (2000) found that the relationship between reading and writing is strong in young writers. Barrs looked at the influence of children's reading of challenging literary texts on their writing development. The study involved six teachers who were teaching Year 5 in five primary schools located in London. Two children's texts were studied: *The Green Children* by Kevin Crossley Holland and *Fire, Bed and Bone* by Henrietta Branford. Throughout the 1998-1999 school year, the writings of eighteen children across the six classes were collected. In-depth case studies were completed that examined developments that occurred with the children's writing.

The books were initially presented to the children and discussed in a classroom setting, including in a drama workshop form with the first book. Post presentation, the children were asked to write in the role of the characters within the stories. For example, children wrote as Humble the cat and Fleabane her puppy. As part of the data analysis, T-unit length was measured, which is described as a main clause and all subordinate clauses attached to it. The author found that T-unit length did not increase in a uniform way over the course of the project. However, the author discovered that T-unit length of the children's writing was influenced by the texts they were reading. For example, when reading texts that had relatively short T-unit lengths, the children's writing also contained short T-units. Likewise, when reading texts with elaborate T-unit lengths, the children's writing tended to be long T-units. The author also found that the writing done in response to the text exhibited a strong sense of empathy with the characters, since the children used excellent descriptive language to describe the emotions of the characters. It was pointed out that reading texts with emotionally charged themes helped children write

about another's point of view and to delve into the inner states of characters taking on the language with which to express emotion. Children's writing also mirrored the poetic language read in the texts. By the end of the project year, the author stated that the children began to read more demanding texts. Thus the author concluded that it appeared that fundamental reading and writing development go hand-in-hand and that progress in one mode (reading) is dependent on progress in the other mode (writing) and vice versa.

Not only has the reading-writing connection been shown to be important in the development of both language skills, but the reciprocal relationship between reading and writing has been shown to be essential in the enhancement of both skills. In a study demonstrating how reflective writing can help students become more critical readers, a preservice, graduate-level young adult literature course was offered as an elective to students in a teacher education program (Glenn, 2007). Eight students, six females and two males, agreed to participate in the study. Five were secondary English education students and three were elementary education students. The requirements for the class involved reading both assigned texts and individually chosen texts and writing. Instead of writing a response to literature as a means of assessing comprehension, the students were asked to question their reading as needed based upon their writing. Along these defined lines, each week the students were required to write a two-page reflection piece that focused on his/her observations and contemplations of the texts read. The student texts varied in form. For example, some students wrote short stories, others wrote beginning chapters of novels, and others wrote poetry and song lyrics. The range of topics was diverse as well including historical fiction, romantic relationships, and domestic abuse. The data were analyzed using the constant comparative method. Themes that defined the

reading-writing connection emerged through the color-coding of student writings. The participant writings indicated that they read and wrote with clear goals in mind, and they learned writing skills to emulate from the texts they read. Also, the participants learned to read with depth to better understand the texts which in turn gave them a desire to become more skillful writers. Overall, the author reported that the study demonstrated how the act of reading and writing had a reciprocal effect on the improvement of both skills.

In summary, reading-writing skills have been shown to be interrelated. Low or high skills in one (reading) correspond to low or high skills in the other (writing) and vice versa. The synchrony model of literacy development demonstrates the corresponding development of reading and writing skills (Bear & Barone, 1998). Moreover, the reading-writing relationship is multidirectional and improvement in one skill, such as writing, can result in improvement in the other skill, such as reading. In studies by Barrs (2000) and Glenn (2007), it was shown that young developing readers and writers as well as expert readers and writers, respectively, improve their reading and writing skills when progress is made in one area (reading) or the other area (writing) and vice versa. Overall, the research indicated that reading and writing reinforce each other and skill building in one area, such as writing, can lead to improved skills in both reading and writing.

Empirical Research on Writing

The research on writing and the impact of executive function skills on written language is a relatively new field of research. From 1900 through 1970, information about writing was discussed in instructional terms that were based on the model of text characteristics of the perfect discourse written by gifted writers (Nystrand, 2006). Typically, the research with published authors was about their factual works, such as

scientific or historical information, the authors' directives about writing, or the authors' creative process (Emig, 1971). These models were cognitive in nature and showed writing as a solitary act because writers spend time thinking, writing, and revising their written discourse in a linear fashion (Nystrand). During the 1960s, Rohman's (1965) linear three-step writing model of prewrite, write, and rewrite was the most widely referenced in this era. In his article, Rohman described a course for university students in which they were encouraged to write in three different ways: journal writing, writing with the principles of meditation, and writing with the use of analogies. At the end of the class, the students wrote reflectively about their writing experiences. All appeared to write positive remarks about how this process helped to make their writing better. Rohman reported that the essays from the class were significantly better than those from a control group. Earlier studies on writing had been published, but these were isolated and unsupported by professional networks and support systems, such as doctoral training programs training writing researchers and refereed research journals (Nystrand). Moreover, similar to the Rohman research, the research often relied on informal observation, introspection, and correlational methods for support (Bereiter & Scardamalia, 1987).

Empirical research on writing is typically thought to have begun in the 1970s with the most well-known and cited study on the writing process: Janet Emig's dissertation on *The Composing Process of Twelfth Graders* (Pritchard & Honeycutt, 2006). In her study (1971), Emig interviewed 8 students, 5 girls, 3 boys, to detail the processes they experienced when composing a writing assignment. She met with the students four times over a summer and asked them to orally describe their composing process as they wrote

the essays. Emig concluded that writers use two discrete modes of composing: extensive, which conveys a message, and reflexive, which focuses on the writer's thoughts and feelings. Each process had specific features that were unique and separate from the other process. For instance, Emig found that reflexive writing had a longer prewriting period than extensive writing. In addition, Emig reported that extensive writing was used for school-based assignments, was written for an audience of teachers, and was objective and typically in report form style. In contrast, Emig stated that reflexive writing occurred as poetry and was exploratory in nature, and the audience was the self or a peer. Emig's seminal work heralded a new era of writing research on how to plan instruction along the lines of how real writers write (Pritchard & Honeycutt).

Following Emig's contribution to the study of writing, a new direction ensued with Hayes and Flower's (1980) cognitive model described above, which posited three recursive processes of planning, translating, and reviewing. Influenced by the Hayes and Flower model, Bereiter and Scardamalia (1987) proposed two models of recursive writing: (a) a knowledge-telling model of writing, which involves talking about the information one already knows; and (b) a knowledge-transforming model for more advanced writers using abstract thinking skills in which the writer takes the information he/she knows and uses higher-level skills, such as making inferences and judgments based on knowledge. These models described writers as going back and forth between processes of thinking and writing. Also, these models entailed executive control processes, such as planning in the Hayes and Flower model and memory skills in the Bereiter and Scardamalia model. As a result, researchers eschewed the linear view of writing and began to adopt the theory of writing as a complex recursive process. The new

discussion about writing was now about how students write instead of solely about what good writing looks like. The new writing discourse was thus not only pedagogical but also theoretical (Nystrand, 2006).

In summary, prior to 1970, the accepted theory on writing was that it was a linear model with typically three steps of prewriting, writing, and rewriting. In addition, during this time period there was relatively little empirical research about writing. However, following the 1970s, there was a theoretical change regarding writing from a linear to a recursive process, which resulted in numerous empirical studies on the writing process. With the increased research on writing, there have been dramatic alterations with the way writing interventions have been implemented in the classroom. One important change in the manner in which writing is being taught in schools today is the implementation of the process approach to writing.

Process Approach To Writing

Making writing meaningful for children is important in all writing instruction (Graves, 1983). Graham (1992) noted that to make writing meaningful, teachers should include the following in their instruction: encourage students to decide what they want to write about; ask students to establish goals for what they wish to achieve; arrange the environment so that other people besides the teacher are the intended audience; allow students to work on extended writing projects across days and possibly weeks; make writing a part of a larger, more interesting activity; and select writing activities that are designed to serve very specific and real purposes. The approach that Graham (1992) described can be called the process approach to writing, which has emerged since the 1980s as the primary paradigm for teaching writing (Pritchard & Honeycutt, 2006).

The process approach to writing encompasses all parts of the writing process including planning, translating, and reviewing as defined by Hayes and Flower (1980). With these three important parts to the writing process, there are also discrete skills that are necessary in the performance of those parts. For example, Emig (1971) noted that writing is the only literacy skill that involves the hand (tool to write), the eye (words to read), and the brain (knowledge of topic). Thus, writing is not speech written down. As Graves (1983) noted, “writing wears the guise of speech since it uses the same material: words, information, order, organization” (p. 161). However, writing as compared to speaking is performed alone and in silence and does not have the use of immediate feedback from an individual, and the writer supplies all ideas, energy, initiative, and information (Graves, 1983).

There are a number of key ingredients in teaching the process approach to writing. First, it is a recursive process rather than a linear process (Pritchard & Honeycutt, 2007). That is, students are encouraged to brainstorm ideas, write, and revise on an ongoing basis and after receiving feedback from others. Second, the importance of writing in a social context is emphasized. Writing is essentially a social interaction between the writer and the audience (Graves, 1983; McCutchen, 2006; Pritchard & Honeycutt; Temple et al., 1993). Writing begins with a desire to communicate with someone or a will to let someone know your ideas (Temple et al.). In the process approach, teachers do not restrict writers to composing only for the teacher, but students are taught to compose for a variety of audiences, including peers, and to write for authentic purposes (Graves; Temple et al.). As students are encouraged to write for authentic purposes, they should write on topics of their own choosing (Graves). Teaching the process approach to writing

is defined as teaching writing in the classroom “based on a belief that the driving force behind young children’s learning is their own interest in life, coupled with their desire to express themselves” (Temple et al., p. 163). Along these same lines, publication of one’s work is encouraged, whether it is in a newsletter, on the bulletin board in the office or on the wall of the classroom (Graves; Temple et al.). Graves (1983) touted the importance of publication for all children as “an important mode of literary enfranchisement for each child in the classroom” (p. 55).

When teachers implement a process approach to writing instruction in their classrooms, students will participate in a community of writers intellectually and emotionally (Pritchard & Honeycutt, 2007). Since writing is such a complex process, it cannot be taught in one succinct lesson. In the process approach, writing is considered a skill in which all are trainees in learning to write and writing to learn. Good writers all have the potential to change and improve their writing (Pritchard & Honeycutt). Thus, third, in the process approach, teachers model writing skills and share their own writing with students (Graves, 1983; Pritchard & Honeycutt; Temple et al., 1993). Just as teachers recognize that silent reading with their students is a way to demonstrate and reinforce good reading skills, teachers who practice modeling writing skills and sharing their own writing with their students recognize that this is good practice in reinforcing writing skills (Graves; Pritchard & Honeycutt; Temple et al.).

Fourth, it is important for teachers using the process approach to foster a writing environment in their classrooms that is positive, noncompetitive, and joyful (Graves, 1983; Temple et al., 1993). Children are then free to write at length, revise, edit, talk with others (peers, family members, teachers) about their writing, try new forms, and

experiment with their writing. In this healthy environment, students can take risks and make mistakes without the fear of condemnation, scorn, or reprimand (Graves).

Specific Writing Strategies That Have Been Shown to Be Successful

Within the writing instruction paradigm of the process approach to writing, there are specific instruction-writing strategies that have been shown to be successful. Using the Hayes and Flower (1980) seminal model as an example of the processes involved in writing, the following research has demonstrated success with strategy instruction, which explicitly and directly teaches planning, transcription, and revising skills (De la Paz, 1999; Graham & Harris, 2007).

Planning strategies. Writing can be a demanding task with the many discrete skills involved for success. However, it is not an impossible task (Graham & Harris, 2007). Children acknowledge the difficulty they have with writing. When asked why they had difficulty writing, Graham and Harris (2007) reported that some children reported it was the planning task that made writing so difficult. Planning has been defined as generating ideas, organizing the text, and setting goals (Berninger, Fuller, & Whitaker, 1996). Since skilled writers have been found to spend more time planning than less-skilled writers (Bereiter & Scardamalia, 1987; Graham & Harris; McCutchen, 2006), planning clearly plays a central role in successful writing (Graham & Harris). Expert writers plan by formulating goals for their texts (e.g., to address a particular audience, to write with a specific voice) and developing plans to achieve the goals (e.g., language to be used in the discourse; McCutchen). Mature writers often mix planning with text production (Hayes & Flower, 1980). The mature writers switch back and forth between planning and production, and both complement each other. However, the reciprocal

nature of these two skills depends on whether planning and production become significantly differentiated (Bereiter & Scardamalia).

All writers engage in planning; nevertheless, a major difference between novice and expert writers is the nature of planning (McCutchen, 2006). When given a writing assignment, expert writers develop a plan to make it their own (Hayes & Flower, 1980). On the other hand, novice or beginning writers may use the assignment itself as a plan in which they primarily focus on retrieving relevant information from memory. In novice writers, planning is typically relegated to generating content to the exclusion of developing other kinds of goals (McCutchen). So, despite being explicitly asked to plan in advance, young writers often have difficulty separating planning from writing (McCutchen).

Bereiter and Scardamalia (1987) analyzed planning skills in the writing protocols from children ages 10, 12, 14, and 16 years and noted that about 90% of the statements produced by the 10- and 12-year-old students involved either (a) generation of content or (b) explicit dictation or rereading. They reported that content generation was the predominant form of planning across all the age groups, and even for the oldest age group, content generation comprised nearly half of the protocols. However, the researchers noted that planning did improve for children in the older age group. For instance, when asked to make notes in advance of writing, the 10-year-old children typically wrote what later turned into a first draft of the composition itself. Most of these notes received only minor changes before they were turned into text. In contrast, older children produced ideas that were later expanded into the completed composition. They made considerable changes to notes that later evolved into text.

In their exploratory interviews with children, Bereiter and Scardamalia (1987) explained that adults may think for 15 min or more before beginning to write. The children expressed astonishment and could not imagine what there was to think about for that length of time. The children noted that expert writers, being intelligent, should act more quickly. Likewise, Graham and Harris (2007) found similar sentiments with children about the planning stage. They reported that children were confused about the concept of planning and described creative but inefficient ways of planning. Since planning is an important part of skilled writing, knowing how to plan is an important skill to obtain in the writing process (Graham & Harris, 2007). The reason planning is beneficial is because it provides an external memory bank where ideas are stored for later retrieval. As a result, during the writing process, cognitive skills can be directed to other important aspects of the writing process, such as monitoring the flow of the text (Graham & Harris).

Two studies investigated the effects of planning instruction on the writing of children with a learning disability (LD). In the first study, Troia, Graham, and Harris (1999) implemented a multiple-baseline across subject design study with 3 fifth-grade students: 2 boys and 1 girl. All children had average cognitive abilities (WISC-III Full Scale IQ: 101) and reading and writing standard scores of at least one standard deviation below the mean. All had a diagnosis of LD, and English was the primary language. There were six phases of the study:

1. *Preinstruction*: Students were instructed in the elements of a good story and persuasive essays. They were taught using the SRSD (Self-Regulated Strategy Development) strategy of SPACE (Setting, Problem, Actions, Consequence,

Emotions) for narratives and DARE (Develop a topic sentence, Add supporting details, Reject arguments, End with a conclusion) for persuasive essays.

2. *Baseline probes*: Students wrote a story and a persuasive essay.

3. *Strategy instruction*: Teachers modeled the SRSD strategies, and students practiced by writing a number of stories.

4. *Postinstructional probes*: Stories and persuasive essays were written postinstruction.

5. *Maintenance probes*: Three weeks after writing the last postinstructional story and essay, students wrote one more story and persuasive essay.

6. *Task generalization probes*: Persuasive essay writing probes were administered during baseline, postinstruction, and maintenance. These probes were not modeled or taught during the strategy instruction phase.

The authors found overall improvement in the writing of both narratives and persuasive essays. Specifically they found that during the baseline portion, students did not show evidence of using planning strategies; following SRSD planning instruction, behavior improved in post instruction and maintenance, story schematic improved, gains continued in maintenance, and generalization occurred. Interestingly, the length of stories improved, but the quality did not. Quality was assessed by reviewing word choice, grammar, sentence structure, organization, and imagination. The authors noted that a limitation of the study was that the design did not allow them to identify the specific instruction components responsible for the strong maintenance and transfer effects obtained for strategy use.

De La Paz and Graham (1997), in a larger study, looked at the effects of planning instruction on the writing of persuasive essays in two modes: writing and dictation. The writing mode involved transcription by hand and the dictation mode involved transcription by the teacher. Forty-two fifth-, sixth-, and seventh-grade students (33 male, 9 female) with LD who had at least one writing goal in their Individualized Educational Plans (IEPs) were randomly assigned to experimental and control groups. Both groups were taught the characteristics of good essays, they read and revised sample essays for meaning and structure, and they composed and shared their own essays with peers. In the experimental group, the students were additionally taught the SRSD strategies of STOP (Suspend judgment, Take a side, Organize ideas, and Plan more as you write) and DARE, as described in the above study. On all dependent measures (planning, length, elements, coherence, quality, rate of words generated, strategy use), the experimental group performed significantly better than the control group. Surprisingly, there was no statistical difference between the writing and dictation modes. The authors surmised that (a) the instructional methods were so well-detailed and executed that it did not matter what mode the students used, and (b) the composing process may have been terminated before the effects of dictation were fully realized.

Text production strategies. Writing has been described as a tool that is used as a memory aid or a means of personal reflections, such as putting one in touch with one's own thoughts by writing in personal journals and diaries (Scott, 1999). Writing has been acknowledged as a means to demonstrate creativity such as with stories or narratives, and as a method to share information or explain something like how to ride a horse or clarify why one likes to swim (Temple et al., 1993). As a whole, writing is a tool to clarify,

categorize, and expand one's thoughts. Thus, these descriptions of writing involve linguistic knowledge, which entail knowing how to write in various genres, in addition to spelling, punctuation, and sentence and paragraph structure (Scott). Above all these descriptions indicate that, "writing is always an act of writing a particular text," (Scott, 1999, p. 224).

The Hayes and Flower model (1980) places the act of generating ideas in the planning phase. That is, the writer may jot down words, phrases, and incomplete sentences to form ideas for the organization of the paper. Adjacent to the planning phase is the translating phase. Even though there are no subcomponents listed in the visual model, Hayes and Flower stated that part of the translating process is to take the material generated in the planning phase and turn it into satisfactory sentences. Berninger et al., (1992) noted that novice writers may be able to generate ideas, but may have difficulty producing language in a coherent text to express those ideas. Thus translating, as text generation has been described, is transforming ideas into the language of words, sentences, and paragraphs (Berninger et al., 1992; Berninger et al., 1996; McCutchen, 2006; Scott, 1999).

Beginning writers initially put individual words or phrases on paper, and then as skills progress, they create sentences that extend to paragraphs and then evolve into stories, informational text, or expository text (Bereiter & Scardamalia, 1987; Saddler, 2007). The first step in putting words on paper for a well-written text is writing well-constructed sentences. Producing a well-written sentence encourages the reader to want to read more, results in the text being easy to read, and makes the text flow smoothly (Saddler). Because of the importance of the skill of writing well-crafted sentences, direct,

systematic instruction has been shown beneficial for students who have difficulty writing (Saddler). In a study that used peer-assisted strategy along with sentence combining instruction, Saddler and Graham (2005) demonstrated the benefits of specific instruction in producing complex sentences. The participants were 44 fourth-grade students who were determined to be either a “skilled writer” or a “less skilled writer.” To determine the classification, the students were administered the Form A of the Sentence Combining Subtest of the TOWL-3 (Test of Written Language-3). Less skilled writers were identified as those scoring one standard deviation or more below the mean, and more skilled writers’ scores were at or above the mean of this subtest. Teachers were asked to confirm the students in each category. In addition, students in each group were administered the Contextual Language and Story Construction of the TOWL-3. The subtests were then averaged, and skilled writers had higher scores than unskilled writers. Since reading and oral language can affect sentence combining, these skills were assessed for all participants. There was no statistical difference between treatment conditions or student type for either measure. The students were randomly assigned to either the experimental group (sentence-combining instruction) or control group (grammar instruction). The authors noted that, in the school setting, grammar instruction is typically the method for teaching students how to improve their text production writing skills. In each group, a less skilled writer was paired with a more skilled writer. Each student group received 30 lessons, 25 min long, three times per week for 10 weeks. The participants were asked to write and revise two stories immediately before and after treatment, and Form B of the Sentence Combining Subtest of the TOWL-3 was administered after treatment.

In the sentence-combining group, five topics were covered: (a) connecting sentences using and, but, and because; (b) embedding an adjective or adverb from one sentence into the other; (c) creating complex sentences by embedding an adverbial; (d) adjectival clause from one sentence to another; and (e) extension of previous embedding skills taught by teaching students to make multiple embeddings involving adjectives, adverbs, adverbial clauses, and adjectival clauses. In the grammar group, the instruction involved teaching the following parts of speech: nouns, adjectives, adverbs, subjects, and predicates.

The researchers found that students in the sentence-combining group were twice as likely as the students in the grammar group to produce a correctly written sentence. Also, on the TOWL-3 posttest, the experimental group improved over the control group. Moreover, the writing quality overall improved for the sentence-combining group. From the draft to the revised text, the sentence-combining group made more revisions involving combining sentences than the grammar group. However the effect size was moderate (.64), as the experimental group averaged less than one type of this revision and the control group did not demonstrate any of these types of revisions. The length of the students' writing did not change, as predicted by the authors. The authors postulated that the overall number of words in a text may be reduced if children made more combined sentences as a result of the intervention or the number of words may increase if the intervention allowed for cognitive attention to be devoted to text generation, due to more automatized skills in sentence combining. All in all, the results of this study indicate that sentence-combining instruction can be beneficial to improving the text of young, developing writers.

According to Bereiter and Scardamalia (1987), when children begin to write, they approach the task similarly to their experience of conversing orally with peers. However, with writing, unlike conversing with peers, there is no feedback. Bereiter and Scardamalia pointed out that consequently, children often write texts that are short and incomplete, as they write only one side of the conversation. Bereiter and Scardamalia explained that when children are given simple prompts to say more, they write longer texts with higher quality. An example of a study in which children were prompted to write more was conducted by Graham, MacArthur, Schwartz, and Page-Voth (1992) with 4 fifth-grade students with LD who were considered poor writers. The students were taught to use a planning and writing strategy for composing persuasive essays during a minimum of six sessions of 40 min each. The composition strategy consisted of three steps: (a) do PLANS (Pick goals, List ways to meet goals, And make Notes, Sequence notes); (b) write and say more; and (c) test goals. The experiment was a multiple probe design across subjects. The study included the following sections: preteaching, baseline, treatment, posttreatment probes, and maintenance probes. All essays were scored in terms of number of words, essay elements, coherence, and quality. The authors found that all 4 students demonstrated significantly improved essays in the data measured. The researchers attempted to have the students generalize their improved skills to narrative writing by asking the students to write a story after the treatment for persuasive essays was completed. However, the students were not able to generalize the skills they learned previously without direct instruction in how to use the newly acquired skills with story writing.

Revising strategies. In the most general terms, revision can be simply described as making changes to a text that is already written and that it is an important part of the composing process (Bartlett, 1982; MacArthur, 2007; Scott, 1999). However, revision is, in fact, a complex process that has distinct task demands (Bartlett). To revise a text, a writer must use reading comprehension skills in order to identify problems, such as disjointed meaning of the text and incorrect conventions, and to improve the text overall (Bartlett; Hayes & Flower, 1980; MacArthur). In identifying problems, the writer must use a process of comparison between something in the text (e.g., word, phrase, sentence, paragraph) and the knowledge that the writer has about the intent of the text (Bartlett). Furthermore, in the Hayes and Flower major cognitive model of the writing process, revision is described as a process of detecting differences between the intended meaning and the actual meaning. In this way, writers evaluate what they have written and then more closely align their writing in reference to their audience and intended goals (Gould, 2001; MacArthur).

It is important that the writer re-read the text in a detached manner in order to read from the perspective of the reader and not from the perspective of the author (Bartlett, 1982). Re-reading the text in this manner allows the author to discern whether or not important details are in place, such as proper referents and appropriate cohesive ties, which assist the reader in understanding the intended meaning of the text. Bartlett described a study in which she detailed the difficulty that young children have with this skill. In her study, 79 fifth-grade students from four public school classrooms composed a narrative and 1 week later edited their narratives. One week after editing their own texts, children were asked to edit a series of eight short paragraphs adapted by a researcher

from texts produced by children in a previous study. The researchers predicted that (a) children would be better able to detect logical inconsistencies or referential ambiguities in the texts of others rather than in their own texts, and (b) children would be able to detect spelling and convention irregularities in their own texts just as well as in the text of others. To the surprise of the researchers, the findings indicated that these children could detect both logical and conventional irregularities in the text of others far better than in their own texts. The authors surmised that different skills are involved in revising one's own text versus another's text with regard to the type of knowledge required and the circumstance under which the knowledge must be recalled.

Proficient writers revise frequently, both during the writing of the text and after the completion of a draft (Hayes & Flower, 1980; MacArthur, 2007). They make changes in terms of their goals and audience as well as overall changes in organization, content, language and conventions (MacArthur). Thus, revising plays a crucial role in the composing process for skilled writers (Britton, 1996). In contrast to expert writers, beginning writers may not revise their work at all (Gould, 2001). When they begin to revise, they will notice that something is wrong with the text but will not be able to identify the problem. The novice writer may sense that something does not sound right but not have the skills to determine the reason for the unease (Bartlett, 1982). At first when beginning writers start to make revisions, they proceed in a haphazard way without well-planned goals or strategies (Bartlett). Moreover, they tend to concentrate on minor errors, such as spelling, conventions, syntactic form (e.g., subject-verb agreement), lexical choice, and punctuation (Bartlett; MacArthur; Scott, 1999). In addition, in an attempt to revise, a novice writer may rewrite a sentence instead of looking at the

problems with meaning and intent (Gould). Novice writers may have difficulty revising text because they may not have a clear goal and purpose for their writing (MacArthur).

Teachers can assist beginning writers in acquiring the skills needed to revise by teaching the direct skills involved in the revising process (Gould, 2001; MacArthur, 2007). In one study (Graham, MacArthur, & Schwartz, 1995), researchers randomly assigned 67 fourth- through sixth-grade students from six self-contained classrooms for students with LD into one of three groups:

1. *General-Goal Condition*: Students were told to revise their paper to “make it better.” This included thinking about what they wanted to change or add, making notes about these changes on their first draft, and rewriting their story with the accompanying changes on a new piece of paper.
2. *Goal-To-Add-Information*: Students were told to add at least three things to their papers to make them better. They were further told that adding information (including things that happened, description of things or details) to their papers would make them better. As in the first condition, this included thinking about what they wanted to change or add, making notes about these changes on their first draft, and rewriting their story with the accompanying changes on a new piece of paper.
3. *Goal-To-Add-Information Plus-Procedural-Facilitation*: Students were given a specific goal to add at least three things to make their paper better. In addition they were directed to use the following procedure that was first modeled: (a) Students were asked to write on a separate piece of paper at least five things they could add to their story; (b) students were encouraged to “try to think of as many

things as you can” including things that happened, descriptions of things, or details; and (c) students then evaluated their possible additions and made a check next to the three that would best help their story.

For all conditions, the students were offered two story prompts and told to write a narrative from one of the prompts. The students wrote the first draft and then revised the draft two to four days later. The stories were rated on quality, length, and revisions.

As predicted, the students in Group 1 who were assigned a general revising goal produced revisions that involved either mechanical corrections or word changes, with little or no corresponding improvement in the quality of the text. Over 70% of their revisions involved changes in capitalization, punctuation, spelling, or format. Only 16% of their revisions resulted in changes in meaning. The authors noted that revising had little effect on improving the overall quality of the papers. The authors further predicted that Group 2 would make more meaning-changing revisions than Group 1, and this theory proved to be true. However, the authors reported that changes in the quality of their papers were modest in this group. Moreover, the majority of revisions did not make a positive change in the substance of the text. That is, meaning-changing revisions were outnumbered by meaning-preserving revisions. Lastly, the authors predicted that Group 3 would make greater improvements in the quality than the first two groups, and this was found not to be true. Group 3 made greater improvements over Group 1, but not over Group 2. Another surprise was that length was not found to be significantly affected by the instructional conditions. The authors suggested that goal setting and procedural facilitation paired with modeling and an executive function method, such as strategy instruction, may be needed to more fully address student’s revising difficulties.

To address both goal setting and procedural facilitation with additional executive function instruction, De La Paz, Swanson, and Graham (1998) conducted a study in which 12 eighth-grade students with LD who had difficulty with writing skills were randomly assigned to one of two groups:

1. *Normal revising condition*: In this group, students wrote an expository essay draft. Two days later each student was asked to read his/her essay and “make it better.”
2. *CDO (compare, diagnose, operate) condition*: In this group, students also wrote an expository draft. However, in the second session to revise their draft, students were presented with the CDO procedure to use when revising (examiner modeled the procedure first).

The CDO procedure followed these steps: Global Concerns: (a) Compare and Diagnose—read essay and select the applicable evaluation cards: ignores the obvious point against my idea, too few ideas, part of the essay doesn’t belong with the rest, part of the essay is not in the right order; (b) Operation—select one of the following tactics for each evaluation: rewrite, delete, add, move, and perform the chosen tactic. Students were then told to take a second look at their essays and address their concerns locally: (a) Reread the paper highlighting any areas that still need changing; and (b) choose the appropriate change for each place highlighted: this one doesn’t sound right, this is not what I intended to say, this is an incomplete idea, this is a weak idea, this part is not clear, this problem is __. Essays were rated for quality, length, and revisions.

De La Paz et al. (1998) predicted that the CDO condition would produce more nonsurface revisions (words, phrases) than the normal revising condition, and this was

true. In addition, the authors predicted that students in the CDO group would make more meaning-changing revisions than the normal revising group, and again this was true. Length, as in the previous study, did not have an affect on the revising texts of either group. What is surprising about this study is that there was a negative consequence of the study using the CDO method. It was found that students in the CDO group made significantly more meaning-preserving and meaning-changing revisions that received negative ratings than the students in the normal revising group. The authors believed that these results did not negate the positive results of the study for the following reasons: (a) The changes that received a positive rating outweighed negative ones by a 2:1 ratio, (b) students who made a negatively rated revision typically produced a final CDO draft that was rated higher in overall quality than their first draft, and (c) this reflected a greater willingness on the students' part to undertake more difficult and less familiar changes than normal. They made revisions like deleting or rearranging textual material, and typically students with LD only make surface revisions.

One possible reason for the significant negative ratings is that students may have deficits in the language area that may prevent them from fully understanding the process and producing more positively improved writing at the local level. For example, the cards to prompt the students may be helpful in cueing the students about what steps to take. However, if a student has difficulties with, for instance generating text, word retrieval, and choosing pertinent information to include in an essay, then the cueing may not be enough to teach better writing skills. The student may be able to follow the cue cards but not be able to internalize the process or have the language skills necessary to ultimately produce improved revisions at the local level. Along these same lines, in the first study

described, the authors reported that in both the goal-to-add-information and the goal-to-add-information-plus-procedural-facilitation conditions, the majority of the revisions did not make a positive change in the substance of the text because meaning-changing revisions were outnumbered by meaning-preserving revisions. Again, students may lack the linguistic skills to make meaningful changes in text. Consequently, good linguistic skills appear central in the ability to produce well-written discourse

In summary, not only are good linguistic skills central to the ability to produce cohesive writing as noted in the above study, but intact linguistic skills appear to be a critical component in the Hayes and Flower (1980), the Simple View of Writing (Juel et al., 1986), and the Abbott and Berninger (1993) neuropsychological models of writing. The aforementioned models of writing emphasize linguistic skills because all models include the ability to produce words to write on paper. Consequently, there appears to be a need to further investigate the impact of linguistic skills on written language. One aspect of linguistic skills is the executive function skill of verbal fluency. Verbal fluency is defined as the “speed and ease of verbal production” (Lezak, Howieson, & Loring, 2004, p. 518). Measuring verbal fluency typically entails counting the number of words produced within a particular category or in response to a stimulus and often within a specified time limit (Lezak et al., 2004). Even though executive functioning plays a vital role in proficient writing, there is a paucity of research on its function, development, or impact on children in elementary school who are learning to write (Graham et al., 2007). Thus, the reason for the current study is to explore the relationship between verbal fluency skills and writing skills in developing writers.

To explore the connections between verbal fluency and writing skills in developing writers, the following chapter will propose three main research questions. In addition, the statistical measures used will be presented, the instrumentation procedures will be explained, and the procedure of the study will be described.

CHAPTER III

RESEARCH METHODOLOGY

Overview

The development of language skills is interrelated (Bain et al., 2001; Bear, 1991), and a deficit in one area, such as reading, may contribute to difficulties in another language area, such as writing (Moats, 2006). In the development of language skills, writing is at the top of the development hierarchy, which indicates that this skill is the most difficult of language skills to achieve (Moats). One of the reasons that writing is a difficult language skill to accomplish is because in evolutionary terms, human brains are not as fully evolved for the processing of written language (reading and writing) as they are for processing oral language (Moats). As a result, writing has been shown to be difficult for all school-age children. Research has demonstrated that written language skills are challenging for children in the general education classrooms (Catts & Kamhi, 2005; Harris et al., 2003; Hooper & Montgomery, 1993) and for children who receive special education services (Harris et al.; Newcomer et al., 1989; Vallecorsa & Garriss, 1991).

Verbal fluency is an executive function skill. It was chosen for this study for its importance in the influential Hayes and Flower (1980) model of written language. This model posits that writing consists of three recursive processes: planning, translating, and reviewing. In this model, verbal fluency is important because the writing task involves not only planning (generating ideas) but also translating (writing ideas on paper).

The first purpose of this study was to determine if students in the fifth grade with a learning disability in written language exhibit differences in the executive function skill

of verbal fluency compared to students in the fifth-grade with typical development. In addition, the present study examined the relationship between verbal fluency measures and scores on the SPEP (State Proficiency Examination Program) 5th-Grade Writing Assessment for fifth-grade students with a learning disability and for fifth-grade students with typical development. Third, this study investigated reading level and verbal fluency executive function skills as predictors of writing scores on the SPEP 5th-Grade Writing Assessment.

Research Questions (RQ)

For the purposes of this study, there were three main research questions:

RQ# 1: Is there a difference between fifth-grade students who have a learning disability in written language and fifth-grade students with typical development on the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001) Verbal Fluency Test? Specifically:

RQ#1a: Is there a difference between fifth-grade students who have a learning disability (LD) in written language and fifth-grade students with typical development (TD) on the letter fluency scores of the D-KEFS?

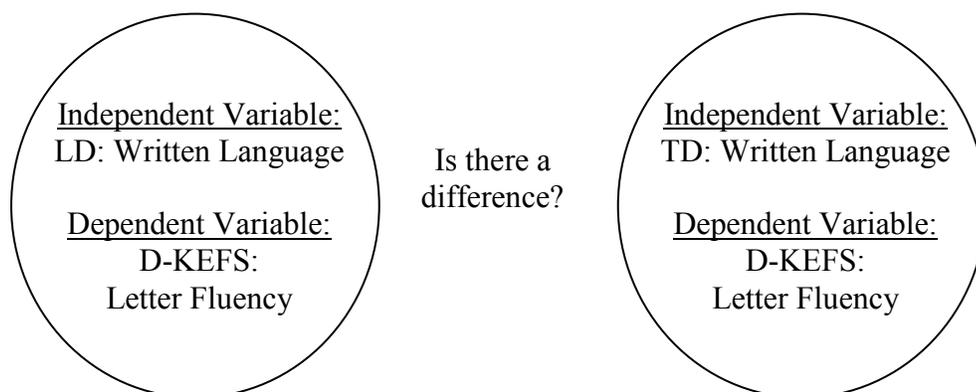


Figure 3. Illustration of Research Question 1a.

RQ#1b: Is there a difference between fifth-grade students who have LD in written language and fifth-grade students with TD on the category fluency scores of the D-KEFS?

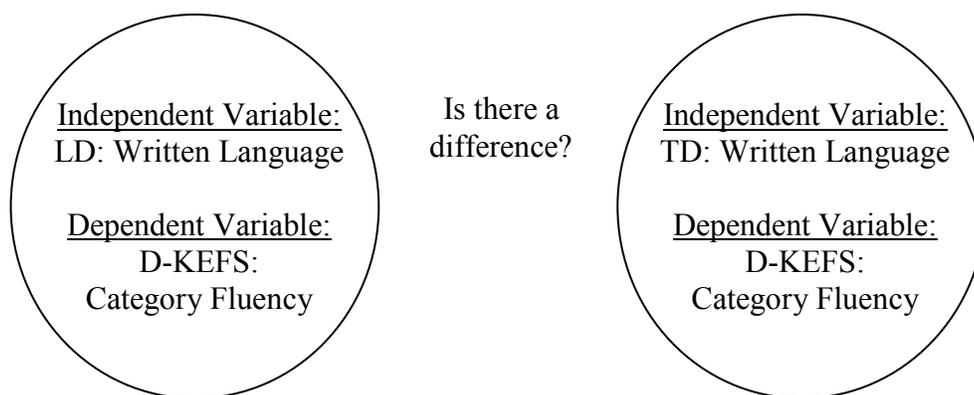


Figure 4. Illustration of Research Question 1b.

RQ#1c: Is there a difference between fifth-grade students who have LD in written language and fifth-grade students with TD on the category switching number correct (CS# Corr) scores of the D-KEFS?

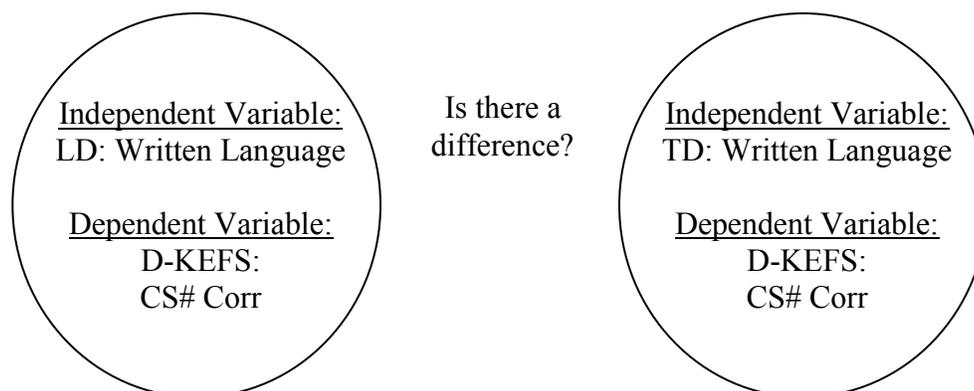


Figure 5. Illustration of Research Question 1c.

RQ#1d: Is there a difference between fifth-grade students who have LD in written language and fifth-grade students with TD on the category switching accuracy (CS Acc) of the D-KEFS?

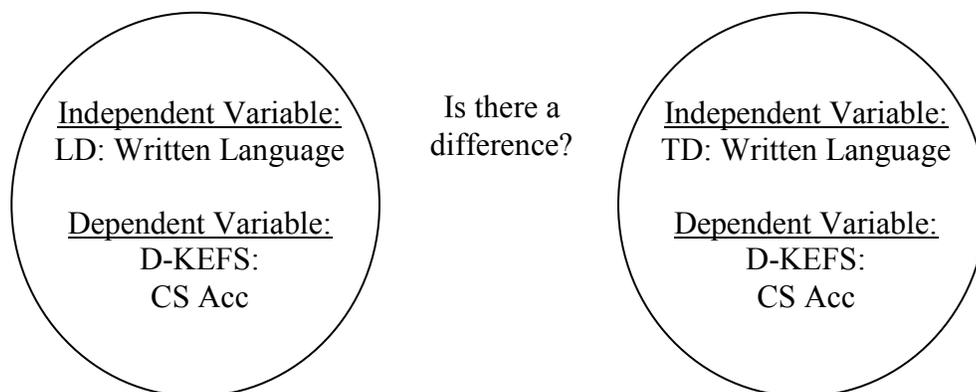


Figure 6. Illustration of Research Question 1d.

RQ# 2: Is there a relationship between scores on the D-KEFS Verbal Fluency Test (letter fluency, category fluency, category switching number correct, and category switching accuracy) and the scores on the SPEP Fifth-Grade Writing Assessment?

Specifically:

RQ# 2a: What are the relationships between the D-KEFS Verbal Fluency Test scores (letter fluency, LF; category fluency, CF; category switching number correct, CS# Corr; and category switching accuracy, CS Acc) and the Composite Writing Score on the SPEP Fifth-Grade Writing Assessment for fifth-grade students with LD?

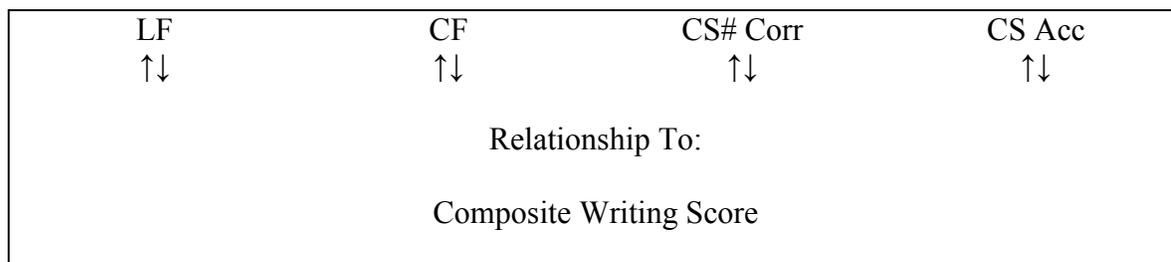


Figure 7. Illustration of Research Question 2a for Students with LD.

RQ# 2b: What are the relationships between the D-KEFS Verbal Fluency Test scores (letter fluency, LF; category fluency, CF; category switching number correct, CS#

Corr; and category switching accuracy, CS Acc) and the Composite Writing Score on the SPEP Fifth-Grade Writing Assessment for fifth-grade students with TD?

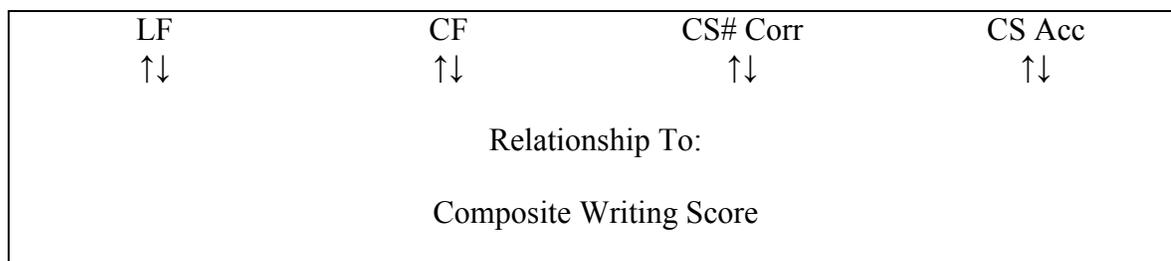


Figure 8. Illustration of Research Question 2b for Students with TD.

RQ# 3: Do reading level and executive function, in particular, letter fluency, LF; category fluency, CF; category switching number correct, CS# Corr; and category switching accuracy, CSAcc; predict the Composite Writing score on the SPEP Fifth-Grade Writing Assessment for students with a learning disability in written language and for students with typical development?

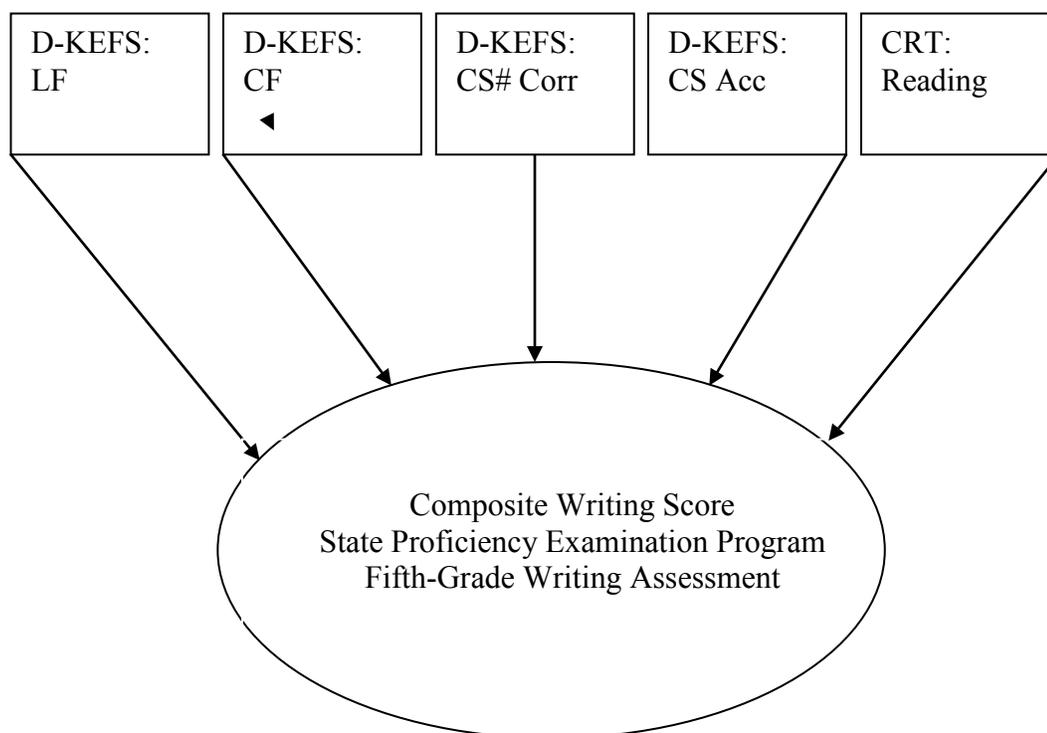


Figure 9. Illustration of Research Question 3.

Research Design

This was a quantitative, nonexperimental study. The study was primarily a correlational study that analyzed relationships among variables. However, the first research question examined differences between groups using a t-test. Research Questions 2 and 3 considered correlations among variables. The second research question was purely correlational, and the data were analyzed using the Pearson-Product Moment Coefficient. Research Question 3 was predictive correlational, and the data were analyzed using multiple regression analysis.

Independent and Dependent Variables

For RQ#1, the independent variables were fifth-grade students with a learning disability in written language and fifth-grade students with typical development. The dependent variables were the letter fluency, category fluency, category switching number correct, and category switching accuracy scores from the D-KEFS Verbal Fluency Test (Delis et al., 2001). Since RQ#2 was a purely correlational design, independent and dependent variables were not defined. Even though RQ#3 was a correlational design, independent and dependent variables were distinguished because the design was predictive correlational. Hence, the independent variables were letter fluency, category fluency, category switching number correct, and category switching accuracy scores from the D-KEFS Verbal Fluency Test (Delis et al.) and CRT reading scores. The dependent variable was the Composite Writing score from the SPEP Fifth-grade Writing Assessment.

Sample

The participants in this study were 30 fifth-grade students with LD in written language and 30 fifth-grade students with TD from a large school district in a western state. Students from 10 elementary schools in the district were recruited by the experimenter. The students ranged in age from 10 years 7 months to 12 years 1 month (LD: $M=11.11$, $SD=.44$; TD: $M=11.02$, $SD=.43$), and were enrolled in fifth-grade general education and special education classrooms.

All students with LD in written language met the qualification criteria outlined by the State Educational Regulations (see Appendix A). To qualify for membership in the group of students designated with a learning disability in written language, students had at least one reading and/or writing goal in their IEPs. The group of students with TD were composed of students who were enrolled full-time in a general education classroom and did not receive special education or Section 504 services. Four demographic variables, by school, were obtained from public information published by the State Department of Education for the school year 2007-2008. As shown in Table 1, the demographics reported were the number of students enrolled in each school, the percentage of students who have an IEP, and the percentage of students who participate in the free and reduced lunch program. The latter statistic was used to determine social economic status (SES). The final demographic variable reported in Table 2 was the ethnicity composition of each school.

As exhibited in Table 1, the number of students enrolled in each school varied from a low of 212 to a high of 799. Most schools had relatively similar percentages of

students who have an IEP. The percentage of students receiving a free and reduced lunch (FRL) varied from 6.6 % to 40.6 %.

Table 1

Student Enrollment and School Percentages for IEP and FRL

School	Enrollment	IEP	FRL
1	720	12.6	14.3
2	799	13.9	2.9
3	561	13.4	11.6
4	406	9.1	40.6
5	512	9.0	23.0
6	219	11.9	*
7	427	13.8	29.5
8	574	17.4	22.8
9	656	11.0	30.8
10	212	11.8	6.6

*Data not presented for groups fewer than 10

Table 2

Ethnicity Percentages for Schools

School	American Indian/Alaskan Native	Asian Pacific Islander	Hispanic	Black	White
1	2.2	8.1	13.3	4.2	72.2
2	1.1	5.1	8.1	3.3	82.4
3	1.6	7.7	11.8	2.5	76.5
4	2.5	5.7	17.7	3.0	71.2
5	2.1	4.9	24.2	2.3	66.4
6	2.7	9.6	15.1	2.3	70.3
7	1.6	8.0	15.7	4.9	69.8
8	1.4	13.1	14.5	4.9	66.2
9	2.0	4.6	31.7	4.9	56.9
10	1.4	7.5	1.9	0.9	88.2

All schools had a large percentage of students who were White and a relatively small percentage of students who were identified as American Indian/Alaskan Native. The percentage of students who were Black and Asian/Pacific Islander was relatively the same for all schools except for one school that had a small percentage of Black students at 0.9 % and a small percentage of Asian/Pacific Islander students at 1.4 %. The percentage of students who were Hispanic varied from a low percentage of 1.9 % to a high percentage of 31.7 %.

Instrumentation

There were three instruments used in this study. The tests used were the Delis-Kaplan Executive Function System (D-KEFS; Delis et al., 2001), the State Proficiency Examination Program (SPEP) Fifth-Grade Writing Assessment, and the Reading Criterion-Referenced Test (Reading CRT). The D-KEFS is one of the most widely used assessment batteries to measure executive function skills (Meltzer & Krishnan, 2007). The D-KEFS Verbal Fluency Test measures the student's "ability to generate words fluently in an effortful, phonemic format (letter fluency), from overlearned concepts (category fluency), and while simultaneously shifting between overlearned concepts (category switching)" (Delis et al., p. 55).

The SPEP Fifth-Grade Writing Assessment is a district-wide writing assessment that was administered to all fifth-grade students, including those in charter schools. The purpose of the test was to provide information for students, teachers, parents, and administrators to use in instruction of specific, identifiable writing areas that will lead to practice with and achievement of the statewide writing standards. The test consisted of one writing prompt in which the student was to write an essay in response to the prompt.

The criterion referenced tests were administered district-wide, which included charter schools, to students in third through eighth grades to assess their proficiency in reading, mathematics, and science. The tests were administered within 10 days on either side of the 120th day of instruction. For purposes of this paper, only the reading CRT test score from the participants' fourth-grade year was used.

Verbal fluency. The D-KEFS (Delis et al., 2001) Verbal Fluency Test consisted of three testing conditions: letter fluency, category fluency, and category switching. All testing conditions were administered one-on-one with an examiner in a private room. For the letter fluency condition, the student was asked to generate words that begin with a particular letter as rapidly as possible. There were three letters (FAS), and the student was given 60 seconds (s) for each letter. Each correct response was scored as 1. A scaled score was obtained for this condition. The internal consistency reliability for this subtest for ages 10, 11, and 12 years were .80, .76, .77, respectively. The test-retest reliability for this subtest was .67.

In the category fluency condition, the student was asked to generate words that belong to a designated semantic category as quickly as possible. For this condition, the student had 60 s to name items that were animals and 60 s to name items that were boy's names. Each correct response was scored as 1. A scaled score was obtained for this condition. The internal consistency reliability for this subtest for ages 10, 11, and 12 years were .71, .58, .72, respectively. The test-retest reliability for this subtest was .70.

The category switching condition asked the student to generate words, alternating between two different semantic categories as quickly as possible. In this condition the subject had 60 s to switch back and forth between saying as many fruits and as many

pieces of furniture as he/she could verbalize. Each correct item that was named for the designated category was given a score of 1. A scaled score for total correct responses was obtained. A second scaled score for this condition was obtained by totaling the correct category switches. The internal consistency reliability for total correct responses for ages 10, 11, and 12 years were .56, .62, .62, respectively. The test-retest reliability for this subtest was .65. The internal consistency reliability for total correct category switches for ages 10, 11, and 12 years were .64 .76, .65, respectively. The test-retest reliability for this subtest was .53.

Because the previously described tests had a limit of 1 minute (min) each, minimal time was spent with each student. Including introductions and the explanation of each test, the total time involved for testing each student was no more than 10 min.

State Writing Assessment. The SPEP Fifth-Grade Writing Assessment was administered to all students in the district during the months of January and February 2009. Schools were assigned to a 3-day period either in January 2009 or February 2009 in which to administer the test. The writing reliability coefficient of the test across trait scores for the school years 2006, 2007, 2008 were 0.956, 0.952, 0.942, respectively (A.H. Davidson, State Department of Education, personal communication, March 4, 2009). The test consisted of one writing prompt. Examples of past writing prompts were:

1. Sometimes we give help, and sometimes we get help. Think of a time when you helped someone or when someone helped you. Tell a story about what happened.
2. Sometimes it's hard to do something new, and sometimes it's not. Think of a time when you tried something new. Tell a story about what happened. (State Department of Education: *Writing Assessment*).

The test was administered in three sessions by each classroom teacher. However, if a student had an IEP that specified that tests will be taken in a small environment setting, the student took the test with a special education teacher in a small class setting. Each teacher was given a test administration manual and instructions to follow the script verbatim. Each writing session had a designated assignment with an approximate time allocated to that session. Each school had the discretion to choose one of two ways in which students, if they were working productively and would like to continue writing, could work past the approximate time allocated for that session. Students either finished the assignment in a quiet setting following the time allocated for Sessions I and II or continued working past the allocated time in the final session until the essay was complete. The following were the prescribed assignments and approximate times for each session: Session I: prewriting, first draft, revision – approximately 65 min; Session II: drafting, revision, editing – approximately 50 min; Session III: revision, editing, final draft, proofreading – approximately 50 min.

After all writing assessments were completed at each school, the tests were sent to the district test director, who in turn sent the assessment to the State Department of Education (NDE) for scoring. At the NDE, each student's writing was read by two trained educators and scored on each of the following four traits: (a) ideas and content (development), (b) organization, (c) voice, and (d) conventions. Each student received a score from 1 (lowest) to 5 (highest) on each trait. The summation of the trait scores determined the composite score. See Appendix B for the achievement standards for the composite score and description of the developmental continuum for the 5-point trait

scale. See Appendix C for the scoring rubrics for writing traits (State Department of Education: *Writing Assessment*).

Reading Criterion-Referenced Test (CRT). The reading CRT was a multiple-choice test that required the student to “bubble in” his/her answers. The CRT reading test had questions that addressed the following: phonics, vocabulary development, making inferences, summarizing, knowledge of narrative parts, identifying themes and understanding metaphors in a text, making predictions, and organization of texts (State Department of Education: *Criterion Referenced Tests*). The reliability coefficient for the fourth-grade reading CRT was .93 (State Department of Education: *State Technical Report for the CRT and HSPE Assessments*).

The reading CRT was administered by the classroom teacher or by the special education teacher with accommodations in a small group setting for students who have an IEP. Since the reading CRT was intended to be a measure of reading proficiency rather than speed, there were no time limits on the test. However, the test had to be completed in one sitting and could not be continued during another day and/or time. Raw scores were converted to scale scores that ranged from 100 (low) to 500 (high). The scoring descriptions were as follows: 100-199: Emergent/Developing; 200-299: Approaches Standard; 300-379: Meets Standard; 380-500: Exceeds Standard (State Department of Education: *Criterion Referenced Tests*).

After all children in each school completed the CRTs, the designated testing director (typically the principal) sent the completed documents to Measured Progress, a nonprofit testing company located in New Hampshire. The company then scanned and scored all tests, and returned the scored documents to the Department of Education as

well as to the individual schools (H. King, State Department of Education, personal communication, January 15, 2009).

Procedure

This research followed and met the requirements established by the University's Institutional Review Board (IRB) on conducting research on human subjects. After approval from the IRB, authorization was also granted by the local school district. The student investigator contacted school psychologists, principals, and teachers in the school district notifying them of the study. Contacts were made by phone, by email, and in person. School personnel assisted the student investigator in identifying students who were appropriate for the study. School personnel who agreed to have students in their schools participate in the study were given a letter for students to take home. The letter, addressed to parents/caregivers, explained the study and requested permission for their child to participate, as outlined in the IRB's guidelines (see Appendix D).

After the signed consent form was returned, the student investigator reviewed each child's file for the reading CRT score results and SPEP Fifth-Grade Writing Assessment score results. In addition, for students with LD in written language, the student investigator reviewed the student's IEP (Individualized Education Plan) to confirm that there was at least one reading and/or writing goal in the IEP. Testing took place during the school day within a time period that did not involve instruction in core academic subjects. For instance, students were tested during periods of silent reading, art, and music. The testing time was agreeable to parents, teachers, and school administrators. Testing took place either in a private room or in a quiet section of one of the hallways in the school.

Test Administration

Each student was administered the letter fluency, category fluency, and category switching conditions from the D-KEFS (Delis et al., 2001). For the letter fluency condition, the student was given 60 s to say as many words as he/she could that began with the letter F. The student then had 60 s to say words that began with the letter A and 60 s to say words that began with the letter S. None of the words could be names of people, places, or numbers. For the category fluency condition, the student had 60 s to name animals and another 60 s to say boys' names. In the category switching condition, the student had 60 s to switch back and forth and say the names of as many fruits then pieces of furniture as possible. The total time for the tests was no more than 6 min. For each correct answer, the student was given a score of one. For each incorrect answer, the student was given a score of zero. Raw scores were tallied for each condition: letter fluency, category fluency, and category switching. The total raw scores for each condition was converted to scaled scores. The scaled scores for each student was summarized on a Data Summary Sheet (see Appendix E). The information on the Data Summary Sheet was coded in such a way as to conceal the identity of the student participating in the study.

Data Analysis

To analyze the data for each of the three research questions, the statistical program used was SPSS 16.0 (Statistical Package for the Social Sciences, 2008). For the first research question, t-tests were performed to establish differences between students in fifth grade with a learning disability in written language and students in fifth-grade with typical development on the D-KEFS (Delis et al., 2001) Verbal Fluency Test scores for

letter fluency, category fluency, category switching number correct, and category switching accuracy.

For the second research question, Pearson-Product Moment Coefficients were used to determine correlations between the D-KEFS (Delis et al., 2001) Verbal Fluency Test scores (letter fluency, category fluency, category switching number correct, and category switching accuracy) and the scores on the SPEP Fifth-Grade Writing Assessment.

For the third research question, multiple regression analyses were performed to predict the influence of reading level from the CRT test scores and the letter fluency, category fluency, category switching number correct, and category switching accuracy variables of the D-KEFS (Delis et al., 2001) Verbal Fluency Test on the composite writing score of the SPEP Fifth-Grade Writing Assessment.

Summary

In the major models of written language, verbal fluency and reading are integral parts of the writing process. The Hayes and Flower model (1980), which posits writing as a recursive process with three reciprocal interactions among the stages of planning, translating, and reviewing, the writer must utilize verbal fluency and reading skills: planning (inner language to guide plans), translating (having the words to put on paper), and reviewing (reading what one has written). Similarly, in the Simple View of Writing (Juel et al., 1986), ideas entail using language to write thoughts on paper and spelling involves the writing of ideas in a readable format. Likewise, the Abbott and Berninger (1993) model posits oral language/verbal reasoning, reading, and compositional fluency as major components in written language.

Given that verbal fluency skills are an essential part of the writing process, the overall goal of the study was to investigate the impact of verbal fluency skills on written language skills of fifth-grade students with a learning disability in written language and fifth-grade students with typical development. More specifically, the intent of this study was to determine if students in the fifth grade with LD in written language exhibited differences in the executive function skill of verbal fluency compared to students in the fifth-grade with TD. Second, the study examined the relationship between verbal fluency measures and scores on the SPEP Fifth-Grade Writing Assessment for students in the fifth-grade with a learning disability in written language and students in the fifth-grade with typical development. Third, this study examined reading level and verbal fluency executive function skills as predictors of writing scores on the SPEP Fifth-Grade Writing Assessment.

The instruments used were the D-KEFS (Delis et al., 2001), the SPEP Fifth-Grade Writing Assessment, and the NDE reading CRT scores. After receiving signed permission from parents/caregivers, the experimenter administered the Verbal Fluency Test from the D-KEFS to each student individually. Testing took no longer than 10 min. The scores for the SPEP Fifth-Grade Writing Assessment, and the reading CRTs were obtained from the student's school file. For the first research question, the data were analyzed using t-tests to test for differences between fifth-grade students with a learning disability in written language and fifth-grade students with typical development on the D-KEFS executive function Verbal Fluency Test for letter fluency, category fluency, category switching number correct, and category switching accuracy. For the second research question, Pearson-Product Moment Coefficients were used to determine

correlations between the D-KEFS Verbal Fluency Test scores (letter fluency, category fluency, category switching number correct, and category switching accuracy) and scores on the SPEP Fifth-Grade Writing Assessment. For the third research question, multiple regression analyses were performed in order to predict how much influence reading level from CRT test scores and the letter fluency, category fluency, category switching number correct, and category switching accuracy variables from the D-KEFS Verbal Fluency Test had on the composite writing score on the SPEP Fifth-Grade Writing Assessment.

The following chapter describes the results of this investigation. Each research question will be addressed specifically with regard to the statistical method utilized for each question. Descriptive tables will be presented.

CHAPTER IV

RESULTS

Overview of Study

As Bain, Bailet, and Moats (2001) suggest, the development of language skills (e.g., receptive language, expressive language, linguistic awareness, reading, etc.) is interrelated. More specifically, reading and writing skills are closely aligned and correlated (Catts & Kamhi, 2005; Lerner, 1997). There is much research that has indicated that good reading skills are important for academic success (Lyon, 1998; Webre, 2005). Even though writing has been shown to be an important influence in academic success (Graham & Harris, 2005), there is less research on the importance of writing relative to the research on reading for school success. Writing has been shown to be difficult for students who receive special education services (Harris, Graham, & Mason, 2003; Newcomer, Barenbaum, & Nodine, 1989; Vallecorsa & Garriss, 1991) as well as for students who are in the general education population (Catts & Kamhi; Harris et al.; Hooper & Montgomery, 1993). Intact executive function skills are important components involved in good writing skills for all students. There are a number of executive function skills involved in writing, including verbal fluency skills.

Consequently, the purpose of this study was to investigate the differences in writing skills between children with learning disabilities (LD) in written language and children with typical development (TD). More specifically, this study (a) determined if there were differences in the executive function skill of verbal fluency between students in fifth grade with LD in written language and students in fifth-grade with TD, (b) examined the relationship between verbal fluency measures and scores on the SPEP

(State Proficiency Examination Program) Fifth-Grade Writing Assessment, and (c) investigated reading level and verbal fluency executive function skills as predictors of writing scores on the SPEP Fifth-Grade Writing Assessment.

The first section of this chapter will explain the descriptive data pertaining to the Delis-Kaplan Executive Function System (D-KEFS) verbal fluency tests, reading CRT Criterion Reference Test (CRT) tests, and the SPEP Fifth-Grade Writing Assessment. Means and standard deviation tables will be presented for the combined group of subjects in addition to separate tables for students with a LD in written language and students with TD. Following the descriptive data, the results for each research question will be described. A table representing the results of each research question will be presented. Finally, a summary of the results of the statistical analyses will be stated.

Descriptive Data

Table 3

Means (M) and Standard Deviations (SD) for the D-KEFS Test Scores for Fifth-Grade Students with a LD and for Fifth-Grade Students with TD

Tests	Overall M (SD)	LD M (SD)	TD M (SD)
Letter Fluency	9.25 (3.13)	7.93 (2.82)	10.57 (2.91)
Category Fluency	10.00 (3.11)	8.87 (2.46)	11.13 (3.33)
Category Switching Number Correct	9.10 (2.69)	7.87 (2.34)	10.33 (2.47)
Category Switching Accuracy	9.48 (2.80)	7.97 (2.59)	11.00 (2.11)

Note. LD=Learning Disabilities, TD=Typically Development

Table 3 shows the means and standard deviations for the D-KEFS verbal fluency tests for all subjects in the study. For the D-KEFS verbal fluency tests, the scaled scores range from 1 (lowest) to 19 (highest) with a mean score of 10 and a standard deviation of 3 (Delis et al., 2001). As shown in Table 3, the overall sample mean scores were in the midrange.

Means and standard deviations for the trait and composite writing scores on the SPEP Fifth-Grade Writing Assessment for all subjects in the study are shown in Table 4.

Table 4

Means (M) and Standard Deviations (SD) for the Trait and Composite Writing Scores on the SPEP Fifth-Grade Writing Assessment for Students with a LD and Students with TD

Tests	Overall M (SD)	LD M (SD)	TD M (SD)
Ideas	2.68 (.87)	2.03 (.66)	3.32 (.52)
Organization	2.71 (.85)	2.12 (.72)	3.30 (.47)
Voice	2.71 (.96)	1.95 (.61)	3.47 (.56)
Conventions	2.69 (.98)	1.95 (.72)	3.43 (.55)
Composite Writing Score	10.78 (3.49)	8.05 (2.44)	13.52 (1.82)

The SPEP Fifth-Grade Writing Assessment trait scores ranged from 1 (lowest) to 5 (highest) and the composite writing scores range from 0 (lowest) to 20 (highest). The results for the overall sample were slightly above the midpoint. In contrast, the scores for

students with LD were below the midpoint. The scores for students with TD were above the midpoint. The following are the descriptions of the level of development corresponding to the trait score: Beginning: 1; Emerging: 2; Developing: 3; Maturing: 4; Strong: 5. The composite writing score indicates a child's writing performance relative to the western state's writing achievement standards. The composite writing scores are labeled according to the following categories: (Non-proficient) Emergent/Developing: 0 to 7.5; Approaches Standard: 8 to 11.5; (Proficient) Meets Standard: 12-15.5; Exceeds Standard: 16-20 (State Department of Education: *Writing Assessment*).

Table 5 shows the means and standard deviations for the reading CRT test scores for all subjects in the study.

Table 5

Means (M) and Standard Deviations (SD) for the Reading CRT Scores for Fifth-Grade Students with LD and for Fifth-Grade Students with TD

Tests	Overall M (SD)	LD M (SD)	TD M (SD)
Reading CRT	290.72 (89.80)	226.10 (65.65)	355.33 (58.80)

The reading CRT scores range from 100 to 500. The following are the categories corresponding to the score: Emergent/Developing: 100-199; Approaches Standard: 200-299; Meets Standard: 300-379; Exceeds Standard: 380-500; (State Department of Education: *Criterion Referenced Tests*).

The results for the overall sample were slightly above the midpoint. The scores for students with LD were in the category of Approaches Standard. The scores for

students with TD were in the category of Meets Standards. The LD population had a relatively large standard deviation.

Research Question Results

RQ# 1: Is there a difference between fifth-grade students with LD in written language and fifth-grade students with TD on the Delis-Kaplan Executive Function System (D-KEFS; Delis et al., 2001) Verbal Fluency Test? Specifically:

RQ#1a: Is there a difference between fifth-grade students with LD in written language and fifth-grade students with TD on the letter fluency scores of the D-KEFS?

The scores, listed in Table 3, were analyzed with a t-test for the difference between two independent samples. For the statistical analyses, because of multiple sequential t-tests, the Bonferroni correction was applied, and a more stringent alpha level of .012 was used on each individual t-test.

The results revealed that the students with TD scored significantly higher on the letter fluency test than the students with LD, $t(58) = -3.56, p < .01$. The effect size was large (.92).

RQ#1b: Is there a difference between fifth-grade students with LD in written language and fifth-grade students with TD on the category fluency scores of the D-KEFS?

Table 3 lists the scores that were analyzed with a t-test for the difference between two independent samples. The results indicated that the students with TD scored significantly higher on the category fluency test than the students with LD, $t(58) = -3.00, p < .01$. There was a medium effect size (.77).

RQ#1c: Is there a difference between fifth-grade students with LD in written language and fifth-grade students with TD on the category switching number correct scores of the D-KEFS?

The scores presented in Table 3 were analyzed with a t-test for the difference between two independent samples. The results showed that the students with TD scored significantly higher on the category switching number correct test than the students with LD, $t(58) = -3.97, p < .01$. There was a large effect size (1.02).

RQ#1d: Is there a difference between fifth-grade students with LD in written language and fifth-grade students with TD on the category switching accuracy scores of the D-KEFS?

The scores, as displayed in Table 3, were analyzed with a t-test for the difference between two independent samples. The results indicated that the students with TD scored significantly higher on the category switching accuracy test than the students with LD, $t(58) = -4.96, p < .01$. There was a large effect size (1.28).

Q# 2: Is there a relationship between scores on the D-KEFS Verbal Fluency Test (letter fluency, category fluency, and category switching number correct, category switching accuracy) and the scores on the SPEP Fifth-Grade Writing Assessment?

Specifically:

RQ# 2a, 2b: What are the relationships between the D-KEFS Verbal Fluency Test scores (letter fluency [LF], category fluency [CF], category switching number correct [CS# Corr], and category switching accuracy [CS Acc]) and the Composite Writing Score (CWS) on the SPEP Fifth-Grade Writing Assessment for fifth-grade students with LD in written language and for students with TD?

The Pearson-Product Moment coefficients were computed between the D-KEFS verbal fluency test scores and the composite writing score on the SPEP Fifth-Grade Writing assessment for fifth-grade students with LD in written language and for students with TD. The results of the analyses are presented in Table 6.

Table 6

Correlations (r) Between the D-KEFS Verbal Fluency Test Scores and the SPEP Fifth-Grade Writing Assessment Composite Writing Score (CWS) For Students with Learning Disabilities in Written Language and for Students with Typical Development (TD)

	LF	CF	CS# Corr	CS Acc
CWS: LD	.41*	.30	.18	.40*
CWS: TD	.16	-.05	-.06	-.14

*p < .05

The results showed that for students with LD, the correlations between the two D-KEFS tests of letter fluency and category switching accuracy and the SPEP Fifth-Grade Writing Assessment composite writing score were statistically significant and were greater than or equal to .40. For students with TD, no correlations between the D-KEFS tests of verbal fluency and the SPEP composite writing score were statistically significant.

RQ#3: Do reading level and executive function, in particular, letter fluency, category fluency, category switching number correct, and category switching accuracy, predict the composite writing score on the SPEP Fifth-Grade Writing Assessment for students with LD in written language and for students with TD?

A multiple regression analysis was conducted to predict the composite writing score on the SPEP Fifth-Grade Writing Assessment for students with LD in written language and for fifth-grade students with TD, as shown in Table 7.

Table 7

The Unstandardized and Standardized Regression Coefficients for the Variables Entered Into the Model that Includes All Variables Entered Simultaneously

Variable	B	SE B	β
LF	0.19	0.14	0.17
CF	0.05	0.13	0.04
CS# Corr	-0.12	0.21	-0.09
CS Acc	0.34	0.22	0.27
Reading CRT	0.02	0.00	0.49*

* $p < .001$

Using the enter method and inputting all independent variables simultaneously, a significant model emerged: $F(5, 54) = 12.598, p < .001$. This model explained 53.8% of the variance ($R^2 = .538$). Table 7 gives information for the predictor variables entered into the model. In this model, the executive function verbal fluency tests on the D-KEFS (letter fluency [LF], category fluency [CF], category switching number correct [CS# Corr], category switching accuracy [CS Acc]) were not significant predictors individually, but the reading CRT score was a significant predictor of the composite writing score.

Additional multiple regression analyses were conducted with the enter method using one predictor variable or a combination of predictor variables at one time. Using the enter method, as presented in Table 8, nine separate multiple regression models were produced. For the first model, the reading CRT produced a significant model: $F(1, 58) = 47.248, p < .001$. This model explained 44.9% of the variance ($R^2 = .449$). In the second model, the letter fluency produced a significant model: $F(1, 58) = 19.135, p < .001$. This

model explained 24.8% of the variance ($R^2 = .248$). For the third model, the category fluency produced a significant model: $F(1, 58) = 8.454, p < .01$. This model explained 12.7% of the variance ($R^2 = .127$). In the fourth model, the category switching number correct produced a significant model: $F(1, 58) = 11.370, p < .01$. This model explained 16.4% of the variance ($R^2 = .164$). For the fifth model, the category switching accuracy produced a significant model: $F(1, 58) = 22.588, p < .001$. This model explained 28.0% of the variance ($R^2 = .280$). For the sixth model, the combination of category switching accuracy and letter fluency produced a significant model: $F(2, 57) = 14.932, p < .001$. This model explained 34.4% of the variance ($R^2 = .344$). In the seventh model, the combination of letter fluency and reading CRT produced a significant model: $F(2, 57) = 29.649, p < .001$. This model explained 51.0% of the variance ($R^2 = .511$). For the eighth model, the combination of category switching accuracy CS and reading CRT produced a significant model: $F(2, 57) = 29.793, p < .001$. This model explained 51.1% of the variance ($R^2 = .511$). In the final model, the combination of category switching accuracy, letter fluency, and reading CRT produced a significant model: $F(3, 56) = 21.451, p < .001$. This model explained 53.5% of the variance ($R^2 = .535$).

A correlation analysis was carried out to test the relationship among the variables. Table 9 shows the correlation matrix. The correlation coefficients were significant between CWS and LF, CF, CS# Corr, CS Acc, and CRT, which means they were significantly correlated with each other. The four verbal fluency executive function test scores and the reading CRT scores were significantly correlated with one another.

Table 8

The Unstandardized, Standardized Regression Coefficients and Variance for the Variables Entered into the Models

Variable	B	SE B	β	Variance (%)
Reading CRT	0.03	0.00	0.67***	44.9
LF	0.56	0.13	0.50***	24.8
CF	0.40	0.14	0.36**	12.7
CS# Corr	0.53	0.16	0.41**	16.4
CS Acc	0.66	0.14	0.53***	28.0
CS Acc	0.46	0.16	0.37**	34.4
LF	0.33	0.14	0.30*	
LF	0.30	0.11	0.27*	51.0
CRT	0.02	0.00	0.56***	
CS Acc	0.35	0.13	0.28**	51.1
CRT	0.02	0.00	0.54***	
CS Acc	0.25	0.14	0.22	53.5
LF	0.21	0.12	0.23	
Reading CRT	0.02	0.00	0.41***	

*p < .05 **p < .01 ***p < .001

Table 9

Correlation Matrix of Variables

	CWS	LF	CF	CS# Corr	CS Acc	CRT
CWS	—					
LF	.498**	—				
CF	.357**	.536**	—			
CS#Corr	.405**	.487**	.254*	—		
CSAcc	.529**	.540**	.268*	.819**	—	
CRT	.670**	.407**	.352**	.360**	.460**	—

Note. CWS=composite writing score, LF=letter fluency, CF=category fluency, CS# Corr =category switching number correct, CS Acc=category switching accuracy, CRT=reading criterion reference test

* Correlation is significant at the 0.05 level (2-tailed).**Correlation is significant at the 0.01 level (2-tailed).

Summary

There was a difference between fifth-grade students with LD in written language and fifth-grade students with TD on the executive function test of the D-KEFS. The students with TD consistently scored significantly higher than students with LD in written language on all four of the D-KEFS verbal fluency tests. On the letter fluency, category switching number correct, and category switching accuracy tests the effect size was large. On the category fluency test the effect size was medium. Pearson-Product Moment coefficients were computed between the D-KEFS verbal fluency tests and the composite writing score on the SPEP 5th-Grade Writing Assessment. For students with LD in written language, there was a correlation between the letter fluency and category switching accuracy tests of the D-KEFS and the composite writing score. No statistically significant correlations were found for students with typical development. Multiple regression analyses were performed which showed that reading CRT scores were a strong predictor of the composite writing score. The model which combined the reading CRT scores and the D-KEFS scores most strongly predicted the composite writing score. Other models using individual D-KEFS tests and various combinations of D-KEFS tests and/or the reading CRT test scores were also predictors of the composite writing score. Finally, the correlation analysis showed that the relationship among all variables was significant.

In the next chapter the results of the statistical analyses will be explained with reference to the interpretation of the results. In addition, the research and educational significance of the study, including specific writing interventions based on the outcome of the study, and the limitations of the study will be discussed.

CHAPTER V

DISCUSSION

This chapter will first summarize the results of each research question and discuss the meaning of the results. Then, the chapter will describe the educational significance of the results, provide specific interventions that can address difficulties that students have with writing, and finally address the limitations of the current study.

The three main purposes of this study were to (a) determine if there were differences in the executive function skill of verbal fluency between students in fifth grade with learning disabilities (LD) in written language and students in the fifth grade with typical development (TD), (b) examine the relationship between verbal fluency measures and scores on the SPEP (State Proficiency Examination Program) Fifth-Grade Writing Assessment, and (c) investigate reading level and verbal fluency executive function skills as predictors of writing scores on the SPEP Fifth-Grade Writing Assessment.

Research Findings

RQ#1: The results from the t-tests that were performed to explore differences between fifth-grade students with LD in written language and fifth-grade students with TD on the D-KEFS tests of letter fluency (LF), category fluency (CF), category switching number correct (CS# Corr), and category switching accuracy (CS Acc) showed a significant difference between students with LD in written language and students with TD. Moreover, the effect size for each t-test performed was large, except for the medium effect size for the category fluency test.

Students with TD consistently scored higher than students with a LD in written language on all four test scores. This finding was not surprising since students with a LD in written language typically score lower on writing tests than do students with TD (Bain et al., 2001; Graham & Harris, 2007). Within each group, the means were relatively similar for each of the D-KEFS tests, except for the category fluency test, which had the highest mean scores for both groups. For the TD population, over 30% of the students had above average scaled scores, greater than or equal to 13, with the remaining scores in the average to low average range on the category fluency test. In addition, for the TD population there were a few high outlier scores that were not found in the other verbal fluency tests. In contrast, the other verbal fluency tests (LF, CS# Corr, CS Acc), for the TD population, produced scores mostly in the average range. Likewise, for the LD population, 10% of the students with LD had scaled scores greater than or equal to 13, with the remaining scores in the average to low average range. However, for the LD population there were no high outlier scores as there were in the TD population. The other verbal fluency tests (LF, CS# Corr, CS Acc) for the LD population produced scores primarily in the average to low average range. Consequently, for both populations, the high scores in the category fluency test produced a higher mean score for the overall test.

The standard deviation was also similar within each group on all tests except for the category fluency test in the TD population, which had a larger standard deviation. This is because on the category fluency test for the TD population, there were not only a number of high scores but there were also a few high outlier scores in addition to the typical number of average to low average scores. The reason for this will be discussed later. The high outlier scores on the category fluency test resulted in a greater spread of

scores around the mean which in turn resulted in a larger standard deviation on the category fluency test than on the other verbal fluency tests (LF, CS# Corr, CS Acc) for the TD population. Moreover, among the four verbal fluency test scores, the category fluency test had the largest standard deviation difference between the LD and TD groups. This is because the TD group had a larger number of high scores than the LD group.

Based on the higher mean scores for both groups and a larger standard deviation statistic for the TD population, the effect size was only a medium effect size for the category fluency test, whereas the other three verbal fluency test scores had a large effect size. The reason for the difference is because to calculate the effect size for this study, the pooled standard deviation was used, which was a larger number for the category fluency test than for the other tests. The pooled standard deviation was the number used in the denominator of the effect size formula. It then follows that for the category fluency test, with a larger pooled standard deviation relative to the other three verbal fluency tests, the effect size would be smaller.

One possible reason for the category fluency test to have a higher mean than the other three verbal fluency tests for both populations and a larger standard deviation for the TD population as a result of a few high outlier scores is that the test appears to be a relatively easy verbal fluency test due to the way it is designed. For the category fluency test, in 1 minute, the student is asked to name all the words he/she can remember that belong to a specific category (e.g., animals). In this test, the student is provided with a structure in which to recall words. For students without language difficulties and/or minimal language difficulties, the structure provided may have made the test a relatively undemanding and simple task. So the category fluency test allowed a number of students

in each group who either did not have language difficulties and/or had minimal language difficulties to excel and receive relatively high scores. In contrast, on the letter fluency test, when given one letter, students had to recall all the words they could think of that started with that letter. The letter fluency test is more difficult than the category fluency test due to the broad nature of the task. For example, for the letter fluency test, the list of answers that are correct are endless and are found somewhere in the “universe.” In contrast, the correct answers for the category fluency test are in the delineated guidelines (e.g., specific category). The research described below indicates that students with writing problems, who are given specific categories to write about, will show improved writing skills. Also, the research illustrated below indicates that when attempting to recall information (e.g., spelling words), categorizing words prior to inputting them into memory is a more efficient way to recall the information. Thus, recalling information from a specific category (e.g., category fluency test) as opposed to recalling information from a broad spectrum (e.g., letter fluency test) is an easier task.

Studies have shown that students with learning problems demonstrate inefficient learning strategies involving planning and memory (De La Paz & Graham, 1997; Swanson, 1994). However, when given tools that assist in categorizing information, students with learning difficulties improve performance. For instance, students with planning difficulties with regard to writing skills typically do not have a planning strategy when given a writing prompt, such as “write a story about your favorite pet.” These students may write a few words about the topic (e.g., dog named Sam, happy dog), but not demonstrate a planning strategy. Studies have shown that self-regulated strategy development (SRSD) strategies improve the planning strategies of struggling writers (De

La Paz & Graham, 1997; Troia et al., 1999). The SRSD strategy, such as SPACE (setting, problem, actions consequence, emotions) gives the student a specific category (e.g., setting) to write about. Thus, providing a parameter assists the student in planning skills.

Memory involves the ability to encode, process, and retrieve information to which a student has been previously exposed (Swanson & Saez, 2003). Research has shown that students with LD have deficits in memory that affect their performance in academic tasks (de Jong, 1998; Levine & Reed, 1999; Siegel, 1993; Swanson, 1994). These students perform poorly on memory tasks indicating an inefficient approach to memory recall. For example, when given a spelling list, students with TD will often exhibit an efficient learning strategy by grouping words together by category and then rehearsing words in groups that go together. Students with LD do not typically use these strategies (Johnson & Christian, 1993). Putting words in categories prior to memorizing the words is a more proficient way to remember spelling words rather than attempting to memorize words in isolation. The categories provide parameters from which to recall the information.

The scores for the category switching number correct and category switching accuracy tests are derived from a test in which the student must name a fruit then a piece of furniture, then fruit, then furniture, and so on. Even though categories are provided for the student, the task involves an additional executive function skill (e.g., shifting) for success. That is, the student must switch between categories while remembering what words to say and the sequential order in which to say them. Research has shown that students with writing difficulties struggle with the executive function skill of shifting (Hooper et al., 2002), which is defined as switching topics on paper (Feifer & De Fina, 2002). Thus, the category fluency test, which provided parameters in which to recall

words and did not involve the executive function skill of shifting, was the least challenging test for both the LD and the TD populations. Consequently, a handful of students, who did not have language difficulties or had minimal language difficulties, were able to excel.

RQ# 2: The Pearson-Product Moment coefficients were computed between the D-KEFS verbal fluency test scores and the composite writing score on the SPEP Fifth-Grade Writing assessment for fifth-grade students with LD in written language and for fifth-grade students with TD. The results for the students with LD in written language indicated that letter fluency (LF) and category switching accuracy (CS Acc) tests were significantly correlated with the composite writing score (CWS) on the SPEP Fifth-Grade Writing assessment. Consequently, the results indicated that students with LD in written language, who score low on the category switching accuracy and letter fluency tests, may also score low on the composite writing score of the SPEP test. In the category switching accuracy test, the student is asked to alternately name a fruit and then a piece of furniture. The score is the number of accurate switches made. The category switching accuracy may be correlated with the composite writing score because the category switching accuracy test requires two tasks to occur simultaneously: (a) holding an idea in one's head and (b) planning for another idea. These two tasks are also necessary components for good writing skills. For example, when writing an essay a student must write a topic sentence and supporting details while at the same time evaluate the writing to ensure cohesiveness and to plan for future paragraphs.

The letter fluency test may be correlated with the composite writing score because of the linguistic demands that are necessary for success on the letter fluency test. In the

letter fluency test the student is asked to name, one at a time, all the words he/she can recall that begin with the letters “F,” “A,” and “S.” Thus, with minimal structure and no context to visualize, the student must quickly choose vocabulary words from a wide, open-ended prompt. This makes it difficult for the student to find specific words to use that are appropriate for the prompt. Similarly, in the classroom, when writing from a prompt that has minimal structure (e.g., write about your summer vacation), the student must search a large data base (all experiences during a 3-month period) to choose the appropriate words for the discourse. A student with inefficient planning and memory strategies may write a few words, such as play or swim, but not be able to organize the text in a way that makes sense or be able to recall other words that would be appropriate for the essay. In contrast, a student with efficient planning strategies may write, “In the beginning of the summer I...In the middle of my summer... I ended my summer by...” Furthermore, the mature writer would be able to recall words that would be appropriate for each section, such as writing about his/her camp experiences for the beginning of summer.

In contrast, category fluency and category switching number correct tests were not correlated with the composite writing score for students with LD in written language. These two tests, as previously described, provide a structure from which to recall words. Thus, given that students with writing difficulties demonstrate more mature writing skills when provided with structure (De La Paz & Graham, 1997; Swanson, 1994), these tests did not correlate with their low composite writing score test results.

For the students with TD, there were no statistically significant correlations between the D-KEFS tests and the composite writing score on the SPEP test. This

indicated that improved verbal fluency skills did not correlate with writing skills. In addition, even though 93% of students with TD met the standard for the SPEP Fifth-Grade Writing Assessment, only 20% of the students with TD exceeded the standard. This indicated that the writing scores for the TD student population were not as high as one would expect from the TD population. An explanation for the lack of correlation between the D-KEFS tests and composite writing score and the absence of a significant number of high scores on the composite writing score for the TD population may be that once verbal fluency skills are intact, there may be other executive function skills, such as attention and self-monitoring, that significantly affect writing skills. Research has shown that the development of written language skills depend on high levels of executive function skills (Feifer & De Fina, 2002; Hale & Fiorello, 2004). Moreover, the major cognitive/neuropsychological models of writing indicate that characteristics of proficient writers include well-developed executive function skills, such as initiating, sustaining, inhibiting, shifting, organizing, planning and self-monitoring (Abbott & Berninger, 1993; Hayes & Flower, 1980; Juel, 1988). Studies investigating the effects of a number of executive functions on the writing skills of elementary school children found that the executive function skills of inhibition, verbal fluency, planning, and switching attention (Altemeier, Jones, Abbott, & Berninger, 2006) as well as initiating and sustaining (Hooper et al., 2002) made significant contributions to the development of writing skills.

Overall, it appears that verbal fluency executive function skills have more of a relation to writing skills for students with LD in written language than they do for students with TD. At least average verbal fluency executive function skills are necessary

for a student to be a good writer; however, once a student is a good writer there may be executive function skills other than verbal fluency that affect the student's writing skills.

RQ# 3: Multiple regression analyses were conducted to predict the composite writing score (CWS) on the SPEP Fifth-Grade Writing Assessment for students with LD in written language and for fifth-grade students with TD. The analyses included various combinations of the reading CRT (criterion reference test) scores and the verbal fluency test scores on the D-KEFS; letter fluency (LF), category fluency (CF), category switching number correct (CS# Corr), and category switching accuracy (CS Acc) as predictors. The model that best predicted the CWS included all predictor variables: LF, CF, CS# Corr, CS Acc, and reading CRT. This model accounted for 53.8% of the variance in the CWS. However, in this model, only the reading CRT was significant. In contrast, nine other models were produced in which the reading CRT scores were not paired with all predictor variables at one time. Instead, the predictor variables were either paired individually or together with a combination of one or two other variables, and all models significantly predicted the composite writing score, with all predictor variables being significant.

It is interesting that when all predictor variables are in the model (Reading CRT, LF, CF, CS# Corr, CS Acc), the reading CRT overshadows the significance of all other independent variables. There are two likely reasons for the reading CRT consuming the significance in this model. First, according to the correlation matrix of variables, Table 9, compared to the other predictor variables, the reading CRT score has a strong correlation (.670) with the composite writing score. Second, there is a high degree of multicollinearity among the independent variables. This indicates that the correlation

among the independent variables is high and that there are similarities among the constructs being measured. Consequently, the high correlation between the reading CRT and the composite writing score combined with multicollinearity among the independent variables are the likely causes of the CRT overshadowing the significance of the other predictor variables in a model with all predictor variables present.

In the nine subsequent models produced, in which one to three predictor variables were paired, each model varied in the amount of variance accounted for in the composite writing score. These results indicated that two of the four verbal fluency skills measured in this study played a major role in writing skills due to their relatively high variance accounted for in the composite writing score. The first five models were made up of one predictor variable each. From these five analyses, it was evident that the reading CRT, letter fluency, and category switching accuracy tests best predicted the composite writing score with 44.9%, 24.8%, and 28.0% of the variance, respectively, accounted for in the composite writing score. The category fluency and category switching number correct tests accounted for 12.7% and 16.4% of the variance of the composite writing score, which indicated that their contribution to predicting the composite writing score was trivial. Because the latter two predictor variables had minimal prediction value, they were not used in subsequent models. The sixth model paired the two best verbal fluency executive function tests together (letter fluency, category switching accuracy), which accounted for 34.4% of the variance in the composite writing score. The seventh and eighth models paired the two best verbal fluency executive function tests individually (letter fluency, category switching accuracy) with the reading CRT test, which accounted for 51.0% and 51.1% of the variance, respectively, in the composite writing score. Last,

in the ninth model, the two best verbal fluency executive function tests (letter fluency, category switching accuracy) and the reading CRT test were combined into one model that accounted for 53.5% of the variance in the composite writing score. It is clear that of all the predictor variables, the reading CRT best predicts the composite writing score. However, when the model pairs the reading CRT with the letter fluency and category switching accuracy tests, the variance increases significantly.

These findings indicated that verbal fluency and executive function skills play an important role in writing. For example, in the letter fluency test, the student must find words to use from a minimal prompt and in the category switching accuracy test, the student must not only think of words from a designated category but must also hold in his/her mind the last word said and decide what category the next word should come from before choosing a word. Thus, these findings support the theory that verbal fluency and executive function skills are an integral part of the writing process, and that one must ultimately multitask in order to be a competent writer.

These findings also demonstrated the importance of reading skills on writing skills, as exemplified by the multiple regression analysis in which a relatively large amount of variance was accounted for by the reading CRT score (44.9%) in the composite writing score. For example, reading and writing skills are highly correlated and interdependent (Catts & Kamhi, 2005; Temple et al., 1993). Moreover, Bear and Barone (1998) have posited the synchrony model of literacy development in which reading and writing skills share corresponding developmental stages. With the synchrony of reading-writing skills, reading has been shown to be a critical part of the writing process (Noyce & Christie, 1989). Thus, poor readers become poor writers (Juel, 1988).

It is interesting that Table 5 showed a relatively large standard deviation for students with LD on the reading CRT test (65.65). This indicates that the reading skills of students with LD vary greatly. Given that the students with LD, in these schools, received special education services, it appears that reading interventions were not successful for all students.

Research Significance of Current Results

Research has shown that executive function is an important component of the writing task. In fact, it is the executive function demands that separate writing skills from all other achievement skills (Feifer & De Fina, 2002; Hale & Fiorello, 2004). Important executive function demands in writing include using words to convey meaning and link ideas (Berninger, 2002; Feifer & DeFina), which require verbal fluency skills to put words on paper and executive function skills to oversee the meaning and linking of ideas.

The three major models of writing emphasize verbal fluency and executive function skills. In the Hayes and Flower model (1980), the translating phase involves putting words on paper in an organized fashion. Likewise, in the Simple View of Writing (Juel et al., 1986; Juel, 1988) the idea phase involves writing ideas that pertain to the topic. Also, in the Abbott and Berninger (1993) model, compositional fluency and quality entail writing the appropriate words on paper for the topic presented. In addition, the Hayes and Flower model, with its attention to writing as a recursive process, indicates the importance of an additional executive function skill of switching back and forth among the goals of writing, evaluating work, and rewriting.

The results of the current research study correspond to previous research on writing. Research has shown that students with LD have difficulty formulating ideas and

writing down appropriate words for the topic or audience (verbal fluency skills; Berninger et al., 1992; Graham & Harris, 2003). However, with delineated guidelines and structure, such as with the SRSD strategies, studies have shown that students with LD significantly improve their writing skills (Graham et al., 1992; Harris et al., 2003). In the current research study, the letter fluency test, which had minimal structure (e.g., name words that begin with “F”), significantly correlated with the composite writing score for students with LD. For the population of students with LD, most had low composite writing scores and did not meet the writing standard. Based on the correlation of the two tests, this research has shown that on the letter fluency test, students with LD have the most difficulty generating words from an open-ended, nonstructured prompt. In contrast, when given a specific category, such as on the category fluency test (e.g., name animals), students with LD were able to generate an appropriate list of words as demonstrated by the higher scale scores and mean for the category fluency test and the absence of a significant correlation with the composite writing score. This study extended previous research by demonstrating that with structure and parameters, verbal fluency skills improve.

Moreover, research has shown that students with LD have difficulty with the executive function skill of shifting back and forth among the tasks involved in writing (Bain et al., 2001; Hayes & Flower, 1980). This research has shown that in the category switching accuracy test, students with LD had difficulty shifting back and forth between categories (fruit and furniture), as evidenced by the significant correlation between the category switching accuracy test and the composite writing score. This further confirms

the research that students with LD have difficulty with the executive function skill of shifting.

Future research should address the contribution of multiple executive function skills (e.g., initiating, sustaining, inhibiting, shifting, organizing, planning and self-monitoring) to the writing process. Additionally, future studies should focus on the importance of executive function skills to the writing process at different chronological and/or developmental ages.

Educational Significance of Research Results

The current research results have educational significance for instruction. This study indicated that students with LD in written language did better on verbal fluency tests with structure and the ability to visualize than on verbal fluency tests that lacked parameters. Consequently, students with LD in written language may improve writing skills with instruction strategies that involve structured tasks that allow the student to visualize the writing topic. For example, in the classroom a typical writing prompt that is not structured, lacks parameters, and is difficult to visualize may be, “Write about why you think the school day should be shorter.” In this example, the prompt is not structured because it is open-ended and there are countless ways to approach the topic. Students may be overwhelmed by the “bigness” of the question and not know where or how to begin to think of ideas. The prompt is also difficult to visualize because it is abstract and not concrete. A prompt that is considered structured, concrete, and easy to visualize would be, “During the first month of school we did many morning activities with the other fifth-grade class. Describe your three favorite activities and tell why you liked them.” In the second prompt, the student is given a writing task with a clearly delineated

structure (describe your three favorite morning activities and tell why you liked them). In addition, the student can easily visualize the second prompt by recalling and picturing him/herself participating in the morning activities. Consequently, the second prompt, with clearly defined guidelines, is an easier prompt to write about.

Furthermore, in the content standards for the school district's writing achievement indicators (State Department of Education: *English Language Arts Standards*), students need to generate ideas for a specific topic. There are a number of instructional strategies that teachers can use to help students achieve the writing standard goal. For example, with regard to structure, teachers may provide students with descriptive prompts, stories with fill-in-the-blanks, and lists of words to use in a writing task. Additional structure includes story/essay outlines in flow chart-like structure, story maps, and web designs (Bain et al., 2001). Moreover, developing a word list based upon a student's personal experiences enhances the learning process (May, 1986). In this way, a teacher can assist a student with visualization techniques by having the student write about concrete, visual items known to the student such as a student's house or pet animal.

In the current study, given that executive function and verbal fluency skills had a relation to writing skills for children with LD in written language, teachers can use instruction strategies utilizing both skills. For instance, using executive function skills such as the SRSD (Self-Regulated Strategy Development) strategies that have been researched by Graham and Harris (2005) together with specific verbal fluency skill building strategies (discussed below) may substantially increase the writing skills of students with LD in written language. The SRSD strategies help students use their executive function skills when writing, such as the instruction strategy of SPACE

(Setting, Problem, Actions, Consequence, Emotions) for narratives and DARE (Develop a topic sentence, Add supporting details, Reject arguments, End with a conclusion) for persuasive essays (Troia et al., 1999).

Another writing content standard for the school district includes using transitions that add to the organization of the paper (State Department of Education: *English Language Arts Standards*). Teachers can provide verbal fluency skill-building strategies to assist with this writing skill. Emig (1971) noted that free writing increases verbal fluency skills. Hollicks (1986) recommended that free writing take the form of daily journal writing or free and spontaneous writing prompted by music or other particular stimuli. Additional verbal fluency skill building activities include strategies to increase brainstorming ideas prior to writing (Hale & Fiorello, 2004), supplying word lists around a theme, and helping students brainstorm on words to use to convey similar meanings in a sentence (Bain et al., 2001).

With research demonstrating the interrelationship (Bain et al., 2001; Bear, 1991) and reciprocal nature of reading and writing (Glenn, 2007), and the knowledge that reading was shown to be a predictor of the composite writing score in this study, the current findings reinforce the belief that teachers should provide a writing task with reading assignments. Research has indicated that teachers should always plan a writing lesson immediately following a reading lesson because writing tasks can aid in reinforcing both reading and writing just as reading reinforces these same skills (Temple et al., 1993). A writing task can be structured by describing a particular character in a story or in a more abstract way such as summarizing the important parts of the story.

In this study, most of the students with TD met the writing standard on the composite writing score; however, very few exceeded the standard. That is, a very small number of students with TD demonstrated exemplary writing skills. One suggestion to help improve the writing skills of all students is to evaluate student writing samples by using a meaningful rubric that can inform instruction. Even though educators will check for improvement in writing skills by counting the total number of words written, such as with a curriculum-based measure, this evaluation tool may not be the best way to evaluate writing development. Studies have shown that with SRSD instruction, students' writing quality improved but the length did not (De La Paz et al., 1998; Graham et al., 1995; Saddler & Graham, 2005; Troia et al., 1999). Consequently, in addition to using quantitative measures, educators should find qualitative ways to assess for writing improvement, such as assessing for cohesiveness and essay elements. Appendix F is an example of a qualitative measure that teachers can use to assess a student's improvement in writing skills. In this assessment measure, on a 1 to 5 likert scale, teachers rate word choice, ideas organization, and conventions traits in a student's writing. Given that this study has shown that verbal fluency skills for the LD population are correlated with the composite writing score on the SPEP Fifth-Grade Writing Assessment, by using this qualitative measure, teachers can determine if the student is having difficulty with verbal fluency skills (word choice, ideas). If verbal fluency difficulties are detected, teachers can then use instructional strategies to build skills in this particular area and in turn improve writing skills for students with LD. Likewise, because organization is an executive function skill that also affects writing (Feifer & De Fina, 2002), evaluating the

organization of the student's writing sample may assist teachers in using strategies to improve the writing skills of students with TD.

Limitations

One limitation to the current study was the inclusion criteria for participating in the study. For children to be considered as having LD in written language, they had to be certified for special education services and have at least one reading/and or writing goal in their IEP. Consequently, in addition to having reading/writing difficulties, students may have had other disabilities, such as ADHD (Attention Deficit Hyperactivity Disorder) and/or bipolar disorder. These other disability areas could impact their writing skills as well and have an effect on the test results.

Another limitation was the inclusion criteria for students with TD. They were enrolled full-time in a general education classroom and did not receive special education or Section 504 services. Some could have been low-performing children in the general education classroom and possibly in the future would receive special education services. If this was the case, the two groups may have been somewhat similar and the differences in the performance of the two groups may actually be more pronounced.

Summary

It is well known that reading is an important skill for school success (Catts, 1997). If a student cannot read then they will not have access to the school curriculum because textbooks are an integral part of every school program. School assignments are often based on assigned reading material. Consequently and with valid reason, the emphasis in the early elementary school years is on teaching the skills that are necessary for achieving

competent reading skills (e.g., sound symbol relationship, phonics, fluency). However, what is less well known is that acquiring proficient writing skills is an equally important skill for the academic success of elementary-school age students. Not only do students learn new information from reading, but they also gain new information from writing. By writing about a topic, students come to understand the topic in a deeper way (Bereiter & Scardamalia, 1987), make meaning out of what they have learned (Catts & Kamhi, 2005), and develop analytic skills (D. Johnson, personal communication, July 12, 2006). Writing is also important in the school setting because it is the primary way that students demonstrate knowledge and mastery in all academic areas (Graham & Harris, 2005). A predicament in education today is that not only do students with LD have difficulty with writing skills, but students with TD do not demonstrate exemplary writing skills. The National Center for Education Statistics reported in 2002 that only about 28% of fourth graders who received general education and special education services could write at a proficient level or above and only 2% were able to write at an advanced level. Because proficient writing depends on the attainment of executive function skills more than any other academic skill (Feifer & De Fina, 2002), defining which executive function skills need to be intact at particular stages will be beneficial for helping students learn how to write. For example, from this study we know that intact verbal fluency skills are essential to the writing process of fifth-grade students with LD in WCSD. By focusing on improving verbal fluency skills through the strategies previously described, students who are not proficient in writing can improve their writing skills to meet the writing standard. It appears that other executive function skills are important to the writing process after proficiency has been attained, as demonstrated by the relatively small number of students

in the TD population who exceeded writing standards. Strategies that address executive function skills can help all students become better writers.

REFERENCES

- Abbott, R. D., & Berninger, V. W. (1993). Structural equation modeling of relationships among developmental skills and writing skills in primary- and intermediate-grade writers. *Journal of Educational Psychology, 85*, 478-508.
- Altemeier, 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.
- Bain, A. M., Bailet, L. L., & Moats, L. C. (2001). *Written language disorders* (2nd ed.). Austin, TX: Pro-ed.
- Barkley, R. A. (2005). Linkages between attention and executive functions. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 307-323). Baltimore: Paul H. Brookes.
- Bartlett, R. J. (1982). Learning to revise: Some component processes. In M. Nustrand (Ed.), *What writers know: The language, process, and structure of written discourse* (pp. 245-363). San Diego: Academic Press.
- Barrs, M. (2000). The reader in the writer. *Reading, 34*(2), 54-61.
- Bear, D. R. (1991). "Learning to fasten the seat of my union suit without looking around": The synchrony of literacy development. *Theory Into Practice, 30*(3), 149-157.
- Bear, D. R., & Barone, D. (1998). *Developing literacy: An integrated approach to assessment and instruction*. Boston: Houghton Mifflin.
- Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ: Lawrence Erlbaum.

- Berninger, V. W. (2002). *Brain literacy for educators and psychologists*. San Diego: Academic Press.
- Berninger, V. W., Fuller, F., & Whitaker, D. (1996). A process model of writing development across the life span. *Educational Psychology Review*, 8(3), 193-218.
- Berninger, V. W., Yates, C., Cartwright, A., Rutberg, J., Remy, E., & Abbott, R. (1992). Lower-level developmental skills in beginning writing. *Reading and Writing: An Interdisciplinary Journal*, 4, 257-280.
- Borkowski, J. G., & Burke, J. E. (2005). Theories, models, and measurement of executive functioning: An information processing perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 235-261). Baltimore: Paul H. Brookes.
- Britton, B. (1996). Rewriting: The arts and sciences of improving expository instructional text. In M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 323-345). Hillsdale, NJ: Erlbaum.
- Catts, H. W. (1997). The early identification of language-based reading disabilities. *Language, Speech, and Hearing Services in Schools*, 28(1), 86-89.
- Catts, H. W., & Kamhi, A. G. (2005). *Language and reading disabilities* (2nd ed.). Boston: Allyn and Bacon.
- Daniel, S. S., Walsh, A. K., Goldston, D. B., Arnold, E. M., Reboussin, B. A., & Wood, F. B. (2006). Suicidality, school dropout, and reading problems among adolescents. *Journal of Learning Disabilities*, 39, 507-514.
- de Jong, P. (1998). Working memory deficits of reading disabled children. *Journal of Experimental Child Psychology*, 70(2), 75-95.

- De La Paz, S. (1999). Self-regulated strategy instruction in regular education settings: Improving outcomes for students with and without learning disabilities. *Learning Disabilities Research & Practice, 14*(2), 92-106.
- De La Paz, S., & Graham, S. (1997). Effects of dictation and advanced planning instruction on the composing of students with writing and learning problems. *Journal of Educational Psychology, 89*, 203-222.
- De La Paz, S., Swanson, P. N., & Graham, S. (1998). The contribution of executive control to the revising by students with writing and learning difficulties. *Journal of Educational Psychology, 90*, 448-460.
- Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *The Delis-Kaplan Executive Function System: Examiner's Manual*. San Antonio, TX: Psychological Corporation.
- Denckla, M. B. (1994). Measurement of executive function. In G. R. Lyon (Ed.), *Frames of reference for the assessment of learning disabilities: New views on measurement issues* (pp. 117-142). Baltimore: Paul H. Brookes.
- Denckla, M. B. (2005). A theory and model of executive function: A neuropsychological perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 235-261). Baltimore: Paul H. Brookes.
- Denckla, M. B. (2007). Executive function: Binding together the definitions of attention-deficit/hyperactivity disorder and learning disabilities. In L. Meltzer (Ed.), *Executive function in education: From theory to practice*. New York: The Guilford Press.
- Emig, J. (1971). *The composing process of twelfth graders*. Urbana, IL: National Council of Teachers of English.

- Feifer, S. G., & De Fina, P. A. (2000). *The neuropsychology of reading disorders: Diagnosis and intervention workbook*. Middletown, MD: School Neuropsych Press, LLC.
- Feifer, S. G., & De Fina, P. A. (2002). *The neuropsychology of written language disorders: Diagnosis and intervention*. Middletown, MD: School Neuropsych Press, LLC.
- Francis, D. J., Shaywitz, S. E., Stuebing, K. K., Shaywitz, B. A., & Fletcher, J. M. (1996). Developmental lag versus deficit models of reading disability: A longitudinal, individual growth curves analysis. *Journal of Educational Psychology, 88*, 3-17.
- Garton, A. F., & Pratt, C. (2004). Reading and writing texts: An overview. In T. Nunes, & P. Bryant (Eds.), *Handbook of children's literacy* (pp. 149-153). Norwell, MA: Kluwer Academic.
- Glenn, W. J., (2007). Real writers as aware readers: Writing creatively as a means to develop reading skills. *Journal of Adolescent & Adult Literacy, 51*, 10-20.
- Goldberg, E. (2001). *The executive brain: Frontal lobes and the civilized mind*. New York: Oxford University Press.
- Gould, B. W. (2001). Curricular strategies for written expression. In A. M. Bain, L. L. Bailet, & L. C. Moats (Eds.), *Written language disorders: Theory into practice* (2nd ed., pp. 185-220). Austin: Pro-ed.
- Graham, S. (1992). Helping students with LD progress as writers. *Intervention in School and Clinic, 27*, 134-144.

- 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). New York: The Guilford Press.
- Graham, S., & Harris, K. R. (2003). Students with learning disabilities and the process of writing: A meta-analysis of SRSD studies. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 323-344). New York: The Guilford Press.
- Graham, S., & Harris, K. R. (2005). Improving the writing performance of young struggling writers: Theoretical and programmatic research from the Center on Accelerating Student Learning. *The Journal of Special Education*, 39, 19-33.
- Graham, S., & Harris, K. R. (2007). Best practices in teaching planning. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), *Best practices in writing instruction* (pp. 119-140). New York: The Guilford Press.
- Graham, S., Harris, K. R., MacArthur, C., & Schwartz, S. (1991). Writing and writing instruction with students with learning disabilities: A review of a program of research. *Learning Disability Quarterly*, 14, 89-114.
- Graham, S., Harris, K. R., & Olinghouse, N. (2007). Addressing executive function problems in writing. In L. Meltzer (Ed.), *Executive function in education: From theory to practice* (pp. 216-236). New York: Guilford Press.
- Graham, S., MacArthur, C., & Schwartz, S. (1995). 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., MacArthur, C., Schwartz, S., & Page-Voth, V. (1992). Improving the

compositions of students with learning disabilities using a strategy involving product and process goal setting. *Exceptional Children*, 58, 322-335.

Graves, D. H. (1983) *Writing: Teachers and children at work*. Portsmouth, NH: Heinemann.

Graves, D. H. (1985). All children can write. *Learning Disabilities Focus*, 1, 36-43.

Hale, J. B., & Fiorello, C. A. (2004). *School neuropsychology: A practitioner's handbook*. New York: The Guilford Press.

Harris, K. R., Graham, S., & Mason, L. H. (2003). Self-regulated strategy development in the classroom: Part of a balanced approach to writing instruction for students with disabilities. *Focus on Exceptional Children*, 35, 1-16.

Hayes, J. R. (1996). A new framework for understanding cognition and affect in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing* (pp. 1-27). Mahwah, NJ: Lawrence Erlbaum Associates.

Hayes, J. R., & Flower, L. S. (1980). Identifying the organization of writing processes. In L. E. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3-30). Mahwah, NJ: Lawrence Erlbaum.

Hillocks, G., Jr. (1986). *Research on written composition: New directions for teaching*. (Report No. ISBN-0-811-4075-0). Washington, DC: National Institute of Education. (ERIC Document Reproduction Services No. ED265552)

Hooper, S. R., & Montgomery, J. W. (1993). Prevalence of writing problems across three middle school samples. *School Psychology Review*, 22, 610-623.

- Hooper, S. R., Swartz, C., W., Wakely, M. B., de Druif, R. E. L., & Montgomery, J. W. (2002). Executive functions in elementary school children with and without problems in written expression. *Journal of Learning Disabilities, 35*, 57-68.
- Individuals with Disabilities Education Improvement Act of 2004, P.L. 108-446.
- Johnson, D. J. (1982). Programming for dyslexia: The need for interaction analyses. *Annals of Dyslexia, 32*, 61-70.
- Johnson, D. J. (1993). Relationships between oral and written language. *Psychology Review, 22*, 595-610.
- Johnson, D., & Christian, S (1993). *Mnemonics: Can you spell it?* Morehead, KY: Morehead State University. (ERIC Document Reproduction Services No. ED394220)
- Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*, 437-447.
- Juel, C., Griffith, P. L., & Gough, P. B. (1986). Acquisition of literacy: A longitudinal study of children in first and second grade. *Journal of Educational Psychology, 78*, 243-255.
- Lerner, J. W. (1997). *Learning disabilities: Theories, diagnosis and teaching strategies* (7th ed.). Boston: Houghton Mifflin Company
- Levine, M. D., & Reed, M. (1999). *Developmental variation and learning disorders* (2nd ed.). Cambridge: Educators Publishing Service, Inc.
- Lezak, M. D. (1983). *Neuropsychological assessment* (2nd ed.). New York: Oxford University Press.

- Lezak, M. D., Howieson, D.B., & Loring, D.W. (2004). *Neuropsychological assessment* (4th ed.). New York: Oxford University Press.
- LD Online. *Facts about learning disabilities*. Retrieved April 19, 2008, from http://ldonline.org/ld_indepth/general_info/ccld_early_warning.html.
- LD Online. *The relationship between language and learning disabilities*. Retrieved April 26, 2008, from <http://ldonline.org/article/6366?theme=print>.
- Luria, A. R. (1973). *The working brain*. New York: Basic Books.
- Lyon, G. R. (1998). Why reading is not a natural process. *Educational Leadership*, 55, 14-18.
- MacArthur, C. A. (2007). Best practices in teaching evaluation and revision. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), *Best practices in writing instruction* (pp. 141-162). New York: The Guilford Press.
- May, F. B. (1986). *Reading as communication: An interactive approach* (2nd ed.). Columbus, OH: Merrill.
- Mayo, L. (2000). Making the connection: Reading and writing together. *English Journal*, 89(4), 74-77.
- 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). New York: The Guilford Press.
- Meltzer, L. (2007). Executive function: Theoretical and conceptual frameworks. In L. Meltzer (Ed.), *Executive function in education: From theory to practice*. New York: The Guilford Press.

- Meltzer, L., & Krishnan, K. (2007). Executive function difficulties and learning disabilities. In L. Meltzer (Ed.), *Executive function in education: From theory to practice* (pp. 77-105). New York: The Guilford Press.
- Moats, L. C. (2006). *Speech to print*. Baltimore: Paul H. Brookes Publishing Co.
- Murray, D. (1999). *Write to learn* (6th ed.). Fort Worth, TX: Harcourt Brace.
- Myklebust, H. R. (1965). *Development and disorders of written language*. New York: Grune & Stratton.
- National Center for Education Statistics. *State writing 2002 report cards: Grade 4*. Retrieved April 26, 2008 from <http://www.nces.ed.gov/nationsreportcard/pubs/stt2002/20035324.asp>
- National Dissemination Center for Children with Disabilities, 2007. *What is special education?* Retrieved April 19, 2008 from <http://www.nichcy.org/index.html>
- Newcomer, P. L., Barenbaum, E. M., & Nodine, B (1989). Comparison of the story production of LD, normal-achieving, and low-achieving children under two modes of production. *Learning Disability Quarterly, 11*, 82-86.
- Noyce, R. M., & Christie, J. F. (1989). *Integrating reading and writing instruction in grades K-8*. Boston: Allyn & Bacon.
- Nystrand, M. (1989). A social-interactive model of writing. *Written Communication, 6*, 66-85.
- 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). New York: The Guilford Press.
- 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). New York: The Guilford Press.
- Pritchard, R. J., & Honeycutt, R. L. (2007). Best practices in implementing a process approach to teaching writing. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), *Best practices in writing instruction* (pp. 28-49). New York: The Guilford Press.
- Rohman, D. G. (1965). Pre-writing: The stage of discovery in the writing process. *College Composition and Communication*, 16(2), 106-112.
- Saddler, B. (2007). Improving sentence construction skills through sentence-combining practice. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), *Best practices in writing instruction* (pp. 163-178). New York: The Guilford Press.
- Saddler, B., & Graham, S. (2005). The effects of peer-assisted sentence-combining instruction on the writing performance of more and less skilled young writers. *Journal of Educational Psychology*, 97, 43-54.
- Salvia, J. & Ysseldyke, J. E. (1988). *Assessment in special and remedial education* (4th ed.). Boston: Houghton Mifflin.
- Scott, C. M. (1999). Learning to write. In H. W. Catts & A. G. Kamhi (Eds.), *Language and reading disabilities* (pp. 224-258). Needham Heights, MA: Allyn & Bacon.
- Stanovich, K. (1986). "Matthew effects" in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21, 360-407.
- Siegel, L. S. (1993). Phonological processing deficits as a basis for reading disabilities. *Developmental Review*, 13, 246-257.

- State Department of Education (2008). *Criterion Referenced Tests*. Retrieved January 15, 2009, from http://www.nde.doe.nv.gov/Assessment_CRT.htm
- State Department of Education (2008). *English Language Arts Standards*. Retrieved July 14, 2009 from http://www.doe.nv.gov/Standards/EngLang/Fifth_Grade_Achievement_Indicators.pdf
- State Department of Education (2007). *State Technical Report for the CRT and HSPE Assessments*. Retrieved January 15, 2009, from <http://www.nde.doe.nv.gov/>
- State Department of Education (2008). *Writing Assessment*. Retrieved January 15, 2009, from <http://www.nde.doe.nv.gov/standards.htm>
- Stuss, D. T., & Benson, D. F. (1986). *The frontal lobes*. New York: Raven Press.
- Swanson, H. L. (1994). Short-term memory and working memory: Do both contribute to our understanding of academic achievement in children and adults with learning disabilities? *Journal of Learning Disabilities*, 27, 34-50.
- Swanson, H. L., & Saez, L. (2003). Memory difficulties in children and adults with learning disabilities. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 182-198). New York: The Guilford Press.
- Temple, C., Nathan, R., Temple, F., & Burris, N. A. (1993). *The beginnings of writing*. Boston: Allyn and Bacon.
- Troia, G. A., Graham, S., & Harris, K. R. (1999). Teaching students with learning disabilities to mindfully plan when writing. *Exceptional Children*, 65, 235-252.
- Vallecorsa, A. L., & Garriss, E. (1991). Story composition skills of middle-grade students with learning disabilities. *Exceptional Children*, 57, 48-54.

Vygotsky, L. S. (1986). *Thought and language* (A. Kozalin, Trans.). Cambridge, MA: The MIT Press. (Original work published 1962)

Webre, E. C. (2005). Enhancing reading success with collaboratively created progress charts. *Intervention in School and Clinic, 40*, 291-295.

Westby, C. E., & Clauser, P.S. (1999). The right stuff for writing: Assessing and facilitating written language. In H. W. Catts & A. G. Kamhi (Eds.), *Language and reading disabilities* (pp. 259-324). Boston: Allyn and Bacon.

APPENDIX A

State Criteria for Students with Learning Disabilities

Prior to August 2008:

Nac 388.117: “Specific learning disability” defined. (NRS 388.520) “Specific learning disability” means a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written language, which is characterized by a severe discrepancy between predicted and actual academic achievement that is not primarily the result of a visual, hearing or motor impairment, mental retardation, serious emotional disturbance, or an environmental, cultural or economic disadvantage. The disorder may manifest itself in an imperfect ability to listen, think, speak, read, write, spell or perform mathematical calculations.

Post August 2008:

Nac 388.420: 1. A pupil with specific learning disabilities is eligible for services and programs of instruction if the eligibility team, comprised of the persons described in subsection 4, concludes that:

- (a) The pupil has a specific learning disability and, by reason thereof, needs special education and related services;
- (b) The pupil does not achieve adequately for the pupil’s age or to meet the state-approved grade level standards when provided with learning experiences and instruction appropriate for the age of the pupil or the state-approved grade level standards in one or more of the following areas: (1) Oral expression; (2) Listening comprehension (3) Written expression; (4) Basic reading skills; (5) Reading fluency skills; (6) Reading comprehension; (7) Mathematics calculation; or (8) Mathematics problem solving;
- (c) The pupil:
 - (1) Does not make sufficient progress to meet the age appropriate standards or the state-approved grade level standards in one or more of the areas set forth in paragraph (b) when using a process based on the pupil’s response to scientific, research-based intervention; or
 - (2) Exhibits a pattern of strengths and weaknesses in performance or achievement, or both, relative to the pupil’s age, the state-approved grade level standard or intellectual development, that is determined by the eligibility team to be relevant to the identification of a specific learning disability using appropriate assessments;
- (d) The findings in this subsection are not primarily the result of: (1) A visual, hearing or motor disability; (2) Mental retardation; (3) Emotional disturbance; (4) Cultural factors; (5) Environmental or economic disadvantage; or (6) Limited English proficiency;
- (e) Interventions implemented in general education classrooms have not remedied any identified underachievement; and
- (f) Any identified underachievement or severe discrepancy between achievement and intellectual ability is not correctable without special education services.

APPENDIX B

Achievement Standards for the SPEP Fifth-Grade Writing Assessment Composite Score
and the Developmental Standards for the Trait Scores

Achievement Standards	Composite Scores
ED: Emergent/Developing: Student does not apply skills/strategies and requires extensive remediation.	0 – 7.5
AS: Approaches Standard: Student inconsistently and/or incompletely applies skills/strategies and requires targeted remediation.	8 – 11.5
MS: Meets Standard: Student consistently applies skills without need for remediation.	12 – 15.5
ES: Exceeds Standard: Student comprehensively and consistently applies and generalizes skills/strategies in a variety of situations.	16 - 20

The Developmental 5-Point Scale

The scoring guide's 5-point scale can be conceptualized as a developmental continuum, yielding descriptive and prescriptive information for curriculum and instruction as illustrated in the scale below.

Score	Level of Development	Developmental Description
1	Beginning	Searching, exploring, struggling – looking for a sense of purpose or way to begin
2	Emerging	Moments that may engage the reader – stories/ideas buried within the text
3	Developing	Writer begins to take control, begins to shape ideas – writing gaining definite direction, coherence, momentum, sense of purpose
4	Maturing	More control, writer has confidence to experiment
5	Strong	Writer in control, skillfully shaping and directing the writing – evidence of fine tuning

APPENDIX C

Scoring Rubric and Analytic Scoring Guide for the Writing Traits on the SPEP Fifth-Grade Writing Assessment

IDEAS AND CONTENT (DEVELOPMENT)

5: This paper is clear, focused, and interesting. It holds the reader's attention. Relevant anecdotes, details and/or evidence enrich the central theme or story line. Ideas are fresh and engaging.

- The writer seems to be writing from experience and/or knowledge showing insight/creativity.
- The writing has balance; main ideas stand out.
- Supporting, relevant details give the reader important information that he or she could not personally bring to the text
- The writer works with and shapes ideas, making connections and sharing insights.
- The writer controls and develops the topic in an enlightening way.

3: The paper is clear and focused. The topic shows promise, even though development is still limited, sketchy, or general.

- The writer seems to be writing from experience and/or knowledge but has some trouble going from general observations to specifics.
- Ideas are reasonably clear and purposeful, even though they may not be explicit, detailed, expanded, or personalized to show in-depth understanding.
- The writer is developing the topic. Even though it is fairly easy to see where the writer is headed, more information is needed to “fill in the blanks.”
- Support is present but doesn't go far enough yet in expanding, clarifying, or adding new insights.
- Themes or main points blend the original and the predictable.

1: As yet, the paper has no clear sense of purpose. To extract meaning from the text, the reader must make inferences based on sketchy details. More than one of the following problems is likely to be evident:

- The writer may restate the topic but has not yet begun to develop it in a meaningful way.
- Information is very limited or unclear
- The text is very repetitious or reads like a collection of random thoughts from which no central theme emerges.
- Everything seems as important as everything else; the reader has a hard time sifting out what's critical.
- The writer lacks a sense of direction.

ORGANIZATION

5: The organization enhances and showcases the central idea or thesis. The order or structure is compelling and moves the reader through the text.

- Organization flows so smoothly the reader hardly thinks about it.
- An inviting introduction draws the reader in, and a satisfying conclusion leaves the reader with a sense of completion.
- Details seem to fit where they're placed; sequencing or structure is logical and effective.
- Transitions are smooth and weave the separate threads of meaning into a cohesive whole.
- Progression of ideas is very well controlled; the writer delivers needed information at just the right moment and then moves on.

3: The organizational structure is strong enough to move the reader from point to point.

- The organization, despite a few problems, does not interfere with the main point or storyline.
- The paper has a recognizable introduction and conclusion. The introduction may not create a strong sense of anticipation; the conclusion may not leave the reader with a sense of completion.
- Sequencing or structure is usually logical. It may sometimes be too obvious or create some confusion.
- Transitions often work well; however, some connections between ideas may be weak or may call for inferences.
- Progression of ideas is fairly well controlled, although the writer sometimes spurts ahead too quickly or spends too much time on the obvious.

1: The writing lacks a clear sense of direction. Ideas, details, or events seem strung together in a random, haphazard manner or list, or else there is no identifiable internal structure at all. More than one of the following problems is likely to be evident:

- Lack of organization makes it hard for the reader to understand the main point or storyline.
- The writer has not yet drafted a real lead or conclusion.
- Sequencing of details is limited or nonexistent.
- Transitions are vague or missing; connections between ideas are confusing or incomplete.
- Progression of ideas is not controlled; too much time is spent on minor details, or there are hard-to-follow leaps from point to point.

VOICE

5: The writer speaks directly to the reader in a way that is individualistic, expressive, and engaging. Clearly, the writer is involved in the text, and the writing is written to be read.

- The writing is appropriate to purpose and audience.
- The paper is honest. It has the ring of conviction.
- The word choice brings the topic to life and clarifies the writer's attitude towards the subject.
- The writer establishes a strong connection with the reader and clearly convinces the reader of the writer's commitment to the topic.

3: The writer seems sincere, but not genuinely engaged, committed, or involved. The result is earnest, but short of compelling.

- The writer seems aware of an audience but stands at a distance to avoid risk.
- The writing communicates in an earnest manner and may occasionally interest or move the reader.
- The word choice reveals the writer's attitude toward the topic in some places but may become general, vague, tentative, or abstract in other places.
- The writer establishes a connection with the reader and demonstrates some commitment to the topic; however, the writing hides as much of the writer as it reveals.

1: The writer seems indifferent, uninvolved, or distanced from the topic and/or the audience. As a result, the writing is flat, lifeless, or mechanical. More than one of the following problems is likely to be evident:

- The writer does not connect with the audience or have a sense of purpose.
- The writing communicates on a functional level. There is no presence of the writer on the page.
- The word choice tends to flatten all potential highs and lows of the message.
- The writer is not yet sufficiently engaged to take risks or make a commitment to the topic.

CONVENTIONS

5: The writer demonstrates a good grasp of grade appropriate standard writing conventions (grammar, capitalization, punctuation, usage, spelling, sentence structure, paragraphing) and uses them effectively to enhance readability. Errors tend to be so few and minor the reader can easily skim right over them unless specifically searching for them.

- Grammar and usage are correct and contribute to clarity and style.
- Internal punctuation and external punctuation contain few, if any, errors and guide the reader through the text.
- Spelling is almost always correct, even on more difficult words.
- Sentence structures are varied and add to the stylistic effect.
- Capitalization is correct.

3: The writer shows reasonable control over a limited range of grade appropriate standard writing conventions. The writer handles some conventions well but may make some errors that do not significantly distract the reader.

- Usage and grammar are almost always correct.
- External punctuation is almost always correct; grade appropriate internal punctuation is present.
- Spelling is usually correct on high frequency words, and some more difficult words may be misspelled.
- Sentences are generally structured correctly and show some variety; an occasional run-on or fragment may be present.
- Capitalization is almost always correct.

1: Errors in grade appropriate spelling, punctuation, usage and grammar, capitalization, sentence structure and/or paragraphing repeatedly distract the reader and make the text difficult to read. More than one of the following problems is likely to be evident:

- Errors in grammar and usage are very noticeable and interfere with meaning.
- Punctuation is often missing or incorrect.
- Spelling errors are frequent, even on common words.
- Sentence structure is seriously flawed; run-ons and fragments may impede meaning.
- Capitalization is incorrect or missing.

APPENDIX D

Cover Letter for Caregiver Consent

To Whom It May Concern:

I am a school psychologist in the Washoe County School District (WCSD), and I am on a sabbatical leave for the school year 2008-2009. Currently, I am a doctoral candidate in the Department of Educational Specialties at the University of Nevada, Reno (UNR). My interest is in improving the writing skills of all students. Since all WCSD students in the 5th grade take the State Proficiency Examination Program 5th-grade Writing Assessment (SPEP), I am focusing my study on written language for 5th-grade students.

For my study on written language, the procedure is that once permission is obtained for your child to participate in the study, in a private room before or after school, I will administer 3 tests that will take no more than 10 minutes. The student will be told that the tests are not typical tests that he/she may take in school. That is they are not graded, and there is no one correct answer. There are many correct answers. The purpose of the tests is to help me see how I can best support teachers in helping all students improve their writing skills. After completion of the tests, each student will receive a gift certificate for one ice cream cone at Baskin & Robbins ice cream store, as a thank you for the student's time. In addition to testing a student, your permission will allow me to read your child's school file to review his/her reading CRT scores, SPEP scores, and if applicable, IEP (Individualized Education Plan).

Data gathering for this study has been structured so as to maintain the confidentiality and protection of students participating. After each student has been tested and file reviewed, his/her information will be transferred to a Data Collection Worksheet. This worksheet will conceal the child's identity by assigning a number to each sheet. The files connected with the study will be stored in a locked file cabinet in the office of Tammy Abernathy, Ph.D., at UNR. After 3 years, the files will be shredded.

If you would like your child to participate in the study, please initial the bottom of the attached Consent To Participate In a Research Study form (highlighted at the bottom of each page) and sign the 3rd page of the form in the highlighted area. Your child can then return the form to his/her classroom teacher. If you have any questions, please don't hesitate to call me: 846-0968. Also, even after you have signed permission for your child to participate, if you or your child decide not to participate in the study, please notify me right away and your child's participation will be withdrawn.

Sincerely,

Anne Nathan, M.S., NCSP
School Psychologist

APPENDIX E

Data Summary Sheet

Subject Code #
_____Percentage of school on free and reduced
lunch _____

Age: _____

Sex: _____

General Education _____

OR Special Education _____

SCALED SCORES (D-KEFS)

Letter Fluency _____

Category Fluency _____

Category Switching # Correct _____

Category Switching Accuracy _____

STATE PROFICIENCY EXAM PROGRAM (SPEP) 5th GRADE WRITING
ASSESSMENT

Ideas _____

Organization _____

Voice _____

Convention _____

Composite Writing Score _____

CRITERION REFERENCE TEST (CRT)

Reading Score _____

APPENDIX F

Writing Score Rubric for Classroom Teachers

**Expository Writing (Explaining, Describing, How To) and
Persuasive/Argumentative Writing**

<p style="text-align: center;">Word Choice</p> <p>_____ Used active verbs</p> <p>_____ Used awesome adjectives</p> <p>_____ Bonus: Used at least 1 simile</p> <p>High (5) Medium (3) Low (1) Bonus (1)</p> <p style="text-align: right;">Score _____</p>	<p style="text-align: center;">Ideas</p> <p>_____ Stayed on topic</p> <p>High (5) Medium (3) Low (1)</p> <p style="text-align: right;">Score _____</p>
<p style="text-align: center;">Organization</p> <p>_____ Paragraph has a topic sentence</p> <p>_____ Paragraph has 3 supporting sentences</p> <p>_____ Paragraph has a concluding sentence</p> <p>_____ Paragraph(s) indented</p> <p>_____ Used complete sentences</p> <p>_____ Used compound sentence with linking expression, e.g., and, but, so because, etc,</p> <p>_____ Used transition words, e.g., next, last, therefore, etc.</p> <p>High (5) Medium (3) Low (1)</p> <p>Score _____</p>	<p style="text-align: center;">Conventions</p> <p>_____ Correct punctuation</p> <p>_____ Correct capitalizations</p> <p>High (5) Medium (3) Low (1)</p> <p style="text-align: right;">Score _____ Total Score _____</p> <p><i>M. Miller & A. Nathan</i></p>

Story Writing

Word Choice	Ideas
<p>_____ Used active verbs</p> <p>_____ Used awesome adjectives</p> <p>_____ Bonus: Used at least 1 simile</p> <p>High (5) Medium (3) Low (1)</p> <p>Bonus (1)</p> <p style="text-align: right;">Score _____</p>	<p>_____ Stayed on topic</p> <p>High (5) Medium (3) Low (1)</p> <p style="text-align: right;">Score _____</p>
Organization	Conventions
<p>_____ Story has beginning, middle, end</p> <p>_____ Story has characters, setting, plot</p> <p>_____ Paragraph(s) indented</p> <p>_____ Used complete sentences</p> <p>_____ Used compound sentence with linking expression, e.g., and, but, so because, etc,</p> <p>_____ Used transition words, e.g., next, last, therefore, etc.</p> <p>High (5) Medium (3) Low (1)</p> <p>Score _____</p>	<p>_____ Correct punctuation</p> <p>_____ Correct capitalizations</p> <p>High (5) Medium (3) Low (1)</p> <p style="text-align: right;">Score _____</p> <p style="text-align: right;">Total Score _____</p> <p style="text-align: right; margin-top: 20px;"><i>M. Miller & A. Nathan</i></p>