AN EXAMINATION OF THE STRUCTURAL RELATIONSHIPS OF ADOLESCENT WRITING: IMPLICATIONS OF THE SIMPLE VIEW OF WRITING

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For my parents,
who listen, encourage, and patiently read every page I write

For my sister,
who reminds me to have a little fun

For my students,
may I have taught you as much as you have taught me

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Four years ago, when I applied to the doctoral program in the Department of Special Education, I wrote of the coveted "experience" that is so valued in our culture, yet only a few are willing to provide. At the time, the local school district I worked for in Springville, New York, had taken a chance on a new special education teacher who was primarily trained in English Language Arts. At Springville, I had hopes and dreams . . . at Mizzou, I watched those hopes and dreams become reality.

To the Department, thank you for taking the risk on that high school special education teacher, and for providing the experiences that have led me to this moment.

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ABSTRACT

Writing is a complex process for many students, especially for students with learning disabilities and those who experience difficulties with language and the writing process. Nevertheless, writing has become the gateway for both academic and post-secondary success. Over about the last 30 years, models of writing have been developed to represent the components of writing that best capture writing proficiency. One model that is often used today, is the Simple View of Writing, a model that draws from the pinnacle process model originally developed by Hayes and Flower (1980). The Simple View of Writing suggests relationships between transcription level skills (e.g., handwriting, spelling), self-regulation executive functions (e.g., planning, organizing, attention), text generation (e.g., idea development and translation), and working memory (Berninger & Amtmann, 2003; Berninger et al., 2002; Gough & Tunmer, 1986; Juel, Griffith, and Gough, 1986). However, this model has not been studied at the high school level. Thus, the purpose of this study was to test the Simple View of Writing with a sample of 9th grade students. By identifying the best fitting model, the goal was to better understand the relationship between the variables and to explore the extent to which struggling writers differ from non-struggling writers on a variety of writing and cognitive tasks.

Structural equation modeling using exploratory factor analysis was used to examine the structural relationships of the Simple View of Writing model. One-way analysis of variance (ANOVA) was used to determine whether statistically significant differences exist between struggling and non-struggling writers on the observed variables (standardized assessments). Results reveal a 2-factor model (transcription/working

memory + text generation [a fluency factor]), suggesting that writing, at the high school level, at least within this sample of 9th grade students, is more multi-dimensional. One-way ANOVAs reveal statistically significant differences between struggling and non-struggling writers on all measures except the scales and indices of the Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR) and on the Graphic Speed task of the Detailed Assessment of Speed of Handwriting (DASH). Though this study does not confirm the Simple View of Writing model, it does confirm that writing is not simple and perhaps even suggests that there is a more intertwined nature of the component structure than the triangular structure indicates for adolescent writers.

Keywords: Writing, Simple View of Writing, Adolescents, Structural Equation Modeling

CHAPTER 1

Introduction

Writing – "a process of communication that uses a conventional graphic system to convey a message to a reader" (Lindemann, 2001, p. 10) – involves a complex array of cognitive processes and interrelationships (e.g., between memory and writing, transcription and orthographic knowledge and writing, reading and writing, etc.) that are demanding and intricate (see for example, Abbott, Berninger, & Fayol, 2010; Lindemann, 2001; Vanderberg & Swanson, 2007; Zimmerman & Risemberg, 1997a). Successfully navigating the demands of writing can be very challenging, especially for learners with identified writing challenges and disabilities.

Writing: A Critical Need

Many adolescents struggle with writing across the school-age years as evidenced by performance on National Assessment of Educational Progress writing tests (National Center for Education Statistics [NCES], 2014). The most recent national data (from 2002) in writing at the 4th grade level reveals that 94% of students identified with a disability (including those with a 504 plan) and 70% of students not identified with a disability scored at or below basic on the exam (NCES, 2014). The 2011 Nation's Report Card, for scores at 8th and 12th grade respectively, demonstrated that 97% and 95% of students with disabilities (excluding those with a 504 plan) scored at or below basic, compared to 71% for students without disabilities at each grade level (NCES, 2014). Furthermore, there were no students with disabilities who performed at the advanced level on either exam. The struggles with writing represented by these statistics, though, are only a snapshot of performance.

Rogers and Graham (2008) reveal that approximately 70% of students in grades 4-12 are considered low-achieving writers, almost one-third of high school graduates are not prepared for college-level English composition courses, and 50% of high school graduates are not prepared for college-level writing according to their professors. Moreover, it has been reported that approximately $3.1 billion are spent annually by American businesses for writing remediation, and that 2 out of every 3 students in grades 4, 8, and 12 possess below grade level proficiency in writing, and too often never learn to write at a level that meets or exceeds grade level expectations (Graham & Perin, 2007a, 2007c; Lindemann, 2001; National Commission on Writing for America's Families, Schools, & Colleges, 2004; Rogers & Graham, 2008). What is more, struggling writers are less likely to attend college as writing is used as a qualification to admission (Rogers & Graham, 2008). Research has also consistently demonstrated that weak literacy skills (both reading and writing) are highly correlated with high school dropout, incarceration (in both juvenile and adult facilities), recidivism, unemployment, poverty, low wages, government assistance, teen pregnancy, and low self-esteem (Balfanz, Herzog, & Mac Iver, 2007; Christle, Jolivette, & Nelson, 2007; Harvey, 2001; Montgomery & Hirth, 2011; Morrison & Cosden, 1997; Patterson, Beltyukova, Berman, and Francis, 2007). The seriousness of continued deficits in both reading and writing have led Fuchs, Fuchs, and Compton (2010) to identify adolescent literacy as a national "public health crisis" (p. 26). A national agenda is needed for addressing such a crisis.

Writing and its Importance

Though writing has long been spoken of as one of the three R's (e.g., reading, 'riting, 'rithmetic), it is also equally recognized as the neglected R (National Commission

on Writing in America's Schools and Colleges, 2003). According to the National Commission on Writing in America's Schools and Colleges (2003), there is a need for a writing revolution as writing has been used to help transform the world. Indeed, writing is critical to not only students' overall literacy development, including improving reading comprehension, reading fluency, and word reading (Biancarosa & Snow, 2004; Graham & Hebert, 2010), but it is necessary for success across all content domains (Abbott, Berninger, & Fayol, 2010). Beyond demonstrating one's knowledge on a topic, writing also allows individuals to expand their knowledge on new topics and to communicate what they know (Graham & Perin, 2007a). Moreover, writing is important for the development of critical thinking (Shanahan, 2006). In particular, according to Gillespie, Graham, Kiuhara, and Hebert (2014), writing can be used to facilitate learning in five different ways. First, writing promotes explicitness because students must continually make decisions about what information is most important. Second, writing encourages the learner to make connections between ideas and then connect them in a coherent response. Third, writing encourages review and reflection to ensure that what was intended to be conveyed has reliably been communicated. Fourth, writing involves the student in new information as the student must continually work with and meld ideas. And fifth, writing helps students put ideas into their own words.

Nevertheless, writing remains a critical need as revealed by student performance on national assessments and the many resources required to support students as they move into public and private sector institutions. With the recent adoption of the new Common Core State Standards (CCSS) in many states, or advanced standards that mirror the CCSS in other states, writing and literacy are again a part of the national discussion.

Specifically, these standards require students to write for a variety of audiences, to demonstrate content knowledge, and to support their interpretations with textual evidence in their writing (National Governor's Association & State Education Chiefs, 2010). However, simply setting high standards is not sufficient. Despite the perceived importance of writing and the use of writing for acquiring new knowledge, writing is largely absent from the national scene and within classrooms.

National Picture of Writing in Secondary Schools

Since the implementation of the No Child Left Behind (NCLB) Act of 2001, little attention has been paid to writing in general and specifically to writing at the high school level, despite the increasing demands of writing throughout the secondary years (Cook & Bennett, 2014; Graham, Capizzi, Harris, Hebert, & Morphy, 2014; Kiuhara, Graham, & Hawken, 2009; Schumaker & Deshler, 2003). This is of great concern when considering that throughout high school, writing instruction receives insufficient attention (Cook & Bennett, 2014), especially given that writing is frequently talked about as essential for an individual's future success educationally, professionally, and personally (Cook & Bennett, 2014; Graham & Perin, 2007a, 2007b, 2007c; Kiuhara, Graham, & Hawken, 2009; National Commission on Writing, 2008; Rogers & Graham, 2008; Taft & Mason, 2011).

Types of Writing Activities. Results of recent national surveys report that not only do high school students lack the writing skills necessary for higher education and employment, but that they are rarely required to complete extensive writing assignments in their classes (Applebee & Langer, 2011, 2013; National Commission on Writing, 2008; Gillespie, et al., 2014; Graham et al., 2014; Kiuhara, Graham, & Hawken, 2009).

The most common writing activities that students engage in are note-taking and other writing without composing activities (e.g., short answer responses, worksheets, etc.) with fewer writing activities that require deep synthesis and analysis like that found in research papers, essays, etc. (Applebee & Langer, 2011; Gillespie et al., 2014; Graham et al., 2014).

In an early, seminal writing study by Britton, Burgess, Martin, McLeod, and Rosen (1975) on the development of writing abilities across Years 1 through 7 (ages 11-18) in Great Britain, the authors sought to explore the purpose and function behind different writing activities across content classes. They developed a coding system to identify the intended audience for the writing activity, as well as the function of the writing task. What Britton and colleagues found was that the "teacher as examiner" (e.g., as evidence of content mastery where the expected response will be an assessment of said knowledge as communicated through writing) and the "teacher-learner dialogue" (e.g., writing for an adult within the educational setting as part of an ongoing dialogue where a response is anticipated rather than evaluative feedback) dominated student writing at all grade levels. In fact, teacher as examiner increased as the ages of the writer increased, most likely because of testing situations. This occurred alongside a decline in writing for the teacher-learner dialogue, leaving opportunities for writing for other audiences unexploited. Moreover, the study also found a reliance on low-level writing tasks, which they attribute to changes in curriculum. Though they presume that a great deal of writing is still completed in schools (even since their data was collected), their fear is that most of it involves the use of worksheets. Unfortunately, this is consistent with the recent research from the United States as reported by Applebee and Langer (2011), Gillespie et

al. (2014), and Graham et al. (2014) discussed earlier. Indeed, a testing culture – including that found in the United States – can have a detrimental effect on the types of writing opportunities provided to students and the time spent on authentic writing activities; it also places added pressure on students who struggle with writing (Jacobson & Reid, 2010).

Amount of Writing Instruction Provided. Minutes of writing instruction across middle and high school classrooms each week is very scarce. Graham et al. (2014) report that middle school teachers as a group teach writing for about 32.51 minutes each week, or about 6 minutes each day. At the high school level, the median amount of class time devoted to writing was 30% (Gillespie et al., 2014). Graham et al. (2014) also found that slightly more than half of middle school teachers report that they rarely use writing assessment data to guide the instruction that they provide to students, and an approximately equal number of teachers report limiting how often students write due to the time required to grade student papers (Graham et al., 2014). According to Applebee and Langer (2011), approximately 3 minutes of a 50 minute period would be devoted to explicit strategy instruction in writing.

Writing and Students with Learning Disabilities. For students with learning disabilities (LD) and other struggling writers who require direct supports, writing remains a significant challenge. When working with struggling adolescent writers and students with writing disabilities, most middle school teachers use a number of adaptations, but employ them infrequently (Graham et al., 2014). In their study, extra encouragement was provided at least weekly, and extra time was provided at least monthly (Graham et al., 2014). Kiuhara, Graham, and Hawken (2009) similarly reported that high school

teachers also only utilized a number of adaptations infrequently across the academic year. Students with disabilities and other struggling writers, though, require consistent intensive and direct instruction in writing in order to acquire stronger writing skills, and they need opportunities to practice writing. Gillespie et al. (2014) found that high school teachers moderately agreed that writing to learn activities would be effective for students of varying ability levels. Indeed, writing to learn activities are important, and students of all ability levels need writing activities that are aligned with their unique and individual needs in order to both master content acquisition and to become more fluent in using writing tasks that align with such content. Students with disabilities are no exception. Teachers, though, must also understand the specific challenges that struggling writers and writers with disabilities experience when they do encounter a writing assignment.

Teacher Preparation in Writing. Even though working with struggling writers and writers with disabilities can be a great challenge for many teachers, writing, unlike other school subjects, lacks a framework or scope and sequence that clearly delineates what students should know and be able to do across grades and content domains (Applebee & Langor, 2013). But, to effectively teach in the content areas, "educators need a repertoire of pedagogical practices" (Collopy, 2008, p. 165). However, writing instruction across the content areas is not widely researched and many teachers do not feel that they have been adequately prepared to teach writing (Gillespie et al., 2014; Kiuhara, Graham, & Hawken, 2009).

Recent national surveys of high school and middle school teachers in the four core content areas (i.e., English language arts, social studies, science, and mathematics) reveal that most teachers receive minimal or no formal training in teaching writing

(Gillespie et al., 2014; Graham et al., 2014; Kiuhara, Graham, & Hawken, 2009). At the high school level, 71% of all teachers reported minimal to no preparation during college on teaching writing (Kiuhara, Graham, & Hawken, 2009). For middle school teachers, 48% indicated minimal and 16% indicated no preparation during college (Graham et al., 2014). Similar trends were also reported for in-service preparation in writing – 44% of high school teachers reported little support for teaching writing (Kiuhara, Graham, & Hawken, 2009), and 40% and 4% of middle school teachers reporting minimal or no in-service preparation, respectively (Graham et al., 2014). The percentage of teachers reporting adequate or extensive writing preparation during pre-service programs is also very small across both studies (27% and 9%, respectively, of middle school teachers, and 47% of high school teachers reporting adequate pre-service preparation) (Kiuhara, Graham, & Hawken, 2009; Graham et al., 2014). These numbers are similar for middle school teachers who report their in-service preparation in writing as adequate (41%) or extensive (14%) (Graham et al., 2014), whereas 58% of high school teachers report their in-service preparation as adequate (Kiuhara, Graham, & Hawken, 2009). Moreover, English language arts and social studies teachers reported greater preparation in teaching writing across both studies.

If writing is to be placed "squarely in the center of the school agenda" as the National Commission on Writing in America's Schools and Colleges argues (2003, p. 3), writing must become the focus of many conversations that occur across a number of educational, professional, and political groups. However, as Zimmerman and Risemberg (1997a) note, writing is a complex skill to teach, one that is poorly learned by many. Such findings are confirmed by the stark realities of the teaching of writing across

content areas as revealed by recent national survey studies (Applebee & Langer, 2011; Gillespie et al., 2014; Graham et al., 2014; Kiuhara, Graham, & Hawken, 2009). Yet, the most vulnerable students who struggle with writing cannot be expected to become proficient writers if little time is spent teaching, modeling, and discussing writing skills and strategies with students (Gillespie et al., 2014). Thus, efforts are needed to improve writing, not only at the high school level, but across academic domains (Kiuhara, Graham & Hawken, 2009).

Purpose

In order to support the writing needs of adolescents who struggle with writing and adolescents diagnosed with LD in writing, it is important to identify the characteristics of writing with which students struggle, as well as the characteristics of writing that, if targeted, will provide the greatest amount of benefit to students. Identifying such characteristics will allow researchers and teachers to better understand what makes for good writing.

Characteristics of Writers with Learning Disabilities. For inexperienced and struggling writers, a lack of writing proficiency can impede meaning making, making writing a frustrating process (Lindemann, 2001). As Graham and Perin (2007a) have noted, the inherent difficulty of writing leaves many, students with LD less likely to engage in writing as a means for extending and supporting content learning (Graham & Perin, 2007a). More often, these students refuse to write – even when teachers scaffold the writing process – and too often teachers remove opportunities for them to engage in writing. Graham and Harris (2012) identified two general domains in which students with LD struggle: approach to writing and knowledge of writing.

First, students with LD often approach writing as if it were a singular process: content generation (Gillespie & Graham, 2014). When presented with a topic, they frequently retrieve whatever they know about the topic and the genre and simply write everything that comes to mind without concern for whether the information recalled is relevant to the topic or appropriately contextualized. As a result, their writing is typically less organized, includes fewer details and ideas, and may not stick to the intended topic. This process is often referred to as "knowledge telling" (Graham & Harris, 2012; Harris, Graham, Mason, & Friedlander, 2012).

Moreover, unlike their peers, students with LD spend less time planning, revising, editing, and generating coherent ideas (Gillespie & Graham, 2014; Graham & Harris, 2012). Planning is primarily completed during the act of writing, and they commonly struggle with generating ideas; thus, their writing is often short, though they often know more than what gets recorded on paper (Graham & Harris, 2012). Most students with LD are also likely to devote little time and effort to writing, some because they struggle to sustain their attention or focus on a topic (Graham & Harris, 2012).

When asked to revise and edit, struggling writers and writers with disabilities typically focus on surface level details such as spelling and punctuation, as opposed to focusing on more substantive changes. The result is that their changes either make no contributable difference or negatively impact their text (Graham & Harris, 2012).

Second, students with LD also lack knowledge of writing and of various writing genres (e.g., narrative, expository, etc.). Due to difficulties with handwriting and spelling, the physical, grapho-motor aspect of writing is also slowed down, often resulting in choppy and/or incomplete sentences that are not clearly linked together.

Such difficulties with the mechanics of writing places undue demand on working memory which constrains the rest of the writing process (McCutchen, 2000). Interestingly, though, despite their struggles with writing, students with LD are often more confident than their peers about their writing (Graham & Harris, 2012). Nonetheless, continued struggles with writing, place many students at great risk. Understanding characteristics of writers, though, along with the conceptual understanding of writing, provides a way for researchers and teachers to begin thinking about variables that may provide additional information about supporting struggling writers and writers with LD. Modeling provides one way to explore the relationships of components of writing.

The Promise of Modeling Writing. Over the last 30 years, researchers have sought to develop models of writing to explain what happens when an individual engages the writing process. These models are based on characteristics (like those that students with LD have been shown to struggle with) that have emerged as important or necessary for writing across a number of grade levels (though primarily with elementary aged students), and can be divided into five primary categories according to Berninger and Amtmann (2003): (a) transcription level skills like spelling, handwriting, and orthographic knowledge (e.g., Berninger & Swanson, 1994); (b) memory, including working, short-term, and long-term memory (e.g., McCutchen, 1996; Swanson & Berninger, 1996a); (c) cognitive processes like planning, reviewing, and revising (Hayes & Flower, 1980); (d) strategies for executive functions that support the cognitive processes (e.g., Graham, 1997; Graham & Harris, 1996); and (e) discourse knowledge (e.g., McCutchen, 1995; Wong, 1997). Each of these variables, with the exception of

transcription, has been found to contribute to the writing of high school students; this is consistent with the findings from the literature that investigates the writing of elementary and middle school students. At the elementary level, much research exists supporting the importance of transcription level skills. However, at the high school level, the literature does not appear to explore the role of transcription level skills such as the impact of spelling or handwriting instruction on writing performance.

Developmental correlations between these variables have also been found; transcription skills typically plateau in early adolescence (e.g. Berninger, 1999; Graham, Berninger, Weintraub, & Schafer, 1998; McCutchen, 1996), whereas self-regulatory behaviors typically increase with age (Berninger & Amtmann, 2003). Kellogg (2008) has even suggested that writing is a cognitive developmental process, positing three stages of writing development: (a) a beginning stage in which the writer tells what he/she knows [i.e., knowledge-telling]; (b) an intermediate stage in which the writer transforms what he/she knows for his/her own benefit [i.e., knowledge-transforming]; and (c) a final stage where the writer crafts what he/she knows for the reader's benefit [i.e., knowledge-crafting]. Researchers need to understand the areas where adolescents struggle with writing in order to design effective educational interventions and instructional practices.

However, writing is not a solitary skill; it is complex and multifaceted. As Abbott, Berninger, and Fayol (2010) state, "writing development involves a complex, dynamically changing set of interrelationships" (p. 296). Recognizing the need to look beyond single components of writing, some researchers have conducted studies using structural equation modeling. For example, Abbott and Berninger (1993) studied transcription and oral language skills; Graham, Berninger, Abbott, Abbott, and Whitaker

(1997) studied handwriting and spelling; and Abbott, Berninger, and Fayol (2010) studied the connections between reading and writing; each of these studies was conducted with elementary and early middle school students (grades 1-6 or 1-7 respectively). Only Vanderberg and Swanson (2007), in studying the macro- (e.g., writing, planning, revising, etc.) and micro-structures (e.g., punctuation, grammar, etc.) of writing and working memory, specifically accessed a high school sample of tenth-grade students.

Understanding the complexity of writing variables across the age-span is needed. While the question of remediation versus prevention is often connected with the secondary literature, much work remains in understanding writing conceptually at a high school level and understanding what adolescents in high school struggle with in order to support their writing needs. Research has explored ways to intervene early with students in writing to prevent future academic struggle, yet little has been done to help address what many might consider the intractable writing deficits of adolescent or high school students. Exploring the extent to which the components of current writing models are appropriate for other populations of students is necessary. Indeed, understanding the adolescent population is needed, as the current literature base has conceptualized "adolescence" as encompassing students in grades 4-12. This is often because it is believed that starting in about 4th grade, students experience a shift from learning to write to writing to learn. However, it is inaccurate to presuppose that writing supports for late elementary writers are still appropriate for high school writers, as content demands significantly increase across this time.

As researchers frequently like to explore parsimonious models that will provide pertinent insight on issues that continue to plague education, a model known as the

Simple View of Writing (Berninger & Amtmann, 2003; Berninger & Winn, 2006; Berninger et al., 2002) was used to evaluate four variables (i.e., transcription, text generation, self-regulation, and working memory), which draw from those variables identified earlier. Other models of writing – like Flower and Hayes' (1980) pinnacle cognitive process model, and subsequent iterations of their model developed by Berninger and Swanson (1994), Swanson and Berninger (1996a), and Hayes (1996) – rely on a similar set of predictor variables. However, although models of writing that illuminate both simple and complex structures can be used to better understand writing development (Abbott, Berninger, & Fayol, 2010), Juel, Griffith, and Gough (1986) make clear that there is great advantage in working with a simple model, in that if it is wrong, it can easily be used to advance knowledge.

Thus, the purpose of this study was to test the Simple View of Writing with a sample of 9th grade students. By identifying the best fitting model, the goal was to better understand the relationship between the variables and to explore the extent to which struggling writers differ from non-struggling writers on a variety of writing and cognitive tasks.

Theoretical Framework

Writing is impacted by many forms of learning. Theoretical influences working to shape writing are largely drawn from cognitive processing theories and information processing. While this is not intended to suggest that other theoretical frameworks (e.g., socio-cultural, ecological, etc.) are less important, learning theory, especially in special education and learning difference, often draw from cognitive models. Therefore, this study employs a cognitive theoretical approach.

Indeed, writing depends on the execution and integration of various cognitive processes – including working memory, executive functions, etc. To write, an individual must have control of the grapho-motor, grapho-phonetic, lexical, orthographic, grammatical, and syntactical structures of writing (and the language in which the text is produced), along with knowledge of semantics. Schunk (2012) also emphasizes that writing is demanding and that it "requires attention control, self-monitoring, and volitional control" (p. 439). However, completely capturing the message to be conveyed in writing, requires that individuals also incorporate content knowledge and background knowledge. Thus, a series of cognitive processes are involved in writing. Models of writing explore such processes, taking into account the extent to which these processes are fluent and automatized in writers, as they try to determine how writing processes diverge and differ in strong writers (experts) and developing writers (novices; Schunk, 2012).

Such complexity of writing is captured through various theoretical models that account for the cognitive and self-regulatory processes involved in crafting text. Most recent models, which show a shift away from viewing writing simply as the production of a product, focus on the "mental representation" (Schunk, 2012, p. 334; Kendeou, van den Broek, Helder, & Karlsson, 2014) that writers construct as a result of merging their knowledge of a given topic with knowledge of the requirements of writing.

Adopting a cognitive approach situates understanding as a transfer of knowledge and the subsequent application of that knowledge in various settings; it also posits the great need for providing students with effective feedback on their skills in order for them to incur benefit and learn in diverse ways (Schunk, 2012). Moreover, cognitive

approaches emphasize mental activities such as attention, rehearsal, memory, and self-regulation (Schunk, 2012).

Hayes and Flower (1980), in their seminal work, identified writing as a problem-solving process. This process emerged from research that examines the "cognitive processes that underly [sic.] writing and form a new awareness of the connections between writing, thinking, and learning" (Hayes & Flower, 1986, p. 1106). Namely, the cognitive processes of accessing long-term memory, planning, translating, reviewing, and monitoring progress (Flower & Hayes, 1981), all skills with which many adolescents, particularly adolescents with LD, struggle.

The emergence of self-regulatory abilities and processes also play a prominent role in information processing as it relates to the encoding of information. According to Schunk (2012), "Self-regulation requires learners to have a sound knowledge base comprising task demands, personal qualities, and strategies for completing the task" (p. 416). Zimmerman (1989) identified three general classes of strategies that individuals must exert an influence over: (a) behavioral, (b) environmental, and (c) personal (covert) processes. In what Zimmerman and Risemberg (1997a) call a social cognitive perspective of self-regulation in writing, they suggest that the three previously mentioned classes of strategies interact reciprocally via a feedback loop by which writers self-reflect on and self-monitor feedback on the use of self-regulatory processes throughout writing.

Thus, the theoretical framework of this study draws from both cognitive and information processing theory, suggesting that the act of writing includes a series of cognitive and self-regulatory tasks. Conceptual representations of writing have similarly

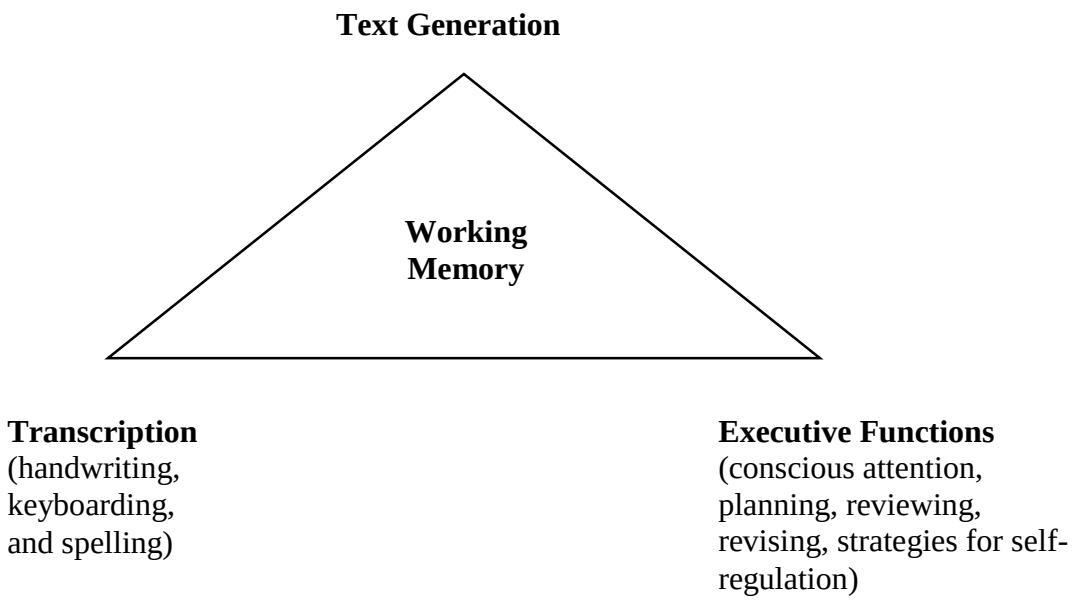
emphasized the importance of cognition and memory along with an emphasis on ideas and self-regulation, components that continue to emerge in models of writing.

Conceptual Framework

The Simple View of Writing (see Figure 1) is a model that draws on diverse theoretical and instructional practices including "cognitive, developmental, neuropsychological, and educational" beliefs according to Berninger et al. (2002, p. 292). The incorporation of multiple theoretical frameworks is consistent with Hallenbeck's (2002) acknowledgment that writing requires a multifaceted approach. The conceptual framework explored in this study is situated within an understanding of the interrelationships posed by the Simple View of Writing. This model was selected because it provides a basic structure for understanding writing, a structure that has strong theoretical foundations, and a structure that within the recent writing literature has been consistently referenced. Furthermore, it is a model that has not been studied at the high school level.

Figure 1.

Simple View of Writing (Berninger & Amtmann, 2003; Berninger et al., 2002)



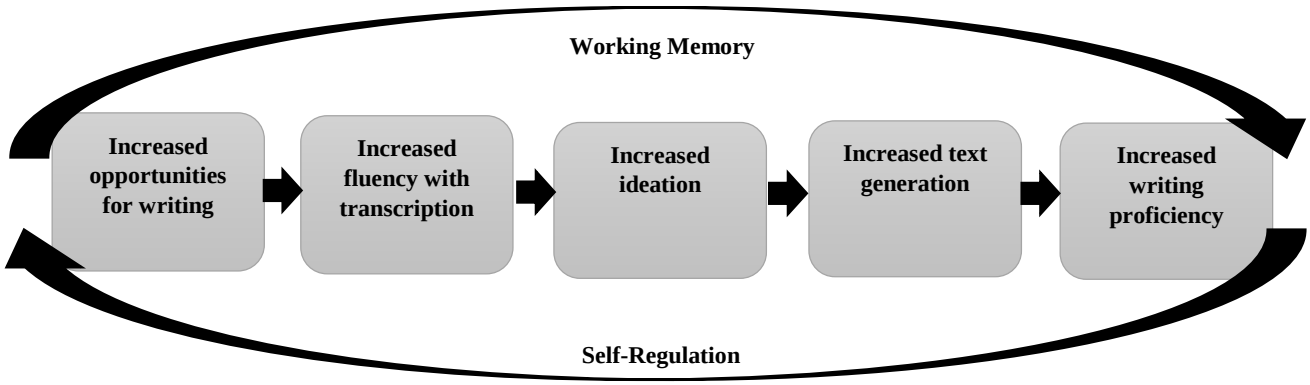
The assumptions of the Simple View of Writing draw from Hayes and Flower's (1980) earlier cognitive process model, as well as from educational, cognitive, linguistic, developmental, and neuropsychological research traditions (Berninger & Amtmann, 2003; Berninger et al., 2002). One assumption is that transcription plays an important role in early writing, but that other components emerge across development. Berninger and Amtmann (2003) identify these other elements as working memory; the cognitive processes of planning, reviewing, and revising; executive functions that support the self-regulation of cognitive processes; and discourse knowledge. Another assumption is that the elements included within the model are believed to capture the most important components for teaching and assessing students at risk for writing challenges (Berninger & Amtmann, 2003). A final assumption is that transcription and self-regulatory skills are the vertices forming the base or foundation of the triangular figure that the authors' posit (see Berninger & Amtmann, 2003; Berninger et al., 2002) which leads to text generation (the outcome). Thus, the more fluent or automatic students' transcription skills are, the more cognitive space is available for generating and translating ideas into text.

A Proposed Theory of Change

This study proposes a theory of change (see Figure 2) that draws from the assumptions of the Simple View of Writing. The assumptions embedded within this proposed theory of change are also situated within a working memory and self-regulation environment. Each assumption is described in detail below Figure 2.

Figure 2.

Proposed Theory of Change



Assumption 1: Increased opportunities for writing will result in improved transcription. In a review of the literature, Graham (1999) suggests that spelling and handwriting improve with increased opportunities for writing, most likely because students can practice these skills more frequently. Subsequently, increasing opportunities for writing will lead to greater fluency with the writing process which will ultimately result in improved writing proficiency. Providing students with explicit instruction in writing and with constructive and timely feedback will also ensure that opportunities for writing are appropriately designed for students to practice and model accurately.

Assumption 2: Increased fluency with transcription skills (e.g., spelling and handwriting) frees cognitive space for increasing the number of ideas one can produce. Writing is a demanding process. When a student can effortlessly identify and form letters, and spell words, students can focus on the ideas needed to generate detailed text (Graham & Harris, 2000). As many researchers have indicated (Gough & Tunmer, 1986; Juel, Griffith, and Gough, 1986; Berninger et al., 2002), stronger, lower level skills

like spelling and handwriting will lead to stronger higher-level skills like ideation, text generation, and later writing proficiency.

Assumption 3: To increase text generation, students need opportunities to acquire and develop ideas. Ideas are the result of increased access to text (both through reading and engaging with writing; Juel, 1988). The more that students know about writing and different topics offers more material for developing various ideas and creativity.

Assumption 4: Improved writing proficiency will result from students increasing their text generation skills. Writing provides an avenue for acquiring new learning, is a context for effectively practicing new skills, and reinforces the importance of using correct spellings (Graham & Harris, 1997a).

Assumption 5: An important goal is to improve students' writing proficiency. As Cook and Bennett (2014) acknowledge, writing proficiency opens opportunities for students, serving as a ticket to future educational, post-secondary, and personal success.

Assumption 6 and 7: Writing requires unconstrained cognitive capacity and high levels of self-regulation. These earlier assumptions (Assumptions 1-5) are constrained by limits in working memory, but can also be further supported by helping students gain and use self-regulatory skills. The larger assumption here is that writers have cognitive channels that can become overwhelmed with keeping spelling, ideas, sentence order, etc. in mind while one writes. When this happens, the connectivity of writing breaks down, because the writer is unable to manage the various demands imposed by writing processes (McCutchen, 2000). Related to this assumption is another assumption that suggests that productive and efficient writers use a number of self-

regulatory skills to guide, monitor, and manage their writing (Effeney, Carroll, & Bahr, 2013; Graham & Harris, 1997a; 1997b; 2000; Zimmerman & Pons, 1986; Zimmerman & Risemberg, 1997a). When they do, writing flows, is developed, and clearly communicates the intended message. Thus, it is proposed, that the development of adolescent writing proficiency depends on high-levels of self-regulation, and mastery of transcription skills in order to ensure sufficient cognitive capacity to sustain the writing process (Graham & Harris, 2000).

Summary

Recent research (Applebee & Langer, 2011, 2013; National Commission on Writing, 2008; Gillespie, et al., 2014; Graham et al., 2014; Kiuhara, Graham, & Hawken, 2009), along with results of recent national assessments (NCES, 2014), reveal that adolescents with and without disabilities are struggling in writing. However, despite an emerging research base, a paucity of research exists for understanding the foundation of writing, or those variables that comprise writing at the high school level. Models of writing (explained further in Chapter 2) have sought to identify the most essential components of writing, though many of these have been tested with elementary writers. Those variables primarily include transcription level skills; memory; planning, reviewing, and revising; strategies for self-regulation; and discourse knowledge (Berninger & Amtmann, 2003).

This study seeks to explore a model of writing referred to as the Simple View of Writing, a conceptual model that posits that transcription and self-regulation are central to producing longer text (a more detailed explanation is provided in Chapter 2). The assumption is that fluency with transcription (which is viewed as a lower-order skill) will

allow for the execution of more cognitively demanding tasks such as idea generation and translation. Whether such a model is still accurate at the high school level, though, is unknown. However, researchers must have a solid conception of writing, before they can understand what adolescents who struggle with writing are struggling with; only then, can effective educational interventions and instructional practices be designed. Beginning by exploring “simple” models will allow for later modification and can lend support for the future generation of more complex models.

CHAPTER 2

Models of Writing

Many researchers have developed writing models of varying complexity (e.g., Berninger, 2000; Berninger & Amtmann, 2003; Berninger & Graham, 1998; Berninger et al., 2002; Hayes, 1996; Hayes & Flower, 1980; Kim, Al Otaiba, Puranik, Folsom, Gruelich & Wagner, 2011; Wagner, Puranik, Foorman, Foster, Wilson, Tschinkel & Kantor, 2011). These models have included both product and process models. The former, commonly referred to as stage models, emphasize the output (e.g., product) of writing; the latter, process models, reflect the recursive nature of writing. Some of the earliest modeling was conducted by Hayes and Flower (1980), which focused on the cognitive development of writing. The success and prominence of the work completed by both Hayes and Flower continued to impact how researchers think about writing cognitively and developmentally. Today, their work remains highly regarded, but it is not without its limitations. These limitations have been the impetus behind a series of revised models. In the paragraphs below, a series of writing models will be discussed, starting with the work of Hayes and Flower, and progressing to more recent adaptations.

Hayes and Flower

Perhaps the most influential process model of writing was developed by Hayes and Flower (1980), which drew heavily from the problem-solving framework originally posited by Newell and Simon (1972)[1]. Hayes and Flower's model situated writing as a

[1] Newell and Simon (1972) indicate that the problem solving situation is composed of both the task environment and the Information Processing System, which naturally imposes a given structure: (1) problem solver creates an internal representation of the external environment (the task environment); (2) once the problem is represented internally, the problem solver must select a problem solving method that will lead to the resolution of the problem; (3) the problem solving method is applied; (4) once the method is ended the problem solver may (a) select a new method, (b) develop a new internal representation to better

problem-solving task or activity that was specifically conceptualized as a cognitively-based problem-solving process (Hayes & Flower, 1980; 1986). Hayes and Flower (1986) indicated that support for this process approach to writing emerged from research that examines the cognitive processes that are fundamental to writing, processes that help to form a new understanding of the interconnectedness of writing, thinking, and learning. The cognitive processes underlying their theory include (a) locating, activating, and retrieving knowledge from long-term memory; (b) planning, a process involving "internal *representation*" of knowledge (inclusive of generating ideas, organizing ideas, and goal-setting); (c) translating, or putting ideas into writing; (d) reviewing, which involves evaluating and revising; and (e) monitoring both progress and process (Flower & Hayes, 1981). Four key principles guided the Flower and Hayes (1981) cognitive process theory: (a) writing is a set of distinctive thinking processes that are employed during writing, (b) these processes are hierarchal and may be embedded within each other, (c) writing is a goal directed process guided by the writer's goals, and (d) writers create goals by generating high-level goals and sub-goals, and changing and even revising goals as influenced by the act of writing.

Their model, derived through protocol analysis[2], divided the "writer's world" into three parts, the task environment, the writer's long-term memory, and the writing process (Hayes & Flower, 1980). The task environment includes everything outside of the writer such as the writing prompt, the intended audience, information pertinent to the writer's motivation, etc. The writer's long-term memory is the place where the writer draws

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fit the problem, or (c) abandon the problem; and (5) during problem solving, new problems may arise that could be viewed as either sub-goals, or set aside for later.

[2] A protocol is a description of the activities that a subject engages in and the order in which they occur, as a subject performs a task (Hayes & Flower, 1980).

background knowledge on a relevant topic to connect to the writing task, as well as any knowledge the writer possesses about the structure of the writing task, that is, the story grammar of the assigned prompt. For example, knowledge that a narrative response requires characters, a problem, a resolution to the problem, etc., or that expository writing requires recognition of the facts and must answer the questions who, what, why, when, where, and how. The writing process within this model is composed of three processes: planning, translating, and reviewing (Hayes & Flower, 1980), which are discussed briefly below.

Planning consists of the sub-processes of generating, organizing, and goal-setting. Generating is the process that is focused on the retrieval of information from long-term memory. The process of organizing helps the writer to select the most pertinent material retrieved and to organize it into a format or order that is consistent with the writing task. The goal setting process takes the reminders that the writer has generated (e.g., transition needed, check voice, etc.) and stores them for later editing (Hayes & Flower, 1980).

Translating is the process of text composition, where the writer takes all of the information that has been collected and transforms it into complete sentences of proper English. Finally, the reviewing component, is where the writer examines and evaluates what he/she has created, focusing on correcting errors of spelling, grammar, conventions, mechanics, etc. However, this process is distinguished from editing in that the process of revision is one systematically initiated by the writer (Hayes & Flower, 1980). Like the process of generating, reviewing too may interrupt any of the other processes or sub-processes (Hayes & Flower, 1980).

Flower & Hayes (1980) note that the difficulty is that "the *dynamics* of composing" (p. 31) is more than just the writer's ability to individually carry out each process or sub-process (e.g., planning, generating, translating, reviewing). To this end, they describe writing as "the act of juggling a number of simultaneous constraints" (Flower & Hayes, 1980, p. 31), and that engaging in planning will help reduce the cognitive strain produced from engaging in this complex process called writing.

Since the early work of Flower and Hayes (1980), though, research on writing has continued to evolve. More recent literature, though honoring the work of Hayes and Flower, has identified several areas for advancement.

Modifications to Hayes and Flower

In the early 1990s, Berninger and colleagues (e.g., Berninger & Swanson, 1994; Berninger, Mizokawa, & Bragg, 1991; Berninger, Whitaker, & Swanson, 1992) began examining the Hayes and Flower model – which was designed around skilled writing with young adults – to determine whether it could be used for understanding beginning and developing writing. They argued that beginning and developing writing is unique and cannot be a scaled-down version of skilled writing, as Hayes and Flower modeled. Unlike Hayes and Flower, they argued that the process of translation in writing emerges before very young children can plan or revise; they also suggested that translation is composed of two parts, what they termed text generation and transcription. Text generation involved transforming ideas into language representations in working memory, whereas transcription involved the translation of the language representations into orthographic symbols/code (Berninger & Swanson, 1994; Berninger, Yates, Cartwright, Rutberg, Remy, & Abbott, 1992). Identification of text generation and

transcription as components of Hayes and Flower's translation phase was an extension to the original model as Hayes and Flower had not originally posited any components of translation. Moreover, Berninger and colleagues (see Berninger & Swanson, 1994) believed that idea generation was distinct from text generation and needed to be represented in that way, suggesting that "writing involves finding the language to express ideas as well as generating ideas" (p. 58). Hayes and Flower had included idea generation as a component of the planning process, but Berninger and colleagues saw idea generation as an element of translation.

In their earliest model, a theoretical model of developmental constraints related to writing acquisition and the identification of writing disabilities, Berninger, Mizokawa, and Bragg (1991) identified three levels of constraints – neurodevelopmental, linguistic, and cognitive. It was hypothesized that neurodevelopmental constraints would be greatest in the primary grades (grades 1-3), where three neuropsychological variables might interfere with what was believed to be the most important lower-level beginning writing skill, rapid, automatized production of the alphabet letters. These variables included retrieval of letter symbols from memory, finger skills/movements, and visual-motor integration (retrieval of letter symbols from memory and orthographically representing them on paper). At the intermediate level (grades 4-6), linguistic skills at three levels of language – words, sentences, and text structures (e.g., paragraphs) – were believed to constrain the writing process. At the junior high level (grades 7 and above), cognitive constraints specific to planning, translating, and revising, were believed to constrain writing as planning and revising typically do not develop until around or after age 12.

In testing the model of developmental constraints with a large sample of primary, intermediary, and junior high students, Berninger and Swanson in 1994 identified additional modifications. They found that the hypothesized level of constraints were not specific to students only at one age range; that is, they seemed to constrain writing at all grades. The only difference was the weight of the constraint at each level. After re-examining the results, Berninger and Swanson (1994) confirmed that writing-related skills (e.g., orthographic, orthographic-motor integration skills, etc.) contributed unique variance to spelling, handwriting, and compositional fluency and quality. Translation still appeared to involve transcription and text generation, though the relative importance of both constructs seemed to decrease across development, suggesting to them that cognitive rather than lower-level constraints play a greater role starting in the intermediary grades. Moreover, handwriting fluency appeared more constraining than spelling at all ages, but production factors and mechanics appear to contribute to compositional fluency well into the intermediary and junior high years.

Swanson and Berninger (1996a) continued to build on the model of writing that they outlined in 1994. While maintaining that translation is composed of both transcription and text generation, they expanded the model to account for additional cognitive processes and sub-processes. Specifically, they posited that long-term, short-term, and working memory must all be considered in a model that describes how writing develops. In their original model, Hayes and Flower (1980) had emphasized only long-term memory. According to Swanson and Berninger (1996a), before students can evaluate during reviewing, they must encode the text in their short-term phonological memory in order to read it. Moreover, students must retrieve information from long-term

memory to hold in working memory as they decide what to write (content), why to write (audience), and how to write it (form). Based on the results of this study, they further suggest that working memory appears to be more closely related to higher-order skills like text generation, planning, and organizing, whereas short-term memory appears more closely related to transcription level skills like spelling and handwriting. Overall, individual differences in writing are proposed to be related to individual differences in working memory.

In 1996, fifteen years after the original model, Hayes revised the process model of writing. As Hayes (1996) explains, there were four main differences between this new model and the 1980 model. These differences included a greater emphasis on the role of working memory, the incorporation of visual-spatial as well as linguistic representations, the role of motivation and affect, and a reorganization of the cognitive processes section of the model (e.g., revision is now text interpretation, planning is now under reflection, and translation is now under a general text production section; Hayes, 1996). Furthermore, the components of the revised model are only divided into two sections – the task environment and the individual (Hayes, 1996).

Emergence of the Simple View of Writing

Shortly after Hayes and Flower's process model came out in 1980, researchers began exploring more streamlined models, which became known as the Simple View of Writing. Drawing from the work of Hayes and Flower, these models sought to identify simple models, or models that included only the most basic components of writing. The first of these models was Juel, Griffith, and Gough's (1986) model of spelling plus ideation. They found that word spelling and idea generation accounted for about 30% of

the variance in writing quality in first and second grade respectively, after controlling for IQ and oral language ability.

The two factors, spelling and ideation, correspond to what Hayes and Flower (1980) (and later Swanson and Berninger, 1996a) termed transcription and text generation respectively. According to the Simple View of Writing, ideation is conceptualized as the ability to both generate and organize ideas, including the generation of creative ideas and the organization of such ideas into sentences and other text structures (Juel, 1988; Juel Griffith, & Gough, 1986). While such a model may appear simplistic (Juel, 1988), it is important to note that each factor (i.e., spelling and ideation) is a complex construct within itself that can be further sub-divided. The model posits that taken together, these two skills are sufficient for forming the overall component of writing. The premise behind the Simple View of Writing is that a lack of fluency or automaticity with the lower-order skill of spelling can impede development of ideation as a higher-order skill (Juel, 1988). Thus, the more students' attention is directed toward spelling, the less attention that can be focused on generating and organizing ideas. Though neither spelling nor idea generation is sufficient within itself to result in writing, the Simple View of Writing also suggests that writing cannot be accomplished without these components. Consequently, there is an interaction that must occur between spelling and the generation of ideas in order to produce writing. According to this model, a poor writer must be a poor speller, struggle with the development of ideas, or experience difficulty with both (Gough & Tunmer, 1986; Juel, 1988). However, because a strong speller typically experiences fewer challenges in generating ideas, the Simple View of

Writing would suggest that most poor writers will experience deficits in both spelling and idea generation.

Just as Hayes and Flower's original model would undergo revision, the Simple View of Writing would also continue to be refined and expanded (Berninger, 2000; Berninger & Graham, 1998). Perhaps the most recent and most frequently cited model of the Simple View of Writing comes from Berninger et al. (2002)[3] (see also Berninger & Amtmann, 2003). They conceptualize the Simple View of Writing as a triangle (see Figure 1), where transcription (e.g., orthographic knowledge, handwriting, spelling)[4] and self-regulation executive functions (e.g., planning, reviewing, revising, etc.) compose the vertices of the base, which supports the outcome of text generation (e.g., idea generation and idea translation) (displayed as the vertex of the triangle); these three components (i.e., transcription, self-regulation, and text generation), however, are situated within a working memory environment which seeks to constrain the said components. Such a visualization of the Simple View of Writing maintains the language of Hayes and Flower (1980), and earlier conceptualizations of the Simple View (Gough & Tunmer, 1986; Juel, Griffith, & Gough, 1986), and specifically situates transcription and text generation – along with self-regulation – within the constraints of memory (just as the work of

[3] Interestingly, much of the current research that utilizes the Simple View of Writing as their theoretical framework, cites Berninger et al. (2002) in their explanation of the model, and do not always cite the work of Gough and Tunmer (1986), Juel (1988) and/or Juel, Griffith, and Gough (1986). Moreover, Berninger et al. (2002) does not cite any of this earlier literature on the model, citing instead their own earlier work. However, some research (e.g., Abbott & Berninger, 1993; Abbott, Berninger, & Fayol, 2010) does cite the earlier literature.

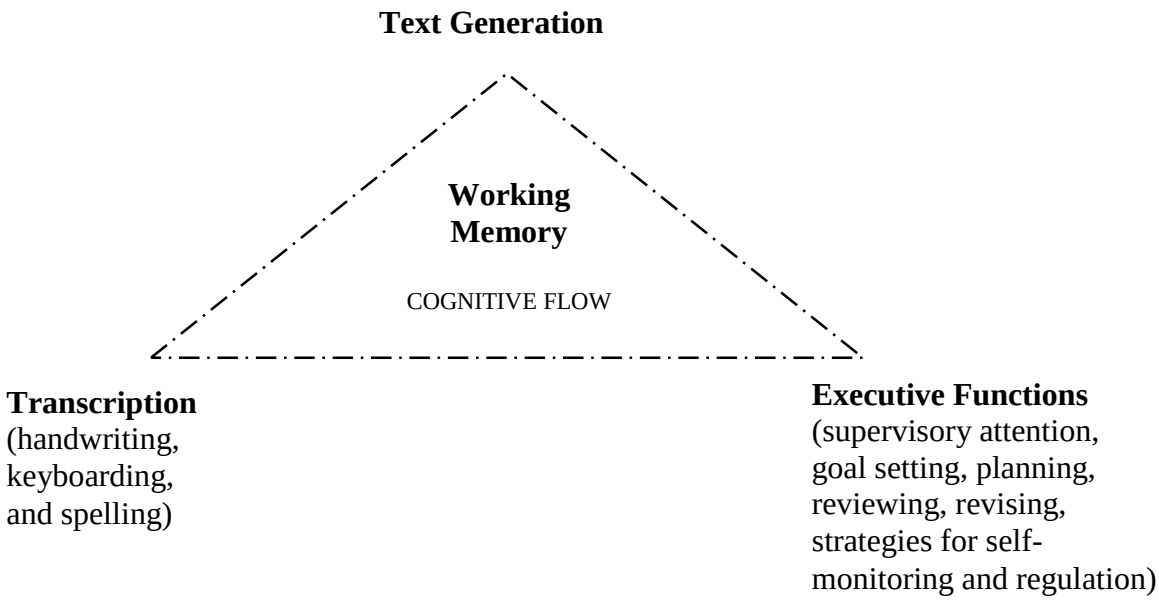
[4] Though the model of the Simple View of Writing specified by Berninger and Amtmann (2003) and Berninger et al. (2002) includes keyboarding as a transcription level skill, the existing literature primarily discusses transcription as spelling, handwriting, and orthographic level knowledge. A small collection of literature has explored the role of keyboarding in writing, however a discussion of that literature is outside of the scope of this chapter.

Berninger and Swanson, 1994; McCutchen, 1994; and Swanson and Berninger, 1996a sought to add to Hayes and Flower's earlier model).

Interestingly, in 2006, Berninger and Winn utilized the same model to identify the Not-So-Simple View of Internal Functional Writing System (see Figure 3). They describe the model as a modification to the 2003 Simple View of Writing detailed in Berninger and Amtmann. This new conceptualization as the Not-So-Simple View still contains the four primary components of transcription, self-regulatory executive functions, text generation, and working memory. However, advancements in brain research and technology have been used to update the understanding behind the model. Whereas the original model (Berninger & Amtmann, 2003; Berninger et al., 2002) indicated that working memory activated long-term memory during composing and short-term memory during reviewing, the 2006 model provides additional detail. Now long-term memory is also activated during planning, reviewing and revising, and short-term memory is activated during reviewing and revising output. Components of working memory have also been provided. These include (a) orthographic, phonological, and morphological storage for verbal working memory; (b) a phonological loop for learning words and encoding verbal materials in working memory; and (c) executive supports that connect working memory with executive functions and nonverbal working memory (e.g., a visual-spatial sketchpad). Additionally, goal-setting and self-monitoring have been added to the list of executive functions, and conscious attention (metalinguistic and metacognitive awareness) has been subsumed under supervisory attention, a system said to regulate focused attention (e.g., inhibition, switching attention, staying on task, conscious attention, cognitive presence, and cognitive engagement).

Figure 3.

Not-So-Simple View of Internal Functional Writing System (Berninger & Winn, 2006)



Literature Supporting the Components of the Simple View of Writing

The Effect of Transcription on Text Generation

The role of transcription skills in the production of writing is well supported (see, for example, Berninger, 1999; Berninger et al., 2002; Graham et al., 1997; Jones & Christensen, 1999; Kim et al., 2015; Wagner et al., 2011). Indeed, most of the writing literature related to the Simple View of Writing explores the impact of transcription level processes on longer, connected writing, particularly at an elementary level (grades 1-6). Berninger et al. (2002) explored whether teaching spelling and composition in isolation or together in third grade would be more effective for predicting persuasive writing. Results of their study revealed that teaching both skills in combination increased skills in each area. As they demonstrate, transcription skills (i.e., handwriting and spelling) uniquely predict writing fluency in elementary school. However, the extent to which

transcription skills continue to impact adolescent writers is unclear, though transcription deficits are often a persistent struggle for individuals with disabilities (McCutchen, 2011), and Dockrell, Lindsay, and Connelly (2009) showed that speed writing remained a direct effect/predictor of writing at age 16.

According to McCutchen (1996), after grade 4, transcription skills generally have developed sufficient fluency that they no longer interfere with composing. Indeed, Berninger (1999) suggests that, in typically developing students, fine-motor skills no longer constrain handwriting in the intermediate years. Berninger (1999) also suggests that the correlation between composing and transcription peaks in the intermediary grades, when handwriting still makes a direct contribution; it is not until junior high that transcription is reorganized to a behavioral channel, providing more cognitive space for higher order skills such as planning and revising. Additionally, Graham, Berninger, Weintraub, and Schafer (1998) suggest that increases in students' handwriting fluency begin to plateau around grade 9, where handwriting speeds approximate adult handwriting fluency levels. However, for students with LD, it has been suggested that it is not until about junior high school that their transcription skills become sufficiently fluent that they cease interfering with transcription processes, and then, perhaps only with narrative text because of its familiarity (McCutchen, 1996). Nevertheless, some limited research has found that transcription continues to contribute to writing fluency through the middle school grades (Berninger & Swanson, 1994; McCutchen, 1996). For students with LD the demands of transcription continue well into the intermediary years, and may continue to be cognitively draining well into the secondary years (McCutchen, 1996).

Spelling. Spelling has traditionally been documented as a significant predictor of writing fluency in early elementary school, but little documentation exists supporting whether spelling continues to be a significant predictor of writing fluency in the intermediate and secondary grades (McCutchen, 1996). As McCutchen notes, "discussions of spelling processes are relatively rare in research on the development of writing" (1996, p. 307). Further, spelling studies have rarely looked at the impact of spelling interventions on writing, and reviews of the literature have actually excluded such studies. Indeed, in their most recent meta-analysis, Gillespie and Graham (2014) note a lack of handwriting and spelling interventions as a limitation, as they did not locate any that focused on writing quality as an outcome. Similarly, Rogers and Graham (2008) excluded handwriting and spelling studies from their meta-analysis noting that such studies rarely evaluate the impact instruction in these areas has on writing. While research on spelling does exist, most studies examine the effects of a spelling intervention on students' spelling abilities. Thus, a paucity of research at the secondary level, along with a lack of current research in the area of spelling, is troubling, when the spelling difficulties of students with disabilities have been noted as some of the most difficult to remediate (Darch, Kim, Johnson, & James, 2000). Further, it has been suggested that students receive little formal instruction in spelling in the United States, and that little research has explored instructional practices for supporting the spelling deficits of students with LD (Darch, Kim, Johnson, & James, 2000).

Handwriting. Handwriting has also been demonstrated to explain students' writing performance, especially at the elementary level (Graham et al., 1997). Abbott and Berninger (1993) also found that motor skills and orthographic coding contributed to

model fit, but that orthographic coding remained a significant predictor across grade levels. In a review of the literature on handwriting and spelling instruction for students with LD, Graham (1999) identified a few key premises related specifically to handwriting. These included the following: (a) no research currently examines the effectiveness of teaching different handwriting scripts (e.g., manuscript, cursive, D'Nealian, or italics) to students with LD; (b) students must be able to quickly and accurately identify letter names and match letter names to the appropriate letter; (c) students should be taught an efficient way of forming the letters of the alphabet – in grades 1-3 the letters q, j, z, u, n, and k accounted for 48% of the errors that students made when writing lower-case letters; (d) students need to be encouraged to use a comfortable pencil grip, though children commonly refine their grip over time; (e) attention should be given to how students position their paper when they write; (f) handwriting speed must be balanced with legibility; (g) students with LD should learn the skills necessary for preparing neat papers; and (h) further research is needed to determine whether fine-motor training provides any greater benefit than handwriting instruction.

These considerations are important in light of the literature in occupational therapy (OT) which suggests that students spend approximately 30-60% of their school day engaged in fine-motor activities in which handwriting accounts for the majority of this time (Hoy, Egan, & Feder, 2011). The authors continue, indicating that about 10-30% of school-age students struggle with handwriting, and that handwriting is one of the most common reasons students are referred to OT (Hoy, Egan, & Feder, 2011).

Christensen, in a 2005 study, investigated the effect of an orthographic-motor integration (i.e., handwriting) program in Brisbane, Australia with students in Years 8

and 9 who exhibited low orthographic-motor integration skills related to handwriting. Results of this study indicate that students receiving the handwriting program outperformed students in a journal writing control group at post-test for both length and quality of compositions. Thus, Christensen (2005) concludes that secondary students who struggle with orthographic-motor integration can be supported to overcome deficits in both handwriting and text production.

Indeed, handwriting is a complex component of the writing process, requiring perceptual-motor skills, visual-motor coordination, motor planning, cognitive and perceptual skills, as well as tactile-kinesthetic skills (Hoy, Egan, & Feder, 2011). A lack of handwriting fluency, then, can tax memory capacity, interfering with the composing process; these struggles, if not remediated, can continue to impact students into their secondary years, though, at this level, resources for intervening are rarely available.

Structural Relationship Between Transcription and Text Generation. Most research exploring components specific to the Simple View of Writing have solely explored the relationship between transcription and text generation using structural equation modeling (SEM). Abbott and Berninger (1993) used multiple group SEM to examine structural relationships between latent factors believed to underlie writing development and component writing skills in a sample of students in grades 1 to 6. However, because their study explored whether a series of structural relationships change with development of transcription skills, their model did not equate ideation, a key component of the Simple View of Writing, with text generation. Results of their models indicated that for handwriting, motor skills and orthographic coding contributed to the model, but only the path from the orthographic coding factor was significant at all grade

levels. For spelling, only the path from the orthographic factor was significant for primary-aged students, whereas in the intermediate sample, the orthographic factor was both significant and larger than the phonological coding factor. For compositional quality, both reading and oral language contributed to the model for the primary-aged sample. However, in the intermediate sample, high covariance between the factors left the authors unable to evaluate the importance of these two factors. As the authors argue, this does not mean that reading and oral language do not contribute to compositional quality at this level, but rather that reading and oral language are highly interconnected.

Similarly, Graham, Berninger, Abbott, Abbott, and Whitaker (1997) also explored structural relationships amongst latent factors of handwriting, spelling, and composing using multiple group SEM with a sample of students in grades 1-6. For the compositional fluency factor, handwriting and spelling were significant paths in the primary grades, but only handwriting was significant in the intermediate grades. Spelling was only found to contribute indirectly to composing because of its correlation with handwriting. The authors suggest that their findings indicate that mechanical skills such has handwriting and spelling may constrain both the quality and quantity of composing that students produce.

Abbot, Berninger, and Fayol (2010) used longitudinal SEM across grades 1-7 for levels of language (e.g., letters or phonemes, words, sentences, and text/discourse) in writing and between writing and reading. Three models were evaluated as part of this study: (Model 1) only the written measures involved in translating ideas into written text, (Model 2) only the sub-word and word writing skills in Model 1 plus word reading, and (Model 3) two levels of language in writing – transcription (spelling) and text generation

(composing) – and reading – which correspond with the Simple View of Reading (i.e., word reading and comprehension). Overall, writing development was best predicted by multiple writing skills or multiple writing and reading skills at various levels of language.

The Effect of Self-Regulation on Transcription and Text Generation

While transcription plays a central role in text generation – especially in the early grades – Berninger and Amtmann (2003) and Berninger and Winn (2006) indicate that self-regulation executive functions, across development, play an increasingly important role in text generation and the writing process. They argue, in detailing the Simple View of Writing, that, as a writer matures, the executive functions that regulate processes shifts from "other-regulation" (e.g., regulation offered via teachers, parents, and peers) to "self-regulation" (Berninger & Amtmann, 2003, p. 350). This transition, they say, is the result of both brain maturation and instruction (see also Berninger & Richards, 2002).

Graham and Harris (2000) have also emphasized that self-regulation plays an important role in writing, and that the development of writing proficiency is contingent upon high levels of self-regulation. Strong writers, like successful students, often utilize a wider range of self-regulatory strategies, and use those strategies more frequently (Effeney, Carroll, & Bahr, 2013; Graham & Harris, 1997a; 1997b; 2000; Zimmerman & Pons, 1986; Zimmerman & Risemberg, 1997a). Moreover, self-regulation has been linked to motivation and self-efficacy (Effeney, Carroll, & Bahr, 2013; Graham, Berninger, & Fan, 2007; Harris & Graham, 1999; Pajares & Johnson, 1996; Pajares, Johnson, & Usher, 2007; Zimmerman & Risemberg, 1997a). Zimmerman and Pons (1986) also found that measures of self-regulated learning were the strongest predictors of standardized assessment scores with their sample of 10th grade students. Such a

finding would seem to support the view that cognitive factors are believed to explain the greatest proportion of variance in writing performance during adolescence (Abbott & Berninger, 1993). This view is also consistent with Effeney, Carroll, and Bahr's (2013) explanation that self-regulatory skills develop over time, including through adolescence. Unfortunately, many secondary students are not directly or explicitly exposed to or taught strategies for self-regulated learning, and teachers lack knowledge about self-regulated learning and appropriate self-regulatory strategies for the classroom (Effeney, Carroll, & Bahr, 2013).

Using structured interviewing, Zimmerman and Pons (1986), identified 13 different self-regulation strategies which also exhibited the greatest predictability of standardized achievement examination scores. Later, Zimmerman and Risemberg (1997a) would detail a series of self-regulatory strategies that they group into three categories: environmental (i.e., context-related), behavioral (i.e., motoric performance), and personal (i.e., cognitive, affective strategies). Graham and Harris (2000), provide a similar list of self-regulatory strategies that theorists have identified writers use to control various behavioral, environmental, and personal processes.

Goal Setting is a commonly encouraged personal self-regulatory strategy, and research has found gains in students' writing productivity as a result of goal-setting, including at the high school level (Gillespie & Graham, 2014; Graham & Perin, 2007a; Rogers & Graham, 2008). Zimmerman and Risemberg (1997b) note that goal-setting helps students to be more self-aware of improvements in their skills, and helps to keep them focused on the task that lies ahead. Research with 4th through 8th grade students has also shown improved outcomes for students using genre elements goals over a general

goal condition (Ferretti, Lewis, & Andrews-Weckerly, 2009; Ferretti, MacArthur, & Dowdy, 2000; Page-Voth & Graham, 1999).

Spivey and King (1989) quantified planning time in a study with 6th, 8th, and 10th grade struggling and typically achieving readers who were asked to write information reports using content from three encyclopedia articles on single topics. The authors observed that the stronger readers developed more detailed written plans and spent more time planning than did the struggling readers. Further, quantity of text and holistic quality of text were significantly correlated ($p < .01$) with amount of time spent planning.

Integration of explicit self-regulatory instruction, embedded within writing strategies using Self-Regulated Strategy Development (SRSD), has frequently demonstrated strong effects and positive gains in writing for students with and without disabilities at middle and high school (Gillespie & Graham, 2014; Graham, Harris, & McKeown, 2013; Mason & Graham, 2008). Chalk, Hagan-Burke, and Burke (2005), for example, found that high school students with LD taught using the SRSD model increased both the number of words written, and the total number of quality points earned on a qualitative rubric.

In 2010, Jacobson and Reid taught three high school students with Attention Deficit Hyperactivity Disorder (ADHD) how to use the STOP+DARE strategy (**S**uspend judgment, **T**ake a side, **O**rganize your notes, **P**lan more while you write + **D**evelop a topic sentence, **A**dd supporting ideas, **R**eject possible arguments for the other side, and **E**nd with a conclusion) for persuasive writing. Results indicate that students increased the number of response parts used, as well as writing quantity and quality, and planning time. Progress was also maintained at 3 weeks.

Exploring quick writes with middle school students with LD, Mason, Kubina, and Taft (2011) report on two similar studies, the first researcher administered and the second teacher administered. Both studies found positive gains for students in quality and the number of words written despite some slight variability. Similarly, Mason, Kubina, and Hoover (2013) reported comparable results for three high school students with emotional disturbances on 10 minute timed persuasive quick writes.

Additionally, Hoover, Kubina, and Mason (2012) explored the effects of POW+TREE (**P**ick my idea, **O**rganize my notes, **W**rite and say more + **T**opic sentence, **R**easons, **E**xplain reasons, **E**nding) on improving students' quick writes; their findings demonstrate a functional relationship despite some variability in the number of words written. While three of the four students increased the number of response parts, the authors suggest that the students were able to better organize their ideas without a need for additional words.

The Effect of Working Memory on Transcription and Text Generation

Within the Simple View of Writing, working memory (which includes attention) broadly is believed to constrain students' transcription, text generation, and self-regulation skills. According to Cowan (2014), working memory can be defined as "the small amount of information that can be held in an especially accessible state and used in cognitive tasks" (p. 198; e.g., planning, comprehension, reasoning, problem-solving, etc.). In writing, the writer is required to maintain a series of processes and information in mind as he/she actively creates text. The idea is that concepts from long-term memory must be accessed and stored in working memory as the writer decides on what, why, and how to write (Swanson & Berninger, 1996a); this continues to be important throughout

planning, translating, reviewing, and revising (Berninger & Winn, 2006). However, short-term memory is also central to the reviewing and revising process. As McCutchen states, "capacity limitations may affect not only the number of writing processes that the writer can manage simultaneously, but also the very nature of those processes" (1996, p. 320).

The Dual-Processing Model of Working Memory. The interpretations of working memory posited by the Simple View of Writing and earlier models (e.g., Berninger & Winn, 2006; Hayes & Flower, 1980; Swanson & Berninger, 1996a) would appear to draw from Baddeley and Hitch's dual-processing model (Swanson & Berninger, 1994). The dual-processing model of working memory (Baddeley & Hitch, 1974) suggests a three-part structure to working memory which includes a central executive that controls and regulates information in working memory with two slave systems, the phonological loop and the visual-spatial sketchpad. The phonological loop contains a passive and temporary phonological store along with a rehearsal system that aids in memory capacity as individuals are better able to maintain and control larger amounts of verbal material. The visual-spatial sketchpad contains a store of visual stimuli and a spatial component associated with sequential location and movement (Olive, 2003). Indeed, Gathercole, Pickering, Ambridge, and Wearing (2004) confirm the tri-partite structure for understanding the organization of working memory from early childhood (approximately age 4 years) through early adolescence (where the visual-spatial sketchpad remains more highly related to the central executive than it does the phonological loop). This finding is consistent with Cowan's (2014) finding that working memory increases across the lifespan, and Berninger, Mizokawa, and Bragg (1991) who

suggest that cognitive factors are more likely to influence writing after about middle school/junior high.

However, Baddeley's later revisions of the working memory model (2000) reveal a fourth component, the episodic buffer, which acts as a temporary store of information and the agent between working memory and long-term memory. Models tested to date, though, have not explored the relationship of this component to writing, and the three-factor structure (e.g., central executive, phonological loop, visual-spatial sketchpad) has provided a good fit to the working memory performance of children (Swanson & Zheng, 2013). Moreover, correlates within the neuropsychological literature provide support for the tri-partite structure, where phonological loop activity is mainly associated with the left hemisphere, and the visual-spatial sketchpad is primarily associated with the right hemisphere (Gathercole, Pickering, Ambridge, & Wearing, 2004; Swanson & Siegel, 2001; Swanson & Zheng, 2013).

The Role of Working Memory in Writing. Swanson and Berninger (1996a) studied whether general or specific processing tasks are related to 4th through 6th graders individual differences in writing, and whether working memory predicts variance in writing. Their research indicates that memory is a significant predictor of writing, but that working memory better predicts text generation, whereas short-term memory better predicts transcription skills. Thus, unlike the role of memory in reading comprehension, working memory and short-term memory do not share a common factor, suggesting that writing relies on specific processing related to working memory. Moreover, individual differences in writing ability are likely related to individual differences in working

memory, and working memory provides unique variance beyond that predicted by reading comprehension and recognition.

In another work, Swanson and Berninger (1996b) report the results of two studies. Results of the first study reveal that working memory was significantly correlated with writing, particularly at the text generation level, and that working memory contributed unique variance beyond reading comprehension. In the second study, they again found that working memory contributed unique variance to text generation measures of writing, and that while working memory improves under a gain condition, this level of increased processing efficiency did not mediate the relationship between working memory and writing.

High school students also lack fluency with transcription and text generation skills, and may continue to be hampered by deficits in short-term working memory (Benton, Kraft, Glover, & Plake, 1984). Further, Daiute (1981, 1984) explains that memory deficits can actually make it more difficult for struggling writers to avoid and later correct some grammatical errors, including subject-verb agreement, because lexical structure becomes more difficult as the number of words increases between the subject and verb in the sentence.

Hoskyn and Swanson (2003) explored the relationship between working memory and writing in three age groups across the life span (mean ages of 15, 30, and 77 years). Results reveal that age-related differences in text generation can be explained by limitations in working memory. Similarly, Bourdin and Fayol (1994) found that working memory correlated with lower-level writing skills in younger, but not older, writers.

In a study with junior high writers, Berninger, Whitaker, Feng, Swanson, and Abbott (1996) found intra-individual differences in cognitive abilities, as well as gender differences in planning, translating, and revising. However, results demonstrated that these gender differences disappeared for quality of translating and revising at the text level when the number of words was used as a covariate.

Vanderberg and Swanson (2007) investigated the relationship between the components of working memory (e.g., central executive, phonological loop, and visual-spatial sketchpad) and the micro- and macro-structure of writing (e.g., planning, writing, and revision; and grammar and punctuation, respectively) in a sample of tenth grade students. Their findings continue to validate the role of working memory in writing, but also suggest that the writing process is more intricately connected to the controlled attention rather than the storage component of working memory. Furthermore, this study supported that working memory can be divided into three components (e.g., central executive, phonological loop, and visual-spatial sketchpad), but that the central executive is primarily responsible in predicting writing performance.

Raulerson, Donovan, Whiteford, and Kellogg (2010), explored the differential contributions of verbal, visual, and spatial working memory in writing. Participants, undergraduate psychology students, were asked to simultaneously write definitions for nouns (concrete and abstract) and perform a task that required updating, storing, and retrieving information in either a verbal, visual, or spatial format. Results demonstrate that the act of writing makes greater demands on verbal working memory. These findings contrast those earlier found by Kellogg, Olive, and Piolat (2007) when they

found that concrete nouns (but not abstract nouns) placed a greater demand on visual working memory.

The Effect of Working Memory on Self-Regulation and Self-Regulation on Working Memory

Though the extant literature supports the relationships between transcription and text generation; and amongst self-regulation, transcription, and text generation; and working memory, transcription, and text generation, there is weak evidence supporting the relationship between self-regulation and working memory. Indeed, in the educational literature, and more specifically in the writing literature, it appears that this relationship has not been studied. In the psychological sciences, however, some recent work is available. Kane et al. (2007) explored working memory and mind wandering in daily life with a convenience sample of undergraduates. They found that during challenging activities (those that required concentration and effort), individuals with high working memory capacity experienced less mind-wandering and maintained more on-task thoughts. Earlier, Kane, Bleckley, Conway, and Engle (2001) also confirmed that higher working-memory span individuals outperformed lower working memory capacity individuals across tasks that required attentional control and active maintenance of goal tasks to prevent rote or habitual responding. This work tends to suggest that "individual differences in WM [working memory] capacity reflect rather fundamental differences in controlled attention [. . .]; that is, an ability to effectively maintain stimulus, goal, or context information in an active, easily accessible state in the face of interference, to effectively inhibit goal irrelevant stimuli or responses, or both" (Kane, et al., 2001, p. 180). Thus, it would appear that higher working-memory span individuals are able to

actively maintain information in working memory, while also being able to give attention to a secondary processing task (Kane, et al., 2001). Low working-memory span individuals, on the other hand, would seem to "zone out;" that is, lose focus, of their goals (Schooler, Reichle, & Halpern, 2004). In writing, having the ability to shift attentional focus, while maintaining information in memory, would be important, as writers must constantly hold ideas and sentences in mind while they match letter-sound correspondences during spelling, and as they rework the organization, flow, and understanding of their writing. Indeed, Berninger and Amtmann (2003) identified conscious attention as an essential executive function in the Simple View of Writing, and later Berninger and Winn (2006) subsumed conscious attention within supervisory attention, which also includes focused attention. Recently, Cowan (2014) posited that working memory is directly related to one's ability to stay on task.

Problems/Gaps in the Research

However, much of what is known about models of writing and the Simple View of Writing, are based on research with populations of students who are either young adults (as in the work of Hayes and Flower, 1980), or with elementary aged writers (as in the work of Berninger et al., 2002). In the writing literature, research appears to *skip* a population of students, namely adolescents, who often experience entrenched and intractable writing challenges. Recall, the repercussions of such writing struggles extends beyond the classroom door, as writing has become a means for moving into jobs, college, and other post-secondary opportunities. Unfortunately, despite being identified as an area of critical need, writing remains under-researched with adolescent populations. Just as Berninger and Swanson (1994) argued that young children are not miniature

adults, adolescents are neither young children nor adults, and their writing needs may, therefore, be unique. Additionally, in solely focusing on the prevention of writing disabilities and writing challenges in younger students, research does a disservice to the great number of adolescents in high schools who are struggling with writing and who may not have access to high quality research-based practices and instructional techniques.

Moreover, Berninger and colleagues do not appear to have tested the complete model of the Simple View of Writing. Most of the literature that currently exists, as was reviewed earlier, specifically focuses on modeling the relationship between transcription and text generation with elementary samples. If research is to invoke the Simple View of Writing as an appropriate and rigorous theoretical model, then studies are needed to test the complete model, and to test the model across the age span. This study takes a more integrated or holistic approach to assess the complete model.

Summary

A review of the literature indicates that there are identifiable variables that contribute to students' writing progress. Though some of the current literature has explored other variables outside of writing, such as oral language abilities (Abbott & Berninger, 1993) and reading (Abbott, Berninger, & Fayol, 2010), this study sought to explore the variables specifically aligned to the Simple View of Writing (e.g., transcription, self-regulation executive functions, text generation, and working memory).

The Simple View of Writing (originally posited by Juel, 1988; Juel, Griffith, & Gough, 1986; Gough & Tunmer, 1986) suggests that spelling (and other transcription skills), along with ideation (and text generation) are essential to writing. Subsequent modifications (see for example, Berninger & Amtmann, 2003; Berninger & Winn, 2006;

Berninger et al., 2002) to the Simple View of Writing model, though, expanded the model to include working memory and self-regulation executive functions. However, the outward simplistic nature of the Simple View belies the complexity of the individual variables and the intricacies of the overall model (see Berninger & Amtmann, 2003; Berninger & Winn, 2006; Berninger et al., 2002; Juel, 1988; Juel, Griffith, & Gough, 1986; Gough & Tunmer, 1986). This model (much like the Simple View of Reading; see Gough & Tunmer, 1986), presumes that once an individual has mastered the sound-symbol relationships of language and can correctly spell, that he/she can apply such knowledge to the generation of ideas expressed via an orthographic code. Control of lower-order processes (e.g., spelling) leaves greater cognitive space for working on higher order tasks (e.g., idea generation and translation) that require the efficient use of working memory stores and self-regulatory executive functions. However, whether the model, established and based almost exclusively off of work with elementary aged students, still holds for adolescent writers is yet unknown; modeling whether such an assertion is accurate and sufficient at the secondary level is necessary. Moreover, it is possible that the model is not an appropriate way for thinking about the writing of different sub-groups of students, such as typically achieving writers when compared to students who struggle in writing or students with identified writing disabilities.

As current research reveals (Berninger & Swanson, 1994; Berninger et al., 2002), fluency with transcription skills (e.g., spelling and handwriting) – especially at the elementary level – have been demonstrated to positively impact a student's ability to generate connected text. However, though transcription skills appear to plateau with age (see Graham et al., 1998), McCutchen (1996) supports that difficulties with transcription

continue to be cognitively constraining for struggling writers and writers with disabilities well into the middle and high school grades.

Similarly, self-regulatory executive functions have also been shown to improve both the quantity and quality of students' writing (Graham & Harris, 2000). Research in the area of SRSD at the middle and high school level have produced significant gains for writers with and without identified disabilities.

Further, working memory, which also taps short-term memory and long-term memory within the Simple View of Writing, is important to developing students' writing. Cognitive capacity limitations specific to memory and attention can interfere with the production of connected text; namely, cognitive capacity limitations may affect both the number of writing processes that an individual can engage in, as well as the specific tasks of those processes (McCutchen, 1996).

The present study was designed to evaluate the applicability of the Simple View of Writing at the 9th grade level. Theoretical models of writing might help researchers understand the variables involved in writing. Then, if a student is struggling with a corresponding skill, interventions can be designed. Indeed, efforts in theoretical conceptualizations of writing at the high school level are positioned to help the field gain information about the writing needs of adolescents.

CHAPTER 3

Research Methods

The purpose of this study was to test the Simple View of Writing by theoretically modeling the variables of transcription, text generation, self-regulation, and working memory at the 9th grade level. Three research questions were investigated:

1. Given variations on the Simple View of Writing, which model is better fitting with 9th grade students?
2. What are the scores on the observed variables (indicators) for struggling writers?
3. On which variables are there statistically significant differences between struggling and non-struggling writers?

Participants

Participants in this study included 69 ninth grade students from a large suburban public high school in the Midwest. All students were in one of five English 9 classes taught by the same certified English teacher who was in her second year of teaching. Three of the 5 English classes included support from a certified special education teacher who was in his first year of teaching. Parental consent and student assent were collected following University and school level Institutional Review Board (IRB) requirements. Student demographics are presented in Table 1. Approximately 57% of students were female, 43% male; 57% were White and 43% of another race (2.90% Asian, 18.84% Black, 13.04% Hispanic, and 8.70% Multiracial); and 49% received a free or reduced price lunch. Students ranged in age from 13–16 years of age; the mean age of students, was 14.38 years. Two students received special education services (one as a student with an Autism Spectrum Disorder [ASD] and the other as a student with a Specific Learning

Disability [LD]) and 1 student received services under Section 504 of the American's with Disabilities Act. No students were identified as English language learners.

Table 1.

Student Demographics

Demographic Variable	*n*	%
Sex		
Male	30	43.48
Female	39	56.52
Race		
Asian	2	2.90
Black	13	18.84
Hispanic	9	13.04
Multi-Racial	6	8.70
White	39	56.52
Age[a]		
13	1	1.45
14	43	62.32
15	23	33.33
16	2	2.90
Socio-Economic Status		
Free	28	40.58
Reduced	6	8.70
Paid	35	50.72
Disability		
IEP	2	2.90
504	1	1.45
None	66	95.65

Note: [a] Age based on student age as of administration of the Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR); mean age = 14.38 years. IEP = Individualized Education Plan; 504 = Section 504 of the American's with Disabilities Act.

Five students (2 females and 3 males) had attended a gifted and talented program during their 7th and 8th grade years. No information was available to indicate whether a similar gifted and talented program was available at the high school, or, if there was, whether these students continued to participate. One student (the student receiving

special education services as an individual with ASD) was known to be repeating 9th grade English.

For students with state testing data available, scores on the state assessment in Communication Arts (grades 3–7) or English Language Arts (ELA; grade 8) were collected since 3rd grade. The state assessment assesses student progress in mastering the state learning standards. Table 2 displays student performance by grade and level of performance (e.g., below basic, basic, proficient, and advanced). A greater percentage of students performed at or above basic each year – suggesting that these students demonstrate at least a partial command of the skills associated with the learning standards at the respective grade level – with a very small percentage of students performing below basic – or demonstrating a minimal command of grade level skills.

Table 2.

Performance on State Communication Arts or English Language Arts Exam

Grade	***n***	**Below Basic** ***n* (%)**	**Basic** ***n* (%)**	**Proficient** ***n* (%)**	**Advanced** ***n* (%)**
3rd	42	1 (2.38)	15 (35.71)	10 (23.81)	16 (38.10)
4th	46	1 (2.17)	10 (21.74)	16 (34.78)	19 (41.30)
5th	45	1 (2.22)	11 (24.44)	18 (40.00)	15 (33.33)
6th	48	2 (4.17)	14 (29.17)	22 (45.83)	10 (20.83)
7th	59	1 (1.69)	15 (25.42)	22 (37.29)	16 (27.12)
8th	58	6 (10.34)	12 (20.69)	15 (25.86)	25 (43.10)

Course grades for reading and writing in 7th and 8th grade were collected where available; course grades for 9th grade ELA from semester 1 were also collected. Table 3 reports students' grades for both semesters of 7th and 8th grade, along with semester 1 grades for 9th grade. Letter grade designations are inclusive of students who also received a + or – respectively at each letter level, as well as students who took an

advanced writing class or an online writing course across the semesters. At the end of the school year, second semester 9th grade ELA scores will be requested, along with students' end of year course exams for the academic year.

Table 3.

7th, 8th, and 9th Grade Course Grades

Year	Grade	Writing Semester 1 *n* = 53 *n* (%)	Writing Semester 2 *n* = 55 *n* (%)	Reading Semester 1 *n* = 48 *n* (%)	Reading Semester 2 *n* = 50 *n* (%)
7th	**A**	25 (47.17)	28 (50.91)	24 (50.00)	24 (48.00)
	B	15 (28.30)	12 (21.82)	9 (18.75)	13 (26.00)
	C	10 (18.87)	8 (14.55)	9 (18.75)	2 (4.00)
	D	- - -	5 (9.09)	4 (8.33)	8 (16.00)
	F	3 (5.66)	2 (3.64)	2 (4.17)	3 (6.00)
		Writing Semester 1 *n* = 60 *n* (%)	**Writing Semester 2 *n* = 60 *n* (%)**	**Reading Semester 1 *n* = 47 *n* (%)**	**Reading Semester 2 *n* = 47 *n* (%)**
8th	**A**	34 (56.67)	31 (51.67)	16 (34.04)	24 (51.06)
	B	18 (30.00)	21 (35.00)	22 (46.81)	14 (29.79)
	C	7 (11.67)	5 (8.33)	8 (17.02)	5 (10.64)
	D	- - -	1 (1.67)	1 (2.13)	3 (6.38)
	F	1 (1.67)	2 (3.33)	- - -	1 (2.13)
		Semester 1 *n* = 69 *n* (%)	**Semester 2 *n* = n/a *n* (%)**		**End of Course Exam *n* = n/a *n* (%)**
9th	**A**	26 (37.68)	n/a		n/a
	B	17 (24.64)	n/a		n/a
	C	16 (23.19)	n/a		n/a
	D	7 (10.14)	n/a		n/a
	F	3 (4.35)	n/a		n/a

Note: - - - = no scores at this level; n/a = not available.

Demographic data for race and socio-economic status for the high school, the district, and the state for reporting year 2015 were obtained from the district's state report card, and have been provided in Table 4. Percentage of Black and White students is comparable across the high school, district, and state, however, the percentage of

Hispanic students is higher across the high school and the district when compared to the state, and the percentage of students eligible for free and reduced priced lunches at the high school is comparable to students eligible to receive these services across the state, but the district has a much larger percentage of students who are eligible for free and reduced price lunches.

Table 4.

A Comparison of Building Demographics with District and State Demographics

	% Building	% District	% State
Enrollment			
2015 Academic Year	*n* = 1600	*n* = 14,308	*n* = 886,466
Race			
Asian	*	*	*
Black	10.2	11.1	16.2
Hispanic	14.6	17.3	5.6
Indian	*	*	*
White	66.7	61.9	72.8
Socio-Economic Status			
Eligible for Free/Reduced Lunch	48.9	70.7	51.7

Note: * Percent suppressed due to potentially small sample size

Recruitment and Retention

Contact with the district was initiated through an instructional coach and University of Missouri Fellows Mentor. She facilitated communication with the district superintendent and the building principal for the high school recommended by the superintendent. Once a letter of support was obtained from the superintendent, formal e-mail communication was made with the superintendent and the building principal. The building principal then recommended one 9th grade English teacher for participation following a consideration of the demands of her English teachers. A meeting between the primary investigator, the classroom teacher, and the instructional coach was then arranged in order to provide an overview of the study and to allow the teacher to ask

questions prior to consenting to participation in the study. When consent was obtained, the classroom teacher received copies of the student consent forms (see Appendix A) to send home with the students in her English 9 classes. A standard script (see Appendix B) was attached for the teacher to read to each of her classes. The classroom teacher distributed consent forms to her classes on Friday, 06 November 2015. On Thursday, 12 November 2015 and Friday, 13 November 2015, the primary investigator visited classes to talk with students about the project. Students who returned a consent form, regardless of approval for participation, received candy that the primary investigator had provided to the classroom teacher. The classroom teacher also collected all returned consent forms that were then picked up by the primary investigator. To try to increase the return rate of consent forms, an electronic consent form (see Appendix C) was e-mailed to parents/guardians who had not yet returned the printed copy of the form. This copy of the consent form was identical to the printed copy, with slight modifications to the statement of consent; a footnote read, "I acknowledge that my electronic signature or typed name hereby constitutes my printed signature and therefore certify that my electronic signature or typed name serves as my consent." The e-mail was sent from the classroom teacher, but had been scripted by the primary investigator (see Appendix D). Parents/guardians were asked to return the electronic consent form directly to the primary investigator. Up to 2 additional reminder e-mails were sent by the classroom teacher which were scripted by the primary investigator. Only one parent chose to return her son's consent form electronically.

Of the classroom teacher's 124 students, 80 students returned consent forms, for a return rate of 64.52%. Nine of the 80 students returned consent forms denying

participation. One student did not assent to participate in the study despite parental consent, and one student discontinued participation halfway through the study due to concerns about her English grade. In total 69 students participated.

Measures

Students completed an assessment battery of group and individually administered standardized assessments aligned with the components of the Simple View of Writing: transcription, self-regulation, text generation, and working memory. A visual outlining how the assessments map onto the Simple View of Writing is provided in Appendix E, and a discussion of each specific assessment follows.

Transcription

Spelling. To assess spelling, the Spelling subtest of the *Wechsler Individual Achievement Test-III (WIAT-III)* was administered. The WIAT-III is a comprehensive, diagnostic standardized assessment of student academic achievement designed for children in grades Pre-K through 12 (or ages 4 through 19 years, 11 months; Pearson, 2009). The Spelling subtest contains 63 letter sounds/words ascending in difficulty. Letter sounds are presented to students in the context of a word; and each word is dictated orally, used in a sentence, and then stated again. Students wrote the letter sound/word on their provided answer sheet. Unlike the standardized directions, all letter sounds/words were administered to all students in medium-sized groups (11-16 students); basals and ceilings were scored later by the primary investigator. Each correctly spelled letter sound/word (as dictated and used in context by the administrator) received one point. All raw scores were then converted to standard scores following the standardized scoring procedures. Age based reliability coefficients for the Spelling subtest range from .95 to

.97 for students ages 13 to 16 (Breaux, 2009). The stability coefficient of the Spelling subtest is strong, with a Corrected *r* of .92 (Breaux, 2009).

Handwriting. The Detailed Assessment of Speed of Handwriting (DASH) (Pearson, 2007), a standardized handwriting assessment was used to assess students' handwriting abilities. This assessment includes five subtests (Copy Best, Alphabet Writing, Copy Fast, Graphic Speed, and Free Writing) that evaluate different aspects of handwriting speed, including fine motor and precision skills, quick and accurate production of well-known alphabetic symbols, the ability to vary handwriting speed, and free writing (Barnett, Henderson, Scheib, & Schulz, 2007). Though handwriting is rarely taught or assessed during the high school grades, Dockrell, Lindsay, and Connelly (2009) showed that speed writing at age 16 remained a direct effect/predictor of writing at age 16, making it appropriate to assess handwriting speed with the DASH at 9th grade.

The Copy Best and Copy Fast subtests ask students to copy the familiar sentence "The quick brown fox jumps over the lazy dog" as quickly as possible in 2 minutes in their best handwriting, and later in their fast handwriting. Between the two copying tasks, students complete the Alphabet Writing subtest. In this task, students write the letters of the alphabet in order in lower case for one minute. The next task is a Graphic Speed task, which is a "'purer' measure of perceptual-motor competence" (Barnett, Henderson, Scheib, & Schulz, 2007, p. 15). During this task, students must make an X within a series of circles, where the lines of the X must touch the smaller circle, but not exceed the bounds of the larger circle. This task is timed for one minute, but is not used to derive the total standard score. The final task is a Free Writing essay on "My Life." Students can write on any topic of their life; they are provided with a filled in graphic

organizer to help them in thinking about relevant topics, though they are not limited to those topics. The task is timed for 10 minutes, with time markers every two minutes.

The DASH was standardized using a nationally stratified normative sample of 546 children collected across the United Kingdom (UK) in 2006, a sample that closely approximated the UK 2001 Census data (Barnett, Henderson, Scheib, & Schulz, 2007). Inter-rater reliability is high across the Copy Best, Alphabet Writing, Copy Fast, and Free Writing tasks, with intra-class correlations greater than .99. Inter-rater reliability is much lower for the Graphic Speed task, with an intra-class correlation of .85. Total score test-retest reliability is above .80, with Spearman correlation coefficients of .72 (Copy Best), .75 (Copy Fast), .92 (Alphabet Writing), .87 (Free Writing), and .89 (Total Score) for a sample of students ages 14-15 years. Internal consistency of the DASH is high, with Cronbach alphas between .83 and .89. Criterion validity with the Movement ABC-2 test administered concurrently, reveals positive, but low correlations at or below .4.

Moreover, data from a very small sample (n = 12) of children ages 11-13 years who are identified as children with special educational needs (SEN) in a mainstream secondary school is available; when compared to an age-matched sample from the standardization sample, the SEN group performed more slowly. Statistically significant differences were observed for all tasks except the Copy Best task.

Text Generation – Writing Assessments

Writing Measures. To generate student writing at the sentence level, the *Sentence Composition subtest of the WIAT-III,* which includes *Sentence Building* and *Sentence Combining*, was administered. The Sentence Building task requires students to generate a complete sentence that correctly uses the target word in context. The target

words that students are provided with include: the, or, until, of, an, than, and as. The Sentence Combining task requires students to accurately combine two or three target sentences into one sentence that includes the essential information from the target sentences while maintaining the same meaning. The standardized scoring directions account for the use of morphology, syntax, semantics, grammar, mechanics, punctuation, and spelling. First, sentences are evaluated to determine whether they meet the necessary prerequisites. For Sentence Building, the prerequisites include: (a) that the response includes the target word, (b) that the response is not a fragment, and (c) that the target word is not used within a title or as the subject or object of the sentence. For Sentence Combining, the prerequisites include: (a) that the response includes the essential information outlined in the Examiner's Manual; (b) disregarding capitalization, punctuation, and spelling, that the response is more than a restatement of the original sentences without changing or combining them; and (c) that the response is not more than one sentence, a fragment, or a run-on sentence. Sentences that meet the prerequisite criteria are then evaluated using a set of criteria to evaluate semantics and grammar, mechanics, and extra credit. Extra credit is awarded for a sentence that (a) does not use the conjunction *and* to join two independent clauses, (b) does not use poor sentence structure, and (c) conveys the same meaning as the original sentences. Each (e.g., semantics and grammar, mechanics, extra credit) is scored on a scale from zero to two. There are no extra credit opportunities for Sentence Building. The maximum raw score for Sentence Building is 28, and the maximum raw score for Sentence Combining is 25. All raw scores were converted to standard scores following the standardized scoring procedures. Age based reliability coefficients for Sentence Composition range from .84

to .88 for students ages 13 to 16 (Breaux, 2009). The stability coefficient for Sentence Composition is moderate, with a Corrected *r* of .76 (Breaux, 2009).

To generate a student writing sample at the paragraph/essay level, the *Essay Composition subtest of the WIAT-III* was administered. This subtest measures students' expository writing in response to a prompt which states, "Write about your favorite game. Include at least 3 reasons why you like it." All standardized administration and scoring directions were followed for the total number of words written and Theme Development and Text Organization only. Age based reliability coefficients for Essay Composition range from .87 to .88 for students ages 13 to 16 (Breaux, 2009). The stability coefficient for Essay Composition is strong, with a Corrected *r* of .91 (Breaux, 2009). Moreover, age based reliability coefficients for the Written Expression composite score (inclusive of Spelling, Sentence Composition, and Essay Composition) range from .94 to .95 for students ages 13 to 16 (Breaux, 2009). The stability coefficient for Written Expression is strong, with a corrected *r* of .91 (Breaux, 2009).

Text Generation – Scoring Indices

Word Count. On the WIAT-III (Pearson, 2009), word count is a measure of writing productivity, where each word is scored 1 point. Acronyms, abbreviations, and symbols or numerals are counted as a single word. Words containing boundary errors are scored according to the spacing used by the student. Word count is also inclusive of any titles or endings that the student writes (e.g., The End). Age based reliability coefficients (based on test-retest correlations) for Word Count are .82 across ages 13 to 16 (Breaux & Frey, 2010).

Theme Development and Text Organization. Theme Development and Text Organization is a measure of the development and organization of a student's response on the Essay Composition subtest of the WIAT-III; it is not a measure of written mechanics. This measure evaluates six components: (a) introduction, (b) conclusion, (c) paragraphs, (d) transitions, (e) reasons, and (f) elaborations. The introduction is scored on a scale from zero to two for including a thesis statement and key words which are also restated verbatim in the body of the essay. The conclusion is scored on a scale from zero to two for including a concluding thesis statement and for restating the key words that are stated in the body of the essay. The number of paragraphs is also counted; one point is awarded for each paragraph written, with a maximum of 5 points available. A paragraph must contain a minimum of 2 ending punctuation marks in order to receive credit. Next, the number of transitional words are counted; one point is awarded for each transition, with a maximum of 5 points available. Acceptable transitions are provided in the Examiner's Manual. Finally, reasons why and elaborations are scored concurrently. Each is scored on a scale from zero to three. Credit is awarded for the first three reasons and the first three elaborations. An elaboration must be attached to a reason; therefore, the number of elaborations cannot exceed the number of reasons. Scores across the 6 components are summed to obtain the Theme Development and Text Organization raw score (Maximum = 20). All raw scores were converted to standard scores following the standardized scoring procedures. Age based reliability coefficients (based on test-retest correlations) for Theme Development and Text Organization are .77 across ages 13 to 16 (Breaux & Frey, 2010).

Self-Regulation

The *Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR)* (PAR, 2004), is a standardized psychological student self-report instrument of 80 items that is designed to assess children's and adolescents' views of their own executive functioning and self-regulatory behaviors across typical, everyday environments (Guy, Isquith, & Gioia, 2004). The BRIEF-SR is appropriate for use with individuals ages 11–18, and (according to the Professional Manual) requires approximately 10–15 minutes to administer. Scoring of the BRIEF-SR is derived from eight clinical scales that form a Behavioral Regulation Index (BRI) and a Metacognition Index (MI); together these two indices form the Global Executive Composite (GEC). Two other subscales – Behavioral Shift and Cognitive Shift – are also included, but these items lack established construct validity. All items are negatively worded and utilize a 3-point Likert scale response (1 = never a problem, 2 = sometimes a problem, and 3 = often a problem). Cronbach alpha coefficients are reported and range from .72 to .87 for the clinical scales and are slightly higher for the BRI (.93), MI (.95) and GEC (.96). Stability coefficients range from .59 to .85 and .84 to .89 for the clinical scales and indices respectively over a period of 1–10 weeks. Moderate correlations (.36 to .57) between student and parent ratings are reported, with small correlations (.20 to .41) between student and teacher ratings. Validation information (e.g., content, convergence-discriminant, and criterion validity) is not sufficiently available for the BRIEF-SR. For the purposes of this study, only the GEC, BRI, and MI composite scores, and the Working Memory and Planning/Organization clinical scales were fully calculated; raw scores were converted to t-scores following the standardized scoring procedures.

Students also completed a planning measure similar to the work of Vanderberg and Swanson (2007), as planning is a self-regulated writing technique that can impact the quality of student writing (e.g., Spivey & King, 1989). To assess students' observable planning, they were provided with a blank sheet of paper prior to completing the WIAT-III Essay Composition subtest. Students were instructed, "If you'd like, you can use this blank page to plan what you will write." Unlike Vanderberg and Swanson (2007), students only received 5 minutes for planning instead of 10 minutes. Students' planning was evaluated using a 5-point holistic, qualitative rubric that has been previously used in the literature (Berninger, Whitaker, Feng, Swanson, & Abbott, 1996; Vanderberg & Swanson, 2007; Whitaker, Berninger, Johnston, & Swanson, 1994). One point was awarded if the student's planning sheet was blank or only contained one word. Two points were awarded if the student included concrete propositions or words. Three points were awarded if the student included a list of reasons and/or questions to be addressed in the essay. Four points were awarded if the student included reasons and at least one example supporting one of the reasons. Five points were awarded if the student included at least two reasons and a corresponding example for each reason. A copy of the rubric is available in Appendix F.

Memory Measures

The five subtests composing the Working Memory Index (WMI) of the *Wechsler Intelligence Scale for Children-V* (WISC-V) (PsychCorp, 2014) were individually administered. The WISC-V is a standardized assessment which measures a student's intellectual or cognitive ability, and is appropriate for students' ages 6 to 16 years. All measures of the WMI were administered (e.g., Digit Span [Forward, Backward,

Sequencing] and Picture Span) in addition to Letter Number Sequencing (which is optional) and scored according to the standardized set of directions. Administering Letter Number Sequencing allowed for the calculation of the Auditory Working Memory Index (AWMI).

The *Digit Span* subtest is a measure that requires cognitive flexibility and mental alertness as students shift between Digit Span tasks. All Digit Span tasks require students to register a set of information; they also require focused attention, auditory discrimination, and rehearsal. The Digit Span Forward task asks students to verbally recall a set of numbers read aloud by the examiner in the same order. This task measures auditory rehearsal and temporary storage capacity. The Digit Span Backward task asks students to verbally recall in reverse a set of numbers that are read aloud by the examiner. This task measures a student's ability to transform a set of information; it assesses mental manipulation and potentially visuospatial imagining as well. The Digit Span Sequencing task (new to the WISC-V) asks students to verbally recall in numerical order (i.e. sequence) the numbers that were read aloud by the examiner. This task also requires a student to transform a set of information, assessing mental manipulation and possibly visuospatial imagining. The primary difference between the Backward and Sequencing tasks is how the sequence is determined; in the Backward task, location of the number in sequence must be held in working memory, whereas in the Sequencing task, the quantitative value of the number must be held in working memory in order to quantitatively discriminate between numbers that occur before and after its position. Average reliability coefficients across ages 13 to 16 range from .79 – .85 for the Forward task, .78 – .82 for the Backward task, and .77 – .85 for the Sequencing task. Overall

average reliability coefficients were .81, .80, and .82 for Forward, Backward, and Sequencing respectively, and stability coefficients (Corrected *r*) were .82, .76, and .79 (Wechsler, 2014).

The *Picture Span* subtest measures primarily visual working memory, but it may also involve visual processing, attention, and response inhibition. During this task, students are shown a stimulus page with one or more pictures for 5 seconds. They must then select the pictures in order (if possible) from a response page containing the shown objects and distractor objects. Rehearsal in this measure is likely most closely related to the verbal/phonological loop. Average reliability coefficients across ages 13 to 16 range from .83 – .85, with an overall reliability coefficient of .85, and a stability coefficient (Corrected *r*) of .80 (Wechsler, 2014).

The *Letter/Number Sequencing* subtest requires focused attention, auditory discrimination, concentration, and rehearsal, along with mental manipulation and sequential processing. It may also require cognitive flexibility and information processing. This subtest requires students to verbally recall the numbers in numerical order and the letters in alphabetical order that were presented in random order by the administrator. Average reliability coefficients across ages 13 to 16 range from .82 – .89, with an overall reliability coefficient of .86, and a stability coefficient (Corrected *r*) of .82 (Wechsler, 2014).

Procedures

All assessments were administered by the primary investigator and one trained instructional coach (a certified special education teacher) from the district during students' scheduled English 9 class. Tasks were completed across 17 days within a 6

week window from Thursday, 12 November 2015 through Tuesday, 15 December 2015. This time also included 3 days of scheduled school break for the Thanksgiving holiday recess.

Individually administered measures (e.g., WISC-V) were given in a small, quiet conference room off of the library media center, which was close to the student's classroom; individual administration occurred once and averaged approximately 20 minutes. Upon entering the room, students were re-introduced to the study and shown the consent form that they had returned with a parent/guardian's signature. Students were then told that they could make a decision on whether or not they wanted to participate and were asked to sign the student assent form, after it was read to them by the administrator. Students had an opportunity to ask questions and seek clarification about any parts of the study before they signed the assent form. Next, students were told, "I'll be asking you to do a number of things today. Some of the things may be easy for you, but some things may seem hard. Most people do not know every answer or finish everything, but please try your best. Do you have any questions?" This set of directions was read to students at the beginning of each administration period for all individual and group measures. It should also be noted that most students completed the WISC-V measures before the group measures, but other students completed the group measures first. Choice of measures to administer each day were determined by the class hour (the high school ran on a modified block schedule[5]), the activities being completed in class, the number of individual sessions remaining per hour and the availability of classroom

[5] This meant that on Mondays, Tuesdays, and Fridays, students' English classes were 45 minutes in length. Wednesdays and Thursdays were block days. On a block day, classes were scheduled for 95 minutes, but students only attended class one of those days. For example, first and seventh hours would have a block class on Wednesdays, but second, fourth, and sixth hours had a block class on Thursdays.

space. Students who completed group measures first completed their assent form prior to starting the measures, and they were provided with the same directions. If class time expired before a student completed all of the WISC-V measures, he/she completed the remaining measures in a subsequent session. On these occasions, a subtest was always finished before letting a student leave, and a late pass was administered to the student. The subtests of the WISC-V were also stratified across classes. Students in first, fourth, and seventh hour completed Digit Span first (Forward, Backward, and then Sequencing), then Picture Span, followed by Letter Number Sequencing. Second and sixth hour classes completed the Letter Number Sequencing task first, followed by Picture Span, and Digit Span (Forward, Backward, Sequencing). The Digit Span Sequencing and Letter Number Sequencing tasks were not administered consecutively due to the similarity of the standardized directions.

Group measures (e.g., WIAT-III, BRIEF-SR, and DASH) were administered across 4 class periods in a comparable classroom close to students' English class. The use of multiple class periods for group administered tasks is consistent with the literature, as is subsequent individual administration of separate tasks, each lasting approximately 45 minutes for intermediate aged students (Abbott & Berninger, 1993; Pajares & Johnson, 1996). All group measures were administered by the primary investigator. When available, the instructional coach observed reliability of the sessions across first, second, and fourth hours. Like the individual tasks, group assessments were stratified across classes. Table 5 provides the order of administration of group assessments by class, and Table 6 provides the order of administration of the subtests of the DASH by

class. A calendar listing the measures administered by course hour, day, and administration type can be found in Appendix G.

Table 5.

Order of Group Administration by Class

Hour	Day 1	Day 2	Day 3	Day 4
1st	Spelling	WIAT-III B[a], C[b], Essay	BRIEF-SR	DASH
2nd	DASH	BRIEF-SR	Spelling	WIAT-III C, B, Essay
4th	WIAT-III B, C, Essay	Spelling	DASH	BRIEF-SR
6th	BRIEF-SR	DASH	WIAT-III C, B, Essay	Spelling
7th	WIAT-III B, C, Essay	BRIEF-SR	Spelling	DASH

Note: [a] Sentence Building; [b] Sentence Combining. WIAT-III = Wechsler Individual Achievement Test-III; BRIEF-SR = Behavior Rating Inventory of Executive Function-Self Report; DASH = Detailed Assessment of Speed of Handwriting.

Table 6.

Order of DASH Administration Subtests by Class

1st Hour	2nd Hour	4th Hour	6th Hour	7th Hour
Copy Fast	Copy Best	Copy Best	Copy Fast	Alphabet Task
Alphabet Task	Alphabet Task	Graphic Speed	Graphic Speed	Copy Best
Copy Best	Copy Fast	Copy Fast	Copy Best	Graphic Speed
Graphic Speed	Graphic Speed	Alphabet Task	Alphabet Task	Copy Fast
Essay	Essay	Essay	Essay	Essay

All consented students were pulled by class hour to complete the group assessments in groups ranging from 11 to 16 students. As with individual assessments, the same opening direction was provided reminding students that some tasks might appear easy, while others appear hard; they were encouraged to try their best. All standardized assessment directions were followed when available. Administration directions are available in Appendix H.

On the first day of group administration when the initial Spelling task took longer than expected, administration sessions were divided across 4 days to ease fatigue effects. In stratifying administration order, it was also decided that all essay level tasks would be administered last to prevent order effects. It should be noted, however, that students in first hour did complete the WIAT-III Essay subtest at the beginning of a session as it was not completed the day the sentence level tasks were administered due to a misreading of the bell schedule. The students in this hour then also completed the BRIEF-SR in the same period. Additionally, fourth hour students completed both the DASH and the BRIEF-SR in one period because it was a block day.

Because the assessment battery for this study included an intensive array of both cognitive and writing measures that some students might have been adverse to, and because students might have become frustrated completing the BRIEF-SR questionnaire regarding their behavior, a protocol for distress was prepared (see Appendix I). In the event that a student experienced high stress or anxiety completing the assessments, the student was to be discretely pulled aside and the administrator was to tell the student about her concerns and to talk with the student about how he/she was feeling. The administrator would stay with the student until another adult could be reached (e.g., school counselor, psychologist, principal, assistant principal, parent/guardian, etc.). At that point, the student would be encouraged to tell his/her counselor about how he/she was feeling. If a student's feelings persisted, his/her parents/guardians would be contacted and provided with techniques for handling anxiety and stress. As the primary school contact, the instructional coach had communicated with the student services staff so that they would be aware of the study and the protocol for distress should a student

have required support. However, no students exhibited distress or anxiety requiring the implementation of the protocol. Only one female student verbally asked if it was too late to discontinue participation as she completed the WIAT-III Sentence Composition tasks. She was reminded by the principal investigator that she had a right to discontinue at any time, though she was encouraged to consider completing the study activities as that day's activities were almost complete and there remained a spelling task that would be completed the following week. The student decided to continue and finish all study tasks.

All WISC-V, WIAT-III, BRIEF-SR, and DASH data was first entered by the primary investigator, and was then double entered by advanced doctoral students. The advanced doctoral student who double entered the WISC-V data also recalculated all scaled scores for Digit Span, Picture Span, and Letter Number Sequencing; as well as the scaled index scores for WMI and AWMI. The advanced doctoral students who double entered the WIAT-III data also recalculated the conversion of raw data to standard scores for Spelling, Sentence Composition, and Essay Composition; as well as summing the subtest scores, converting the Composite Standard Score, and obtaining the 95% Confidence Interval and the Percentile Rank. Any discrepancies across double entry were corrected and agreement was reached. Subsequent analysis (including conversion of raw scores) and data entry using the BRI, MI, Working Memory scale, and Planning/Organization scale of the BRIEF-SR were double entered by the principal investigator. However, initial reliability of data had previously been established, as is outlined in the following section.

Reliability

Reliability Check-Out

Prior to being released into the field, the district instructional coach participated in a one hour policy, procedures, and assessment training session with the principal investigator. The instructional coach was trained on all assessments in the assessment battery. Five days later, the instructional coach and principal investigator communicated virtually to complete the assessment check-out. On the initial check-out session, the instructional coach secured 51 of a possible 55 points on the reliability form (see Appendix J), for 93% accuracy. Inaccuracies were reviewed immediately. Approximately one week later, the principal investigator presented the instructional coach with short re-trials on the items missed. These were completed with accuracy and discussed. Once the instructional coach started administering WISC-V measures, fidelity checks in the field were completed. Fidelity of administration is discussed in greater depth below.

Establishing Reliability

Reliability across measures was set at a minimum of 90%. All individuals who assisted with scoring were trained by the principal investigator on the requisite scoring procedures. Scorers assisting on scoring the WIAT-III Sentence Composition subtests, Essay Composition, and the DASH had not participated in any level of data collection.

The district instructional coach met for an hour with the principal investigator on a Saturday morning to be trained on scoring the Spelling subtest of the WIAT-III and the BRIEF-SR questionnaires. On the Spelling subtest, this included checking the accuracy of students' spellings which had to match the dictated word, and the correct calculation of

students' basal and ceiling windows as the entire subtest had been administered to all students. In days following the session, the instructional coach completed 2 reliability check packets, with the principal investigator's scores being used as the master copy. Across 132 items, scoring was reliable on 131 items, for a mean reliability of 99%. The only error was the misidentification of a basal score; this error was discussed electronically and agreement was reached. This high level of reliability is consistent with that described in the Technical Manual (Breaux, 2009).

During the same Saturday training session, the instructional coach was also trained on scoring the BRIEF-SR. This included transferring students' scores to the scoring sheet (assignment of score [e.g., 1, 2, 3,] only); subtotaling item scores across pages; calculating total scale raw scores; calculating raw scores for the BRI, MI, and GEC indices; and use of the norms tables to identify the t-score, percentile rank, and 90% confidence interval of the GEC. Across 230 items on the 2 reliability checks, scoring was reliable on 225 items, for a mean reliability of 98%. Errors were the result of a calculation error on an item score, which impacted the total raw score for that item, the BRI and GEC scores, and the percentile rank. The instructional coach was asked to recheck her scores; agreement was quickly reached.

A retired school psychologist scored half of the WIAT-III Sentence Combining, Sentence Building, and Essay Composition measures. Given her familiarity with the WIAT-III – especially the sentence-level subtests, the retired school psychologist met with the principal investigator across 2 hour sessions to review together the scoring directions for each subtest. This included talking in detail about the prerequisite criteria and the criteria related to semantics and grammar, and mechanics. Prior to individually

scoring the reliability probes for Sentence Combining, the principal investigator and the retired school psychologist worked together to score a sample (Case 7) from the Scoring Workbook and then individually scored Case 8 separately before comparing scores. Training was first completed for Sentence Combining. Training for Sentence Building did not commence until almost all of the Sentence Combining data was scored. The same process applied to scoring the Essay Composition data; all sentence level data was finished prior to training. Average reliability with each other across 2 probes for Sentence Combining was 97% (50 possible points per probe), with the primary investigator averaging 94% reliability with the Scoring Workbook and the retired school psychologist averaging 95% reliability with the Scoring Workbook. Average reliabilities with each other across 2 probes for Sentence Building was 97% (56 possible points per probe), with the primary investigator averaging 98% reliability with the Scoring Workbook and the retired school psychologist averaging 97% reliability with the Scoring Workbook. Average reliability with each other across 2 probes for Essay Composition was 98% (27 possible points per probe), with the primary investigator averaging 97% reliability with the Scoring Workbook and the retired school psychologist also averaging 97% reliability with the Scoring Workbook. All reliability estimates replicate and often exceed those reported in the Technical Manual (Breaux, 2009).

A retired school principal (and special educator), was trained to score half of the DASH subtests. Training occurred over a 30-40 minute session. General scoring criteria for each assessment were discussed, and the retired principal was provided with a copy of the scoring rules from the Technical Manual. Scoring of many of the subtests (excluding Graphic Speed) is simply a count of the number of words or letters written and the

calculation of words written per minute (wpm). The retired principal was also shown how to use the norms tables for obtaining standard scores for each task, converting the total standard score, confidence interval, and percentile. She was also trained in obtaining the raw and standard scores for the Graphic Speed task, and how to determine whether students' copy speed difference score was at or below the 15th percentile. These latter calculations were discussed in greater detail via e-mail after the 2 reliability check probes were completed. Reliability for the Copy Best and Copy Fast subtests was 100%. Mean reliabilities for Alphabet Writing and Free Writing (total legible wpm) was 98% and 99% respectively. Initial scoring of the number of correctly drawn Xs for the Graphic Speed task were 26% and 85% (with 99% agreement for the total number of circles marked and 70% agreement on the number of errors). However, after an electronic communication regarding the Graphic Speed task, the retired principal rescored the 2 Graphic Speed reliability check probes, and discrepancies were examined item-by-item. Mean reliability was 91%. Before the retired principal commenced scoring this subtest, the item-by-item discrepancies were discussed. Because the Technical Manual of the DASH reports intra-class correlations of .853 for the Graphic Speed subtest, it was determined that 91% agreement was an adequate threshold in which to commence scoring. All reliability estimates for the other subtests replicate those reported in the Technical Manual (Barnett, Henderson, Scheib, & Schulz, 2007).

WISC-V Inter-Scorer Reliability

All WISC-V packets (n = 24) that were administered by the district instructional coach were checked for scoring accuracy by the principal investigator shortly after the date of administration. Reliability of scoring ranged from 73-100% across 11 calculated

scores, with a mean reliability of 95.5%. Only one rating was at 73% and that was due to a discrepancy in what the coach had written down as the student's response when compared to the resulting score circled. In discussion, it was decided that the scores circled would be maintained (these only benefited the student), as the instructional coach explained that she frequently circled whether the response given was correct or incorrect before writing down the student's verbal response. It should also be noted that on one packet reliability was calculated out of 5 scores as the instructional coach only administered Picture Span and Letter Number Sequencing; all Digit Span tasks were administered by the primary investigator. Reliability was 82% on 2 packets, 91% on 5 packets, and 100% on the remaining 16 packets. All discrepancies were discussed and resolved.

A random sample (generated using the RANDBETWEEN function in Microsoft Excel) of 14 WISC-V packets administered by the primary investigator were checked for scoring accuracy by the district instructional coach. Reliability of scoring ranged from 91-100% across 11 calculated scores, with a mean reliability of 99%. On one packet a score had been miscalculated and on another packet a box had been left blank. Both discrepancies were discussed and resolved. Overall, inter-scorer reliability estimates approximated those outlined in the Technical Manual (.98 to .99; Wechsler, 2014).

Spelling Inter-Scorer Reliability

All Spelling subtests were first scored by the primary investigator. A random sample (generated using the RANDBETWEEN function in Microsoft Excel) of 14 students' Spelling subtests were then rescored by the instructional coach (3 students each from 1st, 2nd, 4th, and 7th hours, and 2 students from 6th hour [as this was the smallest

class]). Reliability of scoring ranged from 97-100%, with a mean reliability of 99%. Discrepancies were primarily the result of a scoring error (e.g. the word was spelled correctly, but had been marked as incorrect); on one packet, the scoring error had also precipitated an error in identifying the ceiling. All discrepancies were discussed electronically, rescored, and resolved. Reliability continued to match inter-scorer reliability estimates reported in the Technical Manual (Breaux, 2009).

WIAT-III Sentence Composition Inter-Scorer Reliability

A random sample (generated using the RANDBETWEEN function in Microsoft Excel) of 14 students' WIAT-III Sentence Building and Sentence Combining packets were selected to be rescored, 7 of the packets originally scored by the principal investigator and 7 of the packets originally scored by the retired school psychologist. Three student packets from 1st, 2nd, 4th, and 7th hours were selected, along with 2 student packets from 6th hour (as this was the smallest class). On Sentence Building, reliability ranged from 89-100%, with a mean reliability of 96%. On Sentence Combining, reliability ranged from 92-100%, with a mean reliability of 97%. While a couple of discrepancies were discussed, discrepancies across both subtests were not corrected following scoring, as discrepancies across items usually did not result in a change in the overall raw score for each subtest. Moreover, throughout the scoring process, any questions that arose were discussed either electronically or in a session of about 1 hour after the completion of scoring, in which agreement was achieved on how to score the item. Reliability estimates continued to exceed those reported in the Technical Manual (Breaux, 2009).

WIAT-III Essay Composition Inter-Scorer Reliability

A random sample (the same sample used for WIAT-III Sentence Composition inter-scorer reliability) of 14 students' WIAT-III Essay Composition packets were selected to be rescored, 7 of the packets originally scored by the principal investigator and 7 of the packets originally scored by the retired school psychologist. Reliability of Essay Composition ranged from 85-100%, with a mean reliability of 92%. Again, while a couple of discrepancies were discussed, discrepancies across Essay Composition measures were not corrected following scoring, as discrepancies across items usually did not result in a change in the overall raw score for Theme Development and Text Organization. Throughout the scoring process, any questions that arose were discussed either electronically or in a session of about 1 hour after the completion of scoring, in which agreement was achieved on how to score the item. Additionally, after scoring, it was determined that 6 students had elaboration scores that exceeded their reasons scores; these packets (which included one packet from the reliability sample) were discussed together and agreement was achieved on the number of reasons and elaborations, though this rarely changed the student's overall raw score on Theme Development and Text Organization. Though the mean reliability of these samples was lower than when reliability was established before scoring, this mean reliability matches that reported in the Technical Manual (intra-class correlations of .92 and .99 for Theme Development and Text Organization and Word Count respectively) (Breaux, 2009).

Corresponding Planning sheets for the same 14 students were also checked for inter-scorer reliability. Reliability across 8 students was 100%. For 5 students, scores were discrepant by ±1, and for one student the planning score was discrepant by 2 points.

These 6 Planning measures were discussed by phone and agreement was achieved and corrected. For the student sheet discrepant by 2 points, the retired school psychologist had not seen that the student had continued her planning on the reverse of her sheet.

BRIEF-SR Inter-Scorer Reliability

All BRIEF-SR packets were first scored by the primary investigator. A random sample of 14 BRIEF-SR packets were then rescored by the instructional coach (the same sample used for Spelling inter-scorer reliability). Reliability ranged from 94-100% across 123 criteria (the 80 statement scores, sub-totals of items 1-40 and 41-81, copying sub-totals 1-40, totals for Behavioral Shift and Cognitive Shift subscales, total scale raw scores, BRI, MI, GEC, t-score, percentile rank, and 90% confidence interval), with a mean inter-scorer reliability of 98%, or agreement on 1,688 out of 1,722 items. Any discrepancies – errors in transcription (e.g., a student circled sometimes, but a score of 1 instead of 2 was circled on the scoring sheet) and computation (e.g., addition of item scores within a scale score, like Task Completion) – were discussed via e-mail between the primary investigator and the instructional coach, and agreement was reached.

DASH Inter-Scorer Reliability

A random sample (generated using the RANDBETWEEN function in Microsoft Excel) of 14 students' DASH packets were selected to be rescored, 7 of the packets originally scored by the principal investigator and 7 of the packets originally scored by the retired principal. This included 3 students each from 1st, 2nd, 4th, and 7th hours, and 2 students from 6th hour [as this was the smallest class]). Reliability of scoring of the Copy Fast task was 100% across all packets. Reliability of scoring of the Alphabet Task ranged from 97-100%, with a mean reliability of 99.5% (before rounding). Reliability of

scoring of the Copy Best task ranged from 83-100%, with a mean reliability of 99%. All reliability scores except two were at 100%; the others were 98% and 83% respectively. The packet with 83% reliability for the Copy Best task resulted from a simple mathematical transcription error. Reliability of scoring of the Graphic Speed task ranged from 86-100%, with a mean reliability of 95%. There was only one reliability score below the original 90% threshold, and it resulted from a student's packet where the number of correct Xs was below 9; thus, even one discrepancy in scoring resulted in a significant loss for reliability estimates. Finally, reliability of the Free Write task ranged from 97-100%, with a mean reliability of 99%. All discrepancies (with the exception of those identified on the Graphic Speed task) were discussed and corrected as it was easy to come to agreement on a count-based measure like wpm. Given the subjectivity inherent within the Graphic Speed task, discrepancies were not discussed as mean reliability was above the 90% reliability threshold established before scoring; our reliability was also much higher than that reported in the Technical Manual (see Barnett, Henderson, Scheib, & Schulz, 2007).

Fidelity of Individual Administration

Fidelity of approximately 22% of WISC-V administration sessions was also reviewed. (A copy of the fidelity checklist is available in Appendix K.) Because the principal investigator and the instructional coach administered the WISC-V to all students, they checked fidelity of each other's administration. Six sessions (40%) administered by the principal investigator – three in person and three audio-recorded – were observed or listened to by the instructional coach. Fidelity ranged from 96-100%, with a mean reliability of 99%. Nine sessions (60%) administered by the instructional

coach – four in person and five audio-recorded – were observed or listened to by the principal investigator. Fidelity ranged from 94-100%, with a mean reliability of 97%. It should be noted that one of the audio-recorded sessions administered by the instructional coach was only partially complete (e.g., Picture Span and Letter Number Sequencing) as the period was about to expire; the principal investigator administered the remainder of the assessments during a later session.

Early in administration of the WISC-V measures, it was noticed by the principal investigator that trial 1 of item 8 of the Letter Number Sequencing subtest had been printed incorrectly (that is a 3 instead of an E had been listed in the sequence). Any student who had received the trial incorrectly, was re-administered the trial. Because this trial occurred within a set where the discontinue criterion was met for many students, re-administration of the item oftentimes did not change a student's score; when re-administration did change a student's score, it was typically by only one point.

Fidelity of Group Administration

All group sessions were administered by the principal investigator, with the exception of 3 make-up sessions for individual students which were administered by the instructional coach. The 3 make-up sessions included 2 administrations of the Spelling subtest; 1 administration of the WIAT-III Sentence Combining, Sentence Building, and Essay Composition subtests; and one administration of the BRIEF-SR. Fidelity of 2 Spelling, 2 DASH, 2 WIAT-III Sentence Composition and Essay Composition, and 1 BRIEF-SR session(s) were observed by the instructional coach. A copy of the fidelity checklist is available in Appendix L. Fidelity ranged from 95-100% of the relevant criteria, for nearly perfect administration (99.5% before rounding). Only one session met

20 of the 21 criteria, for 95% fidelity of administration. All other sessions were at 100%. The error was one of directions, related specifically to crossing out mistakes when writing sentences for the Sentence Combining subtest.

Time of Administration

Throughout the study, data was collected on the time of administration per assessment and/or per assessment session to determine whether hypothesized timing estimates accurately reflected what occurred in the field. Prior to the study, it was hypothesized that administration would include one individual session of approximately 25 minutes and 2 group sessions of 45 minutes each. On just under a third of the individual administration sessions (28.99%, or 20 students), time of administration was recorded (this included 7 of the 8 student sessions that were audio-recorded for reliability – 1 session was incomplete – and 4 of the in the field reliability sessions). The mean time of individual administration across this sample was 21:32 minutes, with sessions ranging in length from 16:46 – 30:23 minutes. Additionally, mean time per subtest on the WISC-V was calculated. Times per subtest were available from 11 student sessions (15.94%) where time was known for at least one individual subtest of the WISC-V. Mean administration time for the Digit Span Forward task was 1:40 minutes with a range of 1:09 – 2:41 minutes. Mean administration time for the Digit Span Backward task was 1:58 minutes with a range of 1:20 – 3:10 minutes. Mean administration time for the Digit Span Sequencing task was 2:21 minutes with a range of 1:40 – 3:53 minutes. Mean administration time for the Picture Span task was 7:11 minutes with a range of 5:42 – 8:22 minutes. Mean administration time for the Letter Number Sequencing task was 5:21 with a range of 3:51 – 9:18 minutes.

Data on administration time was also collected on a very small sample of group assessments (during reliability). Administration time for 2 of the 5 classes was collected on the WIAT-III Spelling subtest, for a mean time of 29:06 minutes. The Sentence Building, Sentence Combining, and Essay Composition subtests of the WIAT-III and the Planning measure were all given during one session. Mean administration time for 2 classes was 31:01 minutes. For the BRIEF-SR and the DASH, administration time was only collected for one class; those times were 26:00 minutes and 31:16 minutes, respectively. Table 7 compares the hypothesized administration times with actual implementation times.

Table 7.

Comparison of Hypothesized Administration Time with Actual Implementation

	Assessment	Hypothesized Time (minutes)	Mean Actual Time (minutes:seconds)
Group	WIAT-III Spelling	15	29:06
	WIAT-III Sentence Building, Sentence Combining, Essay Composition & Planning	25	31:01
	BRIEF-SR	15	26:00
	DASH	15	31:16
Individual	WISC-V Digit Span – Forward	5	1:40
	WISC-V Digit Span – Backward	5	1:58
	WISC-V Digit Span – Sequencing	5	2:21
	WISC-V Picture Span	10	7:11
	WISC-V Letter-Number Sequencing	5	5:21

Note: WIAT-III = Wechsler Individual Achievement Test-III; BRIEF-SR = Behavior Rating Inventory of Executive Function-Self Report; DASH = Detailed Assessment of Speed of Handwriting; WISC-V = Wechsler Intelligence Scale for Children-V.

Research Design and Data Analysis

Structural equation modeling (SEM) including exploratory factor analysis (EFA) was used as the primary data analysis method. According to Kline (2011), SEM refers to

a family of interrelated statistical procedures that cannot be inferred to demonstrate evidence of causation. SEM is theory driven and typically viewed as confirmatory, in that the primary question asked is whether one's model detailed at the beginning of a study is supported by the data. This is accomplished by examining a series of fit indices for determining the level of model fit. Additionally, SEM is usually considered a large-sample size technique in that the greater the number of parameters (e.g., hypothesized effects that require statistical estimation), the greater the number of estimates needed. Abbott and Berninger (1993) identify four reasons for why SEM is an appropriate research methodology: (a) it allows a researcher to test a model(s), (b) it permits researchers to go beyond simply modeling variance, (c) it allows researchers to explore structural relationships among factors, and (d) it allows for the comparison of models.

Criteria outlined by Hu and Bentler (1998, 1999) was used to evaluate the fit of the measurement model to the data. Their research recommends use of the following fit indices (using maximum likelihood [ML] based estimation): standardized root mean squared residual (SRMR) supplemented with either the Tucker-Lewis Index (TLI), Bollen's (1989) Fit Index (BL89), Relative Non-centrality Index (RNI), Comparative Fit Index (CFI), Gamma Hat, Mc-Donald's Centrality Index (Mc), or root mean squared error of approximation (RMSEA). SRMR is the most sensitive to model misspecification, and along with TLI, BL89, RNI, and CFI are preferred indices when sample size is small (e.g., $n \leq 250$). Hu and Bentler (1998, 1999) also established more stringent cut-off criteria in evaluating model fit indices. While they indicate that it can be difficult to assign a specific cut-off value because they do not always work with every model specification index, their research recommends cut-off values around .95 for TLI, BL89,

CFI, RNI, and gamma hat, with a cut-off value close to .90 for Mc, .08 for SRMR, and .06 for RMSEA, before researchers can determine whether there is good fit between a hypothesized and observed model. Use of Hu and Bentler's criteria continues to be upheld in research as acceptable guidelines for determining model fit. For the purposes of this study, the following model fit indices are reported across models: chi square (χ^2), degrees of freedom (*df*), level of significance (*p*), AIC (Akaike information criterion), BIC (Bayesian information criterion), CFI, TLI, RMSEA, and SRMR. IBM SPSS AMOS 22 was used for modeling and analysis using ML estimation.

Following the conventions of Bentler (1991), rectangles were used to represent measured or observed variables and circles represent latent or unobserved variables. Single-headed arrows represent directional paths and double-headed arrows represent non-directional covariances. Error or disturbance (e.g., residual) terms, also latent variables, are denoted by e. Each error term was numbered to match the order of observed variables. All error residuals were fixed to one and one unstandardized path from each latent, endogenous variable to an indicator was scaled by fixing the path to one.

The hypothesized measurement model using composite scores (see Appendix M) of the Simple View of Writing contains four latent, endogenous variables that correspond to the primary components of the Simple View of Writing. Each endogenous variable contains between two and three exogenous, observed variables (3 indicators for transcription, 2 indicators for text generation, 2 indicators for self-regulation, and 2 indicators for working memory). According to Kline (2011), models should contain a minimum of three indicators per latent construct; in the event that any one factor contains

more than three, it is permissible to allow one other factor to have fewer than three indicators. Convergence of the measurement model would confirm whether the indicators fit the factors. A lack of convergence would reveal model misspecification. The first research question, identification of a good fitting model of the Simple View of Writing, was examined using SEM and EFA.

Prior to analysis, the data was screened to check for normality and linearity. Descriptive statistics and correlations were also calculated. Descriptive statistics were used to answer the second research question (what are the scores on the observed variables for struggling writers). To answer the final research question (on which variables are there statistically significant differences between struggling and non-struggling students), a series of one-way analyses of variance (ANOVA) were calculated.

Summary

This study sought to test the Simple View of Writing in order to identify a good fitting model. By identifying the best fitting model, the goal was to better understand the relationship between the variables and to explore the extent to which struggling writers differ from non-struggling writers on a variety of writing and cognitive tasks.

The target population included a diverse sample of 9th grade students (n = 69) from a large mid-Western school district. Students completed a series of standardized writing (e.g., WIAT-III and DASH) and cognitive measures (e.g., WISC-V, BRIEF-SR, and Planning) across both individual and group administration periods throughout the Fall of the 2015 academic year. Individual sessions lasted approximately 20 minutes and were completed in a small conference room off of the library media center. Group sessions included only the consented students from the study (approximately 11–16

students per class hour) and were administered in classrooms close to the students' English class. Individual measures were administered by the primary investigator and an instructional coach for the district. Group sessions were administered by the primary investigator.

SEM techniques were used to test the components of the Simple View of Writing and to identify a good fitting model based on the data. Determining whether the components of the Simple View of Writing are reflected at the 9th grade level can lend support for more complex models or models with other variables in later research. Results of this study are provided in the next chapter.

CHAPTER 4

Results

The purpose of this study was to evaluate the fit of the Simple View of Writing at the high school level by identifying the best fitting model that adequately captures the ideas of transcription, text generation, self-regulation, and working memory. By expanding the conceptual understanding of writing, it was believed that additional insight could be gleaned about the characteristics with which students struggle, which could later potentially suggest relationships about variables that could be targeted for intervention and instruction with adolescent students who struggle with writing. This chapter begins with an overview of the screening procedures used in evaluating the normality and linearity of the data, and provides descriptive statistics for each of the measures. To evaluate a good fitting model, structural equation modeling (SEM) and exploratory factor analysis [EFA] were used. A series of one-way ANOVAs were then run to determine whether statistically significant differences existed between struggling and non-struggling writers on the observed variables (standardized assessments).

Data Screening

Before analyzing the data, probability-probability (P-P) plots (a graph plotting the cumulative probability of a variable against the cumulative probability of a given distribution, such as a normal distribution; see Field, 2009), histograms, bivariate scatterplots, and tests of normality were run to ensure the data was normally distributed and to check for nonlinear relationships. Histograms approximated a normal distribution of scores, and P-P plots revealed that the variable distributions shared a normal distribution with a linear trend (see Appendix N for P-P plots and histograms). Bivariate

scatterplots also confirmed a linear trend. Skewness and kurtosis values confirmed that the data approximated the normal distribution. Field (2009) recommends transforming skewness and kurtosis values to *z*-scores (Zskewness = $\frac{S-0}{SEskewness}$ and Zkurtosis = $\frac{K-0}{SEkurtosis}$). Converted *z*-scores revealed non-significant ($p > .05$) absolute values (|Zskewness| < 1.96; |Zkurtosis| < 1.96) for all measures, suggesting a normal distribution of performance across all variables.

Descriptive Statistics

Descriptive statistics (see Table 8) were calculated to examine the means and standard deviations of the memory, self-regulation, and writing measures across the entire sample and across specific subsamples of students. Initially, all analyses were run with total, composite/combined scores. However, throughout analysis, it was deemed important to untangle such scores (e.g., BRIEF-SR Global Executive Composite [GEC] and WIAT-III Essay Composition [EC]) to better understand the uniqueness of the variables. Where available, standard scores are presented. For Letter Number Sequencing (LNS), a scaled score was used, and on the BRIEF-SR, all scores are presented as t-scores. For the planning measure, a raw score was used.

Table 8.

Descriptive Statistics

Measure	All Students (n = 69)		Above 25th %tile (n = 61)		At or Below 25%tile (n = 8)	
	Mean	SD	Mean	SD	Mean	SD
Working Memory Index (WMI)	101.44	12.76	102.98	11.85	89.63	14.10
Letter Number Sequencing[a]	9.71	2.47	10.18	2.18	6.13	1.46
WIAT-III Spelling	104.83	13.96	107.89	11.55	81.50	6.70
WIAT-III Sentence Composition	101.42	15.27	104.69	12.81	76.50	7.39
Planning[b]	3.04	1.17	3.20	1.12	1.88	0.83
WIAT-III Essay Composition	106.30	11.91	108.30	10.65	91.13	10.41
WIAT-III EC WC	112.83	12.83	114.61	11.97	99.25	11.59
WIAT-III EC TD	98.33	14.39	100.26	13.50	83.63	13.06
BRIEF-SR GEC	57.88	10.88	57.46	11.23	61.13	7.45
BRIEF-SR BRI	56.59	10.43	56.13	10.73	60.13	7.32
BRIEF-SR MI	57.80	11.36	57.41	11.62	60.75	9.22
BRIEF-SR WM	58.96	12.25	59.02	12.62	58.50	9.53
BRIEF-SR PO	56.97	10.26	56.53	10.53	60.38	7.63
DASH	97.29	13.79	99.53	12.30	80.25	13.22
Graphic Speed	9.77	4.16	10.07	4.21	7.50	3.07

Note: [a] = scaled score; [b] = raw score; WIAT-III = Wechsler Individual Achievement Test-III; WIAT-III EC WC = Word Count score of Wechsler Individual Achievement Test-III Essay Composition subtest; WIAT-III EC TD = Theme Development and Text Organization score of the Wechsler Individual Achievement-III Essay Composition subtest; BRIEF-SR GEC = Global Executive Composite of the Behavior Rating Inventory of Executive Function-Self Report; BRIEF-SR BRI = Behavioral Regulation Index of the Behavior Rating Inventory of Executive Function-Self Report; BRIEF-SR MI = Metacognition Index of the Behavior Rating Inventory of Executive Function-Self Report; BRIEF-SR WM = Working Memory scale of the Behavior Rating Inventory of Executive Function-Self Report; BRIEF-SR PO = Planning/Organization scale of the Behavior Rating Inventory of Executive Function-Self Report; DASH = Detailed Assessment of Speed of Handwriting.

Participants' scores on the Working Memory Index (WMI) (M = 101.44, *SD* = 12.76), WIAT-III measures (Spelling: M = 104.83, *SD* = 13.96; Sentence Composition: M = 101.42, *SD* = 15.27; Essay Composition: M = 106.30, *SD* = 11.91), and the DASH (M = 97.29, *SD* = 13.79) are within the average range. However, the WIAT-III Spelling

and Essay Composition scores are slightly above average, with the DASH scores slightly in the low average range. On the Essay Composition subtest, scores for Word Count (M = 112.83, *SD* = 12.83) are above average and scores for Theme Development and Text Organization (M = 98.33, *SD* = 14.39) are within the average range. Participants' scores on the BRIEF-SR GEC are also within the average range (M = 57.88, *SD* = 10.88), though slightly within the high average range. This trend is also similar for performance on the other BRIEF-SR indices and scales (refer to Table 8). Means and standard deviations are also presented for the subsample of students who performed above and below the 25th percentile on the WIAT-III Written Expression Composite (a score derived from the standard scores for Spelling, Sentence Composition, and Essay Composition). A greater discussion regarding differences in student performance (using performance at or below the 25th percentile on the WIAT-III Written Expression Composite) are presented below. Moreover, the measures demonstrate low to acceptable reliability (Cronbach's αs = .56 – .78).

Correlations

To ensure that measures were not too highly similar, but related enough to potentially identify a common factor, Pearson product moment correlations were calculated. Cohen (1988, 1992), has suggested effect sizes at or above r = .10, r = .30, and r = .50 constitute small, medium, and large effects respectively. Inter-correlation coefficients amongst writing, memory, and self-regulatory variables are presented in Table 9 and ranged from – .34 to .91. The WMI score was moderately to strongly statistically significantly related to Letter-Number Sequencing (r = .50), Spelling (r = .49), and Sentence Composition (r = .50). Letter-Number Sequencing was moderately to

strongly statistically significantly correlated with Spelling (r = .42) and Sentence Composition (r = .50). Spelling was strongly and significantly correlated with Sentence Composition (r = .62), and the DASH was strongly and significantly correlated with Essay Composition (r = .57), and moderately significantly correlated with the planning measure (r = .40). Interestingly, the BRIEF-SR GEC was negatively correlated with all other variables with the exception of a small to moderate, negative statistically significant correlation with the WMI (r = – .32) and Sentence Composition (r = – .25).

When correlations are examined for Word Count and Theme Development and Text Organization, components of the Essay Composition score, both were strongly statistically correlated with the composite score (r = .82 and r = .86, respectively). Both are also moderately to strongly statistically correlated with the DASH (r = .58 and r = .37, respectively) as well as moderately to strongly statistically correlated with each other (r = .41). For the BRIEF-SR, all component scores are strongly statistically correlated with each other (see Table 9), with primarily very small non-significant correlations with all other variables. Similar to the GEC score, the Behavioral Regulation Index (BRI), and the Metacognition Index (MI) also exhibit a small to moderate, negative statistically significant correlation with the WMI (r = – .34 and r = – .27, respectively), and the BRI has a small to moderate, negative statistically significant correlation with the Sentence Composition subtest (r = – .25).

Table 9.

Inter-Correlation Coefficients

	LNS	WMI	Spell	SC	Plan	WC	TD	EC	BRIEF_WM	BRIEF_PO	BRIEF_BRI	BRIEF_MI	BRIEF_GEC	DASH	GS
LNS	1														
WMI	.50**	1													
Spell	.42**	.49**	1												
SC	.50**	.50**	.62**	1											
Plan	.24*	0.07	0.13	.26*	1										
WC	.38**	0.14	.27*	.29*	.39**	1									
TD	0.21	0.1	0.2	.25*	.25*	.41**	1								
EC	.35**	0.14	.28*	.33**	.37**	.82**	.86**	1							
BRIEF_WM	-0.09	-0.23	-0.08	-0.11	-0.02	0.00	-0.01	-0.01	1						
BRIEF_PO	-0.1	-0.14	-0.16	-0.21	0.02	-0.04	0.03	-0.01	.71**	1					
BRIEF_BRI	-0.23	-0.34**	-0.21	-.25*	0.00	-0.02	-0.06	-0.05	.61**	.67**	1				
BRIEF_MI	-0.14	-.27*	-0.18	-0.22	-0.01	-0.05	-0.01	-0.04	.91**	.89**	.69**	1			
BRIEF_GEC	-0.19	-.32**	-0.21	-.25*	-0.00	-0.03	-0.03	-0.04	.85**	.86**	.90**	.94**	1		
DASH	.37**	.33**	.35**	.36**	.40**	.58**	.37**	.57**	0.05	0.06	-0.03	-0.01	-0.02	1	
GS	.27*	0.22	0.17	0.18	.31*	0.12	0.03	0.09	0.05	-0.00	-0.04	-0.07	-0.06	.25*	1

Note: ** $p \leq 0.01$, 2-tailed. * $p \leq 0.05$, 2-tailed. LNS = Letter Number Sequencing subtest of the Wechsler Intelligence Scale for Children-V (WISC-V); WMI = Working Memory Index of the WISC-V; Spell = Spelling subtest of the Wechsler Individual Achievement Test-III (WIAT-III); SC = Sentence Composition subtests of the WIAT-III; Plan = Planning; WC = Word Count score for Essay Composition subtest of the WIAT-III; TD = Theme Development and Text Organization score of the Essay Composition subtest of the WIAT-III; EC = Essay Composition subtest of the WIAT-III; BRIEF_WM = Working Memory scale of the Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR); BRIEF_PO = Planning/Organization scale of the BRIEF-SR; BRIEF_BRI = Behavioral Regulation Index of the BRIEF-SR; BRIEF_MI = Metacognition Index of the BRIEF-SR; BRIEF_GEC = Global Executive Composite of the BRIEF-SR; DASH = Detailed Assessment of Speed of Handwriting; GS = Graphic Speed.

Covariance Matrix

The covariance matrix was also explored (see Table 10). Covariances measure the average relationship between two variables, providing an indication of the extent to which the variables are related to each other (Field, 2009). As with the inter-correlation matrix presented above in Table 9, all covariances are positive with the exception of those with the BRIEF-SR. This is to be expected as items on the BRIEF-SR are negatively worded. Positive covariances indicate that as one variable deviates from the mean, the other variable deviates in a similar direction. Negative covariances, like those with the BRIEF-SR, indicate that as one variable deviates from the mean (by increasing), the other variable deviates from the mean in the opposite direction (by decreasing) (Field, 2009).

Table 10.

Covariance-Variance Matrix

	LNS	WMI	Spell	SC	Plan	WC	TD	EC	BRIEF _GEC	DASH	GS	BRIEF _WM	BRIEF _PO	BRIEF _BRI	BRIEF _MI
LNS	**6.12**														
WMI	15.86	**162.93**													
Spell	14.54	87.77	**194.82**												
SC	18.80	97.76	131.77	**233.16**											
Plan	0.70	1.03	2.08	4.61	**1.37**										
WC	12.16	22.83	48.46	57.13	5.80	**164.71**									
TD	7.60	17.78	39.62	55.62	4.24	76.27	**207.14**								
EC	10.40	21.78	46.66	60.34	5.21	125.47	147.06	**141.86**							
BRIEF_GEC	-5.03	-44.32	-31.18	-40.83	-0.02	-4.24	-3.96	-4.73	**118.46**						
DASH	12.66	57.58	67.88	75.91	6.44	103.30	73.40	92.98	-2.78	**190.21**					
GS	2.74	11.85	9.75	11.41	1.50	6.30	1.51	4.26	-2.70	14.05	**17.33**				
BRIEF_WM	-2.68	-35.85	-13.82	-20.83	-0.22	0.15	-1.54	-1.13	112.72	8.35	2.71	**149.98**			
BRIEF_PO	-2.61	-18.43	-23.52	-32.72	0.19	-5.84	4.28	-1.07	96.16	8.42	-0.12	89.25	**105.35**		
BRIEF_BRI	-5.84	-44.62	-30.04	-39.08	0.00	-2.20	-9.26	-6.17	101.59	-3.93	-1.77	78.10	71.74	**108.69**	
BRIEF_MI	-3.85	-38.68	-28.82	-37.77	-0.15	-6.70	-1.70	-4.95	116.04	-1.57	-3.11	125.83	103.85	81.61	**129.02**

Note: Variances appear on the diagonal in bold. LNS = Letter Number Sequencing subtest of the Wechsler Intelligence Scale for Children (WISC-V); WMI = Working Memory Index of the WISC-V; Spell = Spelling subtest of the Wechsler Individual Achievement Test (WIAT-III); SC = Sentence Composition subtests of the WIAT-III; Plan = Planning; WC = Word Count score of the Essay Composition subtest on the WIAT-III; TD = Theme Development and Text Organization score of the Essay Composition subtest on the WIAT-III; EC = Essay Composition subtest of the WIAT-III; BRIEF = Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR); DASH = Detailed Assessment of Speed of Handwriting; GS = Graphic Speed; BRIEF_WM = Working Memory scale of BRIEF-SR; BRIEF_PO = Planning/Organization scale of the BRIEF-SR; BRIEF_BRI = Behavioral Regulation Index of the BRIEF-SR; BRIEF_MI = Metacognition Index of the BRIEF-SR.

Dimensionality of Writing: Comparing the Fit of the Structural Equation Models

In order to measure the dimensionality captured in the various writing, memory, and self-regulatory measures (that is, that writing is composed of various factors, and that each variable contributes uniquely to each factor), a series of analyses using SEM were conducted. First, SEM was used to evaluate the hypothesized 4-factor measurement model of the Simple View of Writing. SEM requires that the measurement model be tested before any structural models can be evaluated. When this model did not converge, EFA was used to better understand the factor structure of the data. This included multiple rounds of EFA to better understand the factor structure by breaking apart composite scores and using theory to determine whether a model could be theoretically justified. These analyses address the first research question: Given variations on the Simple View of Writing, which model is better fitting with 9th grade students? Further details about each of these models is provided below.

Research Question 1: Given variations on the Simple View of Writing, which model is better fitting with 9th grade students? To initially confirm whether the data fit the hypothesized factor structure of the Simple View of Writing, a measurement model with 4 latent factors (e.g., transcription, text generation, working memory, and self-regulation) was evaluated. First, the measurement model was evaluated using the GEC of the BRIEF-SR. When this model did not converge, the measurement model was re-evaluated using only the Metacognition Index, before being evaluated using the Working Memory and Planning/Organization scales of the BRIEF-SR (each version of the measurement model, with standardized estimates, is presented in Appendix O, P, and Q,

respectively). Results indicated that the matrix was non-positive definite[6] across each iteration, indicating that no conclusions can be drawn. According to Kline (2011), a non-positive definite matrix might result when the data does not provide enough information (e.g., small sample size, only 2 indicators per factor), the model contains too many parameters, the sample contains outliers or the data is not normally distributed, there is underidentification of factor covariances, or the measurement model is misspecified.

Model fit indices (see Table 11) also suggested poor model fit. In SEM, chi square values should be non-significant, and Hu and Bentler (1998, 1999) recommend that CFI and TLI be at least .95, with cut-off values of .06 for RMSEA and .08 for SRMR. In all iterations of this model, the chi square value is significant; CFI, TLI, and RMSEA values do not meet Hu and Bentler's recommendations; and SRMR is slightly above the recommended threshold. Modification indices calculated through IBM SPSS AMOS suggested adding a covariance between residual terms for variables on different factors. However, adding residual covariances for variables across different factors is an unacceptable modification, as adding residual covariances for items on different factors tends to suggest that these same items are potentially measuring similar constructs. Thus, it became necessary to explore what type of factor structure would be supported by the data.

[6] That is, a matrix containing negative or zero eigenvalues (Kline, 2011; Rigdon, 1997). An eigenvalue is the length or distance from one end of an eigenvector to another. Eigenvectors, according to Kline (2011), are the "lines measuring the length and height of the ellipse that surrounds the scatterplot of data for those variables" (p. 243).

Table 11.

Comparing the Fit of the Measurement Model

Fit Index	4-Factor Model (GEC)	4-Factor Model (MI)	4-Factor Model (WM/PO + WC/TD)
χ^2 (*df*), *p*	40.709 (21), *p* = .006	43.818 (21), *p* = .002	104.365 (38), *p* = .000
AIC	88.709	91.818	160.365
BIC	142.327	145.437	222.920
CFI	.855	.833	.647
TLI	.751	.713	.488
RMSEA	.117	.126	.160
SRMR	.0880	.0891	.1221

Note. GEC = Global Executive Composite of the BRIEF-SR; MI = Metacognition Index of the BRIEF-SR; WM = Working Memory scale of the BRIEF-SR; PO = Planning/Organization scale of the BRIEF-SR; WC = Word Count score of the Essay Composition subtest of the WIAT-III; TD = Theme Development and Text Organization of the Essay Composition subtest of the WIAT-III; AIC = Akaike information criterion; BIC = Bayesian information criterion; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residuals.

Results of a factor analysis using the composite scores for Essay Composition and the BRIEF-SR (using maximum likelihood estimation with an oblique rotation in IBM SPSS) revealed a 2-factor model with good fit (χ^2 = 14.725, *df* = 19, *p* = .740) explaining 54% of the variance; eigenvalues were above 1.0 when modeling using the BRIEF-SR GEC. In factor analysis, an eigenvalue greater than 1.0 is considered an acceptable cut-point; Kaiser's (1960, 1970, 1974) recommendation (i.e., eigenvalue > 1.0) is the default option in IBM SPSS. The 2-factor model specified by the output included one factor that included memory and more transcription level variables (WMI, Letter Number Sequencing, Spelling, Sentence Composition, and the BRIEF-SR GEC), and a second factor that included text generation and writing fluency level variables (Essay Composition, DASH, and Planning). The Graphic Speed subtest of the DASH did not appear to load on either factor. The pattern and structure matrices supporting the factor

compositions are presented in Tables 12 and 13 respectively. Higher factor loadings (whether positive or negative) suggest better fit of the observed variable on the factor (e.g., a factor loading of .667 for Sentence Composition [SC] on the first factor suggests that the variable is more representative of Factor 1 than it is of Factor 2 with a factor loading of .204).

Table 12.

Pattern Matrix with Composite Scores

Variable	Factor 1	Factor 2
WMI	.730	
SC	.667	.204
Spelling	.660	.138
LNS	.517	.275
BRIEF-SR GEC	– .421	.143
EC		.732
DASH	.110	.715
Planning		.568
GS	.173	.211

Note: WMI = Working Memory Index of the Wechsler Intelligence Scale for Children-V (WISC-V); SC = Sentence Composition subtests of the Wechsler Individual Achievement Test-III (WIAT-III); Spell = Spelling subtest of the WIAT-III; LNS = Letter Number Sequencing subtest of the WISC-V; BRIEF-SR GEC = Behavior Rating Inventory of Executive Function-Self Report Global Executive Composite; EC = Essay Composition subtest of the WIAT-III; DASH = Detailed Assessment of Speed of Handwriting; Plan = Planning; GS = Graphic Speed.

Table 13.

Structure Matrix with Composite Scores

Variable	Factor 1	Factor 2
SC	.741	.445
WMI	.731	.264
Spelling	.710	.376
LNS	.616	.461
BRIEF-SR GEC	– .370	
DASH	.368	.755
EC	.252	.728
Planning	.150	.548
GS	.249	.273

Note: SC = Sentence Composition subtests of the Wechsler Individual Achievement Test-III (WIAT-III); WMI = Working Memory Index of the Wechsler Intelligence Scale for Children-V (WISC-V); Spell = Spelling subtest of the WIAT-III; LNS = Letter Number Sequencing subtest of the WISC-V; BRIEF-SR GEC = Global Executive Composite of the Behavior Rating Inventory of Executive Function-Self Report; DASH = Detailed Assessment of Speed of Handwriting; EC = Essay Composition subtest of the WIAT-III; Plan = Planning; GS = Graphic Speed.

When modeling using the BRIEF-SR Metacognition Index (MI), results of a factor analysis (using maximum likelihood estimation with an oblique rotation in IBM SPSS) revealed a 3-factor model with good fit (χ^2 = 11.418, *df* = 12, *p* = .493) explaining 65% of the variance; eigenvalues were above 1.0. The 3-factor model specified by the output included one factor that included visual-spatial abilities and metacognition (Graphic Speed and Metacognition Index of the BRIEF-SR), a second factor that included memory and more transcription level variables (WMI, LNS, Spelling, Sentence Composition), and a third factor that included text generation and writing fluency level variables (Essay Composition, DASH, and Planning). Though the Metacognition Index loads on the first factor, it should be noted that it does not load very well. The pattern and structure matrices supporting the factor compositions are presented in Tables 14 and 15 respectively. However, because the first factor is primarily supported by the Graphic

Speed task, this model was discarded, as it does not appear that metacognition and visual-spatial abilities are related.

Table 14.

Pattern Matrix with BRIEF-SR MI

Variable	Factor 1	Factor 2	Factor 3
GS	0.975	0.297	
BRIEF_MI	0.243	-0.106	
WMI		0.771	-0.112
Spell		0.701	
SC		0.699	0.143
LNS		0.558	0.193
EC	-0.136		0.839
DASH		0.208	0.609
Plan	0.186		0.481

Note: GS = Graphic Speed; BRIEF_MI = Metacognition Index of the Behavior Rating Inventory of Executive Function-Self Report; WMI = Working Memory Index of the Wechsler Intelligence Scale for Children-V (WISC-V); Spell = Spelling subtest of the Wechsler Individual Achievement Test-III (WIAT-III); SC = Sentence Composition subtests of the WIAT-III; LNS = Letter Number Sequencing subtest of the WISC-V; EC = Essay Composition subtest of the WIAT-III; DASH = Detailed Assessment of Speed of Handwriting; Plan = Planning.

Table 15.

Structure Matrix with BRIEF-SR MI

Variable	Factor 1	Factor 2	Factor 3
GS	0.961	0.275	0.262
BRIEF_MI	0.252		
SC		0.755	0.405
Spell		0.728	0.333
WMI		0.727	0.2
LNS	0.113	0.634	0.427
EC		0.319	0.805
DASH	0.169	0.447	0.698
Plan	0.295	0.2	0.527

Note: GS = Graphic Speed; BRIEF_MI = Metacognition Index of the Behavior Rating Inventory of Executive Function-Self Report; SC = Sentence Composition subtests of the Wechsler Individual Achievement Test-III (WIAT-III); Spell = Spelling subtest of the WIAT-III; WMI = Working Memory Index of the Wechsler Intelligence Scale for Children-V (WISC-V); LNS = Letter Number Sequencing subtest of the WISC-V; EC = Essay Composition subtest of the WIAT-III; DASH = Detailed Assessment of Speed of Handwriting; Plan = Planning.

A final EFA was run using the Working Memory and Planning/Organization scales of the BRIEF-SR and the Word Count and Theme Development and Text Organization scores from the Essay Composition subtest of the WIAT-III. This factor analysis (using maximum likelihood estimation with an oblique rotation in IBM SPSS) revealed a 4-factor model with good fit ($\chi^2 = 13.096$, $df = 17$, $p = .730$) explaining 70% of the variance; eigenvalues were above 1.0. The 4-factor model specified by the output included one factor that included self-regulatory executive functions (Working Memory and Planning/Organization scales of the BRIEF-SR), second factor containing memory and more transcription level variables (WMI, LNS, Spelling, Sentence Composition), a third factor that included text generation and writing fluency level variables (Word Count, Theme Development and Text Organization, DASH, and Planning), and a fourth factor that only contained the Graphic Speed subtest of the DASH. The pattern and

structure matrices supporting the factor compositions are presented in Tables 16 and 17 respectively. This model was also discarded. Factors composed of a single variable provide nothing new or interesting to the data or the model, as that variable does not combine with any of the other variables. Thus, the most parsimonious model was the 2 Factor model (Transcription/Memory + Text Generation) and it was retained for representing the data. Even after modeling with the uncombined composite scores, similar variables continued to group consistently together and load on similar factors.

Table 16.

Pattern Matrix with Component Variables

Variable	Factor 1	Factor 2	Factor 3	Factor 4
BRIEF_WM	1.014			
BRIEF_PO	0.697			
Spell		0.784		-0.1
SC		0.759		
WMI	-0.132	0.651	-0.113	0.175
LNS		0.49	0.185	0.178
Word Count			0.843	
DASH		0.172	0.593	0.161
Theme Development			0.517	-0.102
Plan			0.442	0.335
GS		0.102		0.59

Note: BRIEF_WM = Working Memory scale of the Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR); BRIEF_PO = Planning/Organization scale of the BRIEF-SR; Spell = Spelling subtest of the Wechsler Individual Achievement Test-III (WIAT-III); SC = Sentence Composition subtests of the WIAT-III; WMI = Working Memory Index of the Wechsler Intelligence Scale for Children-V (WISC-V); LNS = Letter Number Sequencing subtest of the WISC-V; Word Count = Word Count score of the Essay Composition subtest of the WIAT-III; DASH = Detailed Assessment of Speed of Handwriting; Theme Development = Theme Development and Text Organization of the Essay Composition subtest of the WIAT-III; Plan = Planning; GS = Graphic Speed.

Table 17.

Structure Matrix with Component Variables

Variable	Factor 1	Factor 2	Factor 3	Factor 4
BRIEF_WM	0.997	-0.153		
BRIEF_PO	0.718	-0.215		
SC	-0.157	0.783	0.379	0.216
Spell	-0.128	0.762	0.328	0.143
WMI	-0.266	0.685	0.196	0.331
LNS	-0.117	0.621	0.431	0.373
Word Count		0.323	0.828	0.184
DASH		0.444	0.707	0.379
Theme Development		0.241	0.514	
Plan		0.203	0.502	0.433
GS		0.253	0.181	0.615

Note: BRIEF_WM = Working Memory scale of the Behavior Rating Inventory of Executive Function-Self Report (BRIEF-SR); BRIEF_PO = Planning/Organization scale of the BRIEF-SR; SC = Sentence Composition subtests of the Wechsler Individual Achievement Test-III (WIAT-III); Spell = Spelling subtest of the WIAT-III; WMI = Working Memory Index of the Wechsler Intelligence Scale for Children-V (WISC-V); LNS = Letter Number Sequencing subtest of the WISC-V; Word Count = Word Count score of the Essay Composition subtest of the WIAT-III; DASH = Detailed Assessment of Speed of Handwriting; Theme Development = Theme Development and Text Organization of the Essay Composition subtest of the WIAT-III; Plan = Planning; GS = Graphic Speed.

Students who Struggle with Writing

In order to answer the remaining research questions (e.g., What are the scores on the observed variables (indicators) for struggling writers? On which variables are there statistically significant differences between struggling and non-struggling writers?), the data file was spilt to obtain descriptive statistics; afterwards, a series of one-way analyses of variance (ANOVA) was calculated to determine whether differences in performance were statistically significant. Performance at or below the 25th percentile on the WIAT-III Writing Composite score was selected as the cutoff for students who struggle with

writing. Eight students (n = 8) within the sample met this criteria. Table 8 presents the descriptive statistics for this subsample.

Research Question 2: What are the scores on the observed variables (indicators) for struggling writers? The subsample of struggling writers performed in the low average and below average ranges across most of the standardized assessments. On the BRIEF-SR, students' mean scores were slightly elevated across all scores/indices reported. On average, students who struggled with writing had low scores on Letter Number Sequencing, the WMI, Spelling, Sentence Composition, Planning, Theme Development and Text Organization, and the DASH. Scores on Essay Composition still fell within the average range, though scores were in the lower average range. Word Count scores on the Essay Composition subtest were in the average range. Mean scores were 89.63 on the WMI, 81.50 on Spelling, 76.50 on WIAT-III Sentence Composition, 91.13 on WIAT-III Essay Composition, 61.13 on the BRIEF-SR, and 80.25 on the DASH. For the remaining scores, please see Table 8.

Research Question 3: On which variables are there statistically significant differences between struggling and non-struggling writers? Results of a series of one-way ANOVAs revealed statistically significant differences between students who scored at or below the 25th percentile and students who scored above the 25th percentile on the WIAT-III Writing Composite for the following measures: Letter Number Sequencing ($F = 25.99$, $p = .000$), WMI ($F = 8.61$, $p = .005$), Spelling ($F = 39.63$, $p = .000$), Sentence Composition ($F = 36.79$, $p = .000$), Planning ($F = 10.28$, $p = .002$), Essay Composition ($F = 18.48$, $p = .000$), Word Count ($F = 11.723$, $p = .001$), Theme Development and Text Organization ($F = 10.815$, $p = .002$), and the DASH ($F = 17.08$, $p = .000$). No

statistically significant differences were found on the BRIEF-SR Global Executive Composite (F = .80, *p* = .374), Behavioral Regulation Index (F = 1.039, *p* = .312), Metacognition Index (F = .608, *p* = .438), Working Memory scale (F = .012, *p* = .912), Planning/Organization scale (F = .995, *p* = .322), and the Graphic Speed subtest (F = 2.76, *p* = .102).

Social Validity

Although the primary investigator worked closely with the classroom teacher and her students throughout data collection, a brief social validity questionnaire was administered to students, and a few brief parallel questions were asked of the classroom teacher, as this project required the completion of a great variety of standardized assessments, and required a significant amount of instructional time. Both students and the teacher were asked 5 brief questions with a scale of no, undecided, or yes.

When asked if they enjoyed participating in this project, approximately 70% of students affirmed that they did enjoy the project. When asked about the difficulty of the writing and memory activities, students reported that they did not find the writing activities difficult (~ 70%), but they were split on the difficulty of the working memory measures. When asked if the research activities made them question whether they are a good writer, slightly more students affirmed that they did. However, when asked if they believed participating in the project would improve their writing, slightly more students believed that it would. Table 18 shows the number and percentage of student responses by question, including responses to question six, other comments.

The classroom teacher was also asked five brief questions with the same scale: (a) I enjoyed participating in this project?, (b) The amount of instructional time missed by

students was acceptable?, (c) I believe that participating in this project will help improve my students' writing?, (d) I felt that what I was expected to do for this study was manageable (when considering time and my other responsibilities)?, and (e) What I was told about the study was consistent with what occurred? She responded in the affirmative to each question, reporting that her expectations were manageable, that the amount of instructional time missed by students was acceptable, and that what she was told about the study was consistent with what occurred. She also enjoyed participating in the study and believed that participation would improve her students' writing.

Table 18.

Student Level Social Validity (n = 56)

Question	Yes *n* (%)	No *n* (%)	Undecided *n* (%)
I enjoyed participating in this project?	39 (69.64)	2 (3.57)	15 (26.79)
I found the writing activities difficult?	6 (10.71)	39 (69.64)	11 (19.64)
I found the memory activities difficult?	22 (39.29)	21 (37.50)	13 (23.21)
The research activities made me question whether I am a strong writer?	26 (46.43)	21 (37.50)	9 (16.07)
I believe that participating in this project will help improve my writing?	23 (41.07)	13 (23.21)	20 (35.71)
Other comments: ▪ N/A ▪ Yeet ▪ Could have been more difficult ▪ This stressed me out more than expected. ▪ I hope the results are beneficial. ▪ When Are You Coming Back ▪ Thanks for being verry [sic.] nice to us. ▪ Some of this is not hard but a bit of a challenge.			

Summary

Results of this study reveal that a 2-factor CFA model is the best fitting model to represent the data. This was determined by evaluating the hypothesized 4-factor measurement model and the results of the EFA, each being run first with composite scores for Essay Composition and the BRIEF-SR, and then in iterations attempting to better identify the component structure. A series of model fit indices (AIC, BIC,TLI, CFI, RMSEA, SRMR) along with the chi square test were used to determine model fit in accordance with recommendations outlined in previous research by Hu and Bentler (1998, 1999).

For students who struggle with writing (n = 8; students who performed at or below the 25th percentile on the WIAT-III Writing Composite), this study found that they struggle with transcription, text generation (including planning), and working memory. Scores on the corresponding standardized assessments fell within the low average and below average ranges on most of the assessments. Differences in scores were statistically significant for all measures except those associated with the BRIEF-SR and the Graphic Speed subtest of the DASH.

These findings are further discussed in the next chapter in light of both theory and the extant literature. Limitations of the study, along with implications of the results for both research and practice are also discussed.

CHAPTER 5

Discussion

The purpose of the present study was to test the Simple View of Writing by theoretically modeling the structural relationships of transcription, text generation, self-regulation, and working memory. This was accomplished by using data collected from a small sample (n = 69) of 9th grade students in one teacher's English 9 classes at a suburban, mid-Western school district. The discussion begins with information related to Research Question 1, which sought to identify a good fitting model of the Simple View of Writing. The accepted model was a 2-factor confirmatory factor analysis (CFA) model obtained via the exploratory factor analysis (EFA); an overview of the model is embedded within a discussion of the relative associations of the components of the model. Next, the discussion details the findings from Research Questions 2 and 3 related to struggling writers and writers with disabilities; more specifically, struggling writers' scores on the observed variables, and differences across ability classifications. Limitations of the study, along with implications for future research and practice are also discussed.

Theoretical Underpinnings of Adolescent Writing

The Simple View of Writing posits a series of relationships amongst transcription, text generation, self-regulation, and working memory (Berninger & Amtmann, 2003; Berninger et al., 2002). This model resulted from earlier revisions of the Hayes and Flower (1980) model of writing (see, for example, Berninger & Swanson, 1994; Berninger, Mizokawa, & Bragg, 1991; Swanson & Berninger, 1996a) – in an attempt to better explain what is unique about beginning and developing writing, than the earlier

focus on skilled writing – as well as from initial representations of a Simple View of Writing which suggested that writing was composed of a higher and lower order skill (see Gough & Tunmer, 1986; Juel, 1988; Juel, Griffith, & Gough, 1986). Adolescent writers, though, are in a unique position themselves because it is assumed that many early writing skills have been mastered; however, many of those skills continue to develop, so their writing is typically not as refined as skilled writers. For struggling writers and writers with disabilities, transcription level deficits may continue to constrain working memory and attention well into adolescence (Berninger & Swanson, 1994; McCutchen, 1996). Indeed, the role of cognitive constraints is believed to be higher during adolescence (Berninger & Swanson, 1994).

Relative Associations of the Components of Writing: The Present Study

In line with previous research (e.g., Berninger et al., 2002; Kim, Al Otaiba, et al., 2014, 2015; Puranik et al., 2008; Wagner et al., 2011), this study confirms that writing is multi-dimensional rather than a single construct. However, unlike the previous research that has identified factors specific to singular constructs of the Simple View of Writing (e.g., transcription, text generation, etc.) (e.g., Graham et al., 1997) or factors identified with oral language abilities and reading (see Abbott & Berninger, 1993; Abbott, Berninger, & Fayol, 2010), this study suggests that factors of writing at the high school level are multi-dimensional and do not appear as singular constructs that can be individually evaluated.

Theoretically, the factors identified in this study are representative of, or products of, the key components of writing suggested initially by the work of Juel (1988); Juel, Griffith, and Gough (1986); and Gough and Tunmer (1986); and later by the work of

Berninger and colleagues (2002) and Berninger and Amtmann (2003). The first factor was a combined transcription and memory factor which appeared to be representative of basic writing skills at the letter, word, and sentence level, along with cognitive skills specific to attention, shifting, and executive functioning. The composition of this factor is supported by the measures that loaded on it, namely, Spelling, Sentence Composition, the Working Memory Index, Letter Number Sequencing, and the BRIEF-SR Global Executive Composite. The second factor was a text generation factor that appeared to capture an element of writing fluency, based on the ability to vary text production under timed constraints. The composition of this factor is supported by the three measures that loaded on it: Essay Composition (inclusive of word count and theme development and text organization), the DASH (words per minute) and the Planning measure. In further examining the factors from this study (transcription/working memory + text generation), a few interesting findings emerge.

First, the composition of the factors identified in this study point to the complex and embedded cognitive structures of writing (Berninger & Amtmann, 2003; Berninger & Winn, 2006; McCutchen, 1996). That the first identified factor combines transcription and memory not only represents the twinned nature of writing and cognition, but it is also reflective of the current literature. Theoretically, this association is plausible, given that Swanson and Berninger (1996a) suggest that transcription skills are more closely related to short-term memory, and text generation skills are more closely related to working memory. While this study utilized measures that purportedly assess working memory, it can be argued that these tasks are not pure representations of working memory as students were not expected to hold anything in mind while manipulating extraneous

information. Moreover, Berninger et al. (2002), Berninger and Amtmann (2003), and Berninger and Winn (2006) suggest that working memory within the model of the Simple View of Writing must simultaneously tap both long-term memory and short-term memory depending on the task being completed.

Second, the Graphic Speed subtest of the DASH did not load strongly on either factor of the accepted model. Though this subtest did not provide an impact in this study, Berninger and colleagues (e.g., Berninger & Amtmann, 2003; Berninger et al., 2002; Berninger & Winn, 2006) suggest that visual-spatial abilities are important to writing, and Baddley and Hitch (1974) include a visual-spatial sketchpad within their dual processing model of working memory. The lack of an association of visual-spatial abilities as captured through the Graphic Speed task in this study warrants further investigation.

Third, the Sentence Composition measure was more strongly related to transcription and memory level skills, than text generation skills. According to the Simple View of Writing, transcription level skills are typically thought of as letter and word level abilities, whereas text generation is more representative of connected text, in which students are expected to string words together to form thoughts that are represented at least at a sentence level. However, it may be that for high school students, the ability to generate and combine sentences is a basic or lower level writing skill that is essential for generating connected text at a paragraph or an essay level. It is possible, that efficiency with sentence writing skills for high school students enables them to expend more cognitive resources on crafting more involved text (Kim et al., 2015).

Fourth, it is interesting that the Essay Composition measure from the WIAT-III was more strongly related to text generation. Kim et al. (2015) report that the theme and organization score of the Essay Composition subtest of the WIAT-III was predictive of a writing quality factor rather than a writing productivity factor in their sample of 2nd and 3rd grade students. Thus, it may be that as students grow older, the functions or dimensions of the measure change, given that older students would be more likely to generate longer text. Even when the Essay Composition subtest was broken into its component parts – Word Count and Theme Development and Text Organization – the EFAs revealed a similar factor structure.

Fifth, the correlation between the Working Memory Index and the BRIEF-SR Global Executive Composite is small to moderate and negatively statistically significant ($r = -.32$; $p \leq .01$). This would tend to suggest a negative relationship between these items, in which an increase in working memory, would result in a decrease of negative or ineffective executive functions. As Kane et al. (2001, 2007) have suggested, along with Cowan (2014), differences in working memory may reflect the ability to maintain attention and focus throughout an activity. It is possible that the same is true with writing.

Finally, it is interesting that the two self-regulatory executive function measures load on different factors within this study, even when compound variables are broken apart. Berninger and Winn (2006) outline executive functions to include: supervisory attention (inhibition, selection of relevant information, attentional shifting, attention [staying on task], cognitive engagement and presence, and metalinguistic and metacognitive awareness), goal setting, planning, reviewing, revising, and strategies for

self-regulating and monitoring. The BRIEF-SR Global Executive Composite captures many of these same domains within its eight subscales (e.g., inhibit, shift, emotional control, monitor, working memory, plan/organize, organization of materials, and task completion) (Guy, Isquith, & Gioia, 2004). Interestingly, the working memory measures from the WISC-V similarly account for many of these executive functions as well. For example, moving between Digit Span tasks requires cognitive flexibility or shifting, along with working memory, and focused attention (Wechsler, 2014). Picture Span requires working memory and response inhibition, and Letter Number Sequencing requires focused attention and working memory (Wechsler, 2014). Thus, it seems reasonable that the BRIEF-SR Global Executive Composite would load on a factor with both the Working Memory Index and Letter Number Sequencing.

However, while planning is an executive function, in this study, the provision of a brief planning period loads on the second factor, which was more closely aligned with text generation and writing fluency. For this task, students were provided with a blank sheet of paper containing the WIAT-III Essay Composition prompt; they were then given 5 minutes to plan their response. Students were not required to write anything down. A qualitative rubric was later used to score what students' planned (e.g., 1 = no advanced pre-planning to 5 = mapping or outlining [at least 2 reasons with a corresponding example for each]). Given that the planning period was specific to work that would subsequently be produced when responding to the WIAT-III Essay Composition task, it is understandable that both items would load on the same factor. However, it is possible that specific planning abilities specific to the act of writing may both aid in the generation of text on a central topic, and aid an individual's fluency with written expression. Indeed,

work in the area of SRSD continues to demonstrate that students who utilize strategies for planning writing produce greater quantity and quality text (Chalk, Hagan-Burke, & Burke, 2005; Hoover, Kubina, & Mason, 2012; Jacobson & Reid, 2010). Moreover, researchers who have provided planning time for middle and high school level students have often found positive gains in student text (Spivey & King, 1989; Vanderberg & Swanson, 2007).

Alternatively, it is possible that the observed variables composing this text generation (fluency) factor could be explained as exemplifying higher order writing and cognitive skills, as the factor is specific to being able to craft connected text with fluency. Swanson and Berninger (1996a) suggest that working memory is related to higher-order writing skills, which they identify as planning, organizing, and text generation. Considering this factor as the higher order factor would also be consistent with the early model of the Simple View of Writing in which the higher order variable was ideation, even though Berninger and colleagues (e.g., Berninger & Swanson, 1994; Berninger, Mizokawa, & Bragg, 1991; Berninger, Whitaker, & Swanson, 1992) viewed idea generation as a component of text generation, or transforming ideas into language representations. This study would seem to corroborate Berninger and colleagues' interpretation, that generating ideas – and subsequently planning – is specific to text generation.

Struggling Writers

Descriptive results for a small group of struggling ninth-grade writers (n = 8) (based on performance at or below the 25th percentile on the WIAT-III Writing Composite Score) reveal that these students struggle with spelling, handwriting, generating sentences, combining sentences, producing fluent text, generating connected

text, planning before writing, and with memory. These students, though, were not different from their peers on the Graphic Speed subtest which measures visual-spatial abilities, or in reporting difficulties with self-regulatory executive functions (as measured by the BRIEF-SR). Ironically, the existing literature purports that struggling writers and writers with disabilities typically struggle with self-regulatory executive functions (e.g., see for example, Benton, Kraft, Glover, & Plake, 1984; Effeney, Carroll, & Bahr, 2013; Graham & Harris, 2012). It may be that struggling writers can provide a similarly accurate representation of their self-regulatory executive functions, but that they do not effectively utilize such skills. Moreover, different results may occur with a larger population of writers identified with LD in writing. This finding warrants further investigation.

Though writing abilities (especially transcription level skills) have been shown to plateau into adolescence, many adolescents, especially students who struggle with writing and who have writing disabilities, continue to experience difficulties with these same skills (Graham et al., 1998; McCutchen, 1996), making it important that educators continue to support these skill differences well into the high school years. Unfortunately, once students reach high school, many teachers simply assume that students can write for understanding. As Graham and Harris (2012) have demonstrated, though, students with LD struggle with a variety of components of the writing process, including the ability to self-regulate their performance. However, the literature specific to adolescent writers and adolescent writers with LD, especially as it relates to supporting the instructional needs of these students, is very limited.

Limitations

Several limitations apply to this study. These limitations can be classified into three primary categories: (a) sample size/composition and effects of sample size/composition, (b) measurement, and (c) reliability. First, the sample size used for this study (n = 69) was small for using a statistical technique like SEM. Further, the sub-sample of students with identified disabilities who receive special education support was very limited (n = 2 or 3%), though classrooms typically include a range of learners of varying abilities. This small number of students with disabilities, and specifically of students with identified disabilities in the area of writing, limits the generalizability of the results with regard to this type of student. When looking at the number of struggling writers in the sample based on WIAT-III writing composite scores at or below the 25th percentile, the sub-sample is also very small (n = 8 or 12%). In addition, students were all from the same classroom, and while this arrangement controls for teacher effects, the effects that may be produced by other teachers in unknown. Nonetheless, the sample was diverse racially, ethnically, and in terms of socio-economic status. However, such diversity cannot represent all high school students nationally, nor high school students across this mid-Western district. Thus, it is possible that with a larger sample, more factors might be identified or that the factor structure would be differently arranged.

The next category of limitations is specific to measurement. Composite scores were utilized for select measures as this is consistent with the scoring and interpretation of the standardized assessments administered. However, use of these composite scores may skew the identification of a unitary construct (e.g. factor) and may also have contributed to the non-positive definite matrix observed in the hypothesized measurement

model, though breaking apart these variables did not lead to a positive definite measurement model. Moreover, limited standardized assessments are available for specifically evaluating self-regulatory executive functions as they relate specifically to writing. The BRIEF-SR was selected because it is a standardized assessment, however, it does not solely measure self-regulation of writing.

This study also only relied on expository writing tasks. It is possible that the inclusion of other genres of writing, especially narrative writing, would load differently across the factors, or change the cognitive constraints of writing. As McCutchen (1996) has noted, transcription processes related to narrative text are more likely to become sufficiently fluent by the junior high years because of the familiarity with narrative structures.

The final area of limitations surrounds reliability. Early during data collection, a transposition error in the first trial of item 8 on the Letter Number Sequencing subtest was identified. It was determined that the item would be re-administered to the impacted 18 students. While students' scores for the most part remained the same, it is possible that this error also jeopardizes the reliability of the data for those particular students.

Implications for Future Research

Overall, much work remains in expanding both researchers' and teachers' understandings about the specific writing skills that influence writing development throughout adolescence and high school (Kim, et al., 2015). This includes research that replicates the present study. While researchers typically prefer working with parsimonious models, one of the most powerful ways to better ensure theoretically that researchers are truly capturing the most comprehensive view of writing, is by working

with complex models. This can be accomplished by adding additional parameters and measures to the model in an effort to identify a model that is not only more representative of the data, but that also enhances construct, convergent, and discriminant validity of the data (Trochim, 2006).

Research with elementary aged writers has explored the role of alternative variables in relationship to writing. Abbott and Berninger (1993) explored oral language measures, while Abbott, Berninger, and Fayol (2010) modeled reading and writing variables. Modeling both oral language and reading variables with secondary students is also warranted. Another area of particular interest with adolescent populations is the role of personal self-efficacy beliefs and motivation for writing. Adolescents, especially adolescents with writing disabilities and adolescent struggling writers, have too often experienced repeated years of failure in writing, with feedback oftentimes emphasizing what students have done incorrectly, rather than offering a means by which to improve their writing. It is possible that such variables will account for additional variance when modeling with an understanding of the Simple View of Writing.

The population from which students are sampled is also a viable direction for future research. As this study only considered students in one teacher's English 9 classes, future research might also consider modeling with refined student populations, such as a sample of equal numbers of students identified as learners with specific LD in written expression and their non-disabled peers, or even a sample of high school students across grades 9-12. With similarly sized sub-groups of students, multi-group analysis can be conducted to explore whether the structural paths of an identified and good fitting model

are invariant or not across the groups. Use of longitudinal SEM would also provide rich data about student writing over time.

However, because adding additional measures to the assessment battery can be costly; require numerous resources, including personnel; and because of the demands it places on research participants, including a significant loss of instructional time (which are substantive grounds for districts and for parents/guardians to deny participation/consent), researchers might consider alternative sources of data for modeling purposes. This might include historical data or data available from large national data sets.

As modeling of writing continues, researchers should also consider how the components of such models provide a solid conception of writing, and how this conceptualization can be used for naming and recognizing the area(s) in which adolescents struggle. Only then, can suggestions for intervention and instruction be made. This study can solely suggest possible relationships. It is a snapshot of writing inclusive of only one writing genre. Given the complexity of writing, though, it may be that researchers must continue to explore more multi-component intervention and instructional materials to support adolescents' often intractable and entrenched writing needs. Indeed, recent research in modeling continues to posit that writing is multi-dimensional (e.g., Kim et al., 2014, 2015; Puranik et al., 2008; Wagner et al., 2011).

This study suggests that writing involves transcription, self-regulation executive functions, text-generation, and working memory, but that they load differently across factors. Though much work remains in untangling the foundations of writing, this study adds to the literature base on what is known about adolescent writers. Moreover, this

study is unique in that it does something that other researchers have not yet explored, it provides an initial attempt to holistically test all of the assumptions of the Simple View of Writing. In essence, this study requires that researchers slow down and focus on the "pieces" of writing; it pushes the boundaries of the model and theory.

Implications for Practice

One educational implication from the findings of this study is that intervention and instructional supports for high school students similar to those in this study, might address transcription level writing skills, given that they loaded with memory and self-regulatory variables on the same factor. Some transcription level supports are available for younger writers (e.g. Datchuk, Kubina, & Mason, 2015; Graham & Harris, n.d.), and while it is unclear the extent to which these same supports will be effective with older learners, it is possible that similar supports will scaffold writing while lessening the constraints of memory and executive functions. Specifically, supporting adolescents in crafting and combining sentences may be particularly useful, as struggling writers in this sample mainly lagged in this area when examining mean scores across the measures. Saddler (2012) even suggests that writing good sentences is difficult, yet essential to the production of longer text as sentences are "vehicles of communication" (p. 6). Indeed, a lack of knowledge of effective sentence structures and sentence combining techniques can impede idea translation and text generation, draining cognitive resources.

Datchuk (2011) explored the effects of sentence instruction on improving fluency, acquisition, and application for 4 adolescents in grades 8 to 10 who struggled with sentence writing (3 had been identified as learners with mild disabilities). Results indicated that all students improved on frequency of sentences within 1 minute, and that 3

of the 4 students improved the number of correct word sequences within 1 minute. One student continued to struggle with subject-verb agreement, but this element was outside the scope of the intervention. However, as the study suggests, research (see Datchuk & Kubina, 2012 and Graham & Perin, 2007a) supports teaching grammar skills within lessons on sentence construction.

In their review of the literature on sentence-level writing skills, Datchuk and Kubina (2012) provide very emerging research to support instruction in sentence construction for high school students, though sentence level instruction, especially in sentence combining, has been found to be an effective practice with younger children (e.g., Datchuk, Kubina, & Mason, 2015; Graham & Perin, 2007a; Saddler & Graham, 2005). This review only identified 3 high school studies; though these 3 studies were classified as sentence construction, they primarily evaluated a broad writing program that encompassed direct instruction techniques. McCurdy, Skinner, Watson, and Shriver (2008), who evaluated the Comprehensive Writing Program, found that 1 out of 3 classrooms demonstrated immediate change in level and trend of percentage of sentences; the other classes had positive, but more modest increases. Viel-Ruma, Houchins, Jolivette, Fredrick, and Gama (2010) evaluated the Expressive Writing Program. Though results were variable, there appeared to be a positive trend in writing performance as measured by correct word sequences. Walker, Shippen, Alberto, Houchins, and Cihak (2005) also evaluated the Expressive Writing Program and found positive results. However, when it comes to supporting other transcription level skills – spelling, handwriting, and grammar/usage – with high school students, much work remains.

Conclusion

In summary, the four predictor factors (e.g., transcription, text generation, working memory, and self-regulation) do not appear as four unique, individual factors of writing at the high school level, at least within this sample of 9th grade students. Instead, these factors seem to be working together, suggesting more multi-dimensional factors that draw from both writing and memory/self-regulation. Thus, while the results from this study do not confirm the measurement of the Simple View of Writing model, this is not to suggest that the Simple View of Writing model is not relevant at the high school level. The variables of the model continue to impact the quality and quantity of writing that students produce. Indeed, they reinforce the understanding that writing is recursive and complex and that, therefore, writing, memory, and self-regulation are intricately interwoven. Indeed, Berninger and Winn (2006) begin to suggest this when they modified the Simple View of Writing structure from Berninger and Amtmann (2003), referring to the triangular model as the "not-so-simple view of internal functional writing systems" (p. 97). Adopting this view, the present study confirms that writing is not simple and perhaps even suggests that there is a more intertwined nature of the component structure than the triangular structure indicates for adolescent 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*(3), 478-508.

Abbott, R. D., Berninger, V. W., & Fayol, M. (2010). Longitudinal relationships of levels of language in writing and between writing and reading in grades 1 to 7. *Journal of Educational Psychology, 102*(2), 281-298.

Applebee, A. N., & Langer, J. A. (2011). A snapshot of writing instruction in middle schools and high schools. *English Journal, 100*(6), 14-27.

Applebee, A. N., & Langer, J. A. (2013). *Writing instruction that works: Proven methods for middle and high school classrooms*. New York, NY and Berkeley, CA: Teachers College Press and National Writing Project.

Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences, 4*(11), 417-423.

Baddeley, A.D. and Hitch, G.J. (1974) Working memory. In G. A. Bower (Ed.), *The psychology of learning and motivation* (pp. 47–89). New York, NY: Academic Press.

Balfanz, R., Herzog, L., & Mac Iver, D. J. (2007). Preventing student disengagement and keeping students on the graduation path in urban middle-grades schools: Early identification and effective interventions. *Educational Psychologist, 42*(4), 223-235.

Barnett, A., Henderson, S. E., Scheib, B., & Schulz, J. (2007). *Detailed assessment of speed of handwriting (DASH) Manual*. London, England: Pearson.

Bentler, P. (1991). *Theory and implementation of EQS: A structural equations program* (Version 3.0). Los Angeles: University of California.

Benton, S. L., Kraft, R. G., Glover, J. A., & Plake, B. S. (1984). Cognitive capacity differences among writers. *Journal of Educational Psychology, 76*(5), 820-834.

Berninger, V. W. (1999). Coordinating transcription and text generation in working memory during composing: Automatic and constructive processes. *Learning Disability Quarterly, 22*, 99-112.

Berninger, V. W. (2000). Development of language by hand and its connections to language by ear, mouth, and eye. *Topics in Language Disorder, 20*, 65-84.

Berninger, V. W., & Amtmann, D. (2003). Preventing written expression disabilities through early and continuing assessment and intervention for handwriting and/or spelling problems: Research into practice. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 345-363). New York, NY: Guilford Press.

Berninger, V. W., & Graham, S. (1998). Language by hand: A synthesis of a decade of research on handwriting. *Handwriting Review, 12*, 11-25.

Berninger, V. W., Mizokawa, D. T., & Bragg, R. (1991). Theory-based diagnosis and remediation of writing disabilities. *Journal of School Psychology, 29*, 57-79.

Berninger, V. W., & Richards, T. L. (2002). *Brain literacy for educators and psychologists*. New York, NY: Academic Press.

Berninger, V. W., & Swanson, H. L. (1994). Modifying Hayes and Flower's model of skilled writing to explain beginning and developing writing. In E. C. Butterfield (Ed.), *Advances in Cognition and Educational Practice (Children's writing:*

Toward a process theory of the development of skilled writing) (Vol. 2, pp. 57-81). Greenwich, CT: JAI Press Inc.

Berninger, V. W., Vaughan, K., Abbott, R. D., Begay, K., Coleman, K. B., Curtin, G., Hawkins, J. M., & Graham, S. (2002). Teaching spelling and composition alone and together: Implications for the Simple View of Writing. *Journal of Educational Psychology*, *94*(2), 291-304.

Berninger, V., Whitaker, D., Feng, Y., Swanson, H. L., & Abbott, R. D. (1996). Assessment of planning, translating, and revising in junior high writers. *Journal of School Psychology*, *34*(1), 23-52.

Berninger, V., Whitaker, D., & Swanson, L. (1992). *Developmental and individual differences in planning, translating, and revising*. International Association of Cognitive Education, Riverside, CA.

Berninger, V. W., & Winn, W. D. (2006). Implications of advancements in brain research and technology for writing development, writing instruction, and educational evolution. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 96-114). New York, NY: The Guilford Press.

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*(3), 257-280.

Biancarosa, G., and Snow, C. (2004). *Reading next—A vision for action and research in middle and high school literacy: A report to Carnegie Corporation of New York*. Washington, DC: Alliance for Excellence in Education.

Bourdin, B., & Fayol, F. (1994). Is written language production more difficult than oral

language production: A working memory approach. *International Journal of Psychology*, *29*(5), 591-620.

Breaux, K. C. (2009). *WIAT-III Technical Manual*. San Antonio, TX: Pearson.

Breaux, K. C., & Frey, F. E. (April 2010). "Reliability coefficients and standard errors of measurement for subtest component scores: Technical Report #2." Pearson. Retrieved from http://images.pearsonclinical.com/images/assets/WIAT-III/WIAT3_TechReport2_Fnl.pdf

Britton, J., Burgess, T., Martin, N., McLeod, A., and Rosen, H. (1975). *The Development of Writing Abilities (11-18)*. London, England: Macmillan.

Chalk, J. C., Hagan-Burke, S., & Burke, M. D. (2005). The effects of self-regulated strategy development on the writing process for high school students with learning disabilities. *Learning Disability Quarterly*, *28*(1), 75-87.

Christensen, C. A. (2005). The role of orthographic-motor integration in the production of creative and well-structured written text for students in secondary school. *Educational Psychology*, *25*(5), 441-453.

Christle, C. A., Jolivette, K., & Nelson, C. M. (2007). School characteristics related to high school dropout rates. *Remedial and Special Education*, *28*(6), 325-339.

Collopy, R. M. B. (2008). Professional development and student growth in writing. *Journal of Research in Childhood Education*, *23*(2), 163-178.

Cook, K. B., & Bennett, K. E. (2014). Writing interventions for high school students with disabilities: A review of single-case design studies. *Remedial and Special Education*, *35*(6), 344-355.

Cowan, N. (2014). Working memory underpins cognitive development, learning, and

education. *Educational Psychology Review, 26*, 197-223.

Daiute, C. A. (1984). Performance limits on writers. In R. Beach & L. S. Bridwell (Eds.), *New directions in composition research* (pp. 205-224). New York, NY: Guilford.

Daiute, C. A. (1981). Psycholinguistic foundations of the writing process. *Research in the Teaching of English, 15*(1), 5-22.

Darch, C., Kim, S., Johnson, S., & James, H. (2000). The strategic spelling skills of students with learning disabilities: The results of two studies. *Journal of Instructional Psychology, 27*(1), 15-26.

Datchuk, S. M. (2011). *Achieving learning outcomes of acquisition, fluency, and application for adolescents with difficulty constructing simple sentences* (Doctoral Dissertation). Retrieved from ProQuest. (926808698)

Datchuk, S. M., & Kubina, R. M. (2012). A review of teaching sentence-level writing skills to students with writing difficulties and learning disabilities. *Remedial and Special Education, 34*(3), 180-192.

Datchuk, S. M., Kubina, R. M., & Mason, L. H. (2015). Effects of sentence instruction and frequency building to a performance criterion on elementary-aged students with behavioral concerns and EBD. *Exceptionality, 23*, 34-53.

Dockrell, J. E., Lindsay, G., & Connelly, V. (2009). The impact of specific language impairment on adolescents' written text. *Exceptional Children, 75*(4), 427-446.

Effeney, G., Carroll, A., & Bahr, N. (2013). Self-regulated learning: Key strategies and their sources in a sample of adolescent males. *Australian Journal of Educational & Developmental Psychology, 13*, 58-74.

Ferretti, R. P., Lewis, W. E., & Andrews-Weckerly, S. (2009). Do goals affect the

structure of students' argumentative writing samples? *Journal of Educational Psychology, 101*(3), 577-589.

Ferretti, R. P., MacArthur, C. A., & Dowdy, N. S. (2000). The effects of an elaborated goal on the persuasive writing of students with learning disabilities and their normally achieving peers. *Journal of Educational Psychology, 92*(4), 694-702.

Field, A. (2009). *Discovering statistics using SPSS*, 3rd ed. Los Angeles, CA: Sage.

Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication, 32*(4), 365-387.

Flower, L. S., & Hayes, J. R. (1980). "The dynamics of composing: Making plans and juggling constraints." In L. W. Gregg & E. R. Steinberg (Eds.)., *Cognitive processes in writing* (pp. 31 – 50). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Fuchs, L. S., Fuchs, D., and Compton, D. L. (2010). Rethinking response to intervention at middle and high school. *School Psychology Review, 39*(1), 22-28.

Gathercole, S. E., Pickering, S. J., Ambridge, B., & Wearing, H. (2004). The structure of working memory from 4 to 15 years of age. *Developmental Psychology, 40*(2), 177-190.

Gillespie, A., & Graham, S. (2014). A meta-analysis of writing interventions for students with learning disabilities. *Exceptional Children, 80*(4), 454-473.

Gillespie, A., Graham, S., Kiuhara, S., & Hebert, M. (2014). High school teachers [sic.] use of writing to support students' learning: A national survey. *Reading and Writing, 27*, 1043-1072.

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability.

Remedial and Special Education, 7(1), 6-10.

Graham, S. (1997). Executive control in the revising of students with learning and writing difficulties. *Journal of Educational Psychology, 89*, 223-234.

Graham, S. (1999). Handwriting and spelling instruction for students with learning disabilities: A review. *Learning Disability Quarterly, 22*(2), 77-98.

Graham, S., Berninger, V. W., Abbott, R. D., Abbott, S. P., & Whitaker, D. (1997). Role of Mechanics in composing of elementary school students: A new methodological approach. *Journal of Educational Psychology, 89*(1), 170-182.

Graham, S., Berninger, V., & Fan, W. (2007). The structural relationship between writing attitude and writing achievement in first and third grade students. *Contemporary Educational Psychology, 32*(3), 516-536.

Graham, S., Berninger, V., Weintraub, N., & Schafer, W. (1998). Development of handwriting speed and legibility in grades 1-9. *The Journal of Educational Research, 92*(1), 42-52.

Graham, S., Capizzi, A., Harris, K. R., Hebert, M., & Morphy, P. (2014). Teaching writing to middle school students: A national survey. *Reading and Writing, 27*, 1015-1042.

Graham, S., & Harris, K. R. (1996). Addressing problems in attention, memory, and executive functioning: An example from self-regulated strategy development. In G. R. Lyon & N. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 349-365). Baltimore, MD: Brookes.

Graham, S., & Harris, K. R. (n.d.). CASL handwriting program (grade 1). Retrieved from

http://peabody.vanderbilt.edu/docs/pdf/sped/CASL%20Handwriting%20Program.pdf

Graham, S., & Harris, K. R. (1997a). It can be taught, but it does not develop naturally: myths and realities in writing instruction. *School Psychology Review, 26*(3), 414-424.

Graham, S., & Harris, K. R. (1997b). Self-regulation and writing: Where do we go from here? *Contemporary Educational Psychology, 22*, 102-114.

Graham, S., & Harris, K. R. (2000). The role of self-regulation and transcription skills in writing and writing development. *Educational Psychologist, 35*(1), 3-12.

Graham, S., & Harris, K. R. (2012). *Writing better: Effective strategies for teaching students learning difficulties.* Baltimore: Paul H. Brookes Publishing.

Graham, S., Harris, K. R., & McKeown, D. (2013). The writing of students with learning disabilities, meta-analysis of self-regulated strategy development writing intervention studies, and future directions (Redux). In H. L. Swanson, K. R. Harris, & S. Graham (Eds.). *Handbook of learning disabilities* (2nd ed., pp. 405-38). New York, NY: The Guilford Press.

Graham, S., & Hebert, M. (2010). Writing to read: Evidence for how writing can improve reading. Washington, DC: Alliance for Excellent Education.

Graham, S., & Perin, D. (2007a). A meta-analysis of writing instruction for adolescent students. *Journal of Educational Psychology, 99*(3), 445-476.

Graham, S., & Perin, D. (2007b). What we know, what we still need to know: Teaching adolescents to write. *Scientific Studies in Reading, 11*(4), 313-335.

Graham, S., & Perin, D. (2007c). *Writing next: Effective strategies to improve writing of*

adolescents in middle and high schools – A report to Carnegie Corporation of New York. Washington, DC: Alliance for Excellent Education. Retrieved from http://carnegie.org/fileadmin/Media/Publications/PDF/writingnext.pdf

Guy, S. C., Isquith, P. K., & Gioia, G. A. (2004). Behavior Rating Inventory of Executive Function-Self-Report Version: Professional Manual. Lutz, FL: PAR

Hallenbeck, M. J. (2002). Taking charge: Adolescents with learning disabilities assume responsibility for their own writing. *Learning Disability Quarterly, 25*(4), 227-246.

Harris, K. R., & Graham, S. (1999). Programmatic intervention research: Illustrations from the evolution of self-regulated strategy development. *Learning Disability Quarterly, 22*(4), 251-262.

Harris, K. R., Graham, S., Mason, L. H., & Friedlander, B. (2012). *Powerful writing strategies for all students*. Baltimore: Paul H. Brookes Publishing.

Harvey, M. W. (2001). Vocational-technical education: A logical approach to dropout prevention for secondary special education. *Preventing School Failure, 45*(3), 108-113.

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: Theories, methods, individual differences, and applications* (pp. 1 – 27). Mahwah, New Jersey: Lawrence Erbaum Associates.

Hayes, J. R., & Flower, L. S. (1980). "Identify the organization of writing processes." In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3 – 30). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Hayes, J. R., & Flower, L. S. (1986). Writing research and the writer. *American Psychologist, 41*(10), 1106-1113.

Hoover, T. M., Kubina, R. M., Jr., & Mason, L. H. (2012). Effects of self-regulated strategy development for POW+TREE on high school students with learning disabilities. *Exceptionality, 20*(1), 20-38.

Hoskyn, M., & Swanson, H. L. (2003). The relationship between working memory and writing in younger and older adults. *Reading and Writing: An Interdisciplinary Journal, 16*, 759-784.

Hoy, M. M. P., Egan, M. Y., & Feder, K. P. (2011). A systematic review of interventions to improve handwriting. *Canadian Journal of Occupational Therapy, 78*(1), 13-25.

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to under-parameterized model misspecification. *Psychological Methods, 3*(4), 424-453.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

Jacobson, L. T., & Reid, R. (2010). Improving the persuasive essay writing of high school students with ADHD. *Exceptional Children, 76*(2), 157-174.

Jones, D., & Christensen, C. (1999). Relationship between automaticity in handwriting and studens' ability to generate written text. *Journal of Educational Psychology, 91*, 44-49. doi: 10.1037/0022-0663.91.1.44

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first

through fourth grade. *Journal of Educational Psychology, 80*(4), 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*(4), 243-255.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and psychological measurement*.

Kaiser, H. F. (1970). A second generation little jiffy. *Psychometrika, 35*(4), 401-415.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31-36.

Kane, M. J., Bleckley, M. K., Conway, A. R. A., & Engle, R. W. (2001). A controlled-attention view of working-memory capacity. *Journal of Experimental Psychology: General, 130*(2), 169-183.

Kane, M. J., Brown, L. H., McVay, J. C., Silvia, P. J., Myin-Germeys, I., & Kwapil, T. R. (2007). For whom the mind wanders, and when: An experience sampling study of working memory and executive control in daily life.

Kellogg, R. T. (2008). Training writing skills: A cognitive developmental perspective. *Journal of Writing Research, 1*(1), 1-26.

Kellogg, R. T., Olive, T., & Piolat, A. (2007). Verbal, visual and spatial working memory in written sentences production. *Acta Psychologica, 124*, 382-397.

Kendeou, P., van den Broek, P., Helder, A., & Karlsson, J. (2014). A cognitive view of reading comprehension: Implications for reading difficulties. *Learning Disabilities Research & Practice, 29*(1), 10-16

Kenny, D. A. (2012). Multiple latent variable models: Confirmatory factor analysis. Retrieved from http://davidakenny.net/cm/mfactor.htm

Kim, Y-S., Al Otaiba, S., Sidler, J. F., Greulich, L., & Puranik, C. (2014). Evaluating the dimensionality of first-grade written composition. *Journal of Speech, Language, and Hearing Research, 57*, 199-211.

Kim, Y-S., Al Otaiba, S., Puranik, C., Folsom, J. S., Gruelich, L., & Wagner, R. K. (2011). Componential skills of beginning writing: An exploratory study at the end of kindergarten. *Learning and Individual Differences, 21*, 517-525. doi: 10.1016/j.lindif.2011.06.004

Kim, Y-S., Al Otaiba, S., Wanzek, J., & Gatlin, B. (2015). Toward an understanding of dimensions, predictors, and the gender gap in written composition. *Journal of Educational Psychology, 107*(1), 79-95.

Kiuhara, S. A., Graham, S., & Hawken, L. S. (2009). Teaching writing to high school students: A national survey. *Journal of Educational Psychology, 101*(1), 136-160.

Kline, R. B. (2011). *Principles and practice of structural equation modeling*. New York, NY: The Guilford Press.

Lindemann, E. (2001). *A rhetoric for writing teachers* (4th ed). New York, NY: Oxford University Press.

Mason, L. H., & Graham, S. (2008). Writing instruction for adolescents with learning disabilities: Programs of intervention research. *Learning Disability Research & Practice, 23*(2), 103-112.

Mason, L. H., Kubina, R. M., & Hoover, T. (2013). Effects of quick writing instruction for high school students with emotional disturbances. *Journal of Emotional and Behavioral Disorders, 21*(3), 163-175. doi: 1063426611410429

Mason, L. H., Kubina, R. M., Jr., & Taft, R. J. (2011). Developing quick writing skills in

middle school students with disabilities. *The Journal of Special Education, 44*(4), 205-220.

McCurdy, M., Skinner, C., Watson, S., & Shriver, M. (2008). Examining the effects of a comprehensive writing program on the writing performance of middle school students with learning disabilities in written expression. *School Psychology Quarterly, 23*(4), 571-586.

McCutchen, D. (1996). A capacity theory of writing: Working memory in composition. *Educational Psychologist, 8*(3), 299-325.

McCutchen D. (1995). Cognitive processes in children's writing: Developmental and individual differences. In J. S. Carlson (Ed.), *Issues in education: Contributions from educational psychologists* (pp. 123-160). Greenwich, CT: JAI Press.

McCutchen, D. (2011). From novice to expert: Implications of language skills and writing-relevant knowledge for memory during the development of writing skill. *Journal of Writing Research, 3*(1), 51-68.

McCutchen, D. (2000). Knowledge, processing, and working memory: Implication for a theory of writing. *Educational Psychologist, 35*(1), 13-23.

McCutchen, D. (1994). The magical number three, plus or minus two: Working memory in writing. In E. C. Butterfield (Ed.), *Advances in Cognition and Educational Practice (Children's writing: Toward a process theory of the development of skilled writing)* (Vol. 2, pp. 1-30). Greenwich, CT: JAI Press Inc.

Montgomery, G. T., & Hirth, M. A. (2011). Freshman transition for at-risk students: Living with HEART. *NASSP Bulletin, 95*(4), 245-265.

Morrison, G. M., & Cosden, M. A. (1997). Risk, resilience, and adjustment of individuals

with learning disabilities. *Learning Disability Quarterly*, *20*(1), 43-60.

National Center for Education Statistics (2014). NAEP Data Explorer. Retrieved from http://nces.ed.gov/nationsreportcard/naepdata/

National Commission on Writing. (2008). *Writing, technology, and teens.* College Board: New York, NY. Retrieved from http://www.collegeboard.com/prod_downloads/prof/community/PIP_Writing_Report_FINAL.pdf

National Commission on Writing for America's Families, Schools, & Colleges. (2004). *Writing: A ticket to work . . . or a ticket out: A survey of business leaders.* College Board: New York, NY. Retrieved from http://www.collegeboard.com/prod_downloads/writingcom/writing-ticket-to-work.pdf

National Commission on Writing in America's Schools, & Colleges. (2003). *The neglected R:The need for a writing revolution.* College Board: New York, NY. Retrieved from http://www.collegeboard.com/prod_downloads/writingcom/neglectedr.pdf

National Governor's Association & State Education Chiefs. (2010). "Common Core State Standards for English Language Arts." Retrieved from http://www.corestandards.org

Newell, A., & Simon, H. A. (1972). *Human problem solving.* Englewood Cliffs, NJ: Prentice Hall.

No Child Left Behind Act of 2001, Pub. L. No. 107-110. (2002).

Olive, T. (2003). Working memory in writing: Empirical evidence from the dual-task

technique. *European Psychologist, 9*(1), 32-42.

Page-Voth, V., & Graham, S. (1999). Effects of goal setting and strategy use on the writing performance and self-efficacy of students with writing and learning problems. *Journal of Educational Psychology, 91*(2), 230-240.

Pajares, F., & Johnson, M. J. (1996). Self-efficacy beliefs and the writing performance of entering high school students. *Psychology in the Schools, 33*(2), 163-175.

Pajares, F., Johnson, M. J., & Usher, E. L. (2007). Sources of writing self-efficacy beliefs of elementary, middle, and high school students. *Research in the Teaching of English*, 104-120.

PAR. (2004). Behavior Rating Inventory of Executive Function – Self-Report Version.

Patterson, N. C., Beltyukova, S. A., Berman, K., & Francis, A. (2007). The making of sophomores: Student, parent, and teacher reactions in the context of systematic urban high school reform. *Urban Education, 42*(2), 124-144.

Pearson. (2007). Detailed Assessment of Speed of Handwriting (DASH).

Pearson. (2009). Wechsler Individual Achievement Test – Third Edition.

PsychCorp. (2014). Wechsler Intelligence Scale for Children – Fifth Edition.

Puranik, C. S., Lombardino, L., & Altmann, L. (2008). Assessing the microstructure of written language using a retelling paradigm. *American Journal of Speech Language Pathology, 17*, 107-120. doi: 10.1044/1058-0360(2008/012)

Raulerson, B. A., Donovan, M. J., Whiteford, A. P., & Kellogg, R. T. (2010). Differential verbal, visual, and spatial working memory in written language production. *Perceptual and Motor Skills, 110*(1), 229-244.

Rigdon, E. (1997). Not positive definite matrices--causes and cures. Retrieved from

http://www2.gsu.edu/~mkteer/npdmatri.html

Rogers, L. A., & Graham, S. (2008). A meta-analysis of single subject design writing intervention research. *Journal of Educational Psychology, 100*(4), 879-906.

Saddler, B. (2012). *Teacher's guide to effective sentence writing*. New York, NY: 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*(1), 43-54.

Schooler, J.W., Reichle, E.D., & Halpern, D.V. (2004). Zoning out while reading: Evidence for dissociations between experience and metaconsciousness. In D. Levin (Ed.), *Thinking and seeing: Visual metacognition in adults and children* (pp. 203–226). Cambridge, MA: MIT Press.

Schumaker, J. B., & Deshler, D. D. (2003). Can students with LD become competent writers? *Learning Disability Quarterly, 26*(2), 129-141.

Schunk, D. H. (2012). *Learning theories: An educational perspective*. Boston, MA: Pearson.

Shanahan, T. (2006). Relations among oral language, reading, and writing development. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (pp.171-183). New York, NY: Guilford.

Spivey, N. N., & King, J. R. (1989). Readers as writers composing from sources. *Reading Research Quarterly, 24*(1), 7-26.

Swanson, H. L., & Berninger, V. W. (1996a). Individual differences in children's

working memory and writing skill. *Journal of Experimental Child Psychology, 63*, 358-385.

Swanson, H. L., & Berninger, V. W. (1996b). Individual differences in children's writing: A function of working memory or reading or both processes? *Reading and Writing: An Interdisciplinary Journal, 8*, 357-383.

Swanson, H. L., & Berninger, V. W. (1994). Working memory as a source of individual differences in children's writing. In E. C. Butterfield (Ed.), *Advances in Cognition and Educational Practice (Children's writing: Toward a process theory of the development of skilled writing)* (Vol. 2, pp. 31-56). Greenwich, CT: JAI Press Inc.

Swanson, H. L., & Siegel, L. (2001). Learning disabilities as a working memory deficit. *Issues in Education: Contributions from Educational Psychology, 7*, 1-48.

Swanson, H. L., & Zheng, X. (2013). Memory difficulties in children and adults with learning disabilities. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (2nd ed., pp. 214-238). New York, NY: Guilford Press.

Taft, R. J., & Mason, L. H. (2011). Examining effects of writing interventions: Highlighting results for students with primary disabilities other than learning disabilities. *Remedial and Special Education, 32*(5), 359-370.

Trochim, W. M. K. (2006). Convergent & discriminant validity. Retrieved from http://www.socialresearchmethods.net/kb/convdisc.php

Vanderberg, R. & Swanson, H. L. (2007). Which components of working memory are important in the writing process? *Reading and Writing, 20*(7), 721-752.

Viel-Ruma, K., Houchins, D. E., Jolivette, K., Fredrick, L. D., & Gama, R. (2010). Direct

instruction in written expression: The effects on English speakers and English language learners with disabilities. *Learning Disabilities Research & Practice, 25*(2), 97-108.

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

Walker, B., Shippen, M. E., Alberto, P., Houchins, D. E., & Cihak, D. F. (2005). Using the e*xpressive writing* program to improve the writing skills of high school students with learning disabilities. *Learning Disabilities Research & Practice, 20*(3), 175-183.

Wechsler, D. (2014). *WISC-V technical and interpretive manual*. Bloomington, MN: PsychCorp.

Whitaker, D., Berninger, V., Johnston, J., & Swanson, H. L. (1994). Intraindividual differences in levels of language in intermediate grade writers: Implications for the translating process. *Learning and individual differences, 6*(1), 107-130.

Wong, B. (1997). Research on genre-specific strategies for enhancing writing in adolescents with learning disabilities. *Learning Disability Quarterly, 20*, 140-159.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*, 329-339.

Zimmerman, B. J., & Pons, M. M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal, 23*(4), 614-628.

Zimmerman, B. J., & Risemberg, R. (1997a). Becoming a self-regulated writer: A social

cognitive perspective. *Contemporary Educational Psychology*, *22*, 73-101.

Zimmerman, B. J., & Risemberg, R. (1997b). Caveats and recommendations about self-regulation of writing: A social cognitive rejoinder. *Contemporary Educational Psychology*, *22*, 115-122.

Appendix A

Student Consent Form

UNIVERSITY *of* MISSOURI
COLLEGE OF EDUCATION
DEPARTMENT OF SPECIAL EDUCATION
CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

Researcher's Name(s): Ms. Apryl L. Poch and Dr. Erica S. Lembke
Project Number: 2002088

Project Title: An Examination of the Structural Relationships of Adolescent Writing: Implications of the Simple View of Writing

INTRODUCTION

Your child has been invited to participate in a research study on writing, and he/she has been selected as a possible participant because he/she is currently in the 9th grade within the Independence Central School District.

You have the right to know what your child will be asked to do so that you can decide whether or not he/she should become involved in the study. Your child's participation is voluntary, meaning that he/she is not required to participate if you do not want him/her to. Please read the remainder of this form and contact the researcher with any questions you may have before agreeing to have your child in the study.

WHY IS THIS STUDY BEING DONE?

The purpose of this study is to explore the relationships between transcription, text generation, self-regulation, and working memory in writing at the high school level.

HOW MANY PEOPLE WILL BE IN THE STUDY?

Ninth grade students from the Independence Central School District will be participating in this study.

WHAT IS MY CHILD BEING ASKED TO DO?

If you agree to have your child be a part of this study, he/she will complete a series of standardized assessments in writing, self-regulation, and working memory. Group administered assessments will be completed in your child's classroom or another comparable location identified by the high school. The individual assessments will be administered to your child in a quiet location close to the classroom as identified by the

high school. All measures will be administered by the primary researcher or a member of her research team. Group assessments will take approximately 50 minutes and individual assessments approximately 25 minutes to complete.

In addition, the research team will collect demographic data about your child including age; sex; disability/504 status; English language learning service; gifted/talented services; race/ethnicity; district English language arts scores since 3rd grade; 7th and 8th grade English language arts course grades; 9th grade end of course exam scores or state exam scores; and hand dominance for handwriting.

WHAT ARE THE RISKS AND BENEFITS OF BEING IN THE STUDY?

There is slight risk involved if the classroom teacher uses student participation in the research study to falsely label and/or discriminate against the student based on perceived abilities. Further, there is a slight risk that students may become frustrated in responding to some statements or that they may become frustrated during the assessment period.

The benefits to participation are that the University researcher who will be evaluating the students' writing will be able to provide the district with aggregate findings and recommendations for supporting the writing of high school students.

CONFIDENTIALITY

Please be assured that the strictest measures of confidentiality will be maintained.

Your child will be assigned a pseudonym or code number, and only the primary researcher will have access to students' identifying information. In any sort of published report that may result from this study, no information will be included in which it might be possible to identify the children who participate. All data will be kept in a locked file and only the researcher and her team will have access to those records. This data will be de-identified and will not contain any identifying information. Moreover, your child's performance and responses on the assessments administered will not be shared with your child's teacher or any other school-related employee, except as required by law.

WILL I BE COMPENSATED FOR PARTICIPATING IN THE STUDY?

You will receive no payment or compensation for taking part in this study.

WHAT ARE MY RIGHTS AS A PARTICIPANT?

Participation in this study is voluntary. You do not have to participate in this study.

Your decision whether or not to have your child participate will not affect your current or future relations with the high school, Independence Central School District, or the University of Missouri. If you decide to have your child participate, you are free to withdraw at any time without affecting those relationships. Nor will you be asked to give a reason(s) for withdrawing, and any responses that you have provided will be destroyed and will not appear anywhere in the research study.

WHOM DO I CONTACT IF I HAVE QUESTIONS, CONCERNS, OR COMPLAINTS?

Please contact *Ms. Apryl Poch*, Doctoral Candidate, Department of Special Education at alpty9@mail.missouri.edu or (716) 200.7194 if you have any questions about the research or a research-related injury. Additionally, you may ask questions, voice concerns or complaints to the research team.

WHOM DO I CALL IF I HAVE QUESTIONS OR PROBLEMS?

If you have any questions regarding your child's rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the University of Missouri Campus Institutional Review Board (which is a group of people who review the research studies to protect participants' rights) at (573) 882.9585 or umcresearchcirb@missouri.edu.

A copy of this Informed Consent form will be given to you before you participate in the research.

STATEMENT OF CONSENT (please circle yes or no):

YES

I GRANT permission for my child _____ to participate
(son or daughter's name)

in the University of Missouri research project on writing.

_____ _____

Parent or Guardian (signature) Date

NO

I DO NOT GRANT permission for my child _____
(son or daughter's name)

to participate in the University of Missouri research project on writing.

_____ _____

Parent or Guardian (signature) Date

Appendix B

Standard Script

This is a letter about a writing project that Ms. Poch from the University of Missouri would like to do in our class. You need to have your parents/guardians read it, and then they need to sign the form if they would like you to be a part of the project. Please bring back the blue copy of the form by _____.

Appendix C

Electronic Student Consent Form

UNIVERSITY *of* MISSOURI
COLLEGE OF EDUCATION
DEPARTMENT OF SPECIAL EDUCATION
CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

Researcher's Name(s): Ms. Apryl L. Poch and Dr. Erica S. Lembke
Project Number: 2002088

Project Title: An Examination of the Structural Relationships of Adolescent Writing: Implications of the Simple View of Writing

INTRODUCTION

Your child has been invited to participate in a research study on writing, and he/she has been selected as a possible participant because he/she is currently in the 9th grade within the Independence Central School District.

You have the right to know what your child will be asked to do so that you can decide whether or not he/she should become involved in the study. Your child's participation is voluntary, meaning that he/she is not required to participate if you do not want him/her to. Please read the remainder of this form and contact the researcher with any questions you may have before agreeing to have your child in the study.

WHY IS THIS STUDY BEING DONE?

The purpose of this study is to explore the relationships between transcription, text generation, self-regulation, and working memory in writing at the high school level.

HOW MANY PEOPLE WILL BE IN THE STUDY?

Ninth grade students from the Independence Central School District will be participating in this study.

WHAT IS MY CHILD BEING ASKED TO DO?

If you agree to have your child be a part of this study, he/she will complete a series of standardized assessments in writing, self-regulation, and working memory. Group administered assessments will be completed in your child's classroom or another comparable location identified by the high school. The individual assessments will be administered to your child in a quiet location close to the classroom as identified by the

high school. All measures will be administered by the primary researcher or a member of her research team. Group assessments will take approximately 50 minutes and individual assessments approximately 25 minutes to complete.

In addition, the research team will collect demographic data about your child including age; sex; disability/504 status; English language learning service; gifted/talented services; race/ethnicity; district English language arts scores since 3rd grade; 7th and 8th grade English language arts course grades; 9th grade end of course exam scores or state exam scores; and hand dominance for handwriting.

WHAT ARE THE RISKS AND BENEFITS OF BEING IN THE STUDY?

There is slight risk involved if the classroom teacher uses student participation in the research study to falsely label and/or discriminate against the student based on perceived abilities. Further, there is a slight risk that students may become frustrated in responding to some statements or that they may become frustrated during the assessment period.

The benefits to participation are that the University researcher who will be evaluating the students' writing will be able to provide the district with aggregate findings and recommendations for supporting the writing of high school students.

CONFIDENTIALITY

Please be assured that the strictest measures of confidentiality will be maintained.

Your child will be assigned a pseudonym or code number, and only the primary researcher will have access to students' identifying information. In any sort of published report that may result from this study, no information will be included in which it might be possible to identify the children who participate. All data will be kept in a locked file and only the researcher and her team will have access to those records. This data will be de-identified and will not contain any identifying information. Moreover, your child's performance and responses on the assessments administered will not be shared with your child's teacher or any other school-related employee, except as required by law.

WILL I BE COMPENSATED FOR PARTICIPATING IN THE STUDY?

You will receive no payment or compensation for taking part in this study.

WHAT ARE MY RIGHTS AS A PARTICIPANT?

Participation in this study is voluntary. You do not have to participate in this study.

Your decision whether or not to have your child participate will not affect your current or future relations with the high school, Independence Central School District, or the University of Missouri. If you decide to have your child participate, you are free to withdraw at any time without affecting those relationships. Nor will you be asked to give a reason(s) for withdrawing, and any responses that you have provided will be destroyed and will not appear anywhere in the research study.

WHOM DO I CONTACT IF I HAVE QUESTIONS, CONCERNS, OR COMPLAINTS?

Please contact *Ms. Apryl Poch*, Doctoral Candidate, Department of Special Education at alpty9@mail.missouri.edu or (716) 200.7194 if you have any questions about the research or a research-related injury. Additionally, you may ask questions, voice concerns or complaints to the research team.

WHOM DO I CALL IF I HAVE QUESTIONS OR PROBLEMS?

If you have any questions regarding your child's rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the University of Missouri Campus Institutional Review Board (which is a group of people who review the research studies to protect participants' rights) at (573) 882.9585 or umcresearchcirb@missouri.edu.

A copy of this Informed Consent form will be given to you before you participate in the research.

STATEMENT OF CONSENT (please circle yes or no):

YES

I GRANT permission for my child _____ to participate
(son or daughter's name – please type)

in the University of Missouri research project on writing.

_____ _____

Parent or Guardian (signature or typed name*) Date – please type

** I acknowledge that my electronic signature or typed name hereby constitutes my printed signature and therefore certify that my electronic signature or typed name serves as my consent*

NO

I DO NOT GRANT permission for my child _____
(son or daughter's name – please type)

to participate in the University of Missouri research project on writing.

_____ _____

Parent or Guardian (signature or typed name*) Date – please type

** I acknowledge that my electronic signature or typed name hereby constitutes my printed signature and therefore certify that my electronic signature or typed name serves as my consent*

Appendix D

E-mail to Parents

Dear Parent/Guardian:

This year, your child has the opportunity to participate in a research study on writing that Ms. Apryl Poch from the University of Missouri is completing in my class. Your son/daughter recently received a blue and white consent form that he/she was asked to return. Please either return one of the printed forms with your son/daughter to Ms. Ritchel, or utilize the attached electronic consent form and return electronically to Ms. Poch at ALPTY9@mail.missouri.edu. Should you have any questions, or desire any additional information about the project, Ms. Poch would be happy to assist.

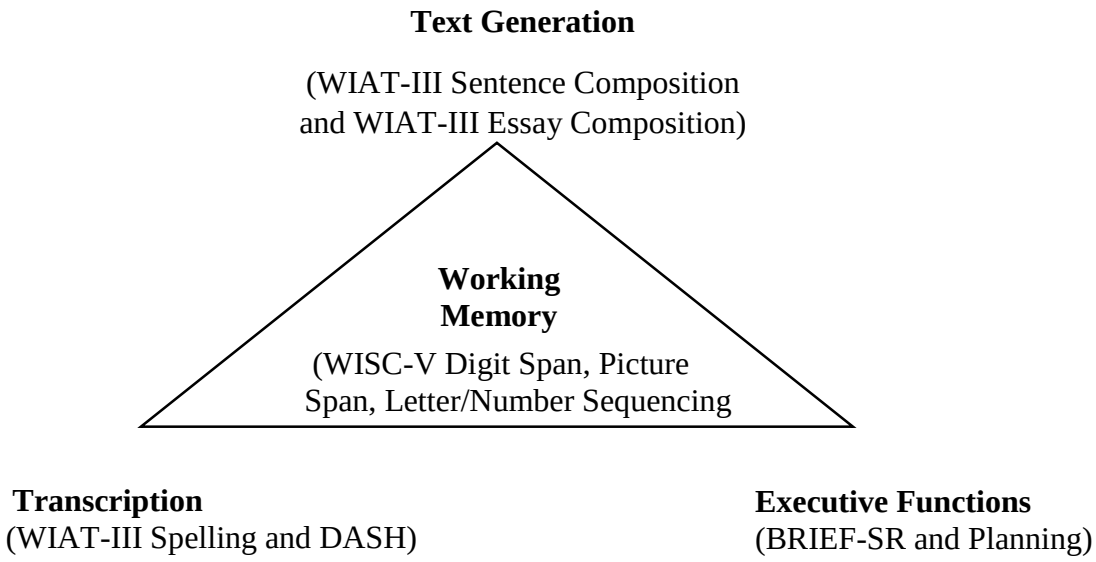
Thank you for your time and consideration.

Sincerely,

Ms. Kassidy Ritchel
9th Grade English Teacher
Truman High School
Independence, MO

Appendix E

Mapping the Assessment Battery to the Simple View of Writing



Appendix F

Rubric for Planning Measure

Planning Measure Holistic Scoring Rubric
(Adapted from Whitaker, Berninger, Johnston, & Swanson, 1994; Berninger, Whitaker, Feng, Swanson, & Abbott, 1996; Vanderberg & Swanson, 2007)

Score	Criteria
1	**No advanced pre-planning** *(Whole sentences corresponding to text written OR Only one word or phrase written OR Nothing on paper)* Student's planning sheet is blank or only contains one word
2	**Listing** *(Listing of propositions or words [concrete, not abstract topics/reasons])* Student includes concrete propositions or words
3	**Questions or topics/reasons with no subordination** *(Listing of questions or topics/reasons to be addressed [no subtopics])* Student includes a list of topics/reasons and/or questions to be addressed in the essay
4	**Topics/Reasons with emerging subordination** *(Topics/reasons with an example for at least one; Structural relationship between topics/reasons is not specified)* Student includes topics/reasons and at least one example supporting one of the topics/reasons
5	**Mapping or outlining** *(At least two topics/reasons and examples for each; Structural relationship between topics/reasons is specified)* Student includes at least two topics/reasons and a corresponding example for each topic/reason

Appendix G

Calendar of Measure Administration by Course Hour, Day, and Administration Type

Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
			11/12 – Individual (all day – Apryl)	11/13 – Individual (all day – Apryl)
11/16 – Individual (all day – Apryl & Becky)	11/17	11/18 – Individual (Becky – part day)	11/19 – Individual (all day – Apryl & Becky)	11/20
11/23 – Individual (all day – Apryl)	11/24 – Individual (all Day – Apryl)	11/25 – Thanksgiving Recess	11/26	11/27
11/30 – Group (Apryl & Becky ½ day reliability) 1 – Spelling 2 – DASH 4 – WIAT (b, c, essay) 6 – BRIEF 7 – WIAT (b, c, essay)	12/1 – Group (Apryl & Becky ½ day reliability) 1 – WIAT (b, c) 2 – BRIEF 4 – Spelling 6 – DASH 7 – BRIEF	12/2 – Individual (1st hour – Becky)	12/3	12/4 – Both (Apryl) 6 – WIAT (c, b, essay) 7 – Individual
12/7	12/8 – Individual (1st and 2nd – Becky)	12/9 – Individual (1st – Becky and 7th – Apryl)	12/10 – Both (Apryl) 2 – Individual 4 – DASH, BRIEF & 1 Individual 6 – Spelling	12/11 – Both (Apryl) 1 – WIAT (essay) & BRIEF 2 – Spelling & 1 student's BRIEF 4 – WIAT (b, c, essay) for 1 student 6 – Spelling for 1 student 7 – Spelling & 2 students' BRIEF
12/14 – Group (Apryl & Becky ½ day) 1 – DASH 2 – WIAT (c, b, essay)	12/15 – Both (Apryl & Becky) 1 – Spelling for 1 student, WIAT (essay) &			

3-6 – Student Folders in Guidance 7 – DASH	BRIEF for 1 student 2 – DASH for 1 student, WIAT (c, b, essay) for 1 student & 1 student check sentences 4 – Two students check sentences; Demographics 6 – Two students check sentences; demographics 7 – WIAT (b, c, essay) for 1 student, BRIEF & Spelling for 1 student, 1 Individual session, 1 student check copy fast, & 1 student DASH			

Appendix H

Standardized Administration Directions

Beginning Instructions – Group and Individual

Regardless of where you start for group and individual assessments, begin the session by saying:

I'll be asking you to do a number of things today. Some of the things may be easy for you, but some things may seem hard. Most people do not know every answer or finish everything, but please try your best. Do you have any questions? [Take and respond to any student questions.]

MISCELLANEOUS:

- The group session can be very cumbersome and tiring for students, especially students who are adverse to the types of tasks being completed. It is acceptable to split the group assessment period into two sessions and/or to provide students with a very short break to stand up, stretch, etc. Continue to remind students to do their best (try to limit evaluative statements like "good job," etc.).
- It is possible that students may become frustrated with the tasks completed during the individual testing session. If you notice a student fatiguing, becoming anxious, etc., engage the student in conversation between tasks.
- If a situation arises where a student cannot be calmed down, or is too anxious to continue, refer to the procedures on the Protocol for Distress.

WISC-V

DIGIT SPAN – FORWARD

Say, **I'm going to say some numbers. Listen carefully, I can only say them one time. When I stop, you say them back to me in the same order. Just say what I say.**

Proceed to Item 1.

Administer Trial 1 and Trial 2 of each item. Proceed to the next item if the discontinue criterion has not been met.

Discontinue Rule: After scores of 0 on *both trials* of an item

Administer Backward and Sequencing regardless of the child's performance on Forward.

DIGIT SPAN – BACKWARD

Trial 1:
Say, **Now I'm going to say some more numbers, but this time when I stop, you say the numbers backward. If I say 9 – 4, what would you say?**

Correct response [4 – 9]: Say, **That's right.** Proceed to Trial 2.
Incorrect response: Say, **That's not quite right. I said 9 – 4, so to say them backward, you should say 4 – 9.** Proceed to Trial 2.

Trial 2:
Say, **Let's try another one. Remember to say them backwards: 5 – 6.**

Correct response [6 – 5]: Say, **That's right. Let's try some more.** Proceed to Item 1.
Incorrect response: Say, **That's not quite right. I said 5 – 6, so to say them backward, you should say 6 – 5. Let's try some more.** Proceed to Item 1.

Items 1-9:
Administer Trial 1 and Trial 2 of each item. Proceed to the next item if the discontinue criterion has not been met.

Discontinue Rule: After scores of 0 on *both trials* of an item

Administer Sequencing regardless of the child's performance on Forward and Backward.

DIGIT SPAN – SEQUENCING

Sample Item A:
Trial 1

Say, **Now I'm going to say some more numbers, but this time when I stop, you say the numbers in order, starting with the smallest number. If I say 3 – 1, what would you say?**

Correct response [1 – 3]: Say, **That's right.** Proceed to Trial 2.
Incorrect response: Say, **That's not quite right. I said 3 – 1. To say them in order, starting with the smallest number, you should say 1 – 3.** Proceed to Trial 2.

Trial 2
Say, **Let's try another one: 8 – 6.**

Correct response [6 – 8]: Say, **That's right.** Proceed to Sample Item B.
Incorrect response: Say, **That's not quite right. I said 8 – 6. To say them in order, starting with the smallest number, you should say 6 – 8.** Proceed to Sample Item B.

Sample Item B:
Trial 1
Say, **Let's try another one: 5 – 2 – 4.**

Correct response [2 – 4 – 5]: Say, **That's right.** Proceed to Trial 2.
Incorrect response: Say, **That's not quite right. I said 5 – 2 – 4. To say them in order, starting with the smallest number, you should say 2 – 4 – 5.** Proceed to Trial 2.

Trial 2
Say, **Let's try another one: 4 – 3 – 3.**

Correct response [3 – 3 – 4]: Say, **That's right. Let's try some more.** Proceed to Item 1.
Incorrect response: Say, **That's not quite right. I said 4 – 3 – 3. To say them in order, starting with the smallest number, you should say 3 – 3 – 4. You may have to say the same number more than one time. Let's try some more.** Proceed to Item 1.

Item 1:
Administer Trial 1 and Trial 2 of each item. Proceed to the next item if the discontinue criterion has not been met.

Discontinue Rule: After scores of 0 on *both trials* of an item

PICTURE SPAN

Sample Item B:
Trial 1
Expose Sample Item B stimulus page and say, **These pictures are in order. This one** (point to sock) **is first, and this one** (point to apple) is next. Begin timing and allow 5 seconds.

Turn to Sample Item B response page and say, **Point to the pictures in the *order* I showed you.**

Correct Response [B – A]: Say, **That's right.** Proceed to Sample Item C.
Incorrect Response: Say, **That's not quite right. Let's try again.** Administer Trial 2.

Trial 2
Re-expose Sample Item B stimulus page and say, **On this page, this one** (point to sock) **is first, and this one** (point to apple) **is next.** Begin timing and allow 5 seconds.

Turn to Sample Item B response page and say, **Point to the pictures in the *order* I showed you.**

Correct Response [B – A]: Say, **That's right.** Proceed to Sample Item C.
Incorrect Response: Say, **That's not quite right.** Re-expose Sample Item B stimulus page and say, **On this page, this one** (point to sock) **is first, and this one** (point to apple) **is next.** Turn to Sample Item B response page and say, **So you should point to this one first** (point to sock), **and this one next** (point to apple). Proceed to Sample Item C.

<u>Sample Item C:</u>
Trial 1
Expose Sample Item C stimulus page and say, **Remember these pictures in order.** Begin timing and allow 5 seconds.

Turn to Sample Item C response page and say, **Point to the pictures in the *order* I showed you.**

Correct response [D – A]: Say, **That's right.** Proceed to Item 4.
Incorrect response: Say, **That's not quite right. Let's try again.** Administer Trial 2.

Trial 2
Re-expose Sample Item C stimulus page and say, **On this page, this one** (point to apple) **is first, and this one** (point to flower) **is next. Remember the pictures in order.** Begin timing and allow 5 seconds.

Turn to Sample Item C response page and say, **Point to the pictures in the *order* I showed you.**

Correct Response [D– A]: Say, **That's right.** Proceed to Item 4.
Incorrect Response: Say, **That's not quite right.** Re-expose Sample Item C stimulus page and say, **On this page, this one** (point to apple) **is first, and this one** (point to flower) **is next.** Turn to Sample Item C response page and say, **So you should point to this one first** (point to apple), **and this one next** (point to flower).

If the child appears confused, repeat the explanation and allow the child to practice the task again, using Sample Items B and C.

Regardless of the child's performance on the sample items, proceed to Item 4.

†Item 4:
Expose Item 4 stimulus page and say, **Remember these pictures in order.** Begin timing and allow 5 seconds.

Turn to Item 4 response page and say, **Point to the pictures in the order I showed you.**

Correct response [C – D]: Proceed to Item 5.
†Incorrect response: Re-expose Item 4 stimulus page and say, **On this page, this one** (point to gift) **is first, and this one** (point to tire) **is next.** Turn to Item 4 response page and say, **So you should point to *this* one first** (point to gift), **and *this* one next** (point to tire). Proceed to the next appropriate item if the discontinue criterion has not been met.

†Item 5:
Expose Item 5 stimulus page and say, **Remember these pictures in order.** Begin timing and allow 5 seconds.

Turn to Item 5 response page and say, **Point to the pictures in the order I showed you.**

Correct response [B – A]: Proceed to Item 6.
†Incorrect response: Re-expose Item 5 stimulus page and say, **On this page, this one** (point to kite) **is first, and this one** (point to ladybug) **is next.** Turn to Item 5 response page and say, **So you should point to *this* one first** (point to kite), **and *this* one next** (point to ladybug). Proceed to the next appropriate item if the discontinue criterion has not been met.

Item 6-26:
Expose the stimulus page and say, **Remember these pictures in order.** Begin timing and allow 5 seconds. Do **not** shorten or eliminate this instruction

Turn to the response page and say, **Point to the pictures in the order I showed you.** This instruction may be shortened or eliminated when the child understands the task.

Proceed to the next item if the discontinue criterion has not been met.

Discontinue Rule: Discontinue after **3** consecutive scores of 0.

LETTER-NUMBER SEQUENCING

Demonstration Item A:
Say, **I'm going to say some numbers and letters. After I say them, you say the number first, then say the letter.**

If I say A – 2, you should say 2 – A. The number goes first, then the letter.

Sample Item A:
Say, **Let's practice: B – 1.**

Correct response [1 – B]: Say, **That's right. Let's try some more.** Proceed to Item 1.
Incorrect response: Say, **That's not quite right. I said B – 1, so you should say 1 – B. The number goes first, then the letter. Let's try some more.** Proceed to Item 1.

Items 1 – 2:
Just read the trial for each item (e.g., **A – 3**). Administer all three trials for each item. Proceed to Demonstration Item B if the discontinue criterion has not been met.

If the child does not say the number first, say, **Remember to say the number first, then say the letter.**

Demonstration Item B:
Say, **Now let's try some with more numbers and letters. I want you to tell me the numbers first, in order, starting with the smallest number. Then tell me the letters in alphabetical order.**

If I say 3 – F – 2, you should say 2 – 3 – F. Say the numbers first, in order, starting with the smallest number. Then say the letters in alphabetical order. Proceed to Sample Item B.

Sample Item B:
Trial 1
Say, **Let's practice: E – 5 – A.**

Correct response [5 – A – E]: Say, **That's right.** Proceed to Trial 2.
Incorrect response: Say, **That's not quite right. I said E – 5 – A, so you should say 5 – A – E. Say the numbers first, in order, starting with the smallest number. Then say the letters in alphabetical order.** Proceed to Trial 2.

Trial 2:
Say, **Let's try another one: 1 – B – 2.**

Correct response [1 – 2 – B]: Say, **That's right.** Proceed to Item 3.
Incorrect response: Say, **That's not quite right. I said 1 – B – 2, so you should say 1 – 2 – B. Say the numbers first, in order, starting with the smallest number. Then say the letters in alphabetical order.** Proceed to Item 3.

Items 3-10:
Say, **Let's try some more.**

Administer all three trials of each item. Proceed to the next item if the discontinue criterion has not been met.

Discontinue Rule: Discontinue after scores of **0** on *all three trials* of an item.

*Note: The child receives credit if all the numbers and letters are recalled in the correct order, ***even if the letters are recalled before the numbers.***

WIAT Spelling:
**Item prompts/instructions may be repeated as needed*

I am going to ask you to write some words. First I will say the number of the word so you will know where to write it on the page. Then I will say the word, use it in a sentence, and say it again. Listen carefully to the sentences so you will know which word to write.

Number _____. *Word* Sentence *Word*

WIAT Sentence Combining:
**Item prompts/instructions may be repeated as needed*

Now I will ask you to write some sentences. You will be using a pencil without an eraser, so if you make a mistake, just cross it out.

Point to Sample A in the Response Booklet and say, **This one has been done for you. Here are two sentences: *The dog has fur. The cat has fur.* These sentences can be put together in many ways. One good sentence that combines these two is, "The dog and cat have fur."** [Point to the sample sentence.] **This is a complete sentence that means the same thing as these two.** [Point to the two target sentences.] **It also uses correct spelling, capitalization, and punctuation. Now you try.**

1. Point to the target sentences in the Response Booklet and say, **Here are two sentences: *Cats are pets. Dogs are pets.* Write one sentence that means the same thing as these two. Remember to write a complete sentence with correct spelling, capitalization, and punctuation. Write your sentences here.** [Point to the writing space under the target sentences.]

2. Point to the target sentences in the Response Booklet and say, **Here are two sentences: *The frog is green. The frog jumps.* Write one sentence that means the same thing.**

3. Point to the target sentences in the Response Booklet and say, **Here are two sentences: *Mark has a sister named Ann. Ann is six years old.* Write one sentence that means the same thing.**

4. Point to the target sentences in the Response Booklet and say, **Now try putting three sentences together: *Antonio is a fast runner. Antonio is a strong student. Antonio won the Best Athlete award.* Write one sentence that means the same thing.**

5. Point to the target sentences in the Response Booklet and say, **Here are three sentences: *Marci bought a new car. Her old car cost too much to repair. Marci's new car is smaller than her old car.* Write one sentence that means the same thing.**

WIAT Sentence Building:
**Item prompts/instructions may be repeated as needed*

Now I will ask you to write a different kind of sentence.

[Point to Sample A.] **This one has been done for you. The word is *and*. Here is a complete sentence that uses the word *and*: I like dogs *and* cats. It also uses correct spelling, capitalization, and punctuation. Now you try.** [Proceed to Item 1]

1. Point to the target word in the Response Booklet and say, **Think of a sentence that uses the word *the*** (pronounce \thə\, rather than \thē\). **Remember to write a complete sentence with correct spelling, capitalization, and punctuation. Write your sentence here.** [Point to the writing space below the target word.]

2. Point to the target word in the Response Booklet and say, **Write a sentence using the word *or*.**

3. Point to the target word in the Response Booklet and say, **Write a sentence using the word *until*.**

4. Point to the target word in the Response Booklet and say, **Write a sentence using the word *of*.**

5. Point to the target word in the Response Booklet and say, **Write a sentence using the word *an*.**

6. Point to the target word in the Response Booklet and say, **Write a sentence using the word *than*.**

7. Point to the target word in the Response Booklet and say, **Write a sentence using the word *as*.**

WIAT Essay (with Planning Measure):
**Item prompts/instructions may be repeated as needed*

On this page I would like you to write an essay. Do your best writing, and also write neatly so I can read it later. If you'd like, you can use this blank page to plan what you will write. Write about your favorite game and include at least three reasons why you like it. Try to write a full page. First you will have 5 minutes to plan. Do you have any questions?

When the student is ready, say, **You may begin planning.**

After 5 minutes, say, **Your planning period has ended. You now have 10 minutes to write your essay. You may now begin writing.**

If the student is still writing at the end of 5 minutes, say, **You have 5 minutes left.**

If the student is still writing at the end of 9 minutes, say, **You have 1 minute left.**

At the end of 10 minutes, say, **Please stop.**

- If student finishes before the time limit, check to see that the student has written at least 30 words and say, **Keep writing until the timer rings. Go back and check your work or add more details.**
- If fewer than 30 words have been written, prompt the student by saying, **Try to write a full page.** If the student does not write any more, record the elapsed time in seconds.
- If fewer than 30 words have been written and the page is full, turn to the next page in the Response Booklet and say, **Try to write more.**

WIAT SPELLING

Say . . .

I am going to ask you to write some letters and words. If you make a mistake, just cross it out.

1. **Next to number 1 please write your first name.**
2. **Write the letter that makes the \a\ sound in *apple*.**
3. **Write the letter that makes the \z\ sound in *zoo.***
4. **Write the letter that makes the \j\ sound in *jump.***
5. **Write the letter that makes the \k\ sound in *kite.***

I want you to write some words. I will say a word, then use it in a sentence, and say the word again. Listen to the sentence so you know what word to write.

6. **Cat. The *cat* is chasing a mouse. Cat.**
7. **In. My books are *in* my room. In.**
8. **Be. *Be* careful. Be.**
9. **Game. The children played a *game* outside. Game.**
10. **Fix. She used tape to *fix* the book. Fix.**
11. **Cake. I had *cake* for dessert. Cake.**
12. **Cold. It is *cold* outside. Cold.**
13. **Tall. The bird made a nest in a *tall* tree. Tall.**
14. **Mother. The child asked his *mother* for a cookie. Mother.**
15. **Night. The stars can be seen at *night.* Night.**
16. **Page. The book was missing a *page.* Page.**
17. **Began. Class *began* five minutes late. Began.**
18. **Windy. On *windy* days, the leaves blow through the air. Windy.**

19. Camped. We *camped* in the forest and slept in a tent. Camped.

20. Suspect. The *suspect* was arrested at the bank. Suspect.

21. Inactive. People are usually *inactive* while watching television. Inactive.

22. Known. The author was *known* throughout the world. Known.

23. Happily. The characters lived *happily* ever after. Happily.

24. Stationary. *Stationary* objects do not move. Stationary.

25. Collection. I have a *collection* of coins. Collection.

26. Budget. A *budget* helps to organize finances. Budget.

27. Width. The *width* of the door was too narrow for the box to fit through. Width.

28. Guitar. I am learning how to play the *guitar*. Guitar.

29. Photography. *Photography* is a hobby of mine. Photography.

30. Factual. A *factual* statement is true. Factual.

31. Resign. I want to *resign* and start a new job. Resign.

32. Doubt. I *doubt* it will rain today because the sky is clear. Doubt.

33. Progressive. *Progressive* research uses new ideas to make advances. Progressive.

34. Suppose. I studied for the test, so I *suppose* I'll do well. Suppose.

35. Confide. I will *confide* in you if you will keep a secret. Confide.

36. Resistance. A healthy diet may improve our *resistance* to illness. Resistance.

37. Exerting. I opened the heavy door by *exerting* pressure. Exerting.

38. Presence. The dog barks in the *presence* of a stranger. Presence.

39. Reign. The queen would *reign* for fifty years. Reign.

40. Ambitious. To become a world leader is an *ambitious* goal. Ambitious.

41. Outrageous. The announcer's *outrageous* comments made the crowd laugh. Outrageous.

42. Sympathetic. I felt *sympathetic* towards the crying baby. Sympathetic.

43. Leisure. In my *leisure* time, I enjoy watching movies. Leisure.

44. Oxidize. Oxygen causes copper to *oxidize*. Oxidize.

45. Achievement. Graduating from high school is an important *achievement*. Achievement.

46. Absurd. It is *absurd* to think you can get water out of a stone. Absurd.

47. Kindliness. I try to practice *kindliness* with everyone I meet. Kindliness.

48. Metabolize. Exercise helps our bodies *metabolize* food. Metabolize.

49. Exhaustion. The runner collapsed from *exhaustion* after the marathon. Exhaustion.

50. Affluent. Many people cannot afford to live in an *affluent* neighborhood. Affluent.

51. Flirtatious. The male peacock showed off his feathers in a *flirtatious* manner. Flirtatious.

52. Stasis. During a time of *stasis*, little or no change occurs. Stasis.

53. Receiving. My teacher enjoys *receiving* letters from students. Receiving.

54. Heterodox. *Heterodox* beliefs do not agree with traditional beliefs. Heterodox.

55. Vacuum. I *vacuum* the rug once a week. Vacuum.

56. Conferred. I *conferred* with my lawyer before making a decision. Conferred.

57. Physicist. A *physicist* studies the natural world. Physicist.

58. Recede. I waited for the tide to *recede* before looking for seashells. Recede.

59. Perceived. The audience *perceived* the nervousness in the speaker's voice. Perceived.

60. Abhors. My friend *abhors* insects and avoids them at all cost. Abhors.

61. Marionette. There was a dancing *marionette* in the talent show. Marionette.

62. Impeccable. After studying for many years, the student speaks *impeccable* French. Impeccable.

63. Gherkin. A *gherkin* is a young, pickled cucumber. Gherkin.

BRIEF Administration Directions

Distribute a copy of the BRIEF-SR form to each student and say, **Before we begin, please write your name, gender, age, date of birth, grade, and today's date in the spaces provided at the top of the page.**

When each student has a copy and the identifying information is completed, say:

Teenagers know a lot about their own behavior and how they solve the problems that they may face. Your help is essential to me [or Ms. Poch] as I [she] attempt(s) to better understand your writing and your behavioral responses when you encounter a problem, like what you do when you get stuck on a problem or you face a challenge. Please listen carefully as I read the directions and the statements aloud. Please respond to all of the items, even if some are difficult or do not seem to apply to you. Remember to think about yourself as you hear these statements.

The following statements describe teenagers. Indicate whether you have had any difficulties with these behaviors over the past 6 months. If the specific behavior has *Never* been a problem for you in the last 6 months, circle the letter *N*; if the behavior has *Sometimes* been a problem for you in the last 6 months, circle the letter *S*; if the behavior has *Often* been a problem for you in the last 6 months, circle the letter *O*.

For example, if you *Never* have trouble completing homework on time, you would circle N for the item I have trouble completing homework on time.

If you make a mistake or want to change your answer, DO NOT ERASE. Instead, draw an X through the answer you want to change and then circle the correct answer.

Do you have any questions? [Take and respond to any student questions; review the directions in the paragraph above as needed]

Great, let's begin.

Over the past 6 months, how often has each of the following behaviors been a problem?

One: I have trouble sitting still. Never, Sometimes, Often. [pause 3-5 seconds, but monitor student progress to ensure you are not moving too quickly or too slowly]

Two: I have trouble accepting a different way to solve a problem with schoolwork, friends, tasks, etc. Never, Sometimes, Often. [pause 3-5 seconds, but monitor student progress to ensure you are not moving too quickly or too slowly]

Three: When I am given three things to do, I remember only the first or last. Never, Sometimes, Often. [pause 3-5 seconds, but monitor student progress to ensure you are not moving too quickly or too slowly]

Four: I start projects (such as homework, recipe) without the right materials. Never, Sometimes, Often. [pause 3-5 seconds, but monitor student progress to ensure you are not moving too quickly or too slowly]

Five: I overreact to small problems. Never, Sometimes, Often. [pause 3-5 seconds, but monitor student progress to ensure you are not moving too quickly or too slowly]

Number six forward: Continue by reading only the statement number and the statement itself. Continue to pause 3-5 seconds, but monitor student progress to ensure you are not moving too quickly or too slowly. (See remaining items on the attached copy of the BRIEF-SR.)

Notes:

- Students shouldn't have any questions about the vocabulary in each statement, but if they do, you may provide a very brief and basic definition.
- When you collect student forms, please check to ensure that they have completed each item. If any items are found to be blank, ask the student to go back and respond to the skipped item.
- If an answer to any item is ambiguous, please ask the student to clarify the answer he/she has selected.

DASH Administration Directions

COPY BEST

Copying a sentence in 'best' handwriting for 2 minutes.

Place the stapled sheets of lined paper in front of the student and the strip of paper with the sentence *The quick brown fox jumps over the lazy dog* just above or next to it. Allow the student to reposition these as required for maximum comfort and ease in copying. Confirm that the student has put his/her name, age, and date at the top. Proceed as follows:

1. Say, **In your folder, please take out the Detailed Assessment of Speed of Handwriting (DASH) Record Form. Please write ONLY the following: your name, circle which hand you use for writing, and circle whether you will be writing with a pen or a pencil. Then put the form back in your folder.** [this should take about a minute]

2. Say, **Now please take out the sentence strip and the lined piece of paper that says number one, Copy Best, at the top. Please write your name, age, and date at the top. Then put your pen/pencil on your desk.** [pause – this should be completed quickly]

3. Say, **Look at this sentence** [hold up the sentence strip]**.** Ask the student to look at the sentence *The quick brown fox jumps over the lazy dog*. Point to the sentence and read it aloud slowly and clearly. If you have any doubts about the pupil's reading ability, read the sentence again, or ask him/her to read it to you.

4. Say, **When I say 'start,' I'd like you to write this sentence in your best handwriting. Keep writing the same sentence in your best handwriting over and over again until I tell you to stop. After one minute, I will call out 'time mark.' When you hear this, draw //** [demonstrate on a piece of paper] **then carry on writing. When I say 'stop,' stop writing immediately, even if you are in the middle of a word. Do you have any questions?** [answer any questions that are posed]

5. Say, **Ready** [students should pick up pen/pencil] **. . . start.** [Start the timer/stopwatch. Do this as unobtrusively as possible.]

6. At one minute, say: **Time mark.**

7. At two minutes, say: **Stop! Stop writing and put down your pen.** [pause] **Please put this paper and the sentence strip back in your folder.**

Notes for group administration
Each student should have the pack of stapled lined paper on their desk ready for writing (they should already have written their name, age, and the date on the top sheet). Hold up the strip of paper with the sentence *The quick brown fox jumps over the lazy dog*. Ask the students to locate this from among the paper materials and place it just above or next to their writing paper. Circulate around the room ensuring that each child has selected the correct papers and is prepared for copy writing. Then demonstrate on the board how to write the time mark [or show the attached sheet if no board is available].

ALPHABET WRITING

Writing the alphabet in lower case for 1 minute.

Ensure the paper on which Task 1 was completed has been turned over and a new lined A4 sheet is in place. [These pages are labelled with the name of the writing task at the top, so please check that students are on the right page!]

1. Say, **Now please take out the lined piece of paper that says number two, Alphabet Writing, at the top. Please write your name, age, and date at the top. Then put your pen/pencil on your desk.** [pause – this should be completed quickly]

2. Say: **When I say 'start,' write out the letters of the alphabet in their correct sequence and continue writing until I say 'stop.' If you finish writing the entire alphabet, just begin again and keep writing until I tell you to stop. I would like you to use lower case, NOT capital letters** [demonstrate a few letters on your sheet of paper]. **Write them in order and write as quickly as possible, but make sure I can read every letter.**

3. Say, **Ready** [students should pick up pen/pencil] **. . . start.** [Start the timer/stopwatch. Do this as unobtrusively as possible.]

4. After 60 seconds have passed, say: **Stop! Stop writing and put down your pen.** [pause] **Please put this paper back in your folder.**

Notes for group administration
Ensure the paper on which Task 1 was completed has been turned over and a new lined A4 sheet is in place [they're labelled!]. A demonstration of the first few letters of the alphabet, written in lower case, should be made on the board [or show the attached sheet if no board is available].

COPY FAST

Copying a sentence quickly for 2 minutes.

Ensure that a new sheet of paper is ready as before, and place the strip with the printed sentence near the writing paper again. Give a reminder that adjustments to the paper and the sentence are permissible.

1. Say, **Now please take out the sentence strip and the lined piece of paper that says number three, Copy Fast, at the top. Please write your name, age, and date at the top. Then put your pen/pencil on your desk.** [pause – this should be completed quickly]

2. Say: **Now look again at the sentence *The quick brown fox jumps over the lazy dog*** [hold up and read aloud once more]. **This time, I want you to imagine you are writing a test or exam. In an exam, you want to be able to write as much as possible but there is no point in writing so fast that the teacher cannot read what you have written. So, try to write as quickly as possible but make sure that every word is readable. Keep writing the same sentence over and over until I tell you to stop. After one minute I will call out 'time mark;' when you hear this, draw / / as before** [demonstrate or show the attached sheet] **then carry on writing. When I say 'stop,' stop writing immediately, even if you are in the middle of a word.**

3. Say, **Ready** [students should pick up pen/pencil] **. . . start.** [Start the timer/stopwatch. Do this as unobtrusively as possible.]

4. At one minute, say: **Time mark.**

5. At two minutes, say: **Stop! Stop writing and put down your pen.** [pause] **Please put this paper and the sentence strip back in your folder.**

Notes for group administration
Ensure that each student has the next sheet of lined paper ready. Ask them to place the strip with the printed sentence in a comfortable place for copying near the writing paper. Give a reminder that adjustments to the paper and the sentence are permissible. Circulate around the room and check that all the children have the correct papers out ready for copy writing again. Demonstrate on the board how to write the time mark [or show the attached paper].

GRAPHIC SPEED

Drawing Xs in circles for 1 minute.

Place the *Graphic Speed* sheet containing rows of printed circles (doughnuts) on top of the sheets of lined paper in front of the student. Confirm the student has put his/her name, age, and date at the top.

For practice, allow the student to complete the row you have begun (that's the row ABOVE the dotted line). Remind the student about the rules, or re-demonstrate if necessary.

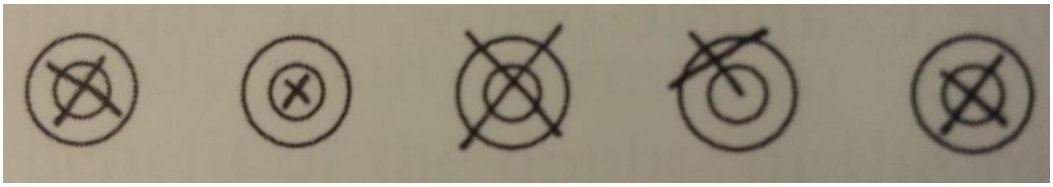
1. Say, **Now please take out the sheet of paper with all the circles on it. Please write your name, age, and date at the top. Then put your pen/pencil on your desk.** [pause – this should be completed quickly]

2. Say, **For this task, you must draw an X in each circle. It must be an X and NOT a cross or addition sign. The two lines must cross within the inner circle and the lines must extend to at least the boundaries of the inner circle, but CANNOT extend beyond the outer circle. Please watch as I model** [model correct and incorrect]**.**

Demonstrate the task to the student, using half of the first row. First, demonstrate how to make a correct X, emphasizing the following rules:

- Drawing an X not a cross (+)
- The two lines must intersect within the inner circle
- The lines must extend at least to the boundaries of the inner circle
- The lines must not extend beyond the outer circle
- Working quickly but accurately

Also show what is not acceptable (for further information, see Appendix D – copied below).



3. **Now it's your turn to practice. Practice completing this task accurately on the circles ABOVE the dotted line on your sheet. Make no other markings!**

For practice, allow the student to complete the row you have begun (that's the row ABOVE the dotted line). Remind the student about the rules, or re-demonstrate if necessary.

4. Say: **Do you have any questions?** [take and respond to any student questions]

5. Say: **Now I want you to draw Xs like this in each circle. Try to do as many as you can, one right after the other, but don't break the rules. Remember to work quickly but carefully. I would like you to do this for one minute. When I say 'start,' you can start. When I say 'stop,' put your pen down immediately.**

6. Say: **There are many circles on this page. Do not expect to fill in all the circles.**

7. Say: **Ready** [students should pick up pen/pencil] **. . . start** [Start the timer/stopwatch. Do this as unobtrusively as possible.].

6. At one minute, say: **Stop! Stop and put down your pen.** [pause] **Please put this paper back in your folder.**

Notes for group administration
Hold up the *Graphic Speed* sheet and ask the students to put this page on their desk [or distribute]. Ask them to check that they have written their name, age, and date at the top. If possible, the *Graphic Speed* sheet should be projected onto a board. Otherwise, draw a line of sample double circles on the board, similar to those on the worksheet and demonstrate the task to the pupils. Afterwards, ask the students to practice using the top row on their paper. Circulate and ensure that all of the students have understood the task correctly and have only filled in the top row. Remind them about the rules, and re-demonstrate as necessary.

FREE WRITING

Writing on the topic of 'My Life' for 10 minutes.

Ensure that a new sheet of lined paper is in place for the student.

1. Say, **Please take out the *My Life* graphic organizer and the lined piece of paper that says number five, Free Writing, at the top. Please write your name, age, and date at the top of BOTH sheets. Then put your pen/pencil on your desk.** [pause – this should be completed quickly]

2. Say: **This is a longer writing task in which you will write about your life. Look at the graphic organizer, it provides some ideas about different topics that you might write about. These might include your family, friends, hobbies, school, etc. What ideas can you think to write about?** [elicit ideas from the class] **Remember, the graphic organizer only provides suggestions; you are not limited to these topics. You may write about only one topic or you may write about more than one topic.**

Take the *My Life* sheet and explain that this is a longer writing task in which the student will write about his/her life. Ask the student to write the title *My Life* on their lined paper and then to put their pen/pencil down. Briefly explain, using the spider diagram on the *My Life* sheet, the different facets/topics of life that they could think about and write about. This might include, for example: family, friends, holidays, school, music, sports, dance, etc. You could elicit some ideas from the student. Be sure he/she understands that these are only suggestions and that he/she can write about just one topic, several topics, or all of the topics. It does not matter what the student writes, but he/she should aim to write continuous text, rather than just produce a list.

If a student has some difficulty and feels his/her life does not include many experiences or things to write about, encourage him/her to write about something else, for example, things he/she dreams of/hopes to do. The student does not have to write about things that really happened or full truths.

3. Say: **I am not looking for beautiful, carefully written work. Please write using your everyday handwriting, nothing very special. As you are writing I will be calling out 'time mark' every two minutes.**

When you hear this, simply mark the point in your writing with this mark // [demonstrate on a sheet of paper or show the attached paper] **and carry on. It will only take you a second and should not disturb your writing or ideas. No matter how much you have written since the last mark, maybe even no words at all, always put in the time mark when you are told. If you need more paper, I will give it to you. I'm now going to let you have a minute to think about what to write and to make some notes and then I'll tell you when to start writing.**

4. Start timing for the 1-minute preparation period. Allow the student to circle the topics on the *My Life* sheet, make brief notes on what he/she might write about if he/she wishes and/or to spend the time thinking about what he/she will write about. Walk around the classroom to make sure students are ONLY writing on the graphic organizer. After 1 minute, stop timing. Say: **Stop! Now get your lined paper out and ready.**

5. Ask the student to get ready to write on the lined paper, beneath the title that they have already written. When they are ready, say: **Ready . . . now start writing** [Start the timer/stopwatch. Do this as unobtrusively as possible.].

If a student stops writing or indicates that he/she is done, say: **What else can you tell me about your life? Please continue writing until my timer goes off.** [Provide at least 2 separate prompts to the student, then, just let him/her sit quietly until time expires.]

6. After 2, 4, 6, and 8 minutes have passed, say: **Time mark.**

7. At the end of the 10-minute period, say: **Stop! Stop and put down your pen, even if you are in the middle of a sentence.** [pause] **Please put this paper back in your folder.**

Notes for group administration
Hold up the *My Life* sheet and ask the students to find this from their papers [or distribute]. Ask them to check that they have written their name, age, and date on it. Ensure that each student also has a new sheet of lined paper ready for use.

If possible, the *My Life* sheet should be projected onto a board. Otherwise, create a similar spider diagram on the board and explain the different facets of life that the students could think about and write about. The group setting lends itself well to a short discussion and exchange of ideas. Ask the students to write the title at the top of the page and then to put their pens/pencils down. Allow the students one minute thinking/preparation time.

During the writing time, remember to keep circulating around the room, and while watching the time, ensure students are writing and marking appropriately. Be sure they stop at the end of the 10-minute period.

Appendix I

Protocol for Distress

Protocol for Distress

An Examination of the Structural Relationships of Adolescent Writing: Implications of the Simple View of Writing

1. Pull the student aside discretely.
2. Tell the student about your concerns.
3. Check on how the student is feeling.
4. If the student is experiencing high anxiety or stress, stay with the student until another adult can be reached (e.g., school counselor, psychologist, principal, assistant principal, parent/guardian, etc.).
5. Encourage the student to tell his/her counselor about how he/she is feeling.
6. Contact the student's parents/guardians as the situation requires.
7. Provide the student and parents/guardians with techniques for handling anxiety and stress.

Appendix J

Reliability Form for Assessment Check-Out

Reliability Check-Out

Research Assistant:	Observer/Rater:
Date:	Attempt #:

Directions. Observe assessment administration to determine research assistant's readiness to administer assessments in field by completing the following reliability checklist to indicate the extent to which the components were administered; write detailed notes regarding other components observed. Provide feedback to the research assistant after completion of each assessment.

	Yes 1	No 0	N/A	Observation notes:
1. Starting Testing				
a. You're beginning a new testing period with a student, what do you have the student complete first? (*Ans. Assent Form*)				
b. Show me the first set of directions that you'll use. *(Ans. Beginning Instructions)*				
2. WIAT				
SPELLING				
a. How many items are you administering? (*Ans. All*)				
b. Pronounces all sounds/words accurately?				
SENTENCE BUILDING				
a. Reads directions accurately (#1-3)?				
SENTENCE COMBINING				
a. Reads directions accurately (#1-3)?				
PLANNING AND ESSAY				
a. How long do students have to plan their writing? (A*ns. 5 min*)				
b. Reads directions accurately?				
c. How long do students have to write their essay? (*Ans. 10 min*)				
d. How many words must a student minimally write on the essay subtest? *(Ans. 30 words)*				
e. True/False . . . you can provide students with assistance on all of the WIAT subtests? *(Ans. False)*				
3. *BRIEF-SR*				

a. Reads directions accurately (#1-7)?				
b. Reads only the statement number and the statement itself starting with #6?				
4. *DASH*				
a. The DASH consists of how many subtests? *(Ans. 5)*				
b. The Copy Best task is administered for how many minutes? *(Ans. 2)*				
c. In the Alphabet Writing task, do students write letters in capital or lowercase letters? *(Ans. Lowercase)*				
d. The Copy Fast task is administered for how many minutes? *(Ans. 2)*				
e. Accurately provides a correct example and non-example for completing the Graphic Speed task?				
f. How long do students have to write their *My Life* essay? *(Ans. 10 min)*				
g. When you say "time mark," what should students do? *(Ans. //)*				
5. *WISC-V*				
a. Reads directions accurately (Digit Span Forward)?				
b. Correctly observes discontinue rule (Digit Span Forward)?				
c. Reads each trial verbatim at the rate of one digit per second?				
d. Records verbatim the student's response?				
e. Accurately totals student raw score (Digit Span Forward)?				
f. Accurately totals student LDS score for Digit Span Forward?				
g. Reads directions accurately (Digit Span Backward)?				
h. Correctly observes discontinue rule (Digit Span Backward)?				
i. Reads each trial verbatim at the rate of one digit per second?				
j. Records verbatim the student's response?				

k. Accurately totals student raw score (Digit Span Backward)?				
l. Accurately totals student LDS score for Digit Span Backward?				
m. Reads directions accurately (Digit Span Sequencing)?				
n. Correctly observes discontinue rule (Digit Span Sequencing)?				
o. Reads each trial verbatim at the rate of one digit per second?				
p. Records verbatim the student's response?				
q. Accurately totals student raw score (Digit Span Sequencing)?				
r. Accurately totals student LDS score for Digit Span Sequencing?				
s. Picture Span – Which sample item do you begin with? *(Ans. B)*				
t. Reads directions accurately (Picture Span)?				
u. Correctly observes discontinue rule (Picture Span)?				
v. True/False . . . In Picture Span, the child receives credit if all of the correct images are recalled, even if they are not recalled in the correct order? *(Ans. True)*				
w. Exposes stimulus page for 5 seconds?				
x. Records verbatim the student's response?				
y. Accurately totals student raw score (Picture Span)?				
z. Accurately totals student LPSs score for Picture Span?				
aa. Accurately totals student LPSr score for Picture Span?				
bb. Reads directions accurately (Letter-Number Sequencing)?				
cc. Correctly observes discontinue rule (Letter-Number Sequencing)?				
dd. Reads each trial verbatim at the rate of one letter/digit per second?				
ee. Records verbatim the student's response?				

ff. Accurately totals student raw score (Letter-Number Sequencing)?				
gg. Accurately totals student LLNs score for Letter-Number Sequencing?				
hh. True/False . . . the child receives credit if all the numbers and letters are recalled in the correct order, even if the letters are recalled before the numbers? *(Ans. True)*				
6. *End of Testing Session*				
a. After your testing session has ended, what should you do? *(Ans. Record assessments administered and completed on student folder checklist, checks that assessments are complete, and has another member of the research team recheck assessments)*				

TOTAL RELIABILITY:	_____ / _____	_____%	PASS / RETRY

*Maximum points = 55

Appendix K

Fidelity Checklist – Individual

Fidelity Check [in field] – Individual Administration

Research Assistant:	Observer/Rater:
Date:	Attempt #:
Class:	Period:
Start Time:	End Time:

Directions. Observe assessment administration to ensure that the research assistant is administering assessments as trained, by completing the following fidelity checklist to indicate the extent to which the components were administered; write detailed notes regarding other components observed. Provide feedback (as needed) to the research assistant at the conclusion of the observation.

	Yes 1	No 0	N/A	Observation notes:
1. Preparedness				
a. Pencils/Pens				
b. Directions for administration				
c. Picture Span Stimulus Book				
d. Student folders – WISC packet				
e. On time				
f. Organized				
g. Confident				
2. Starting Testing				
a. Has students complete assent form (if first administration period).				
b. Reads the beginning instructions.				
c. Pauses for questions.				
d. Takes and responds to student questions.				
e. Effectively manages student behavior.				
f. Follows assigned class order of assessments.				
3. *WISC-V*				
DIGIT SPAN FORWARD				
a. Reads directions accurately.				
b. Reads each trial once and only once.				
c. Correctly observes discontinue rule.				
d. Reads each trial verbatim at the rate of one digit per second.				

e. Records verbatim the student's response.				
f. Accurately sums student score.				
g. Administers Backward and Sequencing tasks regardless of student performance on Forward.				
DIGIT SPAN BACKWARD				
a. Reads directions accurately.				
b. Reads each trial once and only once.				
c. Provides sample trial items.				
d. Correctly observes discontinue rule.				
e. Reads each trial verbatim at the rate of one digit per second.				
f. Records verbatim the student's response.				
g. Accurately sums student score.				
DIGIT SPAN SEQUENCING				
a. Reads directions accurately.				
b. Reads each trial once and only once.				
c. Provides sample trial items.				
d. Correctly observes discontinue rule.				
e. Reads each trial verbatim at the rate of one digit per second.				
f. Records verbatim the student's response.				
g. Accurately sums student score.				
PICTURE WORD				
a. Reads directions accurately.				
b. Begins with sample item B.				
c. Provides sample trial items.				
d. Uses items 4 and 5 to reteach as needed.				
e. Exposes stimulus page only one time (except for sample and teaching items).				
f. Exposes stimulus page for 5 seconds.				
g. Applies reverse rule appropriately as needed.				

h. Correctly observes discontinue rule.				
i. Records verbatim the student's response.				
j. Accurately sums student score.				
LETTER-NUMBER SEQUENCING				
a. Reads directions accurately.				
b. Reads each trial once and only once.				
c. Provides sample trial items.				
d. Correctly observes discontinue rule.				
e. Reads each trial verbatim at the rate of one letter/digit per second.				
f. Records verbatim the student's response.				
g. Accurately sums student score.				
h. Provides credit if all the numbers and letters are recalled in the correct order, even if the letters are recalled before the numbers.				
4. *End of Testing Session*				
a. Collects students' assessment materials and places in the student's folder or has the student place all materials back in his/her folder.				
b. Records completion of assessment(s) on student folder and records initials for administering.				

TOTAL RELIABILITY:	_____ / _____	_____%	PASS / RETRY

*Maximum points = 54

Appendix L

Fidelity Checklist – Group

Fidelity Check [in field] – Group Administration

Research Assistant:	Observer/Rater:
Date:	Attempt #:
Class:	Period:
Start Time:	End Time:

Directions. Observe assessment administration to ensure that the research assistant is administering assessments as trained, by completing the following fidelity checklist to indicate the extent to which the components were administered; write detailed notes regarding other components observed. Provide feedback (as needed) to the research assistant at the conclusion of the observation.

	Yes 1	No 0	N/A	Observation notes:
1. Preparedness				
a. Timer				
b. Pencils/Pens				
c. Directions for administration				
d. Teacher copy of the tasks				
e. Student folders				
f. On time				
g. Organized				
h. Confident				
2. Starting Testing				
a. Distributes student folders.				
b. Has students complete assent form (if first administration period).				
c. Reads the beginning instructions.				
d. Pauses for questions.				
e. Takes and responds to student questions.				
f. Effectively manages student behavior.				
g. Follows assigned class order of assessments.				
3. WIAT				
SPELLING				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				

d. Reads each word twice and uses in a sentence.				
e. Administers all items.				
f. Pronounces all sounds/words accurately.				
g. If a student asks for assistance, says, “I cannot help you. Just do the best you can.”				
h. Has student return paper(s) to folder.				
SENTENCE BUILDING				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Emphasizes crossing out errors.				
e. Reads each set of sentences aloud.				
f. Provides appropriate wait time.				
g. If a student asks for assistance, says, “I cannot help you. Just do the best you can.”				
h. Non-numeric symbols – says, “Please write out the words instead of using symbols or abbreviations.”				
i. If student uses target word within a title or as the subject or object of the sentence – says, “Please write a new sentence that uses this word in a different way.”				
j. Has student return paper(s) to folder.				
SENTENCE COMBINING				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Emphasizes crossing out errors.				
e. Reads each word aloud.				
f. Provides appropriate wait time.				
g. If a student asks for assistance, says, “I cannot help you. Just do the best you can.”				
h. Non-numeric symbols – says, “Please write out the words				

instead of using symbols or abbreviations.”				
i. Has student return paper(s) to folder.				
PLANNING AND ESSAY				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Pauses for questions.				
e. Takes and responds to student questions.				
f. Provides 5 minutes for planning.				
g. Keeps time accurately for planning.				
h. Says, “You may begin planning.”				
i. Says, “Your planning period has ended.”				
j. Provides 10 minutes for writing.				
k. Keeps time accurately for writing.				
l. Says, “You may now begin writing.”				
m. Tells students they have 5 and then 1 minute remaining to write.				
n. Encourages students to write more or to keep writing if they finish early.				
o. If a student asks for assistance, says, “I cannot help you. Just do the best you can.”				
p. Says, “Please stop.”				
q. Has student return paper(s) to folder.				
4. *BRIEF-SR*				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Pauses for questions.				
e. Takes and responds to student questions.				

f. Reads the scale for #1-5.				
g. Reads only the statement number and the statement itself starting with #6 to the end.				
h. Provides appropriate wait time between items.				
i. Has student return paper(s) to folder.				
5. *DASH*				
COPY BEST				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Has students fill in name, hand dominance, and pen/pencil on DASH record form and then put away in folder.				
e. Pauses for questions.				
f. Takes and responds to student questions.				
g. Demonstrates by pointing, when appropriate, to sentence strip.				
h. Demonstrates time mark.				
i. Keeps time accurately.				
j. Says “Ready . . . Start.”				
k. Says “time mark” at 1 minute.				
l. Says “Stop! Stop writing and put down your pen.”				
m. Has student return paper(s) to folder.				
ALPHABET WRITING				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately				
c. Demonstrates by pointing when/if appropriate.				
d. Demonstrates use of lowercase letters.				
e. Keeps time accurately.				
f. Says “Ready . . . Start.”				
g. Says “Stop! Stop writing and put down your pen.”				

h. Has student return paper(s) to folder.				
COPY FAST				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Demonstrates by pointing, when appropriate, to sentence strip.				
e. Demonstrates time mark.				
f. Keeps time accurately.				
g. Says “Ready . . . Start.”				
h. Says “time mark” at 1 minute.				
i. Says “Stop! Stop writing and put down your pen.”				
j. Has student return paper(s) to folder.				
GRAPHIC SPEED				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				
c. Demonstrates by pointing when/if appropriate.				
d. Accurately provides correct examples and non-examples for completing the Graphic Speed task.				
e. Provides students time to practice.				
f. Checks student practice items.				
g. Pauses for questions.				
h. Takes and responds to student questions.				
i. Keeps time accurately.				
j. Says “Ready . . . Start.”				
k. Says “Stop! Stop writing and put down your pen.”				
l. Has student return paper(s) to folder.				
FREE WRITING				
a. Has student take appropriate paper(s) out of folder.				
b. Reads directions accurately.				

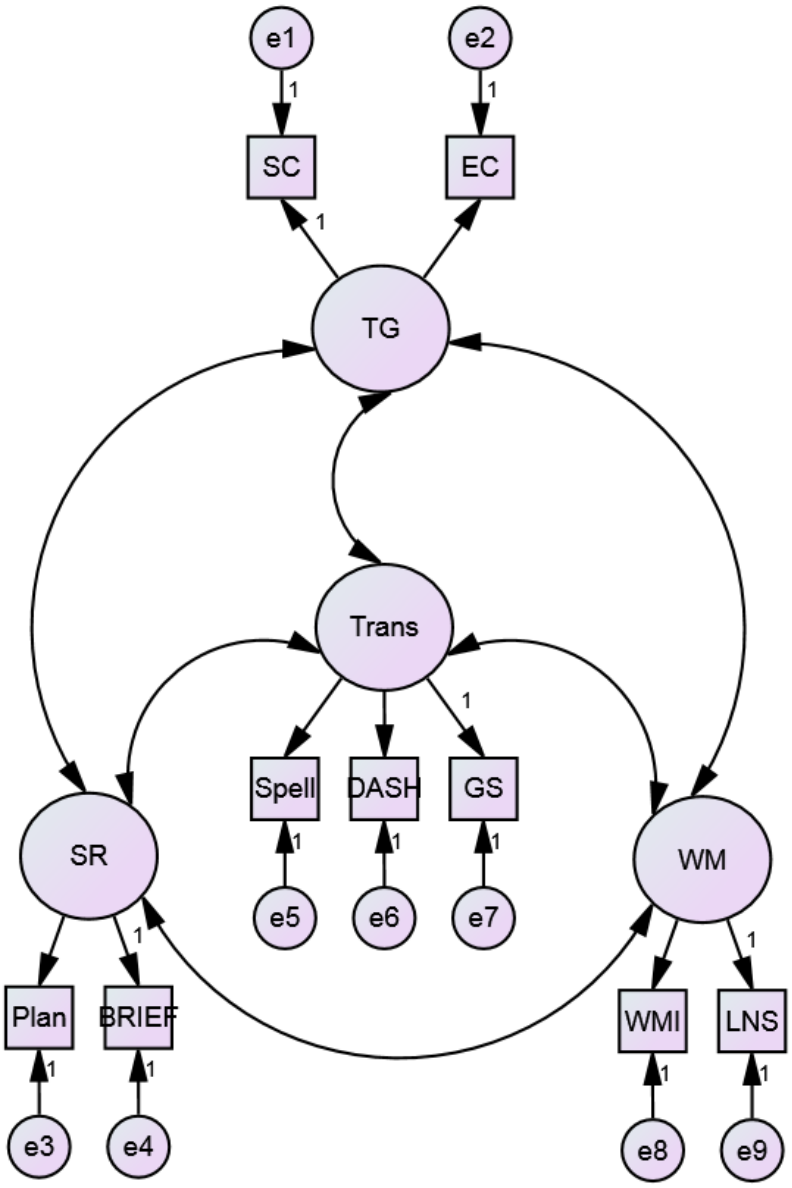
c. Demonstrates by pointing when/if appropriate.				
d. Models how to use the graphic organizer.				
e. Takes and responds to students' suggestions.				
f. Provides 1 minute for planning.				
g. Keeps time accurately for planning.				
h. Says, "Now I'm going to let you . . . ."				
i. Says, "Stop! Now get your lined paper out and ready."				
j. Provides 10 minutes for writing.				
k. Keeps time accurately for writing.				
l. Says, "Ready . . . now start writing."				
m. Encourages students to write more or to keep writing if they finish early.				
n. Says "time mark" every 2 minutes.				
o. Says "Stop! Stop writing and put down your pen, even if you are in the middle of a sentence."				
p. Has student return paper(s) to folder.				
6. *End of Testing Session*				
a. Collects students' assessment materials and places in the student's folder or has the student place all materials back in his/her folder.				
b. Records completion of assessment(s) on student folder and records initials for administering.				

TOTAL RELIABILITY:	_____ / _____	_____%	PASS / RETRY

*Maximum points = 129

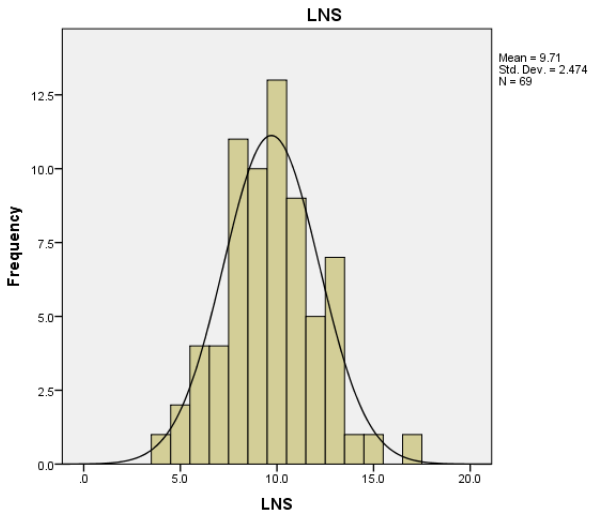
Appendix M

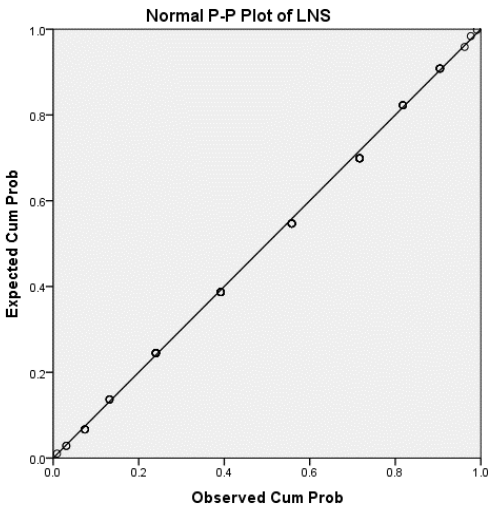
Hypothesized 4-Factor Measurement Model

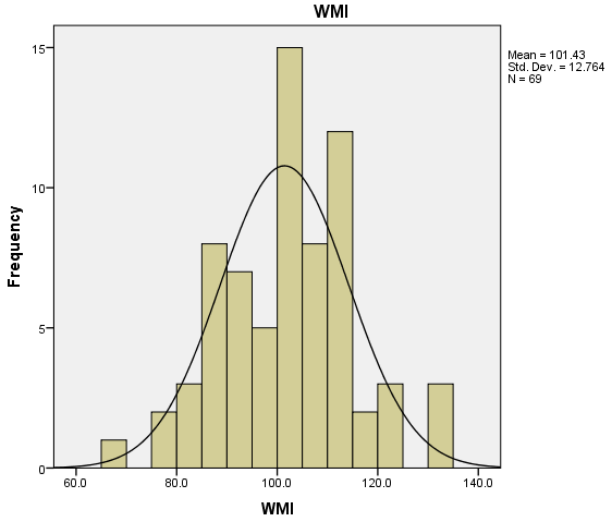


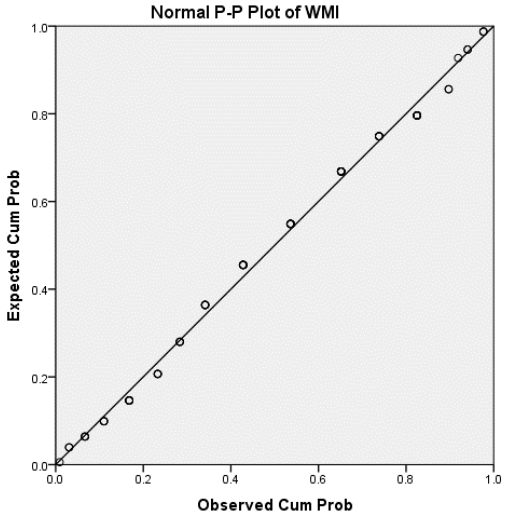
Appendix N

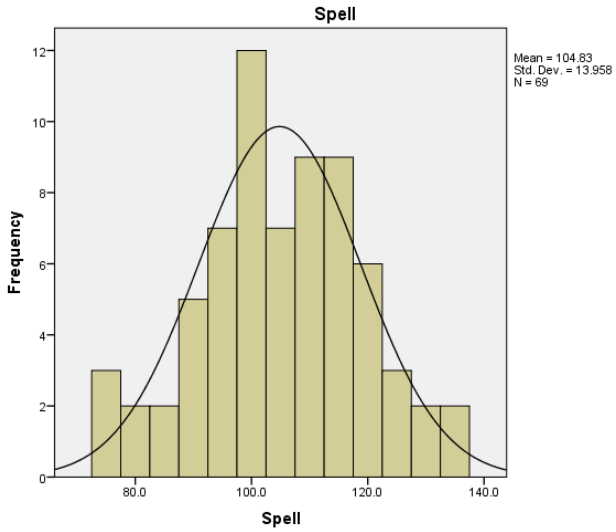
Histograms and P-P Plots

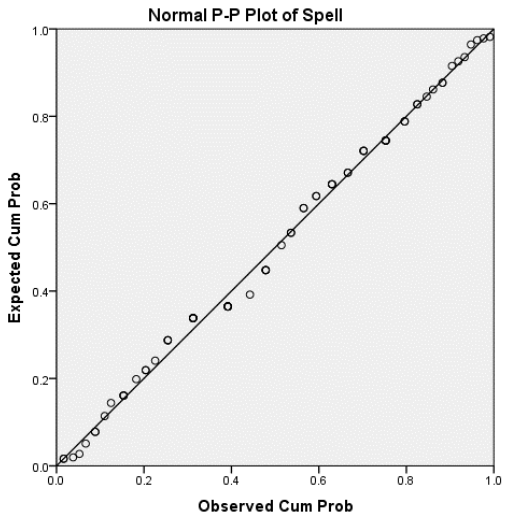


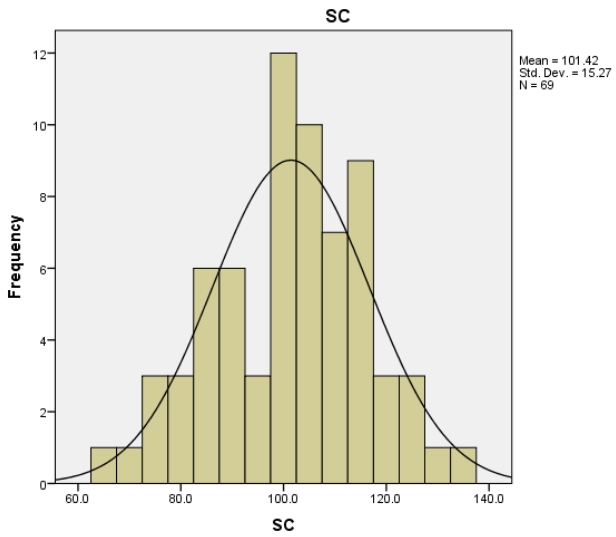


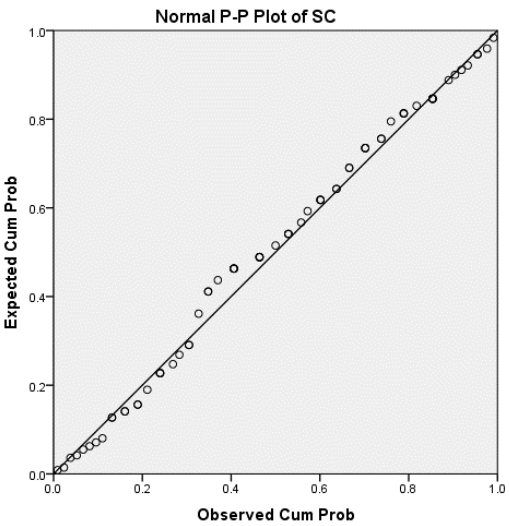


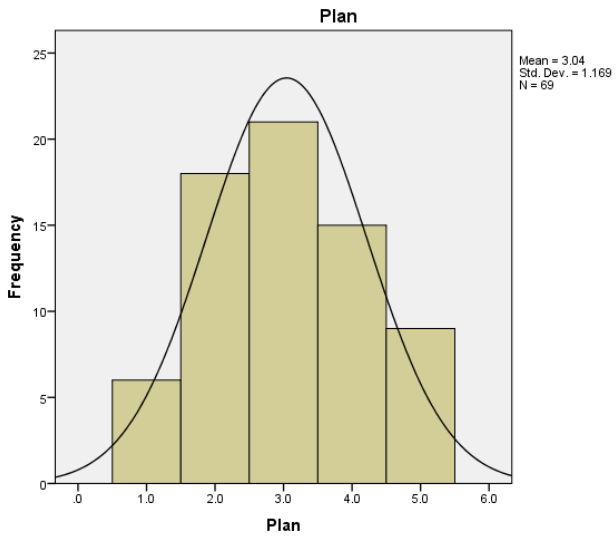


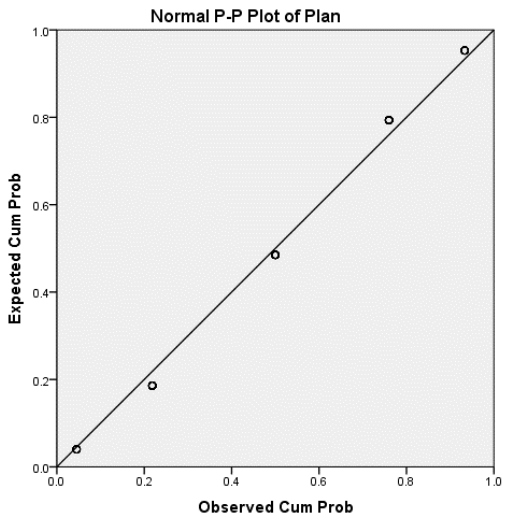

Spell
Mean = 104.83
Std. Dev. = 13.958
N = 69
Frequency
Spell

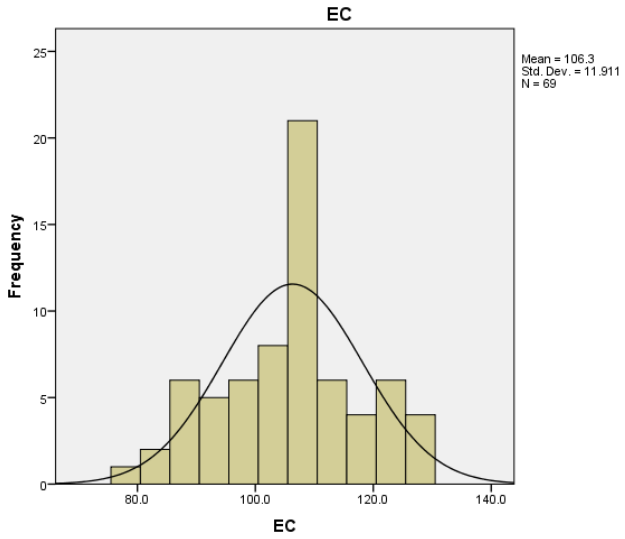

Normal P-P Plot of Spell
Expected Cum Prob
Observed Cum Prob

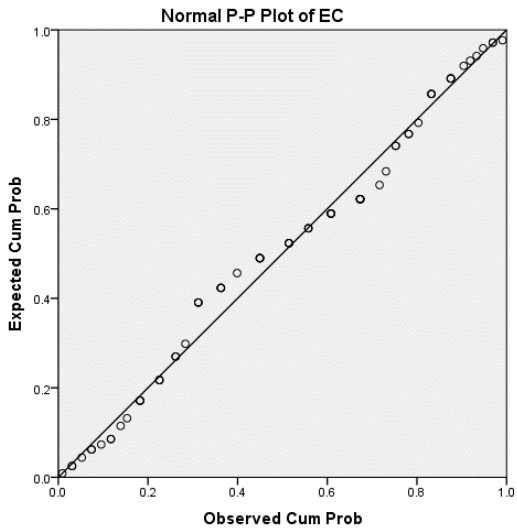

SC
Mean = 101.42
Std. Dev. = 15.27
N = 69
Frequency
SC

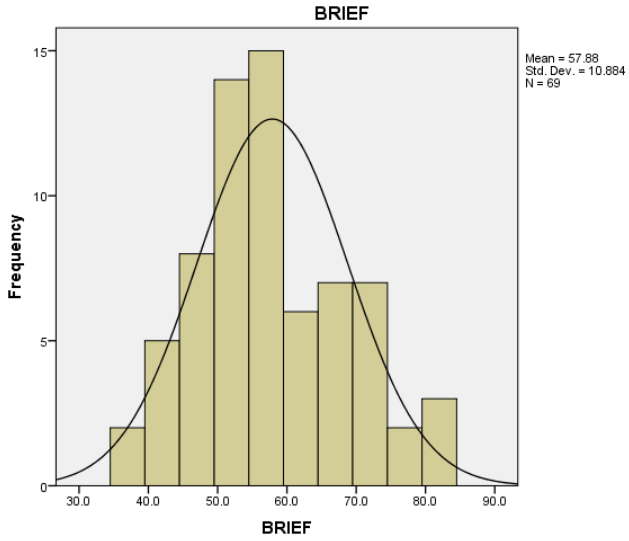

Normal P-P Plot of SC
Expected Cum Prob
Observed Cum Prob


Plan
Mean = 3.04
Std. Dev. = 1.169
N = 69
Frequency
Plan


Normal P-P Plot of Plan
Expected Cum Prob
Observed Cum Prob


EC
Mean = 106.3
Std. Dev. = 11.911
N = 69
Frequency
EC


Normal P-P Plot of EC
Expected Cum Prob
Observed Cum Prob


BRIEF
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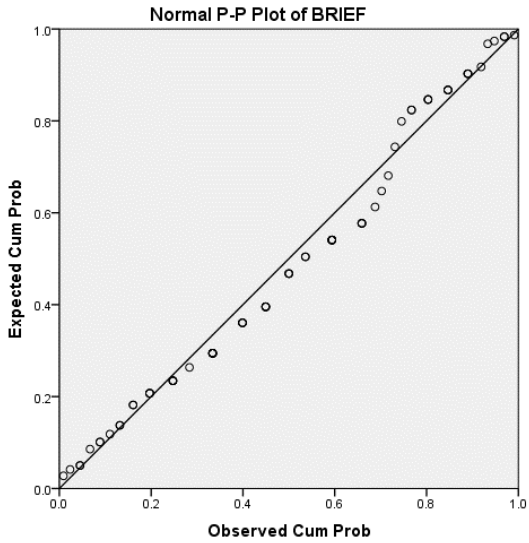
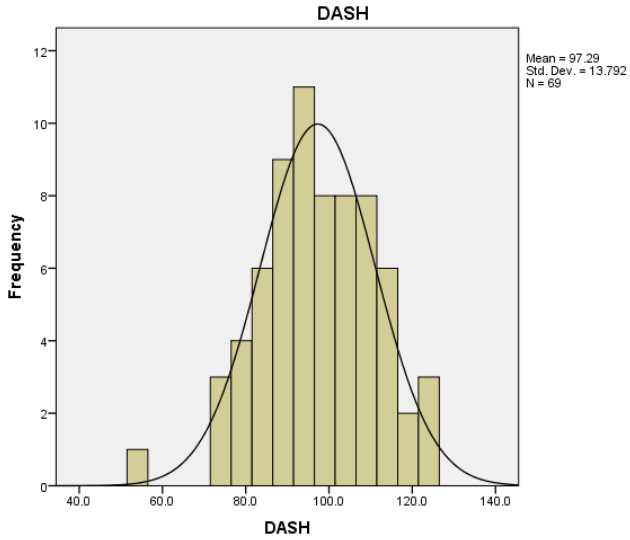
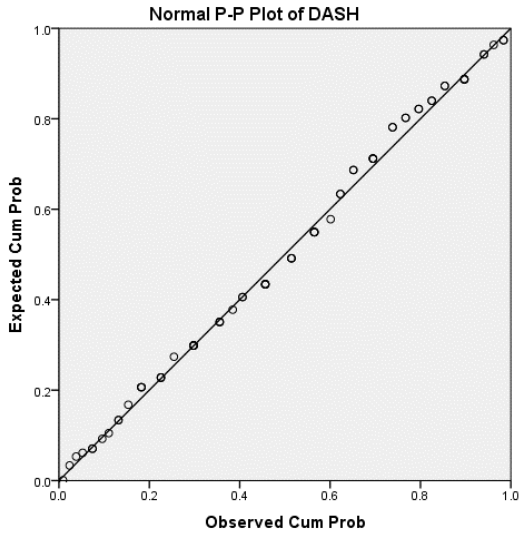
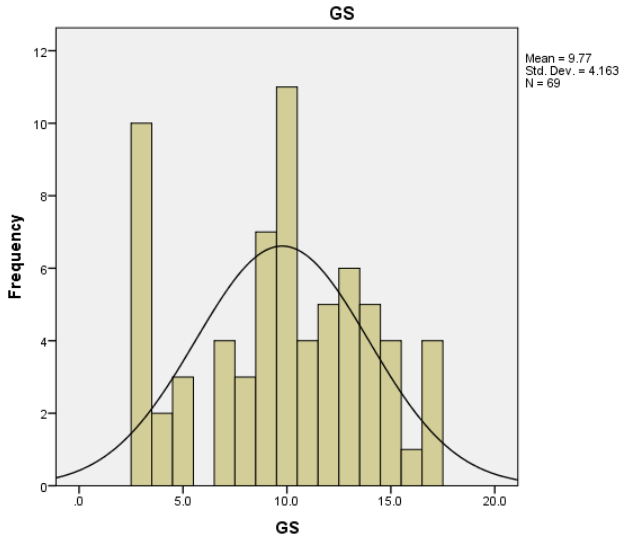
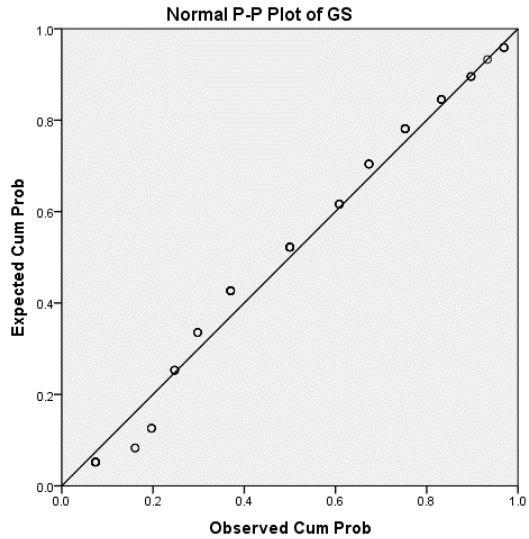
Std. Dev. = 10.884
N = 69
Frequency
BRIEF

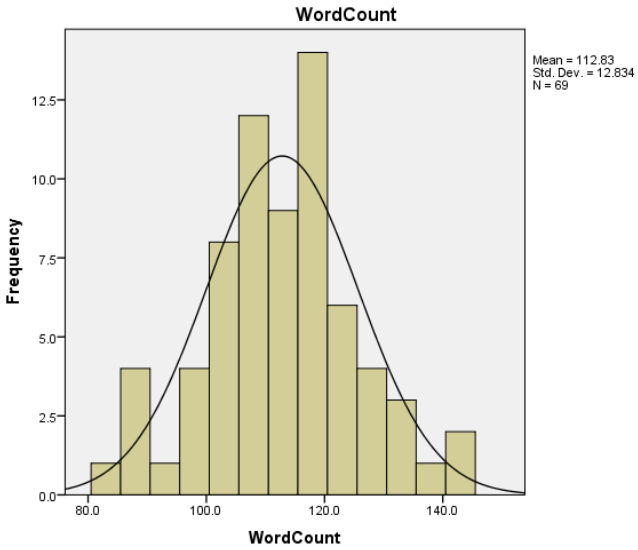

Normal P-P Plot of BRIEF
Expected Cum Prob
Observed Cum Prob

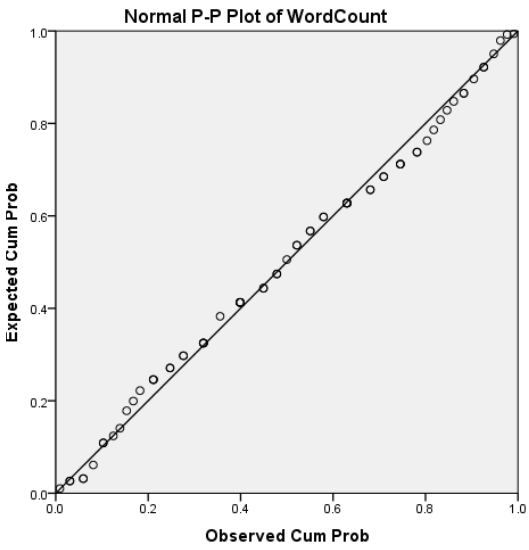

DASH
Mean = 97.29
Std. Dev. = 13.792
N = 69
Frequency
DASH

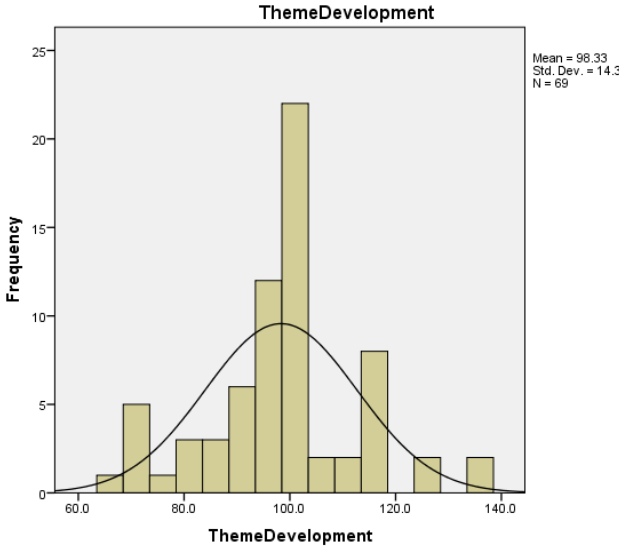

Normal P-P Plot of DASH
Expected Cum Prob
Observed Cum Prob

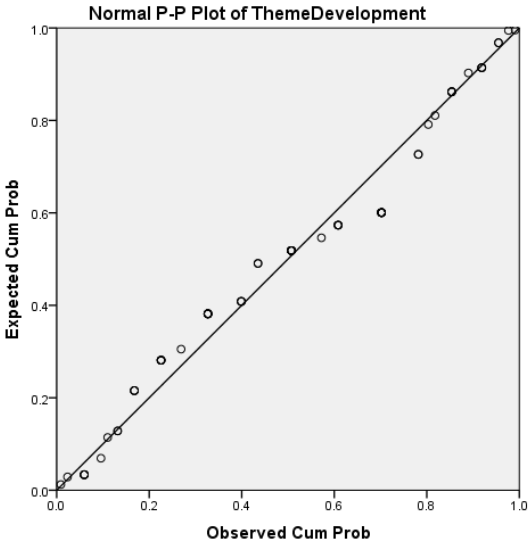

GS
Mean = 9.77
Std. Dev. = 4.163
N = 69
Frequency
GS

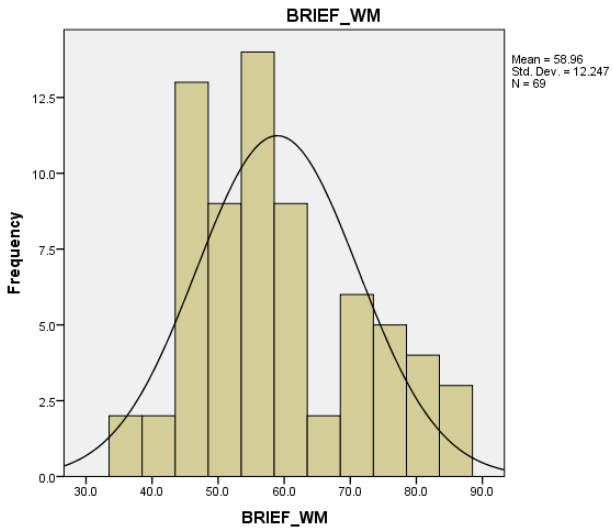

Normal P-P Plot of GS
Expected Cum Prob
Observed Cum Prob

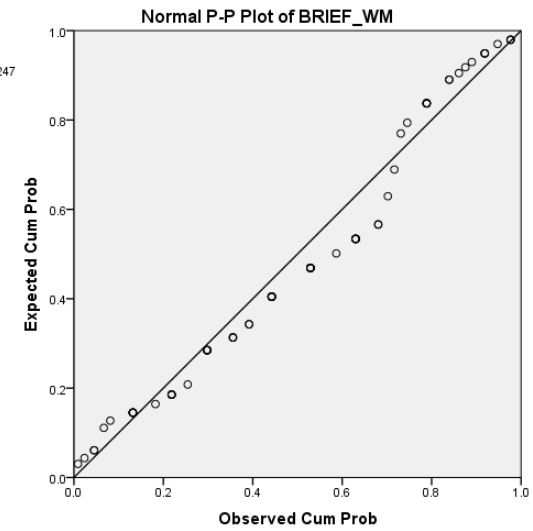

WordCount
Mean = 112.83
Std. Dev. = 12.834
N = 69
Frequency
WordCount

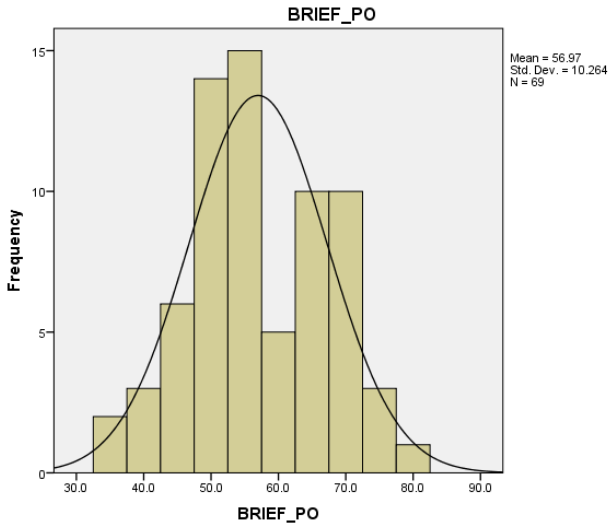

Normal P-P Plot of WordCount
Expected Cum Prob
Observed Cum Prob

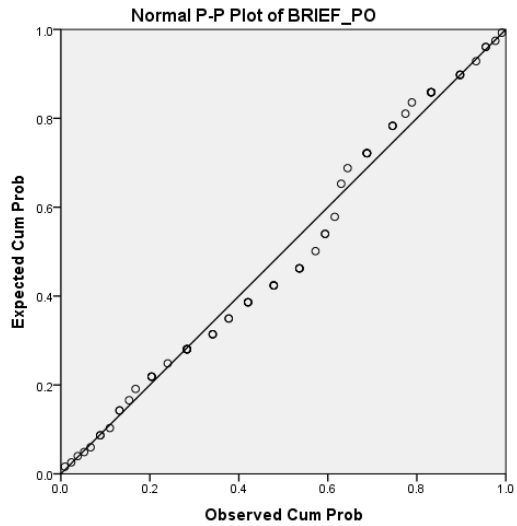

ThemeDevelopment
Mean = 98.33
Std. Dev. = 14.3
N = 69
Frequency
ThemeDevelopment

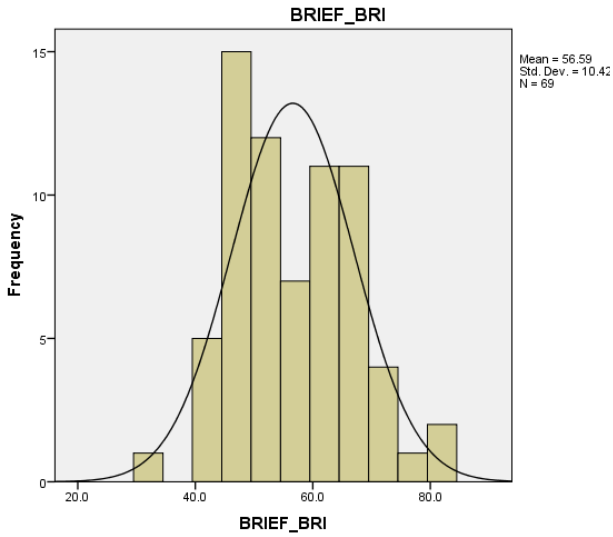

Normal P-P Plot of ThemeDevelopment
Expected Cum Prob
Observed Cum Prob

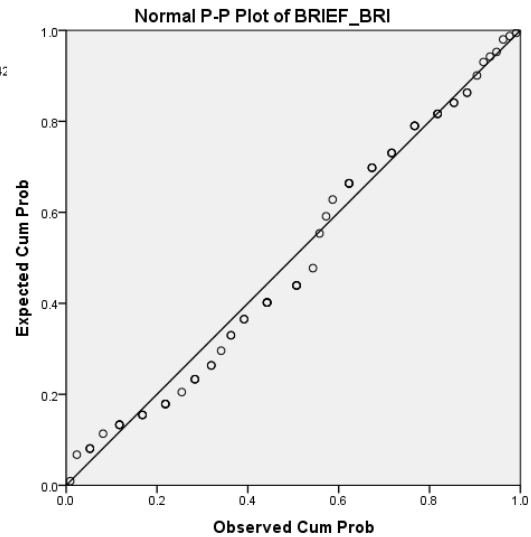

BRIEF_WM
Mean = 58.96
Std. Dev. = 12.247
N = 69
Frequency
BRIEF_WM

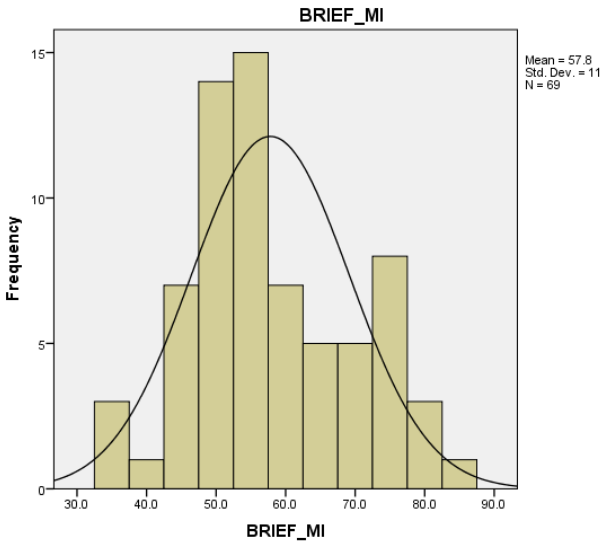

Normal P-P Plot of BRIEF_WM
Expected Cum Prob
Observed Cum Prob

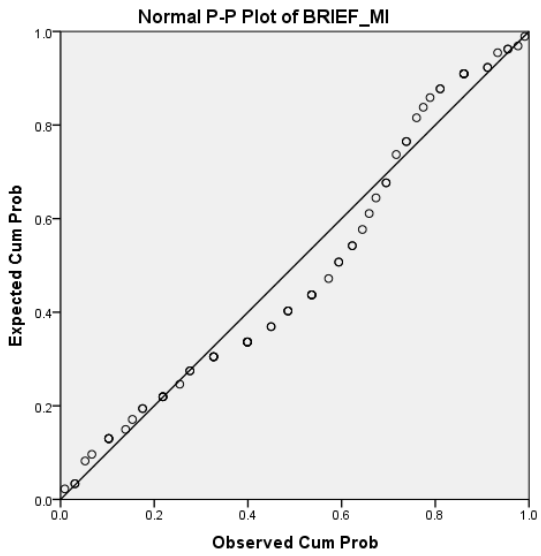

BRIEF_PO
Mean = 56.97
Std. Dev. = 10.264
N = 69
Frequency
BRIEF_PO


Normal P-P Plot of BRIEF_PO
Expected Cum Prob
Observed Cum Prob


BRIEF_BRI
Mean = 56.59
Std. Dev. = 10.42
N = 69
Frequency
BRIEF_BRI

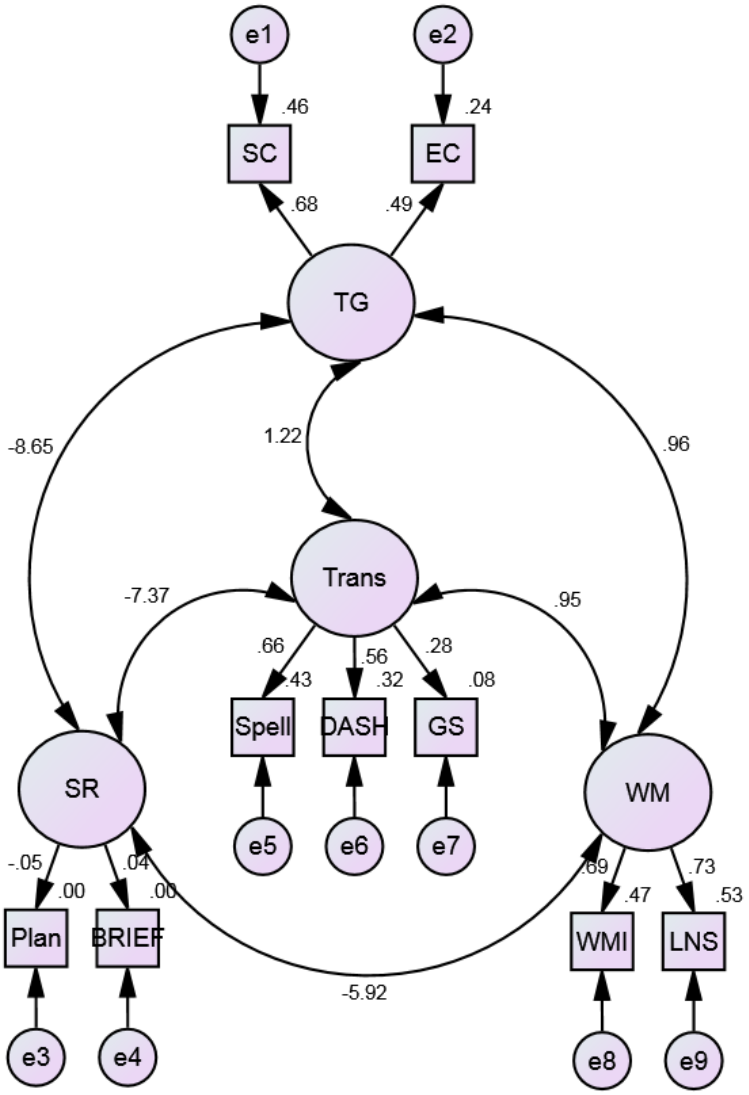

Normal P-P Plot of BRIEF_BRI
Expected Cum Prob
Observed Cum Prob


BRIEF_MI
Mean = 57.8
Std. Dev. = 11
N = 69
Frequency
15
10
5
0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
BRIEF_MI


Normal P-P Plot of BRIEF_MI
Expected Cum Prob
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob

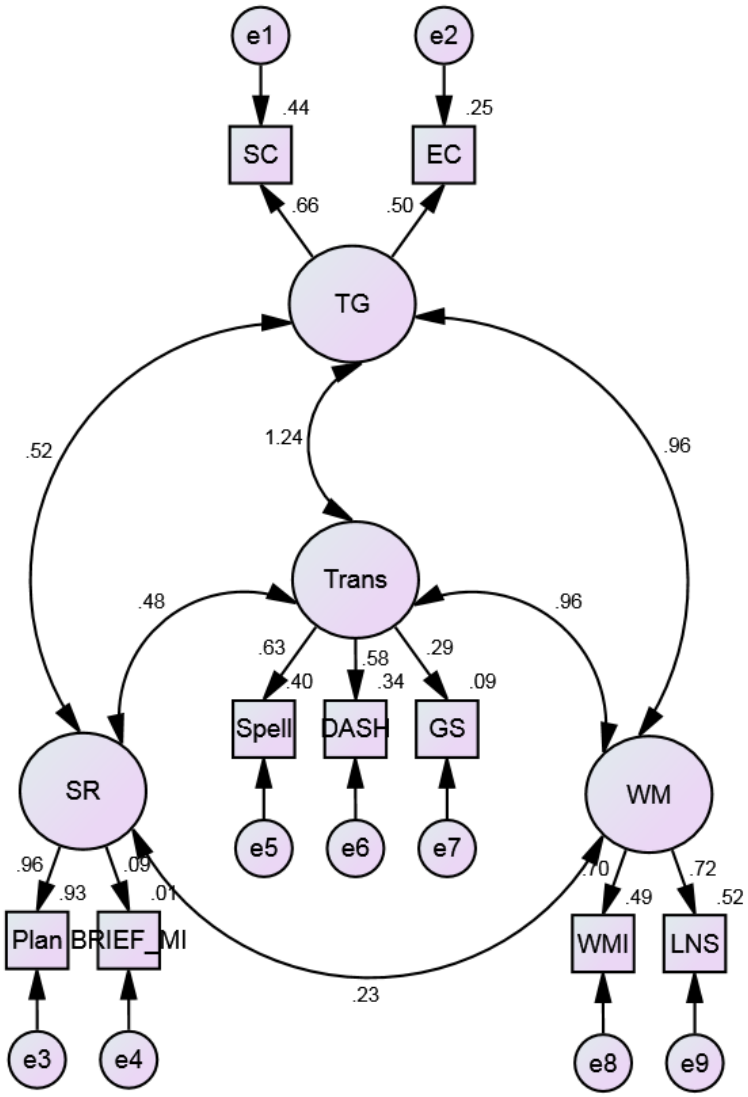
Appendix O

4-Factor Measurement Model with Standardized Estimates – GEC



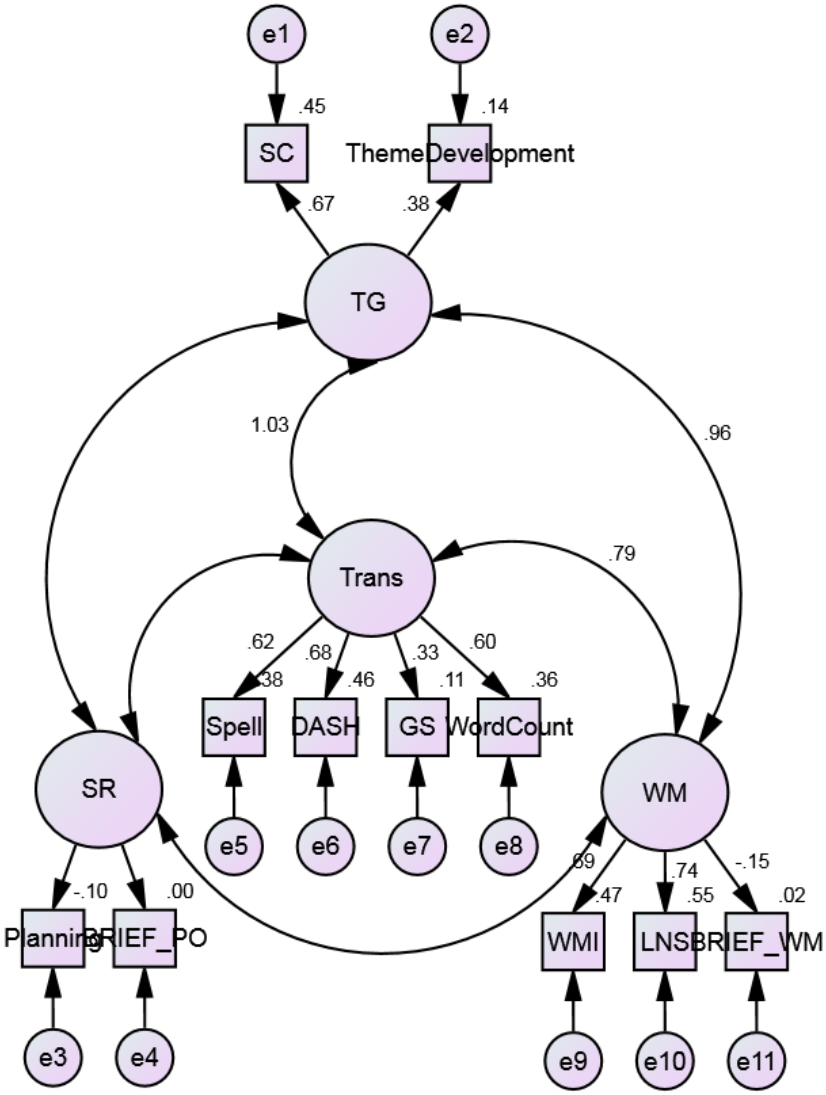
Appendix P

4-Factor Measurement Model with Standardized Estimates – MI



Appendix Q

4-Factor Measurement Model with Standardized Estimates – Component Variables



Appendix R

Dissertation Summary Report

Dissertation Summary Report:
An Examination of the Structural Relationships of Adolescent Writing: Implications of the Simple View of Writing

Apryl L. Poch, Ph.D.

During the 2015-2016 academic year, Truman High School and the University of Missouri collaborated on a research study that examined adolescent writing.

WHY WAS THIS STUDY COMPLETED?

The purpose of this study was to test a model of writing known as the Simple View of Writing at the high school level. This model suggests that transcription level skills (like spelling and handwriting) and self-regulatory abilities (like organizing and planning) are necessary for generating longer text (like paragraphs and essays). However, these skills are all constrained by what an individual can hold in mind as he/she writes.

WHO PARTICIPATED IN THIS STUDY?

Sixty-nine 9th grade students in one teacher's classroom at Truman High School participated in the study. Approximately 57% of students were female, 43% male; 57% were White and 43% of another race (2.90% Asian, 18.84% Black, 13.04% Hispanic, and 8.70% Multiracial); and 49% received a free or reduced price lunch. Students ranged in age from 13–16 years of age; the mean age of students, was 14.38 years. Two students received special education services and one student received services under Section 504 of the American's with Disabilities Act. No students were identified as English language learners.

HOW WERE STUDENTS ASSESSED?

All students completed the following assessments between November and December 2015:

~ Wechsler Individual Achievement Test–III (WIAT-III) – standardized achievement test

- Spelling
- Sentence Building
- Sentence Combining
- Essay Composition

~ Detailed Assessment of Speed of Handwriting (DASH) – standardized handwriting test

- Copy Best

- Alphabet Writing
- Copy Fast
- Graphic Speed
- Free Writing

~ Planning – blank sheet of paper for 5 minute planning period before Essay Composition subtest; assessed using a holistic, qualitative rubric

~ Behavior Rating Inventory of Executive Function–Self-Report (BRIEF-SR) – standardized student self-report questionnaire on difficulties with self-regulatory executive functions

~ Wechsler Intelligence Scale for Children–V (WISC-V) – standardized test of intellectual ability
- Digit Span Forward, Backward, and Sequencing
- Picture Span
- Letter-Number Sequencing (from WISC-V)

WHAT WERE THE RESULTS?

Writing is multi-dimensional at the high school level – cognitive and writing skills are not separate, but rather they work together.

Two factors emerged from the data:

- A combined transcription and memory factor which appeared to represent basic writing skills at the letter, word, and sentence level, along with cognitive skills specific to attention (staying focused), shifting attention between tasks, and executive functioning (measures loading on this factor = Spelling, Sentence Composition, the Working Memory Index [Digit Span + Picture Span], Letter Number Sequencing, and the BRIEF-SR).
- A text generation factor that appeared to capture an element of writing fluency, based on the ability to vary text production under timed constraints (measures loading on this factor = Essay Composition, DASH [except Graphic Speed], and the Planning measure).

Struggling writers performed significantly lower on all measures except the BRIEF-SR and the Graphic Speed subtest of the DASH (which assesses visual-spatial abilities).

WHAT ARE THE IMPLICATIONS FOR PRACTICE?

This study can only suggest possible relationships between the components of transcription, text generation, self-regulation executive functions, and working memory. It is a snapshot of expository writing. However, it is possible that providing intervention and instructional supports for struggling writers in sentence writing and sentence combining will scaffold writing while lessening the constraints of memory and executive

functions. Struggling writers in this study experienced the greatest difficulty with sentence level writing skills.

CONTACT INFORMATION

Thank you for the opportunity to have worked with the 9th grade students at Truman High School. Should you have any questions, or should you desire further information or collaboration on writing, please do not hesitate to contact me.

Apryl L. Poch: ALPTY9@mail.missouri.edu or 716-200-7194

VITA

Apryl Poch is a doctoral candidate at the University of Missouri. She possesses a B.A. (Magna Cum Laude with disciplinary honors in English and education) in Adolescent/Special Education and English from Keuka College (2006), an M.A. in English with a focus in Victorian British literature from the University of Rochester (2007) along with a graduate certificate in Gender and Women's Studies from the Susan B. Anthony Institute, and a Ph.D. in Special Education with a focus in learning disabilities from the University of Missouri (2016).

Prior to pursuing doctoral studies, Apryl was a home instruction teacher for a student with a disability and a student tutor for middle and high school students who had been suspended from school (2007-2008). For the following four years (2008-2012), Apryl was a high school special education teacher for the same district, Springville Griffith Institute, in Springville, New York.

Apryl's research is focused on understanding and supporting the writing difficulties of high school students with identified learning disabilities. She is also interested in identifying ways to help prevent the dropout rate of students with disabilities.