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FACTORS AFFECTING THE READING COMPREHENSION OF SECONDARY
STUDENTS WITH DISABILITIES

A Dissertation Presented
To
The Faculty of the School of Education
Learning and Instruction Department

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

By
Karen L. Sanford
San Francisco
May 2015

THE UNIVERSITY OF SAN FRANCISCO

Dissertation Abstract

Factors that Affect the Reading Comprehension of Secondary Students with Disabilities

Thirty-million Americans are considered functionally illiterate and are unable to complete job applications or understand health care forms. Fifty-seven percent of adults with disabilities believe that job opportunities are limited due to their poor reading ability. Without strong literacy skills, post-secondary college and employment options are limited. The genesis of adult literacy issues can be linked to below-grade level reading at the elementary and secondary school levels. For students with disabilities (SWD), reading deficits are rampant and lead to low self-efficacy and higher drop-out rates. While reading difficulties are not isolated to SWD, there is a significant gap in reading achievement between students with and students without disabilities. Additionally, poor academic outcomes for SWD are related to inconsistency in the application of teaching reading strategies.

To understand the factors integral to reading comprehension, this study explored the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read for the reading comprehension of secondary SWD. These variables represent the major constructs of Kintsch's Construction Integration Model of reading and have been identified in reading comprehension research as the factors integral to reading comprehension.

Participants were 158 SWD in grades 9 to 12 attending two large urban northern California high schools. Multiple regression analyses were conducted with the affective and cognitive variables both individually and jointly and, in order of importance, word

recognition, vocabulary, reading strategies, working memory, and prior knowledge were found to influence the reading comprehension of secondary SWD. Of the motivation-to-read factors, extrinsic motivation had a statistically significant negative relationship with reading comprehension indicating that internally motivated students had higher reading comprehension ability. Intrinsic motivation was also a significant contributor to reading comprehension when the affective factors were regressed onto reading comprehension. Differences in the relative importance of the cognitive components between low- and high-comprehenders were also noted suggesting that high-comprehenders had more internalized reading abilities than low-comprehenders.

The results from this study findings suggest a variety of cognitive and affective factors influence the reading comprehension of secondary SWD. Knowing the relative importance of these variables will help identify appropriate instruction to target key reading deficits. Multi-sensory direct instruction in word recognition and vocabulary is one such method that has promise for secondary SWD.

This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements of the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

Karen L. Sanford   May 13, 2015
Candidate   Date

Dissertation Committee

Robert Burns, Ph. D.   May 13, 2015
Committee Chair   Date

Kevin Oh, Ph. D.   May 13, 2015
                                                             Date

Helen Maniates, Ph. D.   May 13, 2015
                                                             Date

Dedication

The work herein is dedicated to the students and teachers I have had the pleasure of working with for the past nine years. Every day I come to work, I am awed by the resilience and eagerness my students express to learn to read. Through tears and laughter, they strive to become stronger readers so that they will be able to have opportunities when they graduate. Each and every one of them has learned that reading is the key to their future and because of that they push themselves to overcome years of reading failure.

This work is also dedicated to my colleagues who work diligently to make sure all of their students can read. I have been blessed to work with a group of caring and creative individuals who are able to see the future though the eyes of their students.

Acknowledgement

This work could not have been completed without the unwavering support of Dr. Robert Burns, my committee chair. Dr. Burns was instrumental with this process from its inception, and I am honored to have had his guidance and support. From my myriad emails, to lengthy phone calls, to numerous revisions, Dr. Burns was patient in answering all my questions and helping me turn this work into the best that it can be.

I would also like to thank my dissertation committee members, Drs. Kevin Oh and Helen Maniates, who offered pointed insights, which helped perfect this work. The faculty of the Learning and Instruction department at USF also deserves my unwavering thanks for the countless hours they invested into my education and future. My heartfelt thanks are also expressed to Dr. Yvonne Bui who was my committee chair, advisor, and mentor during the last six years; without her assistance this work could not have been completed.

Some believe it takes a village to raise a child, but I would like to posit that it also takes a village to complete a large project like this as well. I could not have completed this work without the support of the Elk Grove Unified School District. First, I would like to express my thanks to Ms. Sylvia Brooks for her unfailing help in organizing students and gathering data at my second school site. To the Resource Specialists at both school sites, my appreciation is boundless. A special thank you is extended to Mr. Brad Hemenway, Mr. Stephen Lee, and Mrs. Sarah McCleary for filling in when I was needed elsewhere, helping assess students, and being available to do whatever was needed so I could finish this project. I would be remiss if I did not express my appreciation to my

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CHAPTER ONE

STATEMENT OF THE PROBLEM

Reading difficulties are a major problem within the United States for both

children and adults. According to the National Association of Adult Literacy (NAAL), 30

million adults, aged 16 and above, need help to complete a job application (U.S.

Department of Education, 2003). Without strong literacy skills, post-secondary college

and employment options are limited. Lack of reading skills limits options for adults with

and without disabilities: 43% live in poverty, 50% have higher hospitalization rates due

to an inability to understand health information, and one in five is unable to access or use

the Internet (U.S. Department of Education, 2003). Poor literacy skills can also impact a

person's perception of job opportunities. Fifty-seven percent of adults with disabilities

believe that job opportunities are limited due to their poor reading ability. Mellard and

Patterson (2008) reported that 50% of participants in their study with students with

learning disabilities earn less than $10,000 per year.

The genesis of adult literacy issues can be linked to below-grade level reading at

the elementary and secondary school levels. According to the National Assessment of

Educational Progress (NAEP), 29% and 20% of fourth- and eighth-grade students

without disabilities, respectively, scored below the basic reading level while 68% of

fourth-grade and 62% of eighth-grade students with disabilities (SWD) scored below the

basic reading level (NCES, 2011). While reading difficulties are not isolated to SWD,

there is a significant gap in reading achievement between students with and students

without disabilities. In high school, 39% of students scored at the proficient level or higher and 24% scored below basic on the NAEP (U.S. Department of Education, 2009). Conversely, 64% of SWD (i.e., students who receive special education services) scored below the basic reading level while only 10% scored at or above the proficient level.

Current reading research shows that several key factors impede a student's reading comprehension (National Reading Panel, 2000; Torgeson, 2002). One of the most important is phonemic awareness, the ability to process the individual sounds of letters, which is needed for word recognition. For instance, when a reader hears the word "bug," he must discriminate the three distinct phonemes within the word. The reader then blends the sounds together to decode the word. Underdeveloped phonemic awareness and phonics skills, as well as poor working memory, interfere with a student's ability to read words fluently (i.e., with automaticity), which is linked to reading comprehension deficits (National Reading Panel, 2000; Torgeson, 2002). During a student's first years in school, reading instruction focuses on decoding and fluency, which require both strong phonemic awareness and phonics skills according to the National Reading Panel's (NRP) report of 2000. Further compounding these reading problems, the emphasis of reading instruction shifts away from phonics instruction to reading comprehension around the third grade. However, only a few studies focusing on secondary reading instruction were included by the NRP as the main research focus centered on early identification of students at risk of reading failure, evidence-based instruction, and the role of teachers in teaching reading. It should be noted that since its release in 2000, this report has garnered criticism in how effect sizes were computed and the subsequent recommendations made by the panel based on these effect sizes (Almasi, Garas-York, & Shanahan, 2006; Garan, 2001).

Poor working memory is another factor that affects a student's ability to read proficiently and comprehend text (Alloway, Gathercole, Kirkwood, & Elliott, 2009; Swanson, Kehler, & Jerman, 2009). Working memory allows a student to temporarily store information in short-term memory while engaging in cognitive tasks. Thus, when a student reads, he can activate prior knowledge about a topic or use context clues to determine the meaning of a word while remembering what has just been read. Students with disabilities often have low working memory capacities, which can negatively affect reading comprehension. According to Swanson, Zheng, and Jerman (2009), students who struggle to read are unable to retain ordered information which is directly related to phonological retention processing. Retaining phonological information (i.e., blending sounds within words, or segmenting multi-syllabic words), a task performed through working memory, is essential to learning to read. Additionally, a direct relationship has been found between working memory and learning, which Alloway, Gathercole, Kirkwood, and Elliott (2009) posit is related to poor academic performance in both reading and math.

Numerous cognitive processes are used when reading that aid comprehension. Strong vocabulary skills are needed to aid a student's ability to read proficiently (Taylor et al., 2009). Unfortunately, as students struggle to read, they often avoid reading. According to Cain and Oakhill (2011), reading influences vocabulary development; however, when students do not read fluently or regularly, their vocabulary skills are impacted. Additionally, Caccamise and Snyder (2005) reported that vocabulary knowledge positively affects reading comprehension and academic performance. During reading, students continually process words to create meaning, and without a strong

vocabulary base, students will struggle to understand what they have read; this problem is compounded for SWD.

Another factor linked to reading difficulties is low prior knowledge (i.e., poor general knowledge) and lack of breadth in vocabulary. Prior knowledge is directly linked to reading comprehension and is a strong predictor of reading ability (Elbro & Buch-Iversen, 2013). When a student lacks prior knowledge about a topic, reading comprehension is impacted (Kintsch, 2013, Tarchi, 2010). Students who have a basic understanding of what they are reading about can connect new information to what they already know. Prior knowledge is formed through experience, by reading or hearing about a topic, or through family customs. A student's general cognitive ability is also a contributor to prior knowledge. A student who reads, or who has been read to, is able to access this knowledge when reading related topics, which can increase comprehension. It is not known at this time, however, if there are mediating factors (e.g., working memory, motivation, decoding) that might impede prior knowledge and impact reading comprehension.

When students struggle to read, reading becomes amotivating and students avoid reading. Reading comprehension is hindered when students lose interest and disengage from reading (Guthrie, 2008). Many students begin to dislike reading because they struggle to gain meaning from what they read. While research supports a strong correlation between reading engagement and reading ability, students often do not read well because they do not spend time reading. A cycle of reading apathy begins, which makes it more challenging to support struggling readers (Bohn-Gettler & Rapp, 2011; Katzir, Lesaux, & Kim, 2009).

At the secondary level, if reading instruction is provided, the main focus is teaching reading strategies such as summarizing and finding the main or key ideas to improve student comprehension. Word recognition, which has been correlated to reading comprehension, is not typically taught at the secondary level as it is presumed that students have mastered this skill (Berkeley, Mastropieri, & Scruggs, 2011; Faggella-Luby & Deshler, 2008; Watson, Gable, Gear, & Hughes, 2012). Additionally, the instructional focus in high school is teaching standards-based curriculum, which is problematic for SWD because they may not be able to access the curriculum content (i.e., read or understand). To facilitate student learning, adaptions of the curriculum are needed, and a focus on word recognition and reading strategies is necessary so that students can read independently. Deshler et al. (2001) confirmed that two types of interventions are needed at the secondary level to help students improve reading skills: (a) teaching that engages students through interesting curriculum that is accessible to the learner, and (b) explicit instruction of skills and strategies to access the curriculum. Secondary teachers are often unsure how to teach students to improve deficient reading skills because they have not been adequately trained in teaching reading strategies (Duchnowski, Kutash, Sheffield, & Vaughn, 2006).

A gap also exists between reading research and the instructional practices of special education teachers (Klingner, Urback, Golos, Brownell, & Menon, 2010). Poor academic outcomes for SWD are related to inconsistency in the application of teaching reading strategies. Reading comprehension is increased when strategies are explicitly taught and used by the student during reading (Coyne et al., 2009; Duke & Pearson, 2002; McKeown, Beck, & Blake, 2009; Sencibaugh, 2008); however, the use of reading

strategies alone may not be enough to improve the reading comprehension of SWD. In a study over 30 years ago, teachers used a teaching model that included mentioning what skill they should use while reading, practice of the skill (through worksheets/workbooks), and assessment (Durkin, 1978). Notably missing was direct instruction on how to use the skill. In their recent study, Klingner et al. (2010) noted very little has changed during the past 30 years in the amount of reading comprehension instruction provided to SWD. It is not known if teachers fail to provide this instruction because they do not know how or what to instruct, but it is known that students need to use reading strategies to help them understand what they read (Klingner et al., 2010).

While there are numerous reading strategies (e.g., visualization, talking to the text), there are three reading strategies essential to reading comprehension: summarization, prediction, and inference (Berkeley, Mastropieri, & Scruggs, 2011). These strategies are crucial when reading, and if they are lacking, comprehension is impacted. Students with disabilities are not often strategic readers. With the shift to the Common Core State Standards (Shanahan, 2013), an emphasis of reading and comprehending challenging texts will be placed on students with and without disabilities (Shanahan, 2013). Critical reading will be paramount for students to make adequate academic progress in school and on standardized tests.

Despite the large body of research on how to increase reading comprehension for students with disabilities, there is no consensus on which factors influence students' abilities to comprehend what they read or the relative importance of these factors. Numerous theories (i.e., schema, auditory processing, socio-cultural, information processing) abound about essential reading factors. Some researchers (Lyon, et al., 2003;

Richardson, et al., 2004; Allen, 2010) focus solely on improving word recognition skills while others (Duke & Pearson, 2002; Sencibaugh, 2008; Coyne et al., 2009; McKeown, Beck, & Blake, 2009) focus on building reading comprehension skills through reading strategy instruction. However, no research has been undertaken on the influence working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read on reading comprehension for secondary SWD. Without a clear understanding of the relative importance of these factors' influence on reading comprehension, teachers are unsure of how to prioritize instruction to support students (Deshler et al., 2001; Duchnowski, Kutash, Sheffield, & Vaughn, 2006; Kamil, 2003).

Purpose of the Study

The purpose of this study, then, was to examine the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read to the reading comprehension of secondary students with disabilities. Reading is a skill needed to be successful both in and out of school, and appropriate reading instruction is essential to improve reading comprehension for SWD. To ensure that instruction targets the skills that will improve reading comprehension, an understanding of the relative importance of factors that improve reading comprehension for secondary SWD is needed.

The study uses a multiple regression correlational design with reading comprehension as the criterion variable. The independent variables are working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read. The independent variables were chosen because they relate to the key components integral to reading comprehension found in both reading research in general (Berkeley,

Mastopieri, & Scruggs, 2011; Deshler, Hock, & Catts, 2006; Faggella-Luby & Deshler, 2008; Saenz & Fuchs, 2002) and Kintsch's Construction-Integration model in particular. These factors have particular relevance to students with disabilities because without a clear understanding of which factor or factors are most important to reading comprehension instructional methods may not address deficient skills.

Participants were chosen from a convenience sample among 350+ ninth to twelfth grade students receiving special education services attending two comprehensive high schools in a large urban school district. For the purposes of this study, participants were those who had mild-to-moderate disabilities (i.e., specific learning disabilities, emotional disturbance, other health impairment, emotional disturbance, autism, traumatic brain injury, or specific language impairment).

Each construct in the study was operationally defined and assessed with multiple measures so that each construct could be adequately measured. Data collection included a combination of standardized tests (e.g., Woodcock-Johnson, 3rd edition), curriculum-based measurement (e.g., reading strategies), rating scales (e.g., motivation-to-read), and demographic data (e.g., student age, parent education, primary language). A combination of existing scores for working memory, general math knowledge, and word recognition already administered by the school psychologist or resource specialists and direct administration of assessments was employed. If data were missing from the student's special education case file, those tests were individually administered by the researcher, special education resource specialists, or school psychologist.

Significance of the Study

This study is important to the field of reading research for several reasons. First, because reading is an essential life skill, post-secondary success for students with disabilities hinges upon the ability to read. Whether these students attend college, vocational training (e.g., mechanic schools, cooking school), or apply for jobs, they will need to be proficient readers. It is widely accepted that reading is essential to provide a strong academic base for students. (Lyon, Shaywitz, & Shaywtiz, 2003). Understanding factors influencing reading comprehension is clearly important for tens of thousands of poor readers.

There is a large body of research on the skills students need to learn to read; however, the majority of current research focuses on elementary school students. The amount of research on reading comprehension, while becoming more prevalent, still falls behind that of teaching young children to read. For secondary students, far less research is conducted, and research on factors that affect reading comprehension for students with disabilities is negligible, and a consensus does not currently exist on which cognitive factor/s have the most effect on reading comprehension (Berkeley, Mastopieri, & Scruggs, 2011; Deshler, Hock, & Catts, 2006; Faggella-Luby & Deshler, 2008; Saenz & Fuchs, 2002). Additionally, while motivation is one aspect to reading, fewer studies have focused on the relative importance of affective factors to reading comprehension. Several researchers, for example, Guthrie (2008), posit that a students' motivation is integral to reaching comprehension and achievement.

Lastly, very few studies have been conducted on the relationship of multiple factors and reading comprehension and none have been conducted with the same

variables as this study. With the large number of adults who struggle to read, research into the relative importance of factors that explain reading comprehension for secondary students with disabilities is timely and important not only to high school students and their teachers but to society as a whole. With a clearer understanding into the factors that affect reading comprehension for secondary SWD, instructional programs can be implemented that will target the specific skills needed to improve comprehension. To realize this aim, teachers will also need to receive adequate professional training on how to support older struggling learners.

Theoretical Framework

The research on reading comprehension is theoretically diverse, and difficult to synthesize into a single framework. To provide a single framework for planning, implementing and interpreting data, Kintsch's Construction Integration (CI) model was used. The CI model is a cognitive processing model that thoroughly describes how readers comprehend, and is one of the most highly cited comprehension models (Deshler, Hock, & Catts, 2006). The theory identifies both cognitive and affective processes that affect reading comprehension and, while the theory itself will not be tested in this study, the model will be applied and extended by testing the relative importance of the factors since Kintsch does not rank them. Additionally, motivation-to-read was further explained through Guthrie's Engagement Model of Reading (Guthrie, 2008).

The fact that this study will not test Kintsch's (1988) model directly does not negate the use of the CI model as the framework for this study. The motivation for this study is to test a variety of key constructs and variables posited in reading literature as integral to reading comprehension, and it is important to that literature to identify which

of these key constructs and variables are most important, which is why the Kintsch model was not tested directly. Kintsch's CI model is useful as a framework for this study precisely because it is comprehensive and includes most of the variables identified in the literature. The model, however, is a cognitive processing model, studied by cognitive psychologists using methods consistent with such models like latent semantic analysis. This study is primarily a statistical model designed to measure and rank order factors thought to contribute to reading comprehension.

Kintsch and van Dijk first developed their theory of text comprehension in 1978, later expanded in 1983, that describes the cognitive and linguistic processes involved in reading. The model describes three sets of operations a reader uses to process text, which are sometimes rendered simultaneously and at other times sequentially. The first operation looks at the semantic structure of text, which is organized into a coherent whole. Some elements are processed more than once, which can affect text retention as the reader may forget what was previously processed. The second operation is when a reader condenses text meaning into its "gist" or main ideas. Lastly, readers generate new text by summarizing text into their own words or ideas. The model applies to both reading and listening comprehension as the same processes can occur during either action. Figure 1 shows one conceptualization of Kintsch's model. It should be noted that, according to Kintsch, the creation of a situation model may occur at various times throughout the reading process, which should not be interpreted in a hierarchical manner as the reader may move between the processes during reading.

Figure 1

The Reading Process based on the Construction-Integration Model

Integration Level

Situation
Model Created

Conceptual Level

Macrostructure

Gist/Themes

Semantic Level—about ideas
conveyed

Mental
Representation

Proposition
Formation

Linguistic Level

Microstructure

Working Memory

Prior Knowledge

Schema Activation
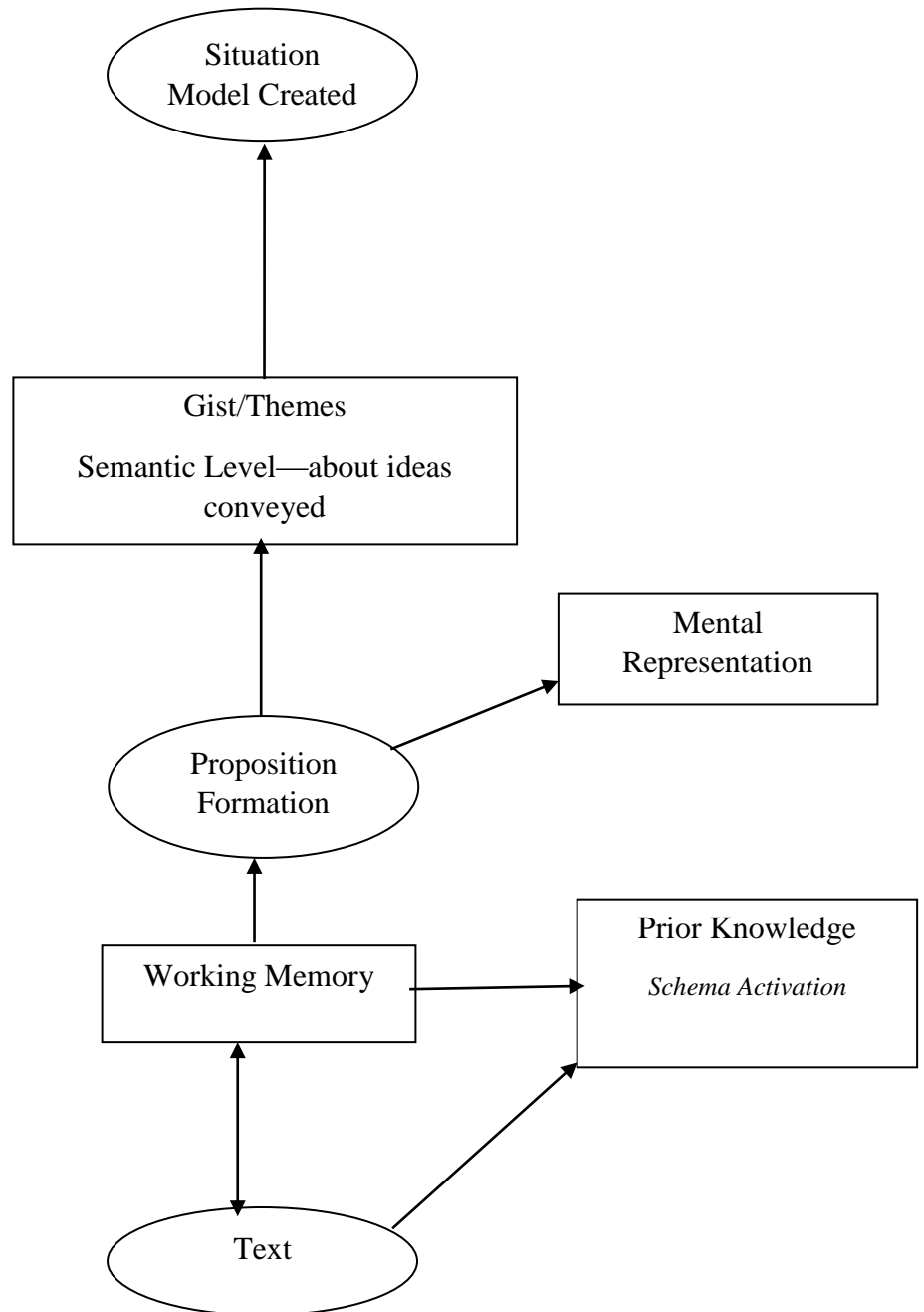
Text

The semantic structure of discourse, or text, has two levels: the microstructure and macrostructure. According to the theory, during the initial reading process, a reader looks at the surface structure, or words on a page, of the text, which can be broken down into propositions (i.e., idea units or concepts) that are connected to subsequent propositions. This process happens at the microlevel. Some of the relationships between propositions are explicitly stated while others are inferred as the reader interprets the text by activating their prior knowledge of the topic. At the macrolevel, the reader condenses the text into its salient parts and focuses on the gist of the text. This process requires the reader to activate current content knowledge as well as make inferences if the meaning is not implicit.

It should be noted that Kintsch and van Dijk's model refers to readers who have automatized word recognition, but they posit that their model does have implications for readers who have difficulty decoding text. If the text is difficult for the reader, then he or she will have to work harder to comprehend, which impacts comprehension and strains working memory.

The CI model employs both bottom-up and top-down cognitive processes to comprehend text, which are needed for perception, problem solving, and comprehension. The interaction between these two processes is what fosters comprehension. The initial stages of reading activate the bottom-up processes when a reader looks at the sensory input or words on the page and decodes them. After decoding the words, a reader relies upon lexical knowledge to understand what each word means (Taylor, Mraz, Nichols, Rickelman, & Wood, 2009). For instance, the word "bank" may convey several meanings—a place where money is kept, the ground surrounding a river, or a group of

something, typically in a row as in a row of elevators. In each of these instances, the reader not only reads the word, but must quickly access his knowledge about the word and apply the correct meaning to the current context (Kintsch, 2013). When reading a challenging text, one where a reader struggles to decode or define words, the reader engages in problem solving through either top-down or bottom-up processes to understand what is being read.

Top-down processes are engaged after words have been decoded, which requires activation of prior knowledge of the words themselves or the concepts they represent. Both of these processes are integral to reading comprehension and require both perception to identify words and analysis of the semantic structure of the text. For instance, in the sentence: *Janet helped Laura to buy a coat*, the reader looks for propositions (a bottom-up process) that might have multiple meanings (e.g., buy also means purchase). Prior knowledge, vocabulary, and the reader's experience are engaged (a top-down process) to help the reader determine appropriate meaning of the word and context. Schema activation only considers the correct meaning of the word while using context allows the reader to eliminate incorrect meanings. For typical readers, this process is effortless. According to Kintsch, this process should be automatic and seamless. When it is not, students will struggle to comprehend what they have read.

For students with disabilities, reading comprehension requires ongoing problem solving during reading, which taxes working memory and can frustrate the reader. Research has shown that many students with disabilities have inaccurate word recognition and decoding skills, which can also impact reading comprehension (Allen, 2010; Eason, Goldberg, Young, Geist, & Cutting, 2012; Lyon, Shaywitz, & Shaywitz,

2003). Word recognition requires the reader to look at visual stimuli and perceive what it says based on the phonemes within the word. Kintsch states word length may also impact a reader's ability to read and comprehend the text. Non-proficient readers often struggle to read single-syllable words, and as multi-syllabic words are introduced the struggle increases. All these factors may singularly, or in combination, impact reading comprehension.

Context, which acts as a filter that allows the reader to sift through appropriate word meanings that fit the context while restraining meanings that do not fit, is another factor that affects reading comprehension. Inference is actively engaged during these analytical processes (i.e., bottom up and top down) to allow the reader to use general and prior knowledge to aid comprehension. Macro-operators allow the reader to understand the gist, and, lastly, the reader uses spatial imagery to imagine what something is like when given a verbal description. These cognitive processes require the reader to continually monitor and analyze as they read.

Students use a variety of reading strategies to analyze and comprehend what they are reading, which include summarization, inference, and prediction. Reading strategies allow struggling readers to actively engage with the text and aid in comprehension (Fritschmann, Deshler, & Schumaker, 2007; Swanson, Edmonds, Hairrell, Vaughn, & Simmons, 2011). Kintsch (1994) asserts that to understand text, a reader uses information in novel ways, and they also summarize and make inferences from the text. For instance, when reading a historical biography, a student could relate the experiences of the author to the present day indicating an understanding of the similarity between both settings. Kintsch states that there is a distinction between summarizing text and learning (i.e., the

ability to make inferences about what was read) (Kintsch, 1994). When reading strategies are used consistently by readers, reading comprehension improves (Antoniou & Souvignier, 2007).

During reading, words and phrases are encoded allowing the reader to make perceptual, verbal, and semantic mental representations about what he reads. Kintsch (2013) asserts that to comprehend text, a reader needs to create a mental representation of what was read, which is dependent upon the goals, interests, and experience of the reader, and based upon the reader's lexical and background knowledge. One type of mental representation is the situation model. Kintsch describes the situation model as a mechanism that connects a reader's prior knowledge to new knowledge, and it allows the reader to create a mental representation of the situation described in the text. Since a reader's prior knowledge is used to create the situation model, a reader is able to retrieve the information from long-term memory to use in new situations enabling deep understanding (Kintsch, 2005).

Struggling readers often become disengaged, which impedes their ability to create a situation model, and therefore, inhibits comprehension. While Kintsch acknowledges that reader motivation is another aspect of reading comprehension, others have provided a more thorough understanding of the affect of student motivation on reading.

Guthrie, for example, states that reading is linked to motivation; in fact, he states that reading interest is a predictor of reading comprehension (2008). Reading engagement, which is driven by a student's intrinsic motivation-to-read, has been positively linked to academic achievement. In 2003, a survey of students in grade 12 were asked to describe their reading engagement. Notably, 93% of the respondents stated

that they do not read for school on a daily basis, 69% stated they almost never read for enjoyment, and 66% stated that reading is not a favorite activity. An international study conducted in 2000, polled 15 year-old students who were asked to quantify how much time they spent reading for enjoyment, the types of materials they read, and their interest in reading. Of all the students polled, those from the United States were ranked 24 out of 28 countries on student's engagement and motivation-to-read indicating that students in the United States, on average, do not read for pleasure compared to other countries in the world. Since learning is a process that requires active engagement, without some interest in the topic, it is difficult for the learner to remain focused long enough to learn.

For SWD, lack of motivation-to-read is often based on poor reading ability (Melekoglu & Wilkerson, 2013). The issue of motivation is compounded for secondary students who are required to read a variety of expository content (i.e., science social studies), and coupled with these reading demands, secondary students lose interest in improving their reading. However, the cyclical relationship between motivation and reading ability is challenging for teachers of secondary students. As reading ability improves, Melekoglu and Wilkerson (2013) posit, so too will motivation to read. Additionally, as reading skills improved, positive feelings toward reading increased, which in turn enhanced students' self-concept as reader. Therefore, secondary students require an increase in basic reading skills before a boost in reading motivation can occur.

Kintsch and Kintsch (2005) note that there are both learner and text factors that impede reading comprehension, which teachers can mitigate by teaching reading strategies. For instance, using descriptive words to help students form mental representations or teaching students to re-read, paraphrase, and summarize what they

have read in their own words. Teaching students to monitor their own understanding as they are reading is another strategy that can aid comprehension. Further they assert that text complexity also may impede a student's understanding. Text that is easy to read and very explicit does not require the reader to form mental representations or situation models where they connect what they read to prior knowledge and therefore the reader does not have a deep understanding of the content (Kintsch & Kintsch, 2005). For SWD, with poor decoding skills, comprehension becomes even more problematic. Reading becomes an endeavor of problem solving where the reader must spend energy in reading words which impedes activation of prior knowledge and adversely affects motivation.

Kintsch's CI model provides a basis to the study because it identifies key variables needed to successfully comprehend text. These key variables (i.e., working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read) will be examined in this study to identify the hierarchical relationships between them, which has practical implications for the reading comprehension of secondary SWD. In summary, the CI Model of Reading is a cognitive processing model, which is a conceptual model of how reading comprehension occurs. The present study will use a statistical model to determine the relative importance of a variety of cognitive and affective factors to explain reading comprehension (see Figure 2). While this study will not test Kintsch's model directly, it will test the linkages between the current study and the CI Model.

Figure 2

Predictor Variables and Dependent Variable of the Study
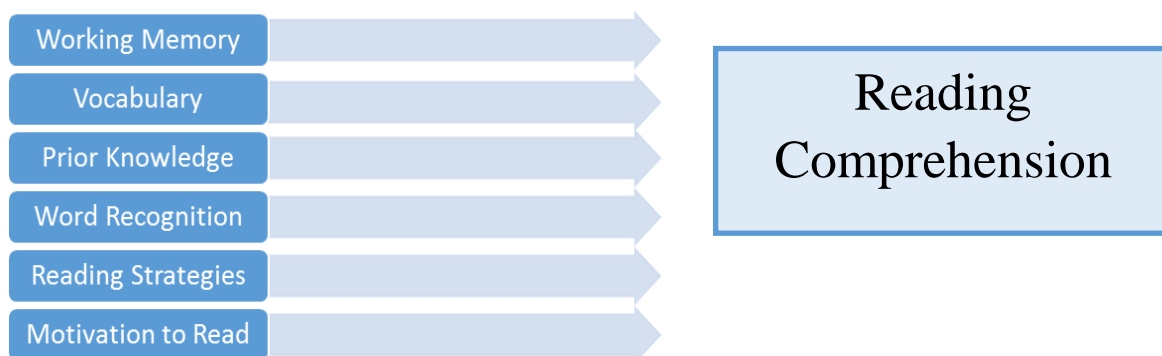
Background and Need

The number of children affected with reading deficits varies depending upon the sample. The NICHHD conducted research during the past 30 years with over 34,000 children and found that approximately 20% have significant reading disabilities. During annual standardized assessments to quantify the progress of American school children in various content areas, the United States Department of Education revealed that America's school children read significantly below the expected proficient level. According to recent assessment results, school children in grades 4, 8, and 12 have not reached reading proficiency (National Center of Educational Statistics, 2009).

NCES (2009) results revealed that only 39% of 12th-grade students without disabilities read at or above the proficient level, and only 10% of students with disabilities read at this same level. Many secondary students with disabilities read markedly below grade level (i.e., three or more years behind their peers), which impacts their current and future academic progress as well as employment options (National Institute for Literacy, 2010; U.S. Department of Education, 2003). Secondary students who are non-proficient readers are unable to read the core curriculum thereby interfering

with content knowledge acquisition. Lack of content knowledge transcends the classroom and negatively impacts standardized tests scores of both state standards and high school exit exams (Fritschmann, Deshler, & Schumaker, 2007).

According to the California Department of Education, approximately 83% of 10th grade students without disabilities who took the California High School Exit Exam in 2013 passed it compared to 40% of 10th grade students with disabilities. These reading difficulties transcend high school and persist into adulthood where the median age of adults who enroll in adult literacy programs is 31 years with the majority between the ages of 16 and 24 years (Mellard & Patterson, 2008).

Compounding these deficits, secondary students infrequently use word analysis strategies and rely heavily on visual memory or context clues to comprehend (Applegate et al., 2009; Archer et al., 2003; Moats, 2001). At the same time students fail to use reading strategies which can help aid reading comprehension (Jitendra & Gajria, 2011). Denton et al. (2011) posit that reading instruction for secondary students with reading deficits requires teaching in word analysis and reading comprehension that would include instruction in reading strategies to increase reading comprehension.

Reading comprehension has also been shown to improve when students have an expansive understanding of words—both functional and content-area vocabulary (Kamil, et al., 2008; Kintsch & Mangalath, 2011). Reading requires students to read fluently as well as understand the meaning of words. If either of these skills are lacking, comprehension diminishes. There is strong evidence to support explicit vocabulary instruction as a means to increase reading comprehension, which is needed in all content-area classes. Additionally, research indicates that students need multiple exposures to

words before they are able to understand what they mean (Ebbers & Denton, 2008).

Many students with disabilities tend to shy away from reading, which exacerbates this

problem.

To improve reading, students not only need to read, but they also need to believe

that they have the reading ability that will allow them to understand what they have read

(Berkeley, Mastropieri, & Scruggs, 2011; Bohn-Gettler & Rapp, 2011; Deshler, Hock, &

Catts, 2006). Struggling readers, however, often do not read for pleasure and avoid

reading whenever possible. This problem hinders reading improvement and causes an

ever-widening gap in reading achievement between students who read for pleasure and

those who do not (Guthrie & Wigfield, 2000; Guthrie, 2008; Solheim, 2011).

Reading failure is not a new phenomenon, and research into the complexity of

reading has been ongoing for many years (Cattell, 1886; Snow, Burns, & Griffin, 1998;

Thorndike, 1917; Watson, Gable, Gear, & Hughes, 2012). These early researchers

acknowledged the complexity of reading and sought to understand the different processes

involved in reading. Cattell (1886), for instance, looked at the amount of time it took a

reader to recognize stimuli (i.e., letters in a revolving drum) as a means of understanding

the mental processes involved in reading.

In 1917, Edward Thorndike noted that "reading is a very elaborate procedure" (p.

323). His assertions are no less true today. Reading requires the ability to decode words

or phrases and make meaning from those individual words and phrases. This process

requires explicit instruction, practice, feedback from the teacher, and more practice to

become a proficient reader. Prior to Thorndike's assertions about the reading process, Dr.

James Hinshelwood coined the term "word blindness" in 1896 about a patient who was

unable to read. Earlier researchers (i.e., Dejerne, 1891) made connections between lack of

reading ability and the brain (Lyon et al., 2003). In 1925, physician Samuel Orton began

working with children who could not read. At the time, the students' teachers indicated

that the children were "retarded" because they were unable to read. Orton conducted

extensive research in the areas of learning disabilities and dyslexia, a neurobiological

disorder that impacts accurate and fluent word recognition and spelling. These deficits

also impact reading comprehension (Allen, 2010).

Beyond these early efforts, the National Institute of Child Health and Human

Development (NICHHD) conducted research beginning in the 1960s to find out why

America's children struggle to read. Specifically, they sought to uncover: (a) How

children learn to read? (b) Why some children and adults are unable to learn to read? (c)

What instructional practices should be used to help children learn to read? The results

from a longitudinal study, which consisted of 41 research sites throughout the United

States, were released in 1994. Several key factors were revealed, which include: (a)

reading is not a natural process, (b) phonological processing (i.e., phonemic awareness) is

an essential skill needed to read, (c) accurate, fluent, automatic decoding is essential to

fluent reading, and (d) laborious decoding over-utilizes memory stores and undermines

reading comprehension. Some key factors were found to be essential to the reading

process: activating background knowledge, vocabulary, summarizing, predicting, and

clarifying, and appropriate instruction and reading practice (Lyon, 1999).

The field of reading has expanded over the past forty years. In 1997, Congress

commissioned key researchers in the field of reading (e.g., Marilyn Adams, Sally

Shaywitz, Timothy Shanahan) to "assess the status of research-based knowledge

including the effectiveness of various approaches of teaching children to read" (National Reading Panel [NRP], p. 1-1, 2000). This report became an essential tool for instructional practices in American schools. While this report is cited extensively on the constructs needed to teach reading (i.e., phonemic awareness, phonics, fluency, vocabulary, and comprehension), the challenges of learning to read were not first identified in this report (Duke & Pearson, 2002; Torgeson, 2002; Camilli & Wolfe, 2004).

Much of the research on reading comprehension has at most looked at several of the six variables included in this study, which is the main reason for the design of this current study. However one study, Swanson and Ashbaker (2000), suggests that both working and short term memory contribute unique variance to both reading comprehension and word recognition.

While the similarities in the Swanson and Ashbaker study included similar variables (i.e., WM, reading comprehension, word recognition), inclusion of secondary SWD, and regression analyses (albeit hierarchical versus multiple regression), there are also several differences. Specifically, there are three additional cognitive variables in the current study (i.e., vocabulary, prior knowledge, and reading strategies) and the inclusion of an affective variable (i.e., motivation to read). No other studies were found that included these specific variables, which supports the need for the present study.

Research Questions

The study will address the following research questions:

1. What is the relative importance of motivation-to-read to the reading comprehension of secondary students with disabilities?

2. What is the relative importance of working memory, vocabulary, prior knowledge, word recognition, and reading strategies to the reading comprehension for secondary students with disabilities?

3. What is the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation to the reading comprehension for secondary students with disabilities?

Definition of Terms

Auditory Processing Disorder is a disorder that makes discriminating auditory stimuli difficult. A person with an auditory processing disorder may struggle to process information presented aurally, have poor memory skills, or have difficulty with reading, comprehension, spelling, and vocabulary (NIDCD, 2004).

Learning Disability is a general term used to describe disorders that cause difficulties for a person to "…acquire and use listening, speaking, reading, writing, reasoning and mathematics abilities, or of social skills." (Birsh, 2011). Learning disabilities are unique to each individual and are due to variations in how a person's brain processes information (NICHCY, 2011).

Phonemic Awareness is the ability to aurally recognize and manipulate phonemes, which are the smallest units of sound within words (i.e., /c/, /a/, /t/ together make the word "cat"). Students must rapidly manipulate these sounds, which will allow students to apply this knowledge when they begin phonics instruction. Phonemic awareness is the first and most important aspect of reading acquisition (Uhry, 2002).

Phonics is the association between letter sounds-symbols. To read fluently, students must rapidly match sounds and symbols when reading (Birsch, 2011).

Prior Knowledge is defined as a student's content knowledge related to the domain (i.e., math, science, and social studies) studied prior to direct instruction from the teacher (Gurlitt & Renkl, 2010).

Reading Comprehension is the ability to gain meaning from what is read. Reading comprehension requires various reading skills (i.e., word recognition, fluency, lexical knowledge, pre-existing knowledge) to be undertaken rapidly so that the reader may gain knowledge from text (Pressley, 2000; Birsch, 2011).

Reading Disability often synonymously used with dyslexia. According to the International Dyslexia Association (2002):

Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede the growth of vocabulary and background knowledge.

Reading Strategies are strategies that good readers use while reading such as predicting, inferring, and summarizing. For instance, a reader might look at the title of a story and predict what the story will be about or they may activate their own knowledge about a topic they are reading. During reading instruction, teachers may explicitly teach strategies to increase a students' reading comprehension (i.e., summarizing, visualizing, and asking questions).

Self-efficacy is a person's belief about their ability to complete a task or fulfill a goal.

Bandura posited that a person learns by observing others, and these observations form the

basis of how behaviors should be conducted. A person's self-efficacy is then guided by

their own beliefs about how effective they are in a given situation and about how

effective others are in the same situation. In the case of reading, if a person is unable to

read proficiently while others around them can, over time their beliefs in their ability to

read will be negatively impacted (Grusec, 1992; Solheim, 2011).

Working Memory is defined as a cognitive processing store with limited capacity. It

provides resources to process information while retrieving the same or different

information (Swanson, Zheng, & Jerman, 2009). For instance, remembering a person's

phone number while trying to find their address.

CHAPTER TWO

LITERATURE REVIEW

Comprehension is the main goal when reading. For many students with disabilities, reading is a skill that eludes them for a variety of reasons. Cognitive processes such as working memory and phonological processing can account for some of the variability in reading comprehension. These processes allow the reader to not only decode words but access memory "stores" to understand written text. Readers also rely on lexical knowledge and reading strategies to comprehend the specific words they have read. Additionally, a reader's motivation to can influence reading comprehension. Reading is essential not only to school success but for post-secondary options (e.g., getting a job or going to college). Understanding which factors are most important to reading comprehension is vital to inform instructional practices so that students with disabilities are able to make academic progress that will ensure they have avenues for post-secondary success.

This chapter reviews the literature for the proposed study of the relationship between working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read and reading comprehension for secondary students with disabilities (SWD). The first section examines how working memory affects reading comprehension for SWD, while the second section looks at the function of vocabulary toward reading comprehension. The third section explores the role of prior knowledge in reading comprehension, and the fourth section of this review investigates the importance of word recognition on reading comprehension. The fifth section reviews the role of reading strategies on reading comprehension, and the sixth section reviews the role

motivation-to-read has on reading comprehension. Kintsch's Construction Integration Model of Reading is a well-developed theory of comprehension; consequently, several of the studies reviewed use Kintsch's CI model as the theoretical framework for their research. The chapter concludes with a summary of the factors and their importance to the proposed study.

Working Memory

There is a substantial amount of research on the relationship between working memory and reading comprehension for students with disabilities (Alloway, Gathercole, Kirkwood, & Elliott, 2009). Working memory (WM) has been described as the ability to store information temporarily while manipulating information needed to complete complex cognitive tasks such as learning, reasoning, and comprehending. Swanson, Zheng, and Jerman (2009) explain that individuals performing WM tasks must remember some parts of the required tasks while other tasks are inhibited, or ignored, as they complete task-related processes (e.g., remembering a person's address while hearing directions on how find the person's house). A correlation exists between WM, which includes phonological loop capacity (i.e., the part of WM that processes spoken and written information), and reading and vocabulary acquisition.

The first study on the role of WM in reading comprehension that will be reviewed is that of Christopher et al., (2012) who examined the relationship between processing and naming speed to word reading and reading comprehension. Christopher et al. tested the amount of shared and independent variance between word reading and comprehension in relation to different cognitive processes. The authors examined whether there was a change in word reading and reading comprehension as students

matured. The sample was split into two distinct age groups to take into account the shift in reading focus that occurs in grade four from learning to read to reading to learn. Four cognitive abilities (working memory, inhibition, processing speed, and naming speed) were investigated in this study due to the research that supports their roles in word reading and reading comprehension. The study consisted of 483 participants (253 boys, 230 girls) aged eight to sixteen who were divided into two groups (i.e., 8 -10 year olds and 11 – 16 year olds). Data were collected from an ongoing twin study from the Colorado Learning Disability Research Center. The sample included 128 students (26.5%) who had a history of reading disability and 93 (19.3%) who had a history of Attention Deficit Hyperactivity Disorder (ADHD). Of these students, 38 were identified as having both a reading disability and ADHD.

Participants were assessed on the constructs of WM, inhibition, processing speed, and listening and reading comprehension. Working Memory was measured with the WISC-R or WISC-III digit span, sentence span, and counting span subtests. Inhibition was measured with Continuous Performance Test (CPT) in which students watch a series of numbers flashed on a screen, and pressed a button when they saw the target numbers. The Stop-signal reaction time test (SSRT), where students pressed either an "X" or an "O" as quickly as possible when the target letter flashed on the screen was also administered. To test processing speed, the following subtests of the Colorado Perceptual Speed (CPS) were used: (a) Test 1, (b) Test 2, and (c) ETS identical pictures. Participants had to visually find a targeted series of letters and pictures. The Rapid Automatized Naming (RAN) test was used to assess RAN. Students had to name as many colors and objects as they could within 15 seconds. Listening comprehension was measured with the

Woodcock-Johnson (WJ) oral comprehension, Qualitative Reading Inventory 3 (QRI), and the Barnes KNOW-IT. In the WJ oral comprehension task, students listen to sentences and short passages and answer follow up questions. The Barnes KNOW-IT test begins by teaching 20 facts to students about a fictitious planet. Students then listened to six episodes about two children who visit the planet. Lastly, students answer 18 comprehension questions. Reading comprehension was measured with several instruments: (a) WJ passage comprehension, (b) QRI, (c) Gray Oral Reading Test-3 (GORT-3), and (d) Peabody Individual Achievement Test (PIAT) comprehension. In each of these tests, students read passages and answer questions to measure comprehension of the passage. The PIAT word recognition, PIAT spelling, and the Time-limited oral reading of single words were used to measure word reading. For the PIAT word-recognition test, students read words of varying lengths and on the spelling test, they answered multiple-choice questions to test spelling recognition. For the Time-limited oral reading test, students read a list of 182 progressively difficult words on a computer screen and responded to the correct one within two seconds.

Confirmatory Factor Analysis (CFA) was used to examine the interrelationship between word reading, listening comprehension, and reading comprehension across the two age groups. Additionally, the study focused on the relationship and age invariance for the four cognitive ability factors (WM, inhibition, processing speed, and naming speed) as well as a path analysis between the cognitive and reading factors. From the four factors, additional CFA was conducted and the two comprehension variables loaded onto the reading comprehension and word reading latent factors. The CFA went through several iterations that resulted in forming a final model comprised of comprehension and

word reading. The relationship between the two factors was .59. Correlation between the latent variables remained static across the age groups suggesting that increased reading comprehension demands in grade four may be explained by increased academic rigor rather than a core relationship between the factors.

Further findings suggest that WM predicts both comprehension and word reading even after controlling for the cognitive processes. The authors explain this finding by stating that reading of words and longer passages requires the reader to actively engage in the reading process, logically manipulate information, and access stored orthographic information. The study's findings suggest that WM independently predicts both reading factors and WM is shared between both word reading and comprehension.

Inhibition and naming speed did not predict word reading or reading comprehension (Christopher et al., 2012). They posit that one interpretation for this phenomena could be that general cognitive ability incorporates inhibition, negating any variance. Overall, their findings suggest that the ability to efficiently manipulate and keep information available in working memory and quickly process visual information are integral to comprehension and word reading.

One limitation of their study is that the participants were part of a larger twin study. It is possible that some environmental factors might have impacted the outcome. For instance, there is a correlation between time spent reading and comprehension (Cain & Oakhill, 2011). Children living in the same home might have the same reading habits simply because they live together. In a home where reading and books are a focus, students are exposed to more print and therefore are more likely to read for pleasure, which positively impacts both reading comprehension and vocabulary. Another limitation

to this study is that all achievement measures (with the exception of the RAN) were language-based assessments, which in essence are measuring similar constructs. If a student does poorly on verbal ability, that deficit could carry over to additional measures of word reading and comprehension. The purpose of the original study was the etiology of reading disability and ADHD, and all participants fit this profile. Some of the results could be reflective of the biological issues inherent to the children.

The work of Christopher et al. (2012) is related to the proposed study in that both studies examine the relationship of WM and word recognition to reading comprehension. Through CFA, the findings suggest that working memory is a predictor of both word recognition and comprehension. The proposed study will also employ CFA to analyze the relationships between the predictor variables. While some of the students in the proposed study will have reading disabilities and ADHD, not all of them will. Additionally, all students are be high school students rather than a mixture of both elementary and middle/high school students. In the proposed study, mathematics achievement measures will be included so that participants' general knowledge can be evaluated.

In a related study, Swanson and Ashbaker (2000) studied the relationship between WM, short term memory (STM), and articulatory speed for both skilled and less skilled readers with learning disabilities (LD). The authors indicate the differences between readers with LD and students without LD are often attributed to WM; however, no consensus exists about the specific aspects of WM that are influenced by deficient reading ability.

In their study, Swanson and Ashbaker (2000) conducted two separate experiments about relationship between the cognitive processes of word recognition and reading

comprehension The purpose of the study was to determine whether: (a) the relationship between WM and reading was mediated by the articulatory system, and (b) deficits in executive processing are independent of the articulatory system and share variance with reading apart from the articulatory system.

The first experiment investigated whether (a) WM, STM, and articulatory speed measures were less for students with reading deficits when compared to skilled readers and (b) the relationship between word recognition, reading comprehension, WM, and STM for readers with LD was shaped by the articulatory system. Participants in this study were 60 high school students and 30 elementary school students from Redlands, CA. Thirty secondary students were identified with specific learning disabilities (through both IQ measures and interdisciplinary teams), and they received special education services through a resource program where most had one special education class per day. Thirty chronologically-aged (CA-matched) skilled readers of similar age were selected from the same high school as the students with LD. The elementary students were matched to the students with LD based on raw scores on the Wide Range Achievement Test, Third Edition (WRAT-3). The reading-matched students (RL) were in grades 2 through 4, and they scored between the 50th and 75th percentile on the Iowa Test of Basic Skills in reading and mathematics. Participants represented the ethnic and gender demographics of the district. There were 17 males and 13 females in each ability group. While there were significant differences on raw reading scores between the CA-matched readers and the other two ability groups, there were no significant differences were noted on the word-recognition raw scores between the RL-matched students and those with LD.

The measures used in this study were the: (a) WRAT-3, Word-recognition subtest, (b) Woodcock Johnson Reading Mastery Test, Revised-Reading Comprehension subtest (WJRMT-R), (c) articulation speed was measured by measuring the amount of time students took to read lists of words, (d) Wechsler Intelligence Scale for Children, Third Edition (WISC-III), Digit Span and Word Span subtests (e) WM Sentence Span, Auditory Digit-Sequencing, Visual Matrix, Mapping/Directions tests (researcher created).

The results of Experiment 1 indicated the articulation speed for the CA-matched group was faster than both the students with LD and the RL group. Articulation speed for the LD group was faster than the RL group. There were statistically significant differences between the ability groups of both the STM and WM tasks. Overall, the CA-matched group performed better than the other two groups with few exceptions: students with LD scored lower on the WM tasks with the exception of the STM task where they scored higher, and the WM digit-sequence task where they had equivalent scores.

Composite scores were created for the verbal and visual-spatial tasks for both WM and STM to compare ability groups. Findings from this experiment indicate that the CA-matched readers performed better than the LD and RL readers on articulation speed, WM, and STM scores. The RL group also performed higher than the LD group on both verbal and visual-spatial composite scores when articulation speed was removed from the analysis. Since LD readers were deficient in both verbal and visual-spatial tasks when articulation speed was removed from the analysis, poor memory performance for students with LD does not appear to be related to specific verbal and visual-spatial domains. Articulation speed did not appear to mediate the relationship between memory and reading. Findings suggest that WM and STM both contribute variance to reading

comprehension and word recognition. Swanson and Ashbaker (2009) conducted a second experiment that replicated Experiment 1 because STM ability group effects, when articulation was partialed out, were unexpected. Additionally, even though WM and STM were identified as separate systems, it was unknown whether they originated in two separate processing systems. Two modifications were made to Experiment 1 to answer these questions. First, verbal prompts were used to help a student access their memory. Swanson and Ashbaker assert that evidence supports that verbal prompts or cues enhance processing efficiency when used with readers with LD. They concluded, increased performance on WM tasks would not increase variance to reading above the STM tasks. Swanson and Ashbaker reasoned that, if WM and STM are part of a "processing efficiency continuum" (p.15), then the cued WM task would add independent variance above what STM contributes.

The second modification they made from Experiment 1 was to explore the relationship between memory span and articulatory proficiency of the readers with LD, or more precisely, they considered whether memory performance is independent of articulation rate. To that end, the readers with LD were matched with the younger readers on articulation rate. A total of 60 students (20 students per ability group) were selected in the same manner as Experiment 1; however, none of these students participated in the first experiment.

The STM and WM tasks presented in Experiment 1 were also used in this experiment. Working memory tasks were presented with both cued and noncued stimuli. Results indicate that, overall, the CA-matched group scored higher than the two other groups. The RL-matched students scored higher than students with LD on measures of

STM, cued sentence span, and auditory digit WM tasks. Students with LD were statistically equivalent to the RL-matched group on the majority of the noncued WM tasks. On the articulation speed tasks, the CA-matched group was the fastest, followed by students with LD, and the RL-matched group was the slowest.

Three key findings were noted by Swanson and Ashbaker: (a) WM and STM performance for students with LD was inferior when compared to skilled readers, and removing articulation speed did not alleviate the differences, (b) students with LD are deficient in WM independent of their deficiencies in STM, and (c) some WM problems appear to be related to the reading problems of students with LD. The results from this study support an earlier finding (Swanson & Berninger, 1995) that the WM system is linked to reading comprehension.

One major limitation to this study was the sample. First, there were a total of 90 participants: 30 elementary school children, 30 secondary SWD, and 30 typically-developing secondary peers. A larger sample might have yielded different findings, and future research should include a larger sample. Additionally, the Cronbach's alpha for the articulation speed test was .54, which gives pause about the usefulness of the test scores.

This research is related to the proposed study in that the relationship between reading comprehension and WM (as well as other variables) is under consideration for secondary SWD. The proposed study will look at the relative importance of WM to reading comprehension for students with disabilities; however, there will be at least 150 students rather than 30 or less as in Swanson's and Ashbaker's study. Additionally, all test instruments have reported reliability above .80.

The final study considered on the role of WM on reading comprehension, Carretti, Borella, Cornoldi, and De Beni (2009), was a meta-analysis on the distinct role WM plays in the reading comprehension difficulties of children and adults with typical decoding skills and intellectual abilities. The strength of the discrepancy in reading comprehension achievement between skilled and unskilled readers in WM tasks was tested using Cohen's effect-size index, which expresses the degree to which two or more variables are associated or correlated.

Carretti et al. conducted a literature search to select studies where WM was measured for individuals in two different age groups (ages 8-14 and 18-30) with reading comprehension deficits. The search was focused between August 1980 and September 2006 and used the Medline, Web of Science, ERIC, and PsychINFO databases. The analysis began in 1980 because it was after Daneman and Carpenter's Reading Span Test, which had been used in studies that concluded that domain-specific factors affect the relationship between WM and reading comprehension. A search using combinations of terms such as reading comprehension difficulties and disabilities, poor comprehenders were included with keywords of WM, verbal span, visuo-spatial span, short-term memory, phonological loop, visual-spatial sketchpad, and digit span was used. The article search was expanded to include English language peer-reviewed journals in published books. From this search, 18 articles were culled and effect-sizes were calculated.

The articles were evaluated to determine the categories of the WM tasks. The tasks were differentiated by simple span memory tasks that required storage of information without manipulation and complex span memory task, which were verbal and visuo-spatial in nature that required simultaneous processing of information while

memorizing other information. Executive function mechanisms that included WM tasks and intrusion errors (i.e., remembering irrelevant information) were also analyzed as well as verbal WM.

The magnitude of the effect size varied depending upon the WM task (i.e., verbal or visuo-spatial). Higher effect sizes were found in the verbal domain, which requires both maintenance and manipulation of data (i.e., $d = 0.89$ in young adults; $d = 0.73$ in children). The effect size for executive functions mechanisms was also high ($d = 1.07$ for WM updating measure; $d = -0.91$ for intrusion errors). When visuo-spatial tasks were considered with verbal tasks, the effect sizes were small and the correlation with reading comprehension was also weaker. In considering age as a factor, the results suggested that WM describes the cognitive profile of individuals with comprehension deficits regardless of age.

Overall Carretti et al. (2009) concluded that the relationship between WM and reading comprehension abilities differs based upon the modality and attention required. Students who have poor reading comprehension tend to be less skilled at complex span tasks when compared to good comprehenders, but both groups were comparable on visuo-spatial and simple span tasks. While modality plays a role on WM task performance, the authors posited that attentional control aspects of WM may also explain poor comprehension. Their findings confirm that WM tasks that require a high degree of attentional resources are better able to predict reading comprehension performance than simple span tasks.

One limitation to the analysis was that the authors only included published studies in the meta-analysis. Unpublished studies, the authors note, yield lower effect sizes,

which may have improved the chance of finding larger effect sizes. Additionally, the studies analyzed were conducted by just a few research teams which could have led to bias.

The findings of Carretti et al. are related to the proposed study because several WM tasks will be evaluated to determine their relationship to reading comprehension performance. In the proposed study, both verbal and visuo-spatial WM tasks will be employed, which Caretti et al. state differ slightly in students with high reading comprehension ability. While all the students in the sample of the proposed study will be SWD, if learning profiles are significantly different (i.e., auditory processing deficits, visual processing deficits, ADHD, emotional disturbance with no processing deficits), it begs the question: is there a significant difference in WM between different categories of SWD? While not the primary focus of the current study, the data will allow analysis of this facet of WM.

The three studies in this section reviewed the role of WM on reading and specifically reading comprehension. Each article relates to the proposed study in that each confirms that WM is an essential component of reading comprehension. While the researchers all looked at different facets of WM, the main conclusion from all three studies is the WM is compromised in students with poor reading abilities, which includes students with disabilities.

Vocabulary

The inception, and reliance upon, high-stakes testing as predictors of reading has, according to Dennis (2012), interfered with instruction and targets constrained skills (i.e., phonemic awareness, decoding, and fluency) rather than unconstrained skills

(comprehension and vocabulary). Dennis asserts that there is no empirical evidence that supports a relationship between proficiency levels on high-stakes tests and individual reading skills as assessed through diagnostic batteries. The reality, however, is that many schools use high-stakes testing as a tool to place students in remedial classes or in intervention programs where the focus is, predominately, on teaching constrained skills.

There is danger in teaching constrained skills because they have a mastery limit. These skills can be mastered rapidly and targeting interventions on these skills exclusively will increase the likelihood that overall reading ability does not dramatically improve. Interventions should, therefore, focus on unconstrained skills that do not have a mastery ceiling. While some older students will need direct teaching of constrained skills, it should be noted that there is no crossover between these skills and comprehension and vocabulary. Dennis adds that while there is a plethora of research on constrained skills there are minimal studies that focus on vocabulary and comprehension for older students (i.e., middle school and above). Therefore the purpose of her study was to uncover the patterns of reading abilities for struggling middle school students. Additionally, the study reviewed the variability of each learner who had been identified as a struggling reader based on high-stakes testing (i.e., Tennessee Comprehensive Assessment Program; TCAP).

Data were collected during the 2006-2007 school year from a large Tennessee school district. Demographic data for the district showed that 81% of the students are Caucasian, 15% African American, 2% Hispanic, and 2% Other. Forty-percent of the students in the district receive free and reduced lunches, 13% receive special education services, and 1.6% are English Language Learners (ELL). Students were chosen to

participate in the study by the director of curriculum and accountability based on the previous years' below proficiency TCAP scores. The final sample included 94 middle school students and, while the schools were representative of the district's demographics, the final sample was not (i.e., 56% Caucasian, 36% African American, 7% Hispanic, 1% Other; 82% received free and reduced lunch; 36% special education; 10% ELL). The overrepresented sample shows that students who consistently score below proficient on the TCAP are poor, minority, and receive special services (i.e., special education and ELL).

Each student received an individually administered diagnostic battery consisting of five instruments that measured phonemic awareness, phonics, decoding, fluency, spelling, vocabulary, and comprehension. Each of the assessments was related to the broad reading categories from the TCAP: content, meaning, vocabulary, writing/organization, writing/process, grammar/conventions, and techniques/skills.

Tests included in the battery were: (a) Woodcock-Johnson Diagnostic Reading Battery-III (WJR-III; Woodcock, 1998) Letter-word Identification and Word Attack subtests, (b) Test of Word Reading Efficiency (TOWRE; Torgeson et al., 1999) Silent Word Efficiency and Phonemic Decoding Efficiency, (c) Intermediate Spelling Inventory (ISI; Bear, Invernizzi, Templeton, & Johnston, 2004, (d) Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997), and (e) Qualitative Reading Inventory-4 (QRI-4; Leslie & Caldwell, 2006). Reliability for all measures ranged from 0.88 to 0.99 with the exception of the ISI, which had no reliability reported.

Exploratory factor analysis was conducted and three factors surfaced for a total variance of 74.8%. The factors, Meaning, Decoding, and Rate, were attributed to sub

average scores on the TCAP. The QRI (with the exception of correct words per minute) and ISI loaded onto Meaning. Both the narrative and expository passages on the QRI measured prior knowledge. The second factor, Decoding, accounted for 31.2% of the total variance. All variables that required decoding (i.e., word identification, sight word efficiency, phonemic decoding efficiency, and word attack) as well as the ISI loaded onto this factor. Factor 3, Rate, accounted for 11.4% of the variance. The QRI words correct per minute and the TOWRE Sight Word Efficiency were the only two variables loaded on this factor. Both variables are timed assessment of students' ability to decode real words.

Dennis surmised that this study revealed that "struggling readers" is a "blanket" term that has been used as a blanket term to describe students who read below grade level. However, she explains that this pattern has emerged because students are looked at as deficient rather than quantifying the skills they have (Dennis, 2012). A majority of the students in the study had mastered constrained skills, but had not mastered skills to become proficient in fluency, vocabulary and comprehension. She noted that struggling readers are able to engage in many facets of the reading process, but require targeted instruction in both vocabulary and comprehension to strengthen their reading ability.

Limitations to this study center on the research design. First, students were selected for participation based on their poor TCAP scores. Due to this, the sample was comprised of mainly disadvantaged students (i.e., low SES, minority, ELL and SWD). Additionally, the sample was relatively small, which undermines generalizability. One area of focus with this study was on the relationship between vocabulary and comprehension, but the measurement used (PPVT) did not correlate with the other

measures in the study. This makes determining if there is a relationship between the variables problematic.

The main finding, however, relates to the proposed study in that Dennis explains that becoming a proficient reader requires mastery of many skills. Without knowing which specific skills a learner lacks, a recommendation of appropriate interventions cannot transpire. The proposed study will evaluate a variety of reading skills and attributes that, together or individually, will help reveal which factor(s) are essential in improving reading comprehension.

In a related study, Cain and Oakhill (2011) studied a phenomena known as the Matthew effect that posits that a gap between good and poor readers may increase over time. It is believed that factors that exist before a student enters school influence later reading ability irrespective of cognitive ability. One factor that might lead to Matthew effects is that when students have poor decoding skills, they struggle to understand what they have read, and a natural consequence is that students may become amotivated to read for pleasure. Similarly, students with good word reading skills, but poor comprehension ability, may also eschew reading. This, of course, causes a circular effect because, to improve reading, students must read.

Additionally, Cain and Oakhill (2011) hypothesized that, when poor readers read, they choose books that do not increase their word reading and comprehension abilities. It is understood that, as a person reads, they are exposed to more words. With that exposure, knowledge of morphology and spelling increases. Words used in print are often vastly different than those used while speaking, and when students do not read avidly,

they are not exposed to complex words that may not be part of the student's typical lexicon.

Reading helps students foster comprehension because, as students read longer passages, they unify what they have read over the course of the text. This ability requires students to synthesize information, decode and define words, and integrate what they are reading into what they already know. Comprehension is also affected when students do not have a rich vocabulary because they are unable to apply word knowledge to the current context.

The purpose of this study was to consider support of the Matthew effects in students with good and poor comprehension relative to word reading, comprehension, and vocabulary development and to understand why Matthew effects occur. To accomplish this goal, the impact of reading experience and comprehension skill on vocabulary was investigated.

To fully consider the Matthew effect, a longitudinal study was employed with 102 children who were seven and eight years old (Year 3 in school) at the beginning of the study. Data was collected at various points during the study: (a) at the beginning of the study, (b) at age 10 and 11 (Year 6), (c) at age 13 to 14 (Year 9), and (d) at age 15 to 16 (Year 11). Very poor readers were excluded from the study because it was believed they would have a difficult time reading the material presented. Very good readers were also excluded because it was believed their scores would be above those on the Neale Analysis of Reading Ability—Revised (NARA; Neale, 1989), the instrument used to measure word reading accuracy and reading comprehension at the beginning of the study.

Students were also excluded from the study if they were ELL or had any behavioral, emotional, or learning disabilities.

Several measurements were used in this study: (a) the NARA measured reading ability, (b) The Gates-MacGinitie Vocabulary subtest (MacGinitie, MacGinitie, MacGinitie, Maria, & Dreyer, 2000) measured sight vocabulary, (c) the British Picture Vocabulary Scale (Dun, Dunn, Whetton, & Pintillie, 1992) measured receptive vocabulary, (d) the Wechsler Intelligence Scale for Children—Third U.K. Edition (WISC-III; Wechsler, 1992) Block Design and Object Assembly subtests measured nonverbal cognitive ability, and (f) reading habits were measured at the beginning of the study and again when students were 10 and 11. Students were asked about their frequency of going to the library, reading to their parents, being read to by their parents, talking about books, and reading on their own (Cain & Oakhill, 2011). Parents were asked to answer the same questions including the number of books in their home. Both parents and students were asked to estimate the number of hours they watched television during the week and on weekends. Eighty-three parents returned questionnaires during the first round and 54 during the second round.

Receptive vocabulary was measured during the first two testing periods, and it was significantly correlated between the two time periods ($r(83) = .59, p < .0001$) indicating that early vocabulary ability was moderately related to later vocabulary ability.

The results indicated there was a relationship between reading experience and growth in vocabulary knowledge irrespective of cognitive ability. Additionally, reading comprehension explained the growth of vocabulary skills when cognitive ability and vocabulary were controlled. Due to a difference in the reading habits between the two

groups, both reading habits and reading comprehension contributed to growth in vocabulary regardless of cognitive ability.

No Matthew effects were discovered between word reading or reading comprehension. Evidence was found that suggested that the difference in vocabulary growth might be attributed to larger opportunities for growth, which led to a deviation in scores. Conversely, the difference between groups in reading comprehension remained similar over time. The study also revealed that reading experience and reading comprehension predicted subsequent performance of receptive vocabulary in addition to the effects on sight vocabulary. Early receptive vocabulary explained the variance in reading comprehension between Years 3 and 6. One explanation for this phenomena is that receptive vocabulary instruments might be more sensitive to printed words than to spoken words.

Lastly, Matthew effects were found in vocabulary growth that were related to reading habits and reading comprehension between Year 3 and Year 11. This suggests that reading for pleasure allows a student to learn vocabulary while reading comprehension also supports vocabulary skill development.

Limitations to this study include the sample size, which was small (n = 40) at the end of the study. The study design was also problematic in that students with disabilities were excluded from the study, which does not allow generalization to this population of students. Cain and Oakhill (2011) raised some interesting points that relate to the proposed study. First, leisure reading is important to both vocabulary development and reading comprehension. Struggling readers, on average, tend to avoid reading whenever possible, which exacerbates the issues of poor word reading, limited vocabulary, and

below-average reading comprehension. The implications for practice are myriad as it relates to finding ways to motivate students to read. Secondly, a correlation exists between reading habits and reading achievement (Cain & Oakhill, 2011), which has practical implications for reading teachers to find ways to motivate students to read at the secondary level so reading comprehension and vocabulary will improve. The proposed study will use a larger sample.

The studies reviewed in this section review the current research on the importance of vocabulary development to reading comprehension. Cain and Oakhill (2011) reported that a vast difference, in the amount of words that are read each year, existed between students who have average reading comprehension ability. In fact, they noted that this difference is directly related to reading ability and comprehension. The proposed study is also interested in the affect vocabulary knowledge has on reading comprehension.

Prior Knowledge

Research supports that prior knowledge about a topic improves both comprehension and memory. Prior knowledge, has been defined as domain or content knowledge that has been attributed to increased reading comprehension and memory about what has been read (Priebe, Keenan, & Miller, 2012). In fact, the effects of prior knowledge are so significant, researchers advocate adding prior knowledge measures to comprehension test batteries. The aim of one reading program is to increase students' core knowledge because it is believed to be strongly correlated to reading comprehension (Hirsch, 2006).

Priebe et al. indicated that there has been scant research on whether prior domain knowledge impacts word recognition. Prior knowledge may increase reading

comprehension because a person's understanding of the topic may aid in word identification. Word recognition is also a strong predictor of reading comprehension (Faggella-Luby & Deshler, 2008; Swanson et al., 2003). Word-recognition fluency deficits have been attributed to reading comprehension deficits as well. The authors speculated that, if differences in prior knowledge are associated with differences in word recognition, insight can be gained on how to improve both.

The authors noted that only one study directly analyzed the effects of prior knowledge and word recognition. In that study (Taft & Leslie, 1985), third grade students who had received instruction in the topic of the food chain understood the passages better when compared to students who did not receive topic instruction. Priebe et al. reported that this finding was encouraging as it related to the role of prior knowledge on word recognition. The purpose of this study was to examine how prior knowledge might help students' word recognition. Students in the study were matched by age and word-recognition ability, thereby isolating any differences between them as prior knowledge. Additionally, error analysis was undertaken to determine if the errors were either semantically (e.g., "horse" instead of "pony") or graphically (e.g., "traffic" for "terrific") similar. Semantic errors would allude to prior knowledge on the specific domain under consideration. When students who read better do make errors, they tend to make more semantic errors than poor readers. Because reading comprehension is effected by prior knowledge in poor readers, Priebe et al. examined typical and poor readers to understand what aids word recognition for poor readers with prior knowledge. Lastly, they investigated the relationship between oral reading errors and reading comprehension to

ascertain whether type or number of errors is more predictive of comprehension which would point to the necessity of classifying types of word-recognition errors.

The data analyzed in this study was collected during an assessment battery of reading comprehension in an ongoing research project by the Colorado Learning Disabilities Research Center. The sample consisted of 60 fourth grade students (males = 27, females = 33) with a mean age of 9.7 years of age. Students were either suspected of having a reading disability (poor reader) or part of the control group. Thirty students were in the prior-knowledge group (15 poor readers, 15 controls) and thirty were in the no-prior-knowledge group also with 15 poor readers and 15 controls.

To measure prior knowledge, word decoding scores were obtained from the aforementioned study. Word decoding scores were standardized from the raw scores. Poor readers' z-scores were all <-1 while the controls had word reading scores above 0 indicating average word-recognition ability. Vocabulary was measured using the vocabulary raw score from the Wechsler Intelligence Scale for Children, 3rd edition (WISC-III).

Word-recognition raw scores were obtained from the Peabody Individual Achievement Test (PIAT), which was a timed oral reading test of single words. Listening comprehension was measured with the Woodcock-Johnson Tests of Achievement, Third edition (WJ-III) oral comprehension raw score. The readers were not matched on their listening comprehension or vocabulary scores, but the data revealed that there was no statistical difference between the groups for both poor and good readers.

Students read a short passage (263 words) on Amelia Earhart from the Qualitative Reading Inventory (QRI), and were asked questions prior to reading to gauge their prior

knowledge. A student with no prior knowledge would be characterized with incorrect responses or a response of "I don't know." Students who were able to answer the question were placed in the prior-knowledge group, and those who could not answer the question were placed in the no-prior- knowledge group.

After reading, the students were asked to summarize the story. The summaries were scored using the idea checklist provided with the test. The number of idea units the students were able to remember were counted and evaluated by multiple raters. The inter-rater reliability was very high (Cronbach's $\alpha = .97$).

Error analysis of the mistakes or miscues were undertaken from a transcribed and coded copy of the readings. Substitution errors were evaluated to determine whether the words were: a) graphically similar (e.g., mound for mountain), b) semantically similar (e.g., hill for mountain), c) graphically similar, but semantically dissimilar (e.g., maintain for mountain), or d) neither graphically nor semantically similar (e.g., apple for mountain). All other errors (e.g., substitutions, omissions, insertions, repetitions, or skipped items) were added together yielding the total number of errors for each student. Self-corrections, when the student later corrected a missed item, were also added together to yield a self-corrections total. Inter-rater reliability for error analysis was very high, Cronbach's $\alpha > .90$, with the exception of semantically dissimilar substitutions where Cronbach's $\alpha = .80$.

Reading comprehension was analyzed using a 2 x 2 analysis of variance (ANOVA) with prior knowledge and reading ability as the between-participants independent variables and recalled idea units as the dependent variable. The results indicated that controls (good readers) were able to remember more idea units from the

text than poor readers, but there was no main effect for prior knowledge. Poor readers were able to recall more information when they had prior knowledge compared to poor readers without prior knowledge. There was no statistically significant effect for the controls with or without prior knowledge. The results suggested that prior knowledge does aid comprehension for students with poor word recognition.

Fluency scores were computed for each student by dividing the total number of correctly read words by the time it took to read the passage. Not surprisingly, good readers had higher fluency scores than poor readers. Reading fluency for the poor readers with prior knowledge was higher when compared to poor readers without prior knowledge, but there was no difference in reading fluency for the good readers in either knowledge group. On average, poor readers without prior knowledge read slower, made more errors and substitutions and self-corrected errors less than all other groups. There was a statistically-significant difference between the knowledge groups of poor readers on the total number of errors made and prior knowledge did not have a significant effect on the number of substitutions. There was also a significant effect for the knowledge group on types of errors.

Evaluation of the errors revealed that more substitutions were graphically similar than dissimilar and substitutions tended to be more semantically dissimilar than similar. There was a statistically-significant interaction between graphic and semantic similarities. The authors explained that prior knowledge allowed the reader to reduce the number of dissimilar substitutions. Poor readers without prior knowledge made more graphically similar but semantically dissimilar errors than poor readers with prior knowledge, which was the same pattern as for the controls.

The importance of these findings is that prior knowledge did affect poor readers' ability to comprehend what they read. When students made errors that were semantically similar the overall "gist" of the passage was not hindered. One way that prior knowledge helps poor readers comprehend is that it takes the reader less effort to read the text when ideas are known to the reader. The poor readers with prior knowledge in this study had greater comprehension scores compared to poor readers without prior knowledge. One explanation for this is that poor readers with prior knowledge were more fluent readers, which, in turn, affected comprehension indicating that, with less cognitive demand to decode words, more cognitive resources are available for comprehension.

There were several limitations to this study. First, the sample of students was not only small ($n = 15$ for each of the four groups), but the students were all of a similar age (mean age of 9.7). These two facts inhibit generalizing the findings to older students, which is the focus of the proposed study. Additionally, the students labeled as poor readers may or may not have been students with disabilities. The authors do not specify whether the students receive special education support, but they stated that students recruited to the earlier study had referrals for a reading disability. Since the focus of the proposed study is SWD, similar results may not be realized.

Though the participants may be dissimilar to the proposed study, there are some similarities that make the Priebe et al. study valuable. First, the relationship between prior knowledge and reading comprehension is of interest in the proposed study. The unique role prior knowledge plays in aiding both comprehension and word recognition will be under examination. Secondly, Priebe et al. (2012) posited that students with prior knowledge were better comprehenders and decoders when compared to students with low

prior knowledge and poor decoding skills. While not the main focus in the proposed study, this phenomena can also be explored.

Comprehension is influenced by the reader's general knowledge and experience (both life and domain-specific). A reader's interaction with the text is one aspect that allows them to understand what they have read. In a related study, Elbro and Iverson (2013) investigated how efficient students were in activating prior knowledge so that they could make inferences about the text, which aided in overall text comprehension. They posited that reading comprehension is improved when students infer even when decoding, vocabulary, knowledge of text structure, comprehension, and verbal ability are controlled, which points to a link between making inferences and reading comprehension.

The study had several goals. First, since making inferences is related to comprehension, which requires activating background knowledge, Elbro and Iverson (2013) reasoned that these demands would be greater when reading expository text. They speculated that middle school students would benefit from an intervention that explicitly taught students how to activate prior knowledge, which would teach them how to make reasonable inferences about what they read. While there are several types of inferences (e.g., bridging where the reader links ideas, predicting where the reader draws conclusions not in the text), the study focused on gap-filling inferences where the reader fills in gaps of information taken from their prior knowledge. The first goal of the study was to broaden earlier research on gap-filling inferences by determining if these skills would generalize with different texts after students had been explicitly taught how to fill in knowledge gaps. Another purpose of the study was to investigate whether gap-filling inferences would generalize to standardized reading comprehension measures and if the

results could be maintained over time. The last research focus was to measure the robustness of the effects by determining what effect student pre-training ability, differences in training, or differences in classroom environment had on using gap-filling inferences, which would lead to an increase in reading comprehension.

The study had experimental and control conditions and used a pretest, posttest, and delayed posttest design. Sixteen sixth-grade Norwegian classes volunteered to participate in the study, and the classes were randomly assigned to the testing conditions. Eight lessons of gap-filling inference were taught during the students' typical language and literature class in the experimental condition while the control condition received their regular teaching.

A total of 236 sixth grade students from six different schools participated in the study. Students' socioeconomic status was at or above national averages. The ages of the students ranged from 10.5 to 11.10 ($M = 11.2$ years). Boys and girls were relatively equal and 9.7% of the children were bilingual. There were 151 students from 10 classes in the experimental group and 85 students from six classes in the control group. The groups were considered equal in relation to students' age, gender and teacher experience ($M = 9$ years). The final analysis included 214 students due to absences during either the pre- or posttest.

The intervention phase consisted of eight training sessions. The students were required to read short expository passages and use the gap-filling inference strategy to answer questions. Students would fill in missing information based on their prior knowledge. After initial practice, the students were provided graphic organizers with three boxes to help visualize missing information and train them on the process of using

gap-filling inferences. Instruction lasted 30 minutes per session and the control group engaged in typical lessons. After training, the students were assessed using five short expository passages with 16 questions that students answered by making gap-filling inferences. Students were also asked to underline words from the text that supported them in answering the questions. To ensure reliability, 20% of the tests were scored twice. Cronbach's alpha was 0.82 for both the pre- and posttests.

Several measures were used during the course of the study. Reading comprehension was measured using the Diagnostic Reading Analysis (DRA), which consisted of short passages followed by a mixture of comprehension questions (i.e., literal and inferential). Two forms were used in the study; Form A was used for the pretest and Form B was used for the posttest. Cronbach's alpha varied from 0.84 (pretest) to 0.76 (posttest). To test receptive vocabulary, a researcher-developed test was used. Students were read 20 words or phrases and asked to find the correct meaning from a choice of three items. Reliability for this test was 0.65 (Cronbach's α). A timed word-chain test consisting of four words "chained" together (e.g., cardoghatbug) was given to test word decoding. Students would then separate as many word chains (e.g., car/dog/hat/bug) as possible within four minutes. Nonverbal IQ was measured using the Raven's Standard Progressive Matrices (Raven, 1958). Mathematics ability was included to mitigate any Hawthorne effects (i.e., students might alter their behavior due to being in the study). The math test was a standardized test used in Norway that had five number sense categories. Lastly, motivation was measured by a translated Motivation for Reading Questionnaire (Guthrie, Wigfield, & VonSecker, 2000) to moderate any expectancy effects (Cronbach's $\alpha = 0.68$).

There were no significant group differences (pretest) with the exception of higher scores on decoding for the experimental group. A 2 x 2 x 16 (i.e., time, condition, classes) ANOVA was employed to analyze the data. There was a statistically significant main effect for time, but no significant effects for condition or class. There was a large (d = 0.92; Cohen. 1988) statistically significant interaction effect between time and condition. A small, significant interaction also was found between time and class within each condition, $F(14, 201) = 1.9$, $p < .05$.

There was a small decline between the pretest and posttest reading comprehension scores for the control group that may have been attributed to using alternate forms of the same test. Transfer effects were also evaluated using a 2 x 2 x 16 (see above) ANOVA. Significant effects were found for time ($p < .01$) and condition ($p < .05$), but no significant differences for class. There were medium effects for training ($d = .69$), DRA fiction and nonfiction texts ($d = .46$ and $d = .57$, respectively), and literal and interpretative questions ($d = .45$ and $d = .73$, respectively).

Analysis effects were also computed with controls for word decoding, vocabulary, and nonverbal IQ. Posttest inference making was analyzed with teaching condition as the independent variable with inference making, word decoding, vocabulary, and nonverbal IQ controlled. The results showed a significant difference between the groups ($p < .001$, partial $\eta^2 = .26$).

Five weeks after the initial study, 27 students from the training condition and 26 students from the control group were assessed to determine the effect that training had over time on inference making. A mixed between-within subject ANOVA with repeated measures was conducted to analyze student transfer. Significant main effects were found

for time ($p < .001$, partial $\eta^2 = .22$) and condition ($p < .05$, partial $\eta^2 = .12$) with a

significant interaction effect

($p < .01$, partial $\eta^2 = .11$). The results show that a significant effect was found during

training that was sustained post-training.

      Several major findings from this study were significant. First, it was possible to

train sixth grade students to use an inference strategy that used the reader's prior

knowledge. The training effect was quite large (almost one standard deviation) even

when word decoding, vocabulary, and verbal IQ were controlled. There was no effect for

motivation and math ability, which indicates that the training effects were attributed

strictly to reading. Second, the training had a positive impact on reading comprehension

for both fiction and nonfiction texts ($d = .69$), which was also present five weeks after

training. This finding supports the notion that teaching students to actively use prior

knowledge to make inferences improves reading comprehension. Lastly, the effect of the

experimental training was robust, and the results were independent of learner

characteristics (i.e., gender, vocabulary, decoding speed, or nonverbal IQ).

      Some limitations were noted by the author. First, the experiment was not blind;

both the teacher and students knew if they were in the experimental or control group.

This might have influenced the way the teachers delivered their instruction. If group

participation (control or experimental) had influenced student responses, an increase in

motivation and abilities would have been expected, which was not the case. To replicate

this study, teachers should be more closely supervised to ensure instructional fidelity.

Additionally, the inference-making training was isolated to expository text and with one

strategy only (gap-filling). Due to this design, it is difficult to cull out activation of prior

knowledge from gap-filling inference making. It is also difficult to determine to what extent the outcome was caused by one or the other. Lastly, the study focused on middle to upper SES sixth grade Norwegian students. These students were chosen because it was believed that they were at a point in their educational career that would allow them to understand the importance of expository text. Generalizing these results to either younger or older students, students who speak different languages (i.e., English), bilingual students, or students with low SES would be problematic.

However, the usefulness of the current study is that teaching students to activate prior knowledge did improve both inference generation and reading comprehension, which are both factors in the proposed study. While the proposed study will focus on students with disabilities in grades 9 – 12, most of whom have low SES, the effect of prior knowledge on reading comprehension for these learners will provide valuable information on whether SES has a role in prior knowledge.

Each of the studies in the review of prior knowledge underscores the importance of prior knowledge to reading comprehension. Both general knowledge, or abilities, and content-specific knowledge (domain-knowledge) are needed to understand text. Many SWD lack these abilities often due to their inability to read. While there are many factors that affect reading comprehension, prior knowledge can be strengthened through systematic instruction as reported by Elbro and Buch-Iverson (2013).

Word Recognition

As students move further away from elementary school, a stronger focus is put on being able to comprehend text. Since there is a strong relationship between word recognition and reading comprehension, oral reading fluency (ORF) has become an

accepted way to quantify a student's reading competence. Whether this applies to older students is unknown. Denton, et al. (2011) indicate that few studies have examined the relationship between ORF and reading comprehension and, those that have, report lower correlations between ORF and comprehension. This becomes problematic for secondary teachers who use data to determine if students need interventions to improve their reading. Accurate measurement of ORF and reading comprehension is needed to ensure that those who need support receive it, and those who do not are not unnecessarily receiving interventions.

One of the purposes of their study was to determine if the relationship between ORF and reading comprehension decreases for secondary students. Specifically, the study looked at whether a difference in the relationship occurred depending upon how these constructs were measured. One concern was whether measuring oral fluency with word lists or passages and silent fluency with maze, word identification, or verification tasks (i.e., reading short questions with a "yes" or "no" answers) was an efficient and accurate way to measure reading fluency and comprehension.

Another focus of the study was to review the state's standardized reading test scores and determine how much unique variance could be accounted for from reading fluency and verbal knowledge after adjusting for the prior year's test. Lastly, Denton, et al. (2011) wanted to answer how accurate ORF passage fluency tests, silent reading fluency tests, and the prior year's standardized reading comprehension test were to classify middle school students at risk for poor performance on later tests.

Participants in the study were 1,421 sixth-, seventh-, and eighth grade students from seven middle schools in the southwest United States. Three of the schools were

from a large urban district and four were from two school districts within a smaller city. A review of student demographics revealed that 56% to 86% of the students received free or reduced lunch in the urban school and 40% and 85% in the smaller schools. Students were ethnically diverse, with 39% African American, 38% Hispanic, 19% Caucasian, and 4% Asian or Other. Fifty-four percent of the students had previously been identified as struggling readers defined as students who failed the state reading assessment (i.e., Texas Assessment of Knowledge and Skills [TAKS]) or who scored within 0.5 standard error of measurement above the passing rate for the TAKS-Reading on their first attempt during the 2006-2007 school year. A larger proportion of struggling readers were included in the study so the results could be generalized to students who would, typically, be given tests of reading fluency.

Students were given a battery of assessments that included multiple measures of reading comprehension, ORF, silent reading fluency, and vocabulary in the fall of 2006. In the spring of 2007, students took the TAKS as part of the schools regularly-scheduled standardized testing that aligns to the state standards. Students were required to read grade-level expository text and answer multiple-choice questions as well as vocabulary and critical thinking questions. Reliability for the TAKS reading test across the grades was .87 to .89.

Reading comprehension was measured by the Group Reading Assessment and Diagnostic Evaluation (GRADE; Williams, 2001) and the Woodcock-Johnson Tests of Achievement (WJ-III; Woodcock et al., 2001) with the passage comprehension subtest from both measurements. For the GRADE, students read short passages and then answered multiple-choice questions and, for the WJ-III, students read short cloze

passages and supplied the missing word. Reliability for the GRADE ranged from .82 to .88 and, for the WJ-III, .94 to .96.

Oral reading fluency was measured using the ORF Curriculum-Based Measurement (CBM) Passage Fluency and Word Fluency (University of Houston, 2008), and the Test of Word Reading Efficiency (TOWRE; Torgeson, Wagner, & Rashotte, 1999). The tasks ranged from reading single words in isolation, reading short passages of less than 500 words for one minute, and reading sight words that varied in difficulty for 45 seconds. The reliability for the ORF CBM Passage Fluency ranged from 0.87 to 0.96 while the Word Fluency test ranged from 0.92 to 0.97. The reliability for the TOWRE was ≥ 0.90.

Silent reading fluency was measured using an AIMSweb Maze CBM (Shinn & Shinn, 2002), the Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner et al., 2010), and the Test of Silent Contextual Reading Fluency (TOSCRF; Hammill et al., 2006). Students had three minutes to complete each of the three tests and answer comprehension questions (AIMSweb) or answer simple "yes/no" questions (TOSREC). On the TOSCRF, students read a passage that had no spaces between the words and then they separated them by drawing a line between the words. Reliability for the three tests ranged from 0.79 to 0.92.

Verbal knowledge was assessed using the Kaufman Brief Intelligence Test-2, Verbal Knowledge test (KBIT-2; Kaufman & Kaufman, 2004). This norm-referenced test measures receptive vocabulary and general information. Reliability ranged from 0.87 to 0.95.

Two important findings were uncovered about the connection between ORF and reading comprehension. First, the relationship between ORF and reading comprehension is not as strong for middle school students ($r = \sim0.50$) compared to younger students ($r = 0.79 - 0.84$; Hosp & Fuchs, 2005). Consequently, the results suggest that the relationship between ORF and comprehension is different for younger and older readers. Second, the relationship between ORF and reading comprehension is more evident when students read connected text rather than word list reading, which indicates that oral passage fluency may represent how well students are able to process text beyond simply reading words. Denton et al. (2011) also noted that the TOSREC (i.e., sentence verification test) had the strongest relationship with reading comprehension than the other silent fluency measures. The TOSREC was also more highly correlated with the WJ-III than all other ORF tests; however, the correlations between the TOSREC and the three comprehension measures were moderate ($r = 0.56$ to 0.62). Additionally, ORF was a better predictor of reading comprehension than the AIMSweb Maze assessment. The relationship between the TOSCRF and reading comprehension was higher ($r = 0.41 - 0.50$) than the relationship between the maze task and reading comprehension ($r = 0.37 - 0.40$).

Overall, of the multiple measures used to measure reading comprehension, the correlations between the three tests were moderate ($r = 0.60 - 0.64$), suggesting the measurement might be assessing different domains of reading. The findings on using vocabulary as a predictor of reading comprehension were mixed, and Denton et al. (2011) posited that, if the vocabulary instruments were related to the content in the reading passages, the relationship between the two might have been higher.

The researchers further noted that using the TAKS as a screening tool to identify struggling readers is supported by the data where the previous year's test scores were a good predictor on how well the student would perform on the present year's test. They noted that these results do not indicate where interventions should be employed, but rather highlight the need for intervention to improve reading comprehension.

One limitation noted in the study was that prediction accuracy of the fluency measurements was evaluated with three rigid cut off-points that might have affected the predictive accuracy. Another limitation, according to Denton et al., was that they used a high number of students with reading difficulties, though they noted the sample was normally distributed.

Due to the shortage of research conducted with secondary students, a trend has been to generalize the results of research conducted with younger students to older students. Denton et al. noted that this practice may not be suitable when trying to identify the factors that impact reading comprehension for secondary students. These findings are connected to the proposed study in that the focus will be on factors that predict reading comprehension for secondary students. Additionally, the method of the proposed study (LISREL structural equation modeling) will allow for better predictability between the factors.

In a related study, Gilbert, Goodwin, Compton, & Kearns (2013) investigated whether morphological awareness (i.e., ability to isolate and manipulate the smallest units of meaning) is essential to reading comprehension. Recent studies suggested that word reading and vocabulary knowledge may facilitate a connection between morphological awareness and reading comprehension. According to the lexical quality hypothesis

(Perfetti, 2007) there is a link between students with poor word reading and poor comprehension. These students are more likely to have a high number of low quality lexical representations (i.e., the "bridge" between sound and meaning). The end result being that text comprehension is hampered because the reader was unable to retrieve codes from long-term memory that would aid in "orthographic, phonological, semantic, and morpho-syntactic information" (Gilbert et al., 2013, p. 35). Conversely, good readers tend to make high-quality lexical representations, which aids in comprehension.

The focus of the study was to investigate whether word reading skills moderate the relationship between morphological awareness and comprehension. For the purposes of the study, multi-syllable words are the moderator, morphological awareness is the independent variable, and reading comprehension is the dependent variable. Academic and vocabulary knowledge were used as control variables since their relationship to morphological awareness, word reading, and comprehension is well established. This allowed the emphasis to be placed on multi-syllabic word reading as a moderator rather than as part of the shared variance with vocabulary and academic knowledge. Gilbert et al. stated that leaving these variables out of the model might overstate the interaction between word reading and morphological awareness.

Participants were two groups of fifth-grade students who had taken part of a longitudinal study. The sample encompassed 164 children (88 female, 56 male) from 40 different schools and 95 teachers. A majority (69%) received free and reduced lunch and 65% were minority students. Poor readers were overrepresented in the sample, which was the focus of the original study. The sample was similar to the sample in the longitudinal study.

Morphological awareness was assessed with four different measures, which produced a composite derived from averaging each test's z scores. Three tests were suffix choice tests. In the first test, students read incomplete sentences and chose the correct word derivative to complete the sentence. The second test required the students to choose five correctly used pseudoderived words that would fit the sentence. For instance, for the word flyless, students might be shown a sentence that read, "When Sarah swatted the fly, she was once again flyless." Students were given 14 sentences with a word missing and asked to choose the correct nonword for the third test. The last test, adapted from an earlier test (Derwing, 1976), was a morphological awareness test. Students were read words, which the students were able to see, and asked if the words were related (e.g., slowly and slow); distractors were words that were orthographically similar (e.g., tamper, tamp). Reliability information was not included for this sample; however, Gilbert et al. refer to the literature which suggested the tests were reliable (Cronbach's $\alpha = 0.73$).

To measure general knowledge the WJ-III Academic Knowledge subtest with reported reliability of 0.83 to 0.85 was used. To assess multi-syllabic word reading, the researchers created a 30-item list of words that all contained a root word plus suffix. The researchers reasoned that these words are important in the fifth grade as content-area knowledge requires an understanding of complex words. Students were given the list of words and asked to read them. Scores were computed by the percent of correctly read words. The internal reliability for the test was 0.94. Reading comprehension was measured with fifth grade passages from the QRI-3 (Qualitative Reading Inventory, 3rd edition; Leslie & Caldwell, 2001). To ensure reliability, 20% of the tests were reviewed by a second rater; interrater reliability was ≥ 0.93. Vocabulary was measured with the

Peabody Picture Vocabulary Test (Dunn & Dunn, 2007). In this test, students were read words and asked to point to one of four pictures that illustrated the meaning.

Hierarchical regression was undertaken to compute effect sizes for the main effects of morphological awareness and word reading in addition to the interaction between the two variables. Students received an average standard score of 90.31 ($SD =$ 13.70) on the general knowledge test and 93.09 ($SD = 15.20$) on the vocabulary test, which indicates that the sample was relatively low achieving. On each of the tests, students averaged just above 50% correct. The correlations among the variables were in the moderate range (i.e., 0.41 to 0.68) with the exception of general and vocabulary knowledge with a correlation of 0.79.

The findings from the study suggest that morphological awareness and reading comprehension were moderated by multi-syllable word reading. In fact, there was a significant positive relationship between morphological awareness and reading comprehension for poor word readers (when general and vocabulary knowledge were controlled). One explanation for this phenomena might be that poor word readers need to use morphological information to read words and comprehend text because they have weak lexical representations. Students who are proficient word readers do not need to rely on word morphology because they have high-quality lexical representations, which allows them to gain meaning from the word itself rather than each morpheme. Poor readers are less likely to have a large number of stored representations which means they rely on word structure (e.g., knowledge of word roots, affixes) to decode words.

One recommendation that Gilbert et al. made was to include direct, explicit instruction beginning in the upper elementary grades on morphological awareness for

poor readers. When reading multi-syllabic words improves, reading comprehension should also improve. The authors recognized that other forms of literacy instruction are equally important and do not advocate ignoring sound instruction in phonics, fluency, and vocabulary. They also caution that, due to the correlational nature of their study, causality should not be presumed, but research supports that an increase in word reading also supports an increase in comprehension. Morphological awareness is one way to improve word reading in poor readers.

Limitations noted in this study were that a non-standardized measurement was used for reading multi-syllabic words. A norm-referenced test would have provided a broader perspective to understand the ways in which morphological awareness is related to reading comprehension. Another limitation is that an assumption was made that morphological awareness influences reading comprehension at the word level, but it might in fact influence it more at the passage level. The authors recommended future research in this area.

The proposed study is also interested in how word reading (i.e., word recognition) influences reading comprehension. As Gilbert et al. (2013) noted, poor morphological awareness impedes students from reading efficiently, which impacts reading comprehension. Without a clear understanding about what influences reading comprehension, teachers will not be able to target the exact skills needed to improve comprehension.

According to the National Reading Panel (NRP; 2000), reading fluency is an essential aspect of reading that correlates extensively to reading comprehension. As O'Connor, Swanson, & Geraghty (2010) explain, this notion stems from the capacity

theory of information processing (LaBerge & Samuels, 1974) which suggests there are limited attentional resources (i.e., capacity), and while a person may process multiple stimuli simultaneously, they are only able to attend to one cognitive task at a time. For poor readers, who struggle with automatic word reading (i.e., automaticity), reading becomes a cognitive task thereby requiring a student to use extensive resources to read words, which impedes reading fluency and comprehension.

To understand the relationship between reading rate (i.e., the number of correctly read words in one minute) and other aspects of reading (i.e., word identification, decoding, comprehension, and vocabulary), the purpose of the study was twofold (O'Connor et al., 2010). First, the impact text difficulty had on reading growth rate for poor readers in second and fourth grade was examined. Text difficulty was determined by the percent or words accurately read in connected text. Text considered to be at the student's independent reading level was read with between 92% and 100% accuracy while instructional text (the level a student can read a text with some help) could be read with 80% - 90% accuracy. In this study, both text types were used to understand this phenomena.

One explanation of how reading rate improvement in might influence other aspects of reading is that reading text at students' independent reading levels might allow a "redundancy effect" because there are more redundant words in easier text, which could improve overall reading rate. It is believed that these skills would transfer to other same-level text. Accordingly, it was surmised that robust gains might occur in word identification and reading rate when students read easier rather than difficult text though

a substantial growth in both vocabulary and comprehension may stem from reading more difficult text due to exposure of grade-level words, phrases, and content.

Participants were from a large school district in the southwestern United States from 31 classrooms (16 second grade and 15 fourth grade classes) in five different elementary schools. Three to six students were identified from each classroom as a struggling reader. Struggling readers were described as second grade students who read between 12 – 45 words per minute on grade-level text and fourth grade students who read between 20 – 80 words per minute. To test receptive English ability, students were given the Peabody Picture Vocabulary Test—III (Dunn, Dunn, & Dunn, 1997) and were excluded from the study if they scored below 70. This cutoff was established because students would need to read aloud in English and have enough vocabulary ability to benefit from the intervention. In total, there were 123 participants in the study. Forty-seven percent were Hispanic, 31% European-American, 14% African American, and 8% other ethnicities. Twenty-one percent of the Hispanic students were English Language Learners with Spanish being their first language. Fifty-one percent of the participants were boys, and 48% were classified as low SES. Due to attrition, 116 poor readers (63 second graders and 53 fourth graders) completed the study.

The treatment consisted of students reading fiction and nonfiction text aloud to a trained adult 3 times per week for 15 minutes. Text complexity varied from easy (i.e., independent reading level) or difficult (instructional reading level). To ensure appropriate reading text was assigned, student's reading accuracy was assessed weekly. The control group (second and fourth grade students receiving grade-level instruction) were

instructed for 90 minutes per day in the school's language arts program. No interventions were provided to this group.

The measures used in this study were: (a) Gray Oral Reading Tests (4th Ed.; GORT-4; Wiederholt & Bryant, 2001) used to assess reading accuracy, rate, and comprehension, (b) Analytic Reading Inventory (ARI; Woods & Moe, 1989) which assessed oral reading rate, (c) Woodcock Reading Mastery Tests—Revised/Normative Update (WRMT; Woodcock, 1998) evaluated word identification, vocabulary, and passage comprehension, (d) the Peabody Picture Vocabulary Test (3rd ed.; PPVT-III; Dunn et al., 1997), which measured receptive vocabulary, and (e) redundancy was measured by researcher-generated redundancy percentages based on the repetitive words used in the passages students read. Reliability for the first four measures ranged from 0.77 to 0.96.

Pretest scores were compared to posttest measures. The study resulted in several major findings. First, regardless of how fluency was measured (i.e., GORT-4 or ARI), students' fluency improved irrespective of text level (independent or instructional), and students in both conditions performed better than the control group. No statistically significant differences were found between grade levels and between treatments. Second, oral reading practice did not improve decoding or vocabulary skills. Lastly, an increase in fluency rate had a direct effect on reading comprehension.

Several practical implications emerged from this research. First, student's reading growth rate became stronger after the tenth week of interventions. In a classroom setting, teachers often gather performance data more frequently and may erroneously deduce that their intervention is not effective when positive growth is not realized. At this point,

teachers may discontinue the intervention they are using. O'Connor et al. state that further research should be conducted to determine what the optimal time for interventions should be.

Another practical implication from the study was that fourth-grade students made significant gains in reading fluency, which exemplified the fact that it is not too late to support struggling readers who are in the fourth grade. Realistically, fluency instruction and/or practice does not typically occur in the fourth grade where the focus is comprehension. Based on the results from this study, it would be incumbent upon upper elementary school teachers to continue helping their students build fluency skills, which would directly impact reading comprehension.

One limitation to the current study was that all of the participants read significantly below grade level; the results might not be same for typical readers. Additionally, students read to adult listeners who did not provide feedback when they could not read the words. If the adults provided help in reading the words, different results might have been attained. A further limitation, and need for future study, was that it is not known if an increase in oral reading fluency has the same effect on decoding or vocabulary skills in poor readers as it does in typical readers.

O'Connor et al. highlighted the interrelatedness with word recognition, fluency, and reading comprehension, which is a similar focus of the proposed study. While there are similarities between the two studies, there are also vast differences. First, the proposed study will focus on secondary students rather than elementary students. As noted by Denton et al. (2011) scant research exists on factors that affect reading comprehension for older students. Additionally, the proposed study will attempt to

identify the factors that can predict reading comprehension for secondary students with disabilities, which will provide a broader scope to the research.

The review of the articles on word recognition elaborate the relationship between being able to read fluently, which requires efficient word decoding, and reading comprehension. A deficit in word recognition also impacts a students' vocabulary growth (O'Connor et al., 2010). Each of these constructs (i.e., word recognition, vocabulary, and reading comprehension) will be examined in the proposed study.

Reading Strategies

Antoniou and Souvignier (2007) report that 80% of students with learning disabilities struggle to comprehend written text, which has been correlated with academic and post-secondary success. One goal for secondary SWD is to garner skills needed to participate fully in society (e.g., live independently, become gainfully employed). The purpose of this study was to administer an intervention program that used explicit teaching coupled with self-regulation strategies to improve reading comprehension of SWD. The researchers indicated that they expected supporting effects on student's strategy knowledge and self-efficacy.

Participants were 73 middle-school aged children ($M = 12.8$, Treatment Group; $M = 12.6$, Control Group) attending fifth through eighth grades at several schools for SWD in Germany. Random assignment was employed for the 14 classrooms in the treatment group and the 13 classrooms in the control group. To be included in the study, students had an IQ above 85, read at least two years below grade level, had no physical disabilities, and exhibited a discrepancy between IQ and reading achievement. Many of the students did not speak German at home ($n = 29$), 19 spoke only German, and 25

spoke German and another language. The 29-hour intervention program consisted of several phases that took place during one school year from September to April. Teachers were trained to explicitly teach cognitive and metacognitive reading strategies and self-regulation procedures. The program taught students to act like "reading detectives" who would look for clues to solve mysteries. The focus of the intervention was for students to see the relevancy of close reading and gathering details about what they read. Throughout the program, teachers provided explicit, direct instruction in text structure (i.e., narrative vs. expository text), reading strategies (i.e., summarization, prediction, inference), meta-cognitive strategies (i.e., monitoring unknown words), and self-regulation strategies (i.e., a reading plan with checklist). Prior to participation in the program, students were given a battery of tests to measure intelligence, vocabulary knowledge and decoding speed. Intelligence was measured with the Culture Fair Intelligence Test (CFT 20; Cattell, Weiss, & Osterland, 1987) with reported internal consistency of 0.90 (Cronbach's α). Vocabulary knowledge was measured with a subtest of the CFT 20 (Cronbach's α = .81), and decoding speed was measured using a German test Wuerzburger Leise LeseProbe Test (WLLP; Kuespert & Schneider, 1998) that reported test-retest reliability of $r = .82$. Reading comprehension was measured using a modified test of reading comprehension; no reliability data was included in the study. Reading strategy knowledge was assessed using an adaptation of a metacognition questionnaire (Schlagmueller & Schneider, 1999) where internal consistency was α = .76. Reading self-efficacy was measured with a likert-scale containing 11 statements that quantified a student's belief about how they handled reading difficulties (Jerusalem & Satow, 1995), and internal consistency was reported as α = .75.

The results indicated that there was a difference in reading comprehension ability pre- and posttest between the treatment and control groups ($p < .10$); $d = 0.45$). While this result is promising, the results for follow up testing were even more encouraging ($p = .002$, $d = .80$). Reading strategy knowledge also showed significant improvement posttest ($p = .007$, $d = .59$). Initial differences in reading self-efficacy were not significant; however, in the follow up group, it was statistically significant ($p = .001$, $d = .78$).

According to Antoniou and Souvignier (2007) intervention programs that use explicit, direct instruction can yield positive results in reading comprehension, reading strategy knowledge, and reading self-efficacy knowledge for SWD. The follow-up gains offer some implications for practice. First, SWD can profit from intensive reading interventions. Second, many intervention programs are not implemented for enough time to allow SWD to make consistent, positive reading gains (Antoniou & Souvignier, 2007). Lastly, intervention effects are strengthened through the use of reading strategies and self-regulation techniques.

One limitation of the study was that no initial effects in reading comprehension and reading self-efficacy were noted even though numerous studies generated immediate, significant effects Antoniou & Souvignier, 2007). The sample provided another limitation to the study because students were chosen for participation based on their attendance in a special school for SWD. Students are enrolled in these schools because they had been deemed academically disadvantaged and required a special school. The impact of being placed in these special schools was not discussed in this article, but placement in this educational environment might be a contributing factor to the student's literacy skill deficits.

The proposed study will assess students' motivation-to-read using measurements that mirror the self-efficacy scale used in Antoniou & Souvignier (2007). A student's perception about their reading abilities and their motivation to read correlates with reading comprehension and reading ability (Guthrie, 2008). Additionally, reading strategy knowledge (i.e., summarization, inference, and prediction) are essential to reading comprehension, and the proposed study will also evaluate how effective secondary SWD are in using these strategies, which will move beyond the scope of Antoniou's and Souvignier's study.

In a related study on reading strategies, Fritschmann, Deshler, & Schumaker (2007) examined the effects of a higher-order reading strategy, on reading comprehension. With an increase of high-stakes tests (exit exams) for high school students, the ability to clarify and assimilate information is essential. To that end, secondary students activate prior knowledge to make inferences about text. Inference is defined as the ability to create a text base and mental representations from information that is not explicitly discussed in the text (Fritschmann, Deshler, & Schumaker, 2007, Kintsch & Van Dijk, 1978).

The purpose of this study was to create and test the effects of an inference strategy teaching program for secondary SWD. The Inference Strategy is a multi-step mnemonically-based reading comprehension strategy that taught students to preview, activate prior knowledge, identify key idea, look for details, and review answers for accuracy (Fritschmann et al., 2007). The study further evaluated the effects of the instructional strategy by computing (a) student strategy knowledge, (b) strategy use with a narrative passage, (c) achievement in answering inferential questions, (d) standardized

reading comprehension scores, (e) affective measures of reading and strategy use, and (f) the optimal amount of time needed to teach the strategy.

Participants were eight secondary students all receiving special education services for a minimum of 180 minutes per school day. Student reading ability was at least five years below grade level as measured by the GRADE. Students attended an urban school in the Midwest.

The study used a variety of instruments to measure the effects of the inference strategy (a) a checklist to rate teacher fidelity, (b) a strategy use test developed for the study, (c) a criterion-based comprehension test created from the reading passages, (d) a strategy knowledge test that required students to list the steps and uses of the strategies, (e) the GRADE standardized reading test (i.e., sentence comprehension and passage comprehension subtests), (f) a student satisfaction survey, and (g) instruction time log. The criterion-based comprehension test, strategy knowledge test, GRADE, and student satisfaction survey were tested before and after strategy instruction. Inter-rater reliability ranged from .80 to .98. No inter-rater reliability was computed for the GRADE and student satisfaction survey.

Students received instruction by Fritschmann, a certified special education teacher, during class sessions that lasted between 60 – 75 minutes. Students were explicitly taught how to use the strategy and given the opportunity to practice. The intervention phase began with students reading passages at the fourth grade level to allow access by all of the students. Intervention ceased when students were able to reach mastery on an eighth grade passage.

The results of the multiple-probe-across-subjects design was used to evaluate the effects of instruction on students' strategy use and reading comprehension. The results indicated that the instructor implemented the program with 98% accuracy. Data showed that students' correctly answered questions increased from 31.74% (pretest) to 77.39% (during the test), and 82% (posttest). Results of the Strategy Use Test were similar. There were significant differences between the pre- and posttest scores on the Strategy Knowledge Test ($p = .00$, $r = 0.99$). There were also significant differences on the GRADE ($p = .12$, $r = 0.91$) and the Reading Satisfaction Survey ($p = .12$, $r = 0.95$). There was an average reading gain of 2.82 grade levels in reading comprehension. The duration of the study ranged from five hours of direct instruction to approximately 15 hours of independent and teacher supported student practice.

The data suggests a strong relationship between the Inference Strategy instruction and gains in reading comprehension and strategy use. Additionally, the Student Satisfaction Questionnaire revealed that students were more satisfied at the end of the study in relation to their feelings about reading and comprehension procedures.

While there were some positive results from the current study, Fritschmann, Deshler, & Schumaker (2007) noted several limitations. The first two limitations related to the sample which consisted of only eight students whose average IQ was 76 and the average reading comprehension standard score on the GRADE (pretest) was 59.75. With such a small sample, generalizing the results is problematic. The students in the sample represented students with extremely deficient reading ability, which is not typical of most SWD. Since one of the variables was amount of instructional time needed to affect gains in reading comprehension, the amount of time needed for the same amount of reading

growth (i.e., 2.82 grade levels) is unknown for students with less severe reading disabilities. The passages used in the study were all narrative, which is another limitation because, according to the Common Core State Standards, 70% of the text secondary students read should be expository text (California Department of Education, 2010).. It is unknown if similar results would be realized with expository text.

Fritschmann, Deshler, & Schumaker (2007) presented some aspects of their study that are related to the proposed study. First, they looked at the effect of reading strategy (inference) instruction on reading comprehension; the proposed study, likewise, is interested in describing the relationship between these two constructs. Secondly, students in both studies are secondary students (i.e., grades 9 – 12). . Lastly, the proposed study will also investigate students' perception about their reading ability.

While there are several similarities between the current and proposed study, there are also some differences. First, the proposed study will have a larger sample that will allow the results to be generalized. Additionally, the ability levels of the students in the proposed study will not be as deficient, which will provide a clearer understanding about the effects of the reading factors to reading comprehension. Lastly, the reading comprehension passages in the proposed study will all use expository text, which is the predominant type of text secondary students read. There are practical implications of being able to understand what facilitates student comprehension (e.g., what types of instruction to offer), and the proposed study will seek to determine those factor(s).

The final study in this section is that of Berkeley, Mastropieri, & Scruggs (2011). The purpose of this intervention study was to investigate whether there was a difference in reading comprehension achievement between three distinct groups: Reading

Comprehension Strategies (RCS), RCS plus Attribution Retraining (RCS+AR), and the school's current reading program, Read Naturally (RN). In addition, of interest was whether any intervention differences would be maintained once the intervention was completed. A total of 59 middle and high school SWD were selected to participate in this study based on their reading deficits. The sample consisted of 45 students with learning disabilities and 14 students with Other Health Impairments (i.e., ADHD or other medical diagnoses). All students had average IQ and scored significantly below grade level on the Stanford Diagnostic Reading Test (SDRT) that was administered to the students at the beginning of the school year. Students read an average of four grades below grade level reading in each group

The intervention was conducted by five special education reading teachers, a reading specialist, and a trained researcher with an average of 12 years teaching experience. The intervention program used a variety of materials to teach six reading comprehension strategies: (a) setting a purpose, (b) previewing, (c) activating prior knowledge, (d) self-questioning, (e) summarization, and (f) strategy monitoring.

Students received 20 minutes of primary instruction and 10 minutes of supplemental instruction for a total of 360 minutes of instruction over the four week intervention period. In the RCS group, students received 20 minutes of instruction on how and when to use the reading strategies. Students in the RCS+AR group received 10 minutes of instruction that focused on developing positive beliefs about their reading success or failure, which included positive self-talk. The RN program was implemented per publisher guidelines. Students in the RCS and RN conditions listened to their teacher reading for the last 10 minutes of each session.

Participants were assessed with several measures pre-, post-, and delayed post-testing. A criterion-referenced comprehension summarization test (adapted from an earlier test by the second author) measured the students' ability to identify main ideas and synthesize text. A researcher created passage-specific content test assessed students' comprehension through short answer, and multiple-choice questions. The test assessed recall of factual content information. Before, during, and after reading strategy use was assessed with the Meta-Comprehension Strategy Index (MSI; Schmitt, 1990). Lastly, the Reading Attribution Scale (RAS, adapted from Shell et al., 1995) measured students' perceptions about their success or failure in reading and whether they attributed strategy use to their success or failure in reading.

Results of the study indicated that there were significant differences for the RCS+AR and RCS conditions compared to the RN group ($p = .000$ and $p = .005$, respectively). Results from the MSI revealed that both the RCS+AR and RCS groups scored significantly higher than the RN group ($p = .005$ and $p = .003$, respectively). The results indicated students in the intervention groups learned and applied strategies with greater efficiency when compared to the RN group. The current study revealed that students in both RCS groups improved in both learning content and in metacomprehension strategy awareness.

On the RAS, the RCS+AR group was significantly different than the RCS and RN groups. The results suggested that students' beliefs about how they approached reading were significantly changed due to the intervention. Students in the RCS+AR condition showed higher attributions for success at posttest and delayed posttest; however, attribution scores for students in the AR condition were not significantly different than

for students in the RCS instruction group. Berkeley, Matropieri, and Scruggs (2011) noted that these results were similar to earlier findings that suggested that effective strategy instruction may alleviate the need for attribution retraining.

One limitation to the current study is that, even though random assignment was employed, the researcher taught a larger proportion of the RCS+AR intervention groups. Another limitation is that students self-reported on the strategy awareness and attribution measures. The RAS had some double negatives (i.e., "When I don't understand what I read, it is because I am not smart.", p. 30), which may have caused confusion for the students.

There are several implications for future research noted by the authors that will be employed in the proposed study. First, a direct measure of strategy use will be employed (e.g., Bader Reading Inventory that will require students to write a short summary about what they have read). Motivation is another construct that will be measured in the proposed study, which was also assessed in the current study. These two aims will aid in understanding the effect strategy use has on reading comprehension.

This section included three articles that examined the effect reading strategy use has on reading comprehension. As a shift from learning to read and reading to learn occurs in the fourth grade, students become more efficient and proficient readers. Secondary students are required to read a large amount of expository text, which requires them to continually monitor their reading by continually translating and consolidating text. Reading strategy use has been shown to promote reading comprehension in SWD. Through the use of reading strategies, students are better able to engage with the text (i.e.,

activate prior knowledge, predict, infer), which, over time, allows students to become not only more proficient readers, but self-regulated readers.

The proposed study will evaluate three specific reading strategies: (a) prediction, (b) inference, and (c) summarization. Each of these strategies are integral to critically read expository text that secondary students are required to read, which this study will use to measure these constructs. The passages in the former studies evaluated narrative passages that tend to be easier to read. Based on these studies, it is also unknown if reading strategy knowledge will positively affect reading comprehension. Given that many SWD have poor reading comprehension, understanding the factors that affect reading comprehension for secondary SWD is essential so that students have post-secondary options (i.e., college or career), which is the goal of secondary education.

Motivation-to-read

The review thus far has considered learner-centered attributes and abilities. In this last section of the review, a look at the role student affect (i.e., motivation) has in reading comprehension will be considered. In their study, Guthrie, Coddington, and Wigfield (2009) affirmed the importance of motivation in reading by expressing that, while reading achievement is important, a major aim for student reading should be to foster life-long readers. While educators often confirm the importance of motivation, it has often been overlooked in "research, theory, practice, and teacher education" (p. 320).

Guthrie, Coddington, and Wigfield (2009) acknowledged that motivation is positively correlated to reading achievement. Conversely, avoidant motivation has been negatively correlated to reading achievement. To understand the specific nuances of reading motivation (i.e., avid readers, ambivalent readers, apathetic readers, and averse

readers), Guthrie et al. categorized readers to form profiles of reading. The purpose of this study was to consider four types of motivation that will form a profile of reading. Further, they examined the role of individual motivation and profiles of motivation to reading comprehension and word reading mastery. Additionally, the study examined whether these reading motivation profiles differed between African American and Caucasian students as regards the type of student motivation, their motivation profile, and the relationship between motivational profile and reading comprehension achievement.

Participants in the study were 245 fifth-grade students in 13 different classrooms in three elementary schools from a small town in a mid-Atlantic state. The town was comprised of middle-income families near a military base with no urban center. The ethnic diversity was predominately Caucasian ($n = 186$), and all African American students who were able to participate were included in the study ($n = 59$). A relatively equal number of boys and girls were included in the study. Approximately 10% of the students were SWD and received special education services. African American students' beginning of the school year mean reading comprehension grade equivalency was 5.00 (SD = 2.47) and 7.13 (SD = 3.29) for the Caucasian students. The mean differences between the groups was statistically significant ($p < .01$).

To determine students' motivation, a motivation questionnaire was developed by the researchers to measure several motivation constructs: (a) intrinsic motivation-to-read defined as reading for enjoyment and interest, (b) reading avoidance which is explained as an evasion and dislike of reading, (c) self-efficacy or a student's belief in their ability to read well, and (d) perceived difficulty or more specifically a student's perception that the reading tasks are above their ability level. Several cognitive measures were used (i.e.,

the Gates MacGinite Reading test, Woodcock-Johnson Fluency and Word Recognition Tests) due to their correlation to intrinsic motivation.

A factor analysis revealed that, for Caucasian students, intrinsic motivation correlated significantly with reading comprehension and reading fluency and, for African American students, intrinsic motivation was significantly correlated with reading fluency. For Caucasian students, avoidance was negatively correlated and intrinsic motivation was more closely correlated to reading comprehension, fluency, and word recognition than avoidance. This indicates that students who avoided reading had relatively low achievement. Avoidance was more closely related to reading comprehension and reading processes than to intrinsic motivation for African American students.

Self-efficacy and perceived difficulty were also analyzed and the results suggested that these two factors were significantly correlated with all cognitive variables for Caucasian students (perceived difficulty was negatively correlated). There was a significant negative correlation for perceived difficulty and reading comprehension for African American students, but self-efficacy was not significantly correlated with any of the cognitive measures. Taken together, the factor analyses revealed that intrinsic motivation explained the variance in the reading variables more robustly than avoidance for Caucasian students. Avoidance motivation resulted in a stronger correlation with the reading abilities than did intrinsic motivation.

Since the results of the study revealed a strong association between intrinsic motivation and avoidance motivation with reading comprehension, Guthrie, Coddington, & Wigfield (2009) formulated student reading profiles based on theoretical criteria. The profiles were created by splitting each motivation variable at the median and forming

student "groups of (a) avid readers (high intrinsic, low avoidance), (b) apathetic readers (low intrinsic, low avoidance), (c) ambivalent readers (high intrinsic, high avoidance), and (d) averse readers (low intrinsic, high avoidance)" (p. 338). The purpose of these profiles was to compare whether students were more or less intrinsically motivated and avoidant than their peers. The profiles further allowed prediction of reading achievement more accurately than when the constructs are isolated. The results suggest that students are better categorized by multiple aspects of motivation as it relates to reading achievement.

One limitation to the current study is the study design made it difficult to determine if reading achievement affected motivation or if their motivation affected reading achievement. Another limitation is that there was a relatively small sample, especially of African American students. A larger sample would provide a clearer understanding of the differences between Caucasian and African American students. Additionally, the study included fifth grade students and it is unknown whether different results would be realized if older students were included.

This study relates to the proposed study in that the role of reading motivation-to-reading comprehension will also be investigated. Student motivation or amotivation have been shown to be positively correlated with academic achievement (Guthrie, Coddington, & Wigfield, 2009). Unlike the previous study, students will be high school SWD; however, a large proportion of the students will be African American. While the research questions of the proposed study do not focus on ethnic differences between the students, the data would allow this analysis.

In a related study, Solheim (2011) posited that there is a strong relationship between motivation-to-read and reading comprehension, and motivation is imperative to a student's reading progress. Additionally, motivation to read is correlated to time spent reading and reading comprehension. Guthrie and Wigfield (2000) explain that these factors encompass the engagement model of reading development, which elucidates that one way reading comprehension improves is when readers are engaged. Another motivational construct, self-efficacy, also influences reading comprehension. Students' beliefs about their ability to read has a direct influence on their "performance, effort, and persistence, as well as their choices of what tasks to perform" (p.4). From these examples, it is clear that student affect (i.e., their beliefs and motivation about reading) are strongly related to reading comprehension.

The purpose of the study was to investigate whether motivation predicts reading comprehension scores based on the format of the reading comprehension measure (i.e., multiple choice [MC] or constructed response [CR]) that Solheim (2011) refers to as task complexity. For the purposes of this study, MC and CR formats are assumed to increase text complexity. Accordingly, it is not known whether writing short-answer responses is perceived as more difficult than answering MC questions.

Participants in the study were 217 fifth-grade students from 12 different classes at five schools in Norway. The economic status for the sample was relatively middle-class. Based on national reading test scores, participants' reading comprehension scores were representative of the national sample.

Students read a total of 11 fiction and nonfiction text types (e.g., short stories, reports, recipes, instructions, narrative, and expository). When finished, participants

answered a mix of MC and CR questions that focused on four distinct aspects of reading comprehension: (a) focusing and retrieving explicit information, (b) making inferences, (c) interpreting and integrating ideas/information, and (d) evaluating content, vocabulary, and elements of the text. The questions were constructed for this study and included two measures for both MC and CR of 20 questions each that evaluated each of the four aspects of reading comprehension listed above. Cronbach's alpha was .86 and .85 for the MC and CR tests, respectively.

Word reading was measured using a Norwegian word chain test (*Ordkjedeproven*, Hoien & Tonnesen, 1998). The test required students to read a connected word and divide it into its four short words (e.g., skybirdtreebus) within 4 minutes. Reliability for the standardized sample was .86 (Cronbach's α).

Eight items were used to measure reading motivation. Six items were measured using an adapted version of the Motivation for Reading Questionnaire (Wigfield & Guthrie, 1997), which focused on reading importance, reading interest, and reading usefulness. Two additional items were added to the motivation questionnaire that focused on the value of reading and reading expectancy.

The regression analysis for the MC and CR reading comprehension scores indicated that for both the MC and CR test formats, word ability, listening comprehension, and nonverbal ability were all significant positive predictors of reading comprehension. Controlling for the variance from the ability measures, yielded a statistically significant positive relationship for both text formats and self-efficacy. This illustrates that students' reading comprehension achievement is linked to their belief in their ability to do well on either MC or CR reading comprehension tasks. To further

understand the role of self-efficacy on reading comprehension, the sample was divided into two groups: (a) low reading self-efficacy (LRE; $N = 102$), and (b) high reading self-efficacy (HRE; $N = 115$). The results were similar for the LRE and HRE groups when compared to the whole group. Self-efficacy explained the variance in reading comprehension scores for both LRE and HRE in both test formats (MC and CR).

Reading comprehension requires strong language skills and, because HRE students were able to activate verbal abilities more efficiently, they were able to answer either MC or CR questions successfully. LRE students' profile was more complicated. Word reading and nonverbal ability could be used to predict reading comprehension in either test format, but reading self-efficacy predicted MC scores only, and listening comprehension predicted CR scores only. This eludes to the uniqueness of LRE students who do not employ these abilities as effectively as HRE students.

Another outcome from the study is the notion that LRE students may believe MC questions are more difficult than CR questions due to the visual format of the question itself. Students need to engage in problem-solving activities to complete MC questions (i.e., evaluate distractors), which may be more daunting for LRE students. A student's belief about their ability to answer MC test questions can also affect how well they succeed in this test format. Research confirms that motivation affects reading comprehension; although, students with low self-efficacy avoid reading, which exacerbates their reading difficulties (Solheim, 2011).

The sample is one limitation to the current study. Students were all Norwegian fifth grade students, and the group was relatively homogeneous (middle class). No information is provided about diversity of the sample, which makes generalizing the

results to a diverse population problematic. Additionally, students were required to read 11 short passages over the course of two days. For students with poor reading ability, this task might appear daunting. Therefore, when completing MC questions, they may have "blindly" chosen their answers rather than expend any more effort/energy to find the correct answer. This could lead to an inflated effect of MC questions for students in the sample. While gender was defined in the study, no demographic data was provided on students with disabilities, languages spoken, and whether any student was suspected of reading difficulties and/or receiving support for poor reading achievement.

This study is related to the proposed study in that both studies recognize the importance of motivation-to-read and reading comprehension achievement. The Motivation for Reading Questionnaire, used by Solheim (2011), will also be used in the proposed study. However, the way both studies choose to look at this construct is discernibly different. The proposed study will evaluate the relationship of motivation to read in conjunction with several other factors (i.e., working memory, prior knowledge, word recognition, vocabulary, and reading strategies) to reading comprehension. Additionally, the proposed study is interested in discovering how each of these factors relate to reading comprehension ability rather than in comparison to test format (MC or CR). Participants in the proposed study will be ethnically and linguistically diverse and, in addition, all students will have disabilities. The complexity of the sample will allow for further discussion as it relates to the role of motivation-to-read and reading comprehension achievement.

According to Wigfield et al. (2008), reading engagement is the combined operation of motivational and cognitive processes. The final study in this section

examines an experimental procedure undertaken to improve reading engagement of elementary school students. At the time of this article, no experimental studies had been undertaken to establish whether engaged reading was a mediating variable that could explain the effect integrated reading instruction might have on reading comprehension of elementary school students. Therefore, the purpose of this study was to determine whether the effect of reading instruction on students' reading comprehension was mediated by engagement.

Participants in the study included both students and teachers. A total of 315 fourth-grade students with ethnicity and gender equivalent to the district (Caucasian, 68%; African American, 20%; Hispanic, 5%; Asian, 4%, and Other 4%) were included. Students attended one of five participating schools in a small mid-Atlantic city. Teacher participants ($n = 15$) were assigned to one of three treatment classrooms: (a) Concept-Oriented Reading Instruction (CORI), (b) strategy instruction (SI), and (c) traditional instruction (TI). Professional development was offered to CORI teachers, and fidelity checks were made through the intervention phase to ensure that teachers were faithfully delivering the anticipated instruction.

The study design was an equivalent group's pretest-posttest design (Guthrie et al., 2008). Use of a MANOVA determined that the groups were relatively equal at pretest in reading comprehension. To measure reading comprehension based on reading of science content, the Gates-MacGinitie Comprehension Test (level 4) was used. Performance assessments consisted of: (a) a multiple-choice comprehension test developed by the authors to evaluate students' ability to activate prior knowledge through open-ended writing assignments; responses were coded based on a rubric, (b) questions that students

wrote from the reading, (c) an ability to search for information within the reading material, and (d) a written response where students were given 30 minutes to write about the topic. Prior knowledge and questioning were formed together into a strategies composite so that analyses could be made about the effect of strategy use on reading comprehension. Two instruments were used to measure reading engagement and reading motivation: the Reading Engagement Index measured the extent teachers perceive the student was an engaged reader and the Motivations of Reading Questionnaire which measured several categories of student motivation (e.g., reading efficacy or reading curiosity). Cronbach's alpha was 0.92 and 0.88, respectively.

Three instructional frameworks were used in this study: (a) CORI where student engagement was fostered through a variety of practices (e.g., using goals, allowing choice, hands-on activities), (b) Strategy Instruction (SI) employed the use of evidence-based strategies to foster reading comprehension, and (c) Traditional Instruction (TI) where teachers implemented their typical language arts/reading instruction. Professional development for both the CORI and SI models were provided through ten days of training during the summer.

CORI was implemented in all fourth-grade classes in two of the schools for 90 minutes per school day for 12 weeks. SI was implemented for all third grade classes in two different schools and TI was implemented in all classrooms at the last school for the same amount of time as CORI instruction. Fidelity of implementation was assessed by videotaping teachers twice per weeks five and nine of the instruction.

Results indicated that engaged readers strengthened their understanding of text (i.e., reading comprehension). A MANOVA with instructional groups (CORI, SI, TI) as

the independent variables revealed that, on the Gates MacGinitie, student engagement, multiple text comprehension, and reading strategies composite, CORI was statistically higher than both SI and TI. Additionally, SI and TI were not statistically different from each other on reading measures. The results show that the CORI significantly improved reading strategies, and student engagement when compared to the SI and TI instructional methods.

Three main findings emerge from this study. First, reading engagement and reading comprehension are positively correlated. Engaged readers are strategic and use comprehension strategies while reading. They tend to be internally motivated, read often, and are critical readers. Engagement, for these readers, is fostered when classroom instruction includes the cognitive process of reading (i.e., teaching strategies) and when reading motivation is supported.

A second finding is that students in the CORI program had higher reading comprehension, strategy use, and engagement compared to both the other instructional programs. Lastly, student engagement is mediated by type of instructional group for both reading comprehension and strategy use. These results have clear implications for practice in the way reading instruction is delivered in elementary schools.

The motivational practices explored in this study were limited to the instructional program under consideration, which is a limitation to this study. While goal setting, hands-on activities, independence support, use of interesting text, and collaboration are correlated with reading engagement, there are other valuable motivational constructs that could have been studied (e.g., incentive programs, book fairs, teacher-student conversations about reading). Future research could consider how other aspects of

motivation affect reading comprehension. Another limitation was that the reading engagement instrument used in the study was limited to motivational and cognitive attributes, and neglected to consider the socio-cultural aspect of the classroom and its impact on reading comprehension. Lastly, one of the reading comprehension measures constructed for this study was related specifically to a science informational text that was used in the CORI program.

While there are several differences between the current and proposed studies, there are several areas in which they align. First, reading engagement is the combination of both motivation and cognitive strategies used while reading. The proposed study will seek to understand the relationship that motivation to read and reading strategies have on reading comprehension. Both studies have or will use the Motivation Reading Profile as one measure of reading motivation. Unlike the current study, the proposed study will use three measures of motivation to investigate the motivational construct more fully. Additionally, the proposed study will examine these constructs in relation to secondary students with disabilities.

Motivation-to-read was reviewed in this section and several key ideas can be formed from the totality of these articles. First, motivation to read is a complex construct that can be affected in a variety of ways. When a pattern of reading failure arises, students become amotivated and apathetic toward reading (Guthrie, Coddington, & Wigfield, 2009). Conversely, when students are intrinsically motivated, they will persevere when tasks are challenging because they have a belief in their ability to succeed. Self-efficacy was also revealed to be an important aspect of reading comprehension. When students believe they have the ability to do well on reading tasks,

they generally score higher on tests of reading comprehension when compared to peers who have low self-efficacy relative to reading ability (Solheim, 2011). Lastly, instructional practices should be considered when planning reading instruction to ensure that students are engaged during instruction that, for many, is very challenging. The implication for motivating instruction is especially important for secondary SWD who still struggle to gain meaning from what they read.

Summary

This review has considered the literature significant to the proposed study of constructs that affect the reading comprehension of secondary SWD. The studies included in the review investigated the role that working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read have on the reading comprehension of these students.

Each of these constructs was chosen because they have been identified in the research literature as important to reading comprehension. Several of the studies were chosen specifically because of their reference to Kintsch' CI Model of Reading (Cain & Oakhill, 2011; Fritschmann et al., 2007; Guthrie et al., 2009) acknowledging how readers comprehend text. The largest majority of articles in this literature review, however, espouse a variety of theoretical models to explain reading comprehension. Table 1 below provides a list of theories of reading and a brief description of the theory. Each theory describes at most three constructs that are relevant to reading comprehension, which are all included in the present study.

Upon analysis of the numerous theories of reading and reading comprehension, the Kintsch Construction-Integration Model of Reading (CI) was chosen for this study

because the important components described in the CI Model are the same components under consideration in the present study, which are also identified in the literature as significant to reading comprehension. While Kintsch's theory describes reading comprehension from an cognitive processing perspective and is not centered on a hierarchical model, the present study, however, sought to identify the relative importance (i.e., hierarchical order) of each of the constructs investigated in this study. To produce a hierarchical model, factor analysis and multiple regression were used to evaluate the constructs and understand the relative importance of each one.

Table 1

Description of Major Reading Theories and Theorists, their Connection to Reading Comprehension, and Key Construct(s) from each Theory

Theory (Main Theorist)	Connection to Reading Comprehension	Key Construct(s)
Schema (Rumelhart)	Schema theorists attribute poor reading comprehension to prior knowledge and vocabulary (Taylor, et al., 2009; Ebro, 2010). Likewise, schema theorists posit that students require strong linguistic (understanding what words mean) skills before they will be able to understand what they read (Berninger, Abbott, Nagy, & Carlisle, 2010; Bowers, & Kirby, 2010).	Vocabulary; Prior Knowledge
Cattell-Horn-Carroll (Raymond Cattel, John Horn, John Carroll)	The Cattell-Horn-Carroll (CHC) theory identifies general ability and measures fluid and crystallized intelligence (Evans, Floyd, McGrew, & Leforgee, 2001). The explanation for students' poor reading ability, according to this theory, is that students have auditory processing deficits, which means they are unable to process phonemes (smallest units of sound within words) accurately or with automaticity (Lyon, et al., 2003; Richardson, et al., 2004; Allen, 2010).	Nine broad abilities including: General and Fluid Intelligence, Reading and Writing Ability, Math Knowledge, and Auditory Processing [word recognition]
Cognitive Processing (Harold Herber; Content area reading)	According to cognitive theorists, to comprehend text, students require explicit strategy instruction that will teach them to summarize, recognize the nuances of text structure (e.g., narrative or expository text), and predict, infer, or summarize. Students who use strategies while reading should be able to understand what they are reading (Wanzek, et al., 2010; Swanson, Edmonds, Hairrell, Vaughn, & Simmons, 2011).	Reading Strategies: inference, prediction, summarization

Cognitive Information Processing (Atkinson and Shriffin; Baddeley & Hatch; Ericsson & Kintsch)	Cognitive information processing theorists state that working memory is the key component needed for reading comprehension. When a SWD is unable to comprehend, these theorists state it is the brain's inability to store and manipulate information efficiently that impedes comprehension (Swanson, Zheng, & Jerman, 2009; Was, 2010).	Working Memory
Engaged Model of Reading (Guthrie)	These theorists suggest that students who struggle to become efficient readers avoid reading, (Wigfield, Guthrie, Perencevich, Taboada, Klauda, McRae, & Barbosa, 2008; Bohn-Gettler, & Rapp, 2011). As students lose faith in their ability to become proficient readers, they "give up." Amotivated students enter a vicious cycle of reading failure because they evade reading, which is improved through appropriate instruction and practice, (Taylor, Frye, & Maruyama, 1990; Bohn-Gettler, & Rapp, 2011).	Motivation-to-read
Interactive Model of Reading (Rumelhart)	The model states that readers use a combination of bottom-up (word reading) and top-down (vocabulary; prior knowledge) processes to comprehend text.	Word Recognition; Vocabulary; Prior Knowledge; Reading Comprehension
Construction-Integration Model of Reading (CI) (Kintsch & Van Dijk)	The CI model posits that reading comprehension occurs when cognitive processes (i.e., word reading, working memory, prior knowledge, strategies [prediction, inference]) are engaged that allow the reader to create mental representations and situation models from the text. Comprehension occurs through the interaction of bottom-up and top-down processes.	Working Memory Vocabulary Prior Knowledge Word Recognition Reading Strategies (prediction; inference; summarization) Motivation to Read Comprehension

Each of the learner-centered constructs listed above is important to reading comprehension; however, the extent to which they are important is unknown at this time. The review has acknowledged a number of key findings that relate to the proposed study.

Students with disabilities do not perform as well on working memory (WM) tasks when compared to students without disabilities (Swanson & Ashbaker, 2000). These performance deficits explain the variability in word reading and reading comprehension achievement. Word reading and reading comprehension are related constructs because to comprehend text one must be able to read the words within the text. For SWD, these tasks are impeded by poor WM (Christopher et al., 2012; Swanson & Ashbaker, 2000). Christopher et al. (2012) note that WM is generally more important to reading comprehension than word reading.

Another skill deficit that impacts reading comprehension for SWD is inference. While reading, authors frequently have "gaps" in the information presented, which allows the reader to interact with the text by using prior knowledge of a subject, ignoring extraneous or unimportant information, and making inferences about the author's intent. These cognitive abilities, require WM to process what they have read (Caretti et al., 2009). Due to deficits in processing information while simultaneously inhibiting non-essential information while reading, SWD are at a disadvantage compared to students without WM deficits because they cannot distinguish between important and unimportant information (Christopher, et al., 2012). Working memory, therefore, is an important vehicle through which reading comprehension is made possible and is a strong predictor of reading comprehension (Caretti et al., 2009; Christopher, et al., 2012; Swanson & Ashbaker, 2000). These studies added to the research base on the relationship between

WM and reading comprehension. The proposed study will likewise investigate the relative importance of WM and reading comprehension. There is a decided gap in the literature, however, in the relationship between WM and reading comprehension for secondary SWD, which the proposed study seeks to address as the participants in the proposed study will be secondary students.

The National Reading Panel (NRP, 2000) provided insight into five key areas that students would need to become proficient readers who can understand what they read. One of those key areas is vocabulary development. In a study on the Matthew effect in young readers, Cain and Oakhill (2011) stated that an ever-widening gap between good and poor readers continues over time. As time progresses, and reading continues to get more difficult, students who struggle to read are less motivated to read outside of school than students who are proficient readers. One area where gaps exist between these two groups of students is in the area of vocabulary. Print exposure is one way that students become familiar with different words. Students who read for pleasure, and score at the 98th percentile rank on reading assessments encounter, on average, four million words a year while students reading at the 10th percentile encounter approximately 50,000, which further explains why a gap exists (Cain & Oakhill, 2011).

Avid readers have a decided advantage over their peers, who do not read as frequently, simply because of word exposure because reading comprehension not only is affected by vocabulary knowledge, but comprehension also positively influences vocabulary growth (Cain & Oakhill, 2011; Dennis, 2012). The review of these articles revealed the importance of vocabulary to reading comprehension. While both studies explored this relationship with middle school students (Dennis, 2012) and some high

school students (Cain & Oaklhill, 2011), neither sample's participants were exclusively secondary SWD as the proposed study will be. Additionally, the proposed study will examine the relative importance of vocabulary to reading comprehension in conjunction with other factors that support reading comprehension as discussed in the preceding paragraphs.

Prior knowledge is another factor that positively affects reading comprehension and word recognition (Priebe et al., 2012). Students who were poor readers were able to decode words more fluently and with more accuracy when they had prior knowledge about what they read. In comparison, poor readers without prior knowledge made significant word reading errors which interfered with their understanding of what they were reading. While reading, prior knowledge enabled students to use constraint satisfaction, which allowed them to use what they knew about a topic or story to aid in inference and word recognition. In this way, prior knowledge can compensate for poor word recognition, which can help improve reading comprehension (Priebe et al., 2012).

Elbro and Buch-Iverson (2013) found that it was possible to improve prior knowledge by teaching elementary school students to use inference while reading to increase comprehension. No students in their study were identified as having disabilities so it is unknown whether similar results would be attained with this population of students. The results are promising for SWD. Students can be taught to activate prior content knowledge and make inferences from the text, they may be able to understand and learn from what they have read. A review of the literature on the role of prior knowledge for secondary SWD is scant. The two articles reviewed for this section did not

include this population of students. The proposed study seeks to remedy this oversight to explore the role prior knowledge has in reading comprehension.

At the basic level of reading, students recognize words and read fluently to comprehend text (Denton et al., 2011, Gilbert et al., 2013). O'Connor et al. (2010) stress the connection between reading fluently and reading comprehension. Often struggling readers disengage from reading, which compounds the existing problem of poor reading ability. Research supports the necessity of reading practice to improve weak word-recognition skills, which will also help improve poor reading comprehension. As teachers work with SWD, specifically, it is important to realize that it may take these students more time to improve deficient reading skills, but with enough time and practice their reading skills can progress and reading comprehension can improve. By the time students reach high school, they are expected to be proficient at reading expository text, which is the type of text primarily read. Due to this expectation, little research has focused on word recognition of secondary students in general and specifically those with disabilities. The proposed study will investigate the importance of word recognition to reading comprehension for secondary students with disabilities.

While the focus of reading is to understand what is read, on a broader level becoming a proficient reader enables individuals to become successful members in society (Antoniou & Souvignier, 2007). Many SWD have adequate word-recognition skills to decode text, but they do not use reading strategies, which can aid comprehension (Berkeley et al., 2011). There are numerous strategies that can be used while reading, but Kintsch (2013) described prediction, inference, and summarizing as essential reading strategies to foster understanding in his theory on text comprehension. According to

Fritschmann et al., using the INFER strategy that embeds prediction, inference, and summarizing improves the reading comprehension of secondary SWD. Each of these studies illuminated the importance of teaching, and using, reading strategies to SWD. Two of the studies (Berkeley et al., 2011; Fritschmann et al., 2007) included high school students but with insufficient numbers to generalize the results ($n = 29$ and $n = 8$, respectively). The proposed study will also evaluate the importance of prediction, inference, and summarizing to reading comprehension but will include a sufficient number of secondary SWD to understand this relationship.

Finally, the relationship between reading comprehension and motivation-to-read was explored. Research suggested that both motivational and cognitive processes work together in engaged readers who are strategic and internally motivated readers (Wigfield, et al., 2008). Through use of reading strategies, engaged readers are able to comprehend what they read. Disengaged students are not motivated to read and, consequently, do not use reading strategies to aid comprehension. Over time, these students avoid reading and the gap in reading comprehension ability between engaged and disengaged readers becomes increasingly wider (Guthrie et al., 2009; Solheim, 2011).

The relationship between reading comprehension and motivation to read was investigated with respect to ethnicity to determine how motivation influences Caucasian and African American students (Guthrie et al., 2009). The results reveal that there was a difference in the motivational levels of intrinsic motivation, avoidance, self-efficacy, and perceived difficulty between the groups. On average, African American fifth grade students with poor reading ability were more avoidant readers than their Caucasian peers, which was significantly correlated to reading comprehension ability. Both word

recognition and reading comprehension had a significant relationship to intrinsic motivation, which was significantly higher in Caucasian students. It is important to understand the ethnic differences in motivation-to-read and reading comprehension because there is an overrepresentation of African American students in many special education classrooms (California Department of Education, 2013). Each of these studies was included in this review because they explain the relationship motivation-to-read has on reading comprehension. These studies also uncover a gap in the current research base as it relates to motivation to read in that the participants in each of these studies were elementary school students in grades 3 to 5 and none investigated this relationship solely with SWD. The proposed study will attempt to redress this oversight.

Given the research explored in this review and the remaining gaps in the literature that exist, a critical need remains for the proposed study to examine the affect working memory, prior knowledge, word recognition, vocabulary, reading strategies, and motivation-to-read have on the reading comprehension of secondary students with disabilities.

CHAPTER THREE

METHODOLOGY

The purpose of this study was to examine the relationship between reading comprehension and working memory, prior knowledge, word recognition, vocabulary, reading strategies, and motivation-to-read for secondary students with disabilities (SWD). These variables were chosen after a literature review on reading comprehension pointed to their importance for secondary SWD. The research design of the study, sample protection of human subjects, instrumentation, procedures, proposed data analysis, and possible limitations to the study will be discussed in this section.

Research Design

The study addressed three research questions:

1. What is the relative importance of motivation to read constructs for reading comprehension for secondary students with disabilities?

2. What is the relative importance of working memory, vocabulary, prior knowledge, word recognition, and reading strategies for reading comprehension for secondary students with disabilities?

3. What is the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read constructs for the construct of reading comprehension for secondary students with disabilities?

This study employed multiple regression correlational techniques to relate reading comprehension to the affective variables, the cognitive variables, and a combination of the two. Multiple regression allows the researcher to examine the relative importance of

the cognitive and affective variables for reading comprehension and to make inferences

about the factors that most contribute to reading comprehension in these students.

Sample

Setting

The study took place at two Northern California comprehensive urban high

schools. The first school has approximately 1,500 students currently enrolled in grades

9 – 12, and includes three Adult Transition Programs serving adults with disabilities aged

18 - 22. The school population is ethnically diverse: 35% Hispanic, 25% Asian, 25%

African American, 5% White, 4% Filipino, 4% Pacific Islander, 2% two or more races.

Twenty-one percent of the students are English Language Learners representing 22

different languages, 15% of the students have disabilities, and 86% have been identified

as students living in poverty. All 75 teachers at the school are fully credentialed. The

second school has approximately 2,200 students currently enrolled in grades 9 – 12.

The school population is ethnically diverse: 24% Hispanic, 35% Asian, 20%

African American, 6% White, 7% Filipino, 3% Pacific Islander, 4% two or more races.

Twelve percent of the students are English Language Learners representing 24 different

languages, 9% are students with disabilities, and 67% have been identified as students

living in poverty. All 97 teachers at the school are fully credentialed.

Participants

The participants in this study were chosen from a convenience sample of

approximately 400 SWD in grades 9 – 12. Table 2 below provides descriptive statistics

on the participants.

Table 2

Demographic Characteristics of Participants in the Sample

Characteristic	Total	Percent	M
Age			15.57
14	24	15.2	
15	40	25.3	
16	43	25.9	
17	35	22.2	
18	14	8.9	
18+	4	2.5	
Gender			
Male	99	62.7	
Female	59	37.3	
Ethnicity			
Caucasian	18	11.4	
African American	89	56.3	
Hispanic	36	22.8	
Asian	13	8.2	
American Indian	1	.6	
More than one	1	.6	
Special Education Disability			
Learning Disability	109	69.0	
Other Health Impaired	13	8.2	
Emotional Disturbance	2	1.3	
Autism	1	.6	
Intellectual Disabilities	3	1.9	
Traumatic Brain Injury	1	.6	
Multiple Disabilities	29	18.4	
Parent Education Level			
Non-High School Graduate	31	21.7	
High School Graduate	52	36.4	
Some College	36	25.2	
College Graduate	23	16.1	
Graduate Degree	1	.7	
Non-English Language Learners	119	75.3	
English Language Learners	39	24.7	
CELDT Level			
Level 1 (Beginning)	3	1.9	
Level 2 (Early Intermediate)	10	6.3	
Level 3 (Intermediate)	18	11.4	
Level 4 (Early Advanced)	6	3.8	
Level 5 (Advanced)	2	1.3	

All students currently have an Individual Education Plan (IEP). Participants had received special education services from one to 16 years with the majority of students receiving services between five and ten years; two students qualified for special education services within the past school year. The average reading level for the students in the study was 4.7. The ethnicity of the sample is not representative of the participating school sites or district.

Special education students with mild/moderate disabilities attend a combination of general education classes, special education classes, and co-taught classes (i.e., classes with both general and special education teachers). If possible, students are in general education math and English classes, but some students receive specialized academic instruction in math and English. Regardless of disability status, all students attend general education science, social studies, and elective (i.e., P.E., art) classes. The first school site has a resource center that is available to support all students with core skills and test taking. At the second school site, the resource center is available for SWD to take tests and/or to complete assignments with help from special education teachers.

The researcher is a current secondary special education teacher in the school district who teaches at one of the two schools that participated in the study. At the second school site, a special education teacher, who is a colleague of the researcher, acted as a liaison between the students and the researcher during the recruitment process by collecting consent forms, reminding students of testing sessions, helping with test proctoring (under the guidance of the researcher), and organizing test sessions with students and teachers.

Protection of Human Subjects

An application was completed and submitted to the University of San Francisco's Institutional Review Board for the protection of Human Subjects. Permission was secured from parents and/or adult students for each participant in the study. Confidentiality for all participants was ensured, and all data collected was locked in a cabinet that could only be accessed by the researcher. No names are used to describe the data and no descriptors can identify the participants. There were no adverse effects to the participants through the participation in this study.

An application was completed and submitted to the school district's Research and Development Department to gain permission to begin the study. Verbal permission was granted from the school site principals to conduct the study. Special education teachers verbally expressed their cooperation to the researcher to assess the special education students they were responsible for monitoring.

Recruitment letters, consent forms, and Participant Bill of Rights were sent home to the parents/guardians of each student who assented to participate in the study. The recruitment letter included information about the study and described why students were selected to participate in the study. Contact information for the researcher was included in the letter to parents/guardians who were advised to contact the researcher if they had any questions about the study. The letter included a consent form for the parent/guardian to sign and return to the researcher at the school. If consent forms were not returned within one week, a follow-up with the student was made. Only students with signed consent forms were allowed to participate in the study.

Instrumentation

Numerous instruments were used in this study to measure the seven constructs. A review of the literature on reading comprehension for secondary SWD reveals that these instruments are ones that are used frequently to measure reading comprehension, working memory, vocabulary, prior knowledge, word recognition, and reading strategies. (Fritschmann, Deshler, & Schumaker, 2007; Guthrie, Coddington, & Wigfield, 2009; Swanson, Howard, & Saez, 2006; Wexler, Vaughn, Roberts, & Denton, 2010).

Reliability scores were computed from raw test scores that were obtained from either existing testing data (i.e., from the school psychologist) or from directly administered tests by the researcher and are listed in Table 3. Scores were computed prior to missing data analysis, which explains the differences in the sample size.

There were seven constructs measured in this study, each construct having at least three measures. The seven constructs were: (a) reading comprehension (b) working memory, (c) prior knowledge, (d) word recognition, (e) vocabulary, (f) reading strategies, and (g) motivation-to-read. A variety of measurements were used including both standardized and non-standardized test instruments. Based on the model presented in Chapter 1, the Table 2 below describes the instruments and tests used in this study. Each construct used in this study is operationally defined in the section below and each instrument has been identified along with a description of what each test measures. Cronbach alpha reliability coefficients are also reported. Reliabilities were estimated for 29 of the 32 tests. Reliabilities were based on all available data, prior to any missing data estimation. Reliabilities could not be estimated for four tests as they were fluency measures (i.e., students performed tasks under speeded conditions and tests were not

divided into two parts); for these measures, Cronbach's alpha is reported from the test's

technical manuals.

Table 3

Instruments used to Measure Reading Comprehension, Working Memory, Prior Knowledge, Word Recognition, Vocabulary, Reading Strategies, Motivation-to-read, and General Knowledge

Constructs	Test or Scale
Reading Comprehension	Woodcock-Johnson III (WJ-III) • Reading Fluency • Passage Comprehension • Reading Vocabulary Synonyms • Reading Vocabulary Antonyms • Reading Vocabulary Analogies
Working Memory	CTOPP • Nonword Repetition WRAML-2 • Verbal Working Memory B • Verbal Working Memory C • Symbolic Working Memory A • Symbolic Working Memory B
Vocabulary	GRADE$_4$ High School Version (H) • Listening Comprehension • Vocabulary • Sentence Comprehension
Prior Knowledge	Bader Reading Inventory—Grade 9 passages: • Modern Chemistry • A Failure to Communicate • Voter Drive
Word Recognition	Basic Reading Inventory (BRI) • 9th Grade Word List (A) TOWRE-2 • Sight Word Efficiency • Phonemic Decoding Efficiency WJ-III Word Identification

Reading Strategies	Bader Reading Inventory:
	• Prediction from:
	   o Modern Chemistry
	   o A Failure to Communicate
	   o Voter Drive

- Summarization from:
  - Modern Chemistry
  - A Failure to Communicate
  - Voter Drive
- Inference questions from:
  - Modern Chemistry
  - A Failure to Communicate
  - Voter Drive

Motivation-to-read   LASSI-HS
- Attitude
- Motivation
- Time Management
- Anxiety
- Concentration
- Information Processing
- Main Ideas
- Study Aids
- Self-Testing
- Test Strategies

MRP
- Self-Concept as a Reader
- Value of Reading

MRQ
- Reading Efficacy
- Reading Challenge
- Reading Curiosity
- Reading Involvement
- Importance of Reading
- Reading Work Avoidance
- Competition in Reading
- Recognition for Reading
- Reading for Grades
- Social Reasons for Reading
- Compliance

Reading comprehension. Reading comprehension is defined as the ability to gain meaning from what is read. Reading comprehension requires various reading skills (i.e., word recognition, fluency, lexical knowledge, pre-existing knowledge) to be undertaken rapidly so that the reader may gain knowledge from text (Pressley, 2000; Birsch, 2011). It was measured by: (a) WJ-III Passage Comprehension, (b) WJ-III

Reading Fluency, (c) WJ-III Reading Vocabulary Synonyms, (d) WJ-III Reading

Vocabulary Antonyms, and (e) WJ-III Reading Vocabulary Analogies.

Passage Comprehension is a broad reading subtest from the WJ-III. Students

supply a missing word to short sentences and paragraphs of increasing difficulty.

Students continue answering questions until they reach a ceiling of six consecutive

incorrect answers. The score on the test was the number of correctly answered responses.

Reliability for this test was .87 (n = 157).

Reading Vocabulary is an extended battery assessment comprised of three

separate subtests on the WJ-III. The test assesses reading comprehension and lexical

knowledge by measuring a student's knowledge of synonyms, antonyms, and analogies.

Students are given a stimulus word that increases in difficulty and continue answering

questions until they reach a ceiling of four consecutive incorrect answers. The score on

the test was the correct responses from the synonyms, antonyms, and analogies sections.

Reliability for the subtests were: .83 for Synonyms, .78 for Antonyms, .67 for Analogies.

Reading Fluency is a broad reading subtest of the WJ-III that assesses a student's

ability to read target sentences and answer "yes or no" to each sentence within a total of

three minutes. The score on the test was the number of correct responses minus incorrect

responses. The test manual reported a Cronbach alpha of .90.

Many students previously completed both the Passage Comprehension and

Reading Fluency subtests. The results were extracted from the students' special education

case files. The Reading Vocabulary subtests were individually-administered to each

participant during the school day in a pull-out testing session (i.e., students were excused

by their teacher to test with the researcher for an average of 45 minutes per student) For

students who had not completed testing within the past year and/or who did not have test data in their case files, the researcher and case managers administered the tests.

Working memory. According to Swanson, Kehler, and Jerman (2010) working memory is a "limited capacity system that allows simultaneous storage and processing of temporary information" (p.24). It was measured by the: (a) Wide Range Assessment of Memory and Learning, 2nd edition (WRAML2; Sheslow & Adams, 2003) Verbal Working Memory subtest B, (b) WRAML2 Verbal Working Memory subtest C, (c) WRAML2 Symbolic Working Memory subtest A, (d) WRAML2 Symbolic Working Memory subtest B, and (e) Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgeson, & Rashotte, 1999) Nonword Repetition.

The WRAML2 Verbal Working Memory B subtest required the student to repeat a list of animals and non-animals. Students ordered the animals from smallest to largest, followed by non-animals in any order. The WRAML2 Verbal Working Memory C subtest was similar to subtest B; however, students also ordered the non-animals after first ordering the animals. The score on the test was the total number correct. Two points were awarded for each correct response, one point for one error, and zero points for an incorrect answer. The test was discontinued after two consecutive incorrect responses. Cronbach's alpha for subtests B and C, respectively, were .80 and .85.

The WRAML2 Symbolic Working Memory subtests required students to order a series of numbers and letters. In subtest A, students were dictated a series of numbers and then shown a stimulus card with the numbers 1 through 8 on it. Using the card, students pointed to the numbers they heard in correct numerical order. For instance, the examiner would say "1-5-2," and the student used the card and pointed to "1-2-5." In subtest B, a

series of random letters and numbers were dictated. Students used a stimulus card to point to the numbers and letters they heard in correct numerical and alphabetical orders. For instance, "3-B-A-2" required the student to point to "2-3-A-B." One point was awarded for each correct response, for a maximum of 14 points. Cronbach's alpha for subtests A and B, respectively, were .79 and .74.

The CTOPP Non-word Repetition was an 18-item subtest that required students to listen to a recording and repeat multi-syllable nonwords (i.e., made up words that follow phonics rules) that ranged in length from 3 to 15 sounds. For this task, students coded and temporarily stored phonological information, which was related to verbal working memory. One point was awarded for each correct response. The reliability for this subtest was .76.

Only students who were not previously administered these tests were tested either by the school psychologist or this researcher. The researcher collected assessment data from the students' special education case files for students who had been administered these tests within the past year.

Vocabulary. Vocabulary, for the purpose of this study, was conceptualized as a student's ability to understand the meaning of a given word either in isolation or in context (e.g., within a sentence or passage). It was measured with the: (a) GRADE-4 Listening Comprehension subtest, (b) GRADE-4 Vocabulary Subtest, and (c) GRADE-4 Sentence Comprehension Subtest.

The GRADE-4 Listening Comprehension subtest required students to look at a series of four pictures while the researcher read a sentence describing one of the pictures. Students listened to the sentence and determined which picture corresponded to what they

heard. The test assessed the student's understanding of vocabulary words, idioms, grammar, inference, and nonliteral words. The score was the number of correct answers out of 17 sentences. Cronbach's alpha for this test was .55.

The GRADE-4 Vocabulary subtest assessed the student's understanding of basic vocabulary words. Students were presented with 40 short phrases with one word typed in boldface. Students chose the word they believed best defined the target word from four multiple-choice answers. Cronbach's alpha for this test was .74.

The GRADE-4 Sentence Comprehension subtest required students to read short sentences that were missing a word. Students identified the missing word from four multiple-choice answers. The score was the number of correct answers out of 19 sentences. Cronbach's alpha for this test was .73.

All three subtests were untimed and administered in small-group settings of approximately ten students either after school or during the school day by the researcher. To indicate their answers, students were provided a scantron sheet to mark their answer choices.

Prior Knowledge. For the purpose of this study, prior knowledge, has been conceptualized as the knowledge the learner has on a particular topic before reading about it or before classroom instruction on the topic. It was measured with the Bader Reading Inventory.

On the Bader Reading Inventory, students answered four to five prior knowledge questions about what they knew about voting, chemistry, and communicating, prior to reading narrative and expository text on these topics (Bader & Pearce, 2009). Student answers were analyzed by the researcher to evaluate whether the student had some

background knowledge on the topic prior to reading a short passage. The researcher obtained permission from the test authors to adapt the test to include these researcher-created prior knowledge questions. The test was administered in a small-group setting of approximately ten students. Cronbach's alpha for this test was .55.

Word recognition. Word recognition is the ability to accurately and fluently decode words that vary in length from single- to multi-syllable words. In the current study, word recognition was measured with the: (a) Basic Reading Inventory (BRI; Johns, 2008) ninth grade Word List A, (b) Test of Word Reading Efficiency, Second Edition (TOWRE-2) Sight Word Efficiency, and (c) TOWRE-2 Phonemic Decoding Efficiency.

The BRI is an informal individually-administered reading assessment. Students read the ninth grade Word List A, which consisted of a list of 20 words that varied in length and difficulty. The ninth grade list was chosen for this study because it was felt that a majority of the students would be able to read most or all of the words. The test was untimed and administered individually by the researcher. The score was determined from the total number that were read correctly. Cronbach's alpha for this test was .86.

TOWRE-2 Sight Word Efficiency is an individually-administered test that measured sight word recognition. Students were presented a stimulus card and asked to read as many words as they could in 45 seconds. The score was the number of words read correctly. The reported reliability from the technical manual for this test with Form A was .84.

TOWRE-2 Phonemic Decoding Efficiency is an individually-administered test that measures how many pronounceable nonwords (i.e., made up words that follow

phonics rules) a student can read in 45 seconds. Students were presented with a stimulus card and asked to read as many nonwords as they could in 45 seconds. The score was the number of words read correctly. Both of the TOWRE-2 subtests were administered individually by the researcher. The reported reliability from the technical manual for this test with Form A was .89.

  Reading strategies. Three key strategies (i.e., summarizing, predicting, inferring) were measured in this study that are integral to efficient reading. Summarizing is the ability to state the gist, or overall main idea(s) from what is read. Predicting requires the reader to make an educated guess (i.e., based on prior knowledge) about what will happen in a passage (a "before-reading" strategy) or to predict what will happen next (an "after-reading" strategy). Reading strategy knowledge was measured with the Bader Reading Inventory, 9th Edition. The test is comprised of both narrative and expository grade-level reading passages ranging from grades K-12. For the purposes of this study, three ninth grade narrative and expository passages were used, which varied in length from approximately 130 to 300 words. The first narrative passage, Voter Drive, was about a phone call the main character received encouraging him to vote. Modern Chemistry was the second passage, and the expository text described the origins of chemistry. The last expository passage, Failure to Communicate, described the roles translators play in a global society.

  After reading each passage, students answered between 7 to 10 general knowledge and inferential questions. For the purpose of this study, the questions were adapted from oral to written response with author permission. Scores were the number of

correct responses out of the total number of questions. Cronbach's alpha for this test was .76.

The reading strategy of prediction was measured by reading the title of the passage, and then writing what the student believed the passage would be about prior to reading. Cronbach's alpha for this test was .61.

Summarization was measured after reading. Students wrote a written summary of the main ideas from the story. The researcher evaluated the summary by analyzing how many memories (i.e., main ideas, supporting details) the student was able to correctly identify from the story. Prior to test administration, the researcher had four teachers read the three stories (two general education English teachers and two special education teachers). The teachers were asked to highlight the main/key ideas from the passage. The researcher compared the teachers' responses and identified seven key ideas from each story. Cronbach's alpha for this test was .78.

The Bader Reading Inventory was administered by the researcher in a small-group setting of approximately ten students after school or individually during the school day.

Motivation-to-read. Motivation to read is defined in this study as a student's intrinsic motivation and interest in reading. It was measured with the: (a) Learning and Study Strategies Inventory - High School Version (LASSI-HS; Weinstein, Palmer, & Shulte, 2002), (b) Motivation for Reading Questionnaire (MRQ), and (c) Adolescent Motivation-to-read Profile (MRP).

The LASSI-HS is a 76-item self-report questionnaire that calculates a student's attentiveness, self-reliance, and eagerness to apply effort when completing academic

tasks. The test manual claims to measure ten different constructs: attitude, motivation, time management, anxiety, concentration, information processing, main ideas, study aids, self-testing, and test strategies. For approximately half of the students, the LASSI-HS was administered in the students' special education classes and the students' special education Case Managers administered the test. The researcher collected the unscored test protocols from the students' case managers once testing was completed. Students who had not completed the LASSI previously were administered the test during an after school small group setting or tested individually by the researcher. Reliability scores for this instrument ranged from .35 to .80.

The MRQ is a 53-item Likert-scale questionnaire that the manual claims to measure 11 reading motivation constructs: reading efficacy, reading challenge, reading curiosity, reading involvement, importance of reading, reading work avoidance, competition in reading, recognition for reading, reading for grades, social reasons for reading, and compliance. The original questionnaire was modified, with author permission, to remove references of "family and friends" when engaging in the reading activities due to the high numbers of students in foster care. The approving school district felt that these questions might disenfranchise some of the participants. Reliability for the 11 constructs ranged from .45 to .81.

The Adolescent MRP consists of two parts: a reading profile survey and a conversational interview. For the purposes of this study, only the 20-item Likert-scale reading profile survey was administered and modified, with author permission, from the original to provide greater accessibility for students with disabilities (i.e., format changed to columns and printed front-to-back rather than on one side of the paper). The survey

evaluated the students' self-concept as a reader and their perceived value of reading. Reliability for test was .69 for self-concept and .62 for value.

Each test was administered in a small-group setting of approximately ten students either after school or individually during the school day.

Background variables. In addition to test scores, additional background information was collected on the sample: (a) Grade level, (b) Gender, (c) Age, (d) Ethnicity, (e) English Language Learner status, (f) Parent's education level, (g) Special Education Eligibility criteria, and (i) Years in special education. All background variables were obtained through a search of the school district's database for each student participant for variables a – f. All special education background information was retrieved from the school district's special education database.

Table 4 provides means, standard deviations, and reliability statistics for each of the 29 constructs measured by the 32 instruments administered. The reliability scores for the three timed assessments (i.e., WJ-III Reading Fluency; TOWRE-2) were reported from each test's Technical Manual. Reliability scores ranged from .35 to .94.

Procedure

The researcher was required by the school district to complete a "Request to Conduct Research" application after first receiving written approval from both high school principals where the study would be conducted. The application to the school district was completed at the same time the request for "IRB Verification of Exempt Research Involving Human Subjects" was sent for consideration to the University's IRB committee. The approvals were procured late in the school year (2013-2014) and recruitment for the study was delayed until the onset of the 2014-2015 school year.

Table 4

Means, Standard Deviations (SD), Reliabilities, and Sample sizes for all Tests Measuring the Seven Constructs.

Construct	Test or Scale	M	SD	α	N
Reading Comprehension	WJ-III Passage Comprehension	4.72	3.17	.87	157
	WJ-III Reading Vocabulary Synonyms	10.04	3.90	.83	160
	WJ-III Reading Vocabulary Antonyms	10.61	3.13	.78	160
	WJ-III Reading Vocabulary Analogies	6.41	2.29	.67	158
	WJ-III Reading Fluency	46.02	13.25	.90	158
Working Memory (WM)	WRAML Verbal WM B	7.48	3.05	.80	160
	WRAML Verbal WM C	4.73	3.17	.85	160
	WRAML Symbolic WM A	9.40	2.51	.79	160
	WRAML Symbolic WM B	4.93	2.20	.74	160
	CTOPP Nonword Repetition	9.42	2.87	.76	158
Vocabulary	GRADE Listening Comprehension	9.04	2.73	.55	159
	GRADE Vocabulary	13.74	5.16	.74	160
	GRADE Sentence Comprehension	5.84	3.53	.73	159
Word Identification	WJ-III Word Identification	54.22	8.85	.94	157
	BRI Graded Word List	12.37	4.51	.86	160
	TOWRE SWE	69.83	13.39	.84	160
	TOWRE PDE	26.78	12.66	.89	160
Prior Knowledge	BADER Prior Knowledge	5.01	2.21	.55	160
Reading Strategies	BADER Prediction	2.39	.90	.61	160
	BADER Comprehension Questions	12.99	4.62	.76	158
	BADER Summary	4.89	3.53	.78	160
Motivation-to-read	LASSI Attitude	21.23	5.53	.61	160
	LASSI Motivation	23.79	4.27	.35	160
	LASSI Time Management	20.39	4.12	.35	160
	LASSI Anxiety	24.58	6.03	.72	160
	LASSI Concentration	23.69	5.57	.64	160
	LASSI Information Processing	25.38	5.23	.68	160
	LASSI Main Ideas	15.94	3.27	.36	160
	LASSI Study Aids	23.85	5.07	.65	155

LASSI Self-Testing	23.86	6.38	.80	160
LASSI Test Strategies	23.07	5.51	.69	160
MRQ Reading Efficacy	8.14	2.22	.69	160
MRQ Reading Challenge	12.81	3.46	.74	159
MRQ Reading Curiosity	17.15	3.70	.70	160
MRQ Reading Involvement	15.85	4.20	.76	160
MRQ Importance of Reading	5.55	1.67	.65	159
MRQ Reading Work Avoidance	9.93	2.60	.45	160
MRQ Competition in Reading	15.65	3.88	.71	160
MRQ Recognition for Reading	13.11	3.74	.81	160
MRQ Reading for Grades	10.72	2.87	.68	160
MRQ Social Reasons for Reading	15.31	4.61	.77	160
MRQ Compliance	12.95	3.03	.50	159
MRP Self-Concept as a Reader	26.83	4.67	.69	159
MRP Value of Reading	26.63	4.44	.62	158

The researcher had access to two separate online databases that provided both special education and student demographic data. At the researcher's home school, a database was created listing all special education students who receive services for students with mild/moderate disabilities in the resource specialist program (RSP) or in the program for students with emotional disturbance (ED).

Once the list of all students in those categories was generated, the researcher sent an email to all special education case managers to notify them that their students would be asked to participate in the research study. Case managers had previously been given information about the scope of the study and had expressed their support to the researcher.

Phone calls were placed to general education teachers to alert them that their students would be asked to participate in a study, and they would need to be excused for approximately 15 minutes. Most teachers were supportive; however, it was not feasible to pull all students during the specified time as the excusal from class might have conflicted with testing or direct instruction. In those few cases, the teacher allowed the student to be

excused on a subsequent day. Individual student passes were created by the researcher and delivered to students' last two classes of the day (i.e., the researcher's prep periods). Passes were delivered by the researcher's teacher's aides (TA).

Students were invited to participate in the study in small groups of up to 12 students. A brief description of the study as well as the purpose for the study was provided to the students. As part of the recruitment process, students at the first school were informed they would receive a $10 cash gift for participation as well as a snack of pizza, soda or water, granola bar, and fruit. (Food allergy information was obtained from each student prior to feeding students.) When students expressed their interest in participating, they were provided a copy of the "Participant's Bill of Rights" and two copies of the consent form. Students were instructed to have one consent form signed by a parent/guardian or themselves (if they were over age 18) and returned to the researcher. As the consent forms were given to students, an update in the student database created by the researcher was made listing the date that the consent form was provided to the student. As students returned the consent forms, they were given a candy treat, a notation was made in the database showing the form had been returned, and then they were scheduled into one of five after school sessions.

Several students did not return the consent forms in a timely manner, and a reminder notice was delivered to their first and second period classes by the researchers TAs. Many students came to the researcher's classroom to return the form, ask for a new one, or explain that they were no longer interested in participating in the study. New forms were provided as needed. During the initial recruitment at the first school, several new students enrolled. The special education case managers for those students alerted the

researcher that they had a new student and those students were also invited to participate in the study. Recruitment continued at the first school over four weeks while testing had already begun.

Students were provided two reminder notices for their commitment to participate in the study. One notice was delivered by TAs to students the day before their scheduled session, and another was delivered the day of their session. During this process, several students asked the researcher to reschedule their sessions due to schedule conflicts. Students were then offered a subsequent after school session.

Recruitment at the second school site was slightly different. The researcher worked with a colleague at the second site who acted as a liaison to identify students who attended RSP classes throughout the day. A list was generated of those students, and the researcher went to the second school site to invite the students to participate in the study. Special education teachers at the second site gave permission to the site liaison for the researcher to visit their classes and speak to the students. Students were invited to participate in the same manner as at the first school. A cash gift of $10 was also provided to students at the second school site; however, students were provided alternate snacks of chips, fruit, cheese sticks, granola bars, and soda/water.

The site liaison was provided a binder with additional consent forms, "Participant Bill of Rights," schedule reminder cards, master schedule, and candy to give to students when consent forms were returned. The liaison notated when the consent forms were returned and scheduled students into one of three initial after-school testing sessions. The liaison frequently reminded students to bring their consent forms to school and provided

schedule reminder cards to remind them when they were scheduled to attend an after school testing session.

The recruitment had two phases at the second school due to "block scheduling" where classes change after each quarter. The first recruitment process happened during the first quarter, and the second recruitment phase began during the second quarter, which allowed more students to participate in the study because different students were invited during each quarter. Students were reminded to return consent forms to the site liaison who also provided additional consent forms to students who misplaced them.

Once parent consent was received, the researcher spoke individually with each student to verify their willingness to participate in the study. Students were asked to participate in an afterschool session that would last approximately 90 minutes, and then the researcher gathered background variables from the school district's online database, which is accessible to all school personnel. Additionally, each special education student's confidential case file that included recent psycho-educational and academic assessments (i.e., WRAML2, WJ-III, and CTOPP) was reviewed by the researcher.

All testers were trained in the administration of psycho-educational and academic assessments. All compiled data received from test administration, case file review, or district database were secured by the researcher to ensure confidentiality. Test instruments and completed tests were stored in a locked cabinet with the only key kept in the possession of the researcher. As students completed tests, the researcher created a file for all data that was placed in a large 10 x 13 inch manila envelope. Each envelope had a number placed on the outside that corresponded to a master list with each participants name and envelope number. The master list included student names so that a database

search for each student could be conducted. All information related to the study and participants were kept in a locked cabinet when not in direct use by the researcher. No other staff or personnel had access to the test materials, student envelopes, or researcher's master list.

When all students agreed to participate in the study, the researcher created an assessment schedule that allowed approximately ten to twelve students to choose from one of five after school sessions per week. Each session lasted approximately 90 minutes. The researcher completed a total after school sessions at the first school site before beginning assessment at the second school site. One make-up session was scheduled at the first site for students who had to leave early during one of the sessions. A total of six sessions were scheduled at the second school site. In between testing sessions, reminders were sent and student recruitment continued. Two types of tests were directly administered during the study: group-administered and individually-administered, which are discussed below.

Group-administered assessments. When students arrived at the testing session, they were asked to sign their name and their arrival time on a sign-in log. They were given their snack once they arrived and were able to eat it while waiting for all participants to arrive. At the first school site, the researcher's class room was set up with tables and chairs rather than individual student desks. Two students were seated at each table, and a binder with all Group Reading and Diagnostic Evaluation (GRADE) test materials, a scantron answer document, and two pencils were placed at each table. Students were seated on opposite sides of the table from one another to discourage cheating.

Once all students had arrived, and snacks were finished, the researcher explained the testing process. Students were told they would take a total of eight separate reading tests that should take approximately 90 minutes to complete. Some students were not able to stay the entire 90 minutes, and they told the researcher prior to the testing that they needed to leave early. Students who were unable to complete testing were either scheduled to come to an after-school make-up session or completed tests during the school day.

The first test was administered to the whole group (i.e., GRADE Listening Comprehension), and the other tests were completed individually. After students finished the GRADE Listening Comprehension test, they were given directions on how to complete the GRADE Vocabulary and Sentence Comprehension assessments. Students worked individually on the GRADE Vocabulary and Sentence Comprehension subtest, which was intended for group administration.

When students finished the GRADE assessments, they brought their completed scantron and binder to the researcher. The researcher checked the answer document for completeness, and then provided the prediction and prior knowledge portion of the BADER reading inventory. Students were instructed to predict what they thought the story would be about by reading the title of the story. Once done, they would answer between four to five questions about the topic to measure their background knowledge of the topic. Students were instructed to raise their hands when they had finished, and the researcher collected the completed document and gave the students the reading passage. After the students read the passage, the researcher collected the passage and gave students the comprehension questions and summary sheet. Students answered between

seven to ten questions for each story, and they wrote a short summary about what they

read. Some students struggled to write a summary, and the researcher allowed the student

to dictate their summary to the researcher who then scribed the student's summary.

The last tests given during the after school session were the three Motivation to

Read scales (i.e., LASSI-HS, MRQ, and MRP). Not all students were able to complete all

tests during the 90 minute session. For those students, they were told they would take the

remaining tests during the school day. Some students wanted to complete all the group

administered tests and asked if they could stay past the 90 minute session to complete

them. With parent permission (students called their parents), several stay an additional 20

to 30 minutes to complete the tests. As students left for the day, they signed out on the

sign-in sheet noting the time they left the testing session. Students were given their $10

gift once all group-administered tests were completed, and they indicated receipt of the

money by initialing on the sign-in sheet under the column for "$10 received."

Individually-administered assessments. The researcher gathered recent

academic testing from the student's special education case files. Missing academic

assessment data occurred in over 40 cases at the first school site and in over 20 cases at

the second school site. Case managers, who generally complete these assessments for

their students, helped assess students along with the researcher. Over 80 students at the

first school site did not have the WRAML-2 in their case files and those tests were

administered by either the researcher or school psychologist. At the second school, no

students had the CTOPP or WRAML-2 in their case files, and all tests were administered

by the researcher.

After students completed an after school testing session, they were tested individually for the BRI graded word list, WJ-III vocabulary tests, the WRAML-2, CTOPP, and TOWRE. Testing occurred in the researcher's private classroom at the first school site, and students were excused from their regularly scheduled classes for approximately 45 minutes to complete testing. Additionally, some students were unable to complete the first battery of tests during the after school session, and those students also completed tests during the school day.

At the second school site, testing occurred in a private office. The site liaison also helped administer the WJ-III academic achievement assessments. The researcher contacted the student's regularly scheduled teacher and gained permission to have the student complete testing. On average, students were excused from classes for about one hour in one or two sessions.

Preliminary Data Analyses

This section describes the process used to prepare the assessment data for data analysis. The next four sections will depict the procedures taken to score the test instruments, rectify missing data, and transform the cognitive and affective variables.

Scoring

Each participant in the study was given multiple assessments, which were scored by hand. For tests with answer keys provided by the publisher (i.e., WJ-III Reading and Math Fluency, TOWRE, GRADE), the researcher or trained helpers scored the tests. The researcher hand scored all BADER reading passages (i.e., prediction, prior knowledge, and summary), the remaining WJ-III assessments, the WRAML-2, and CTOPP. Both the cognitive and affective measures were scored according to the test manuals. The MRP

had nine negatively worded questions, which were recoded prior to data input as described in the test directions. Both the LASSI-HS and the MRQ had negatively worded questions, but no provision for recoding was provided in the test manuals, and no items were reflected.

After scoring was completed, data were input into SPSS, Version 23 (IBM, 2014). All raw scores were entered into three databases for later analysis. The first database included all background variables and all reading comprehension and working memory assessments. The second database included all vocabulary, word identification, prior knowledge, and reading strategies assessments. The last database included all motivation-to-read and general knowledge assessments.

Missing Data

Missing data was minimal for the 32 tests given to the original 160 participants. During testing, the researcher reviewed all test instruments after students completed testing, which accounted for few missing scores. A missing values analysis was conducted, and count data was derived for each variable in the study, which is shown in Table 5 below. Two participants had numerous missing tests and were subsequently dropped from the study, which changed the N from 160 to 158. Missing data from the LASSI-HS included 26 participants with one item missing, nine participants with two items missing, seven participants with 3 items missing, and one participant each with 4 and 8 missing items. Several avenues for addressing the missing data were considered (i.e., dropping subjects, imputation, mean substitution). Since missing data was attributed to missing scores from specific test, mean scores were inserted for the missing scores.

Table 5

Count Variable data for Variables with Missing Data

Test	Count Data
WJ-III Passage Comprehension	3*
WJ-III Reading Vocabulary Analogies	2
WJ-III Reading Fluency	2*
CTOPP Nonword Repetition	2
Bader Prior Knowledge (Failure to Communicate)	1
WJ-III Letter-Word Identification	3*
GRADE Listening Comprehension	1*
GRADE Sentence Comprehension	1*
Bader Strategy Questions (Voter's Drive)	1
Bader Strategy Questions (Modern Chemistry)	2
Bader Strategy Questions (Failure to Communicate)	2
LASSI-HS	44
MRQ	3
MRP	5

Note. Notated tests include missing data from 2 participants who were dropped from the study.

Cognitive Variables

A Principal Component Analysis with varimax rotation was conducted to create composite scores for the cognitive variables. For each construct, the first principal component was used as the measure of the construct. Factor loadings are displayed in Table 6 below. In no case was there more than one component.

Affective Variables

The affective measures were different from the cognitive measures in several ways. First, the affective scales were all Likert-scale items. Second, there were numerous manual-reported constructs. Consequently, a different data reduction strategy was used.

Due to the large number of constructs reported (i.e., 23) for the three affective measures (i.e., Motivation to Read Questionnaire [MRQ], Adolescent Motivation to Read Profile [MRP], and the Learning and Study Strategies Inventory-High School [LASSI]), a

principal axis factor analysis (FA) with varimax rotation was undertaken to reduce the

number of scales to a manageable number.

Table 6

Factor Loadings from Principal Component Analysis with Varimax Rotation of Cognitive Measures

Test	Factor Loading Coefficient
WJ-III Passage Comprehension	.863
WJ-III Reading Vocabulary Synonyms	.856
WJ-III Reading Vocabulary Antonyms	.832
WJ-III Reading Fluency	.693
WJ-III Reading Vocabulary Analogies	.573
WRAML Symbolic Working Memory B	.783
WRAML Symbolic Working Memory A	.767
WRAML Verbal Working Memory C	.730
WRAML Verbal Working Memory B	.612
CTOPP Nonword Repetition	.599
GRADE Sentence Comprehension	.854
GRADE Vocabulary	.853
GRADE Listening Comprehension	.733
BADER Prior Knowledge Modern Chemistry	.780
BADER Prior Knowledge Voter's Drive	.693
BADER Prior Knowledge Failure to Communicate	.653
WJ-III Word Identification	.931
TOWRE Phonemic Decoding Efficiency	.909
BRI Graded Word List	.894
TOWRE Sight Word Efficiency	.816
BADER Comprehension Questions Voter's Drive	.789
BADER Summary	.767
BADER Comprehension Questions Modern Chemistry	.735
BADER Comprehension Questions Failure to Communicate	.662
BADER Prediction	.558

Table 7 shows the results of the factor analysis. The following four components were

identified: self-regulation, intrinsic motivation, study habits, and extrinsic motivation.

The following four constructs from the MRQ were dropped in the final factor analysis:

Reading Involvement, Importance of Reading, Reading Work Avoidance, and Social

Reasons for Reading.

Table 7

Factor Analysis of the 19 Affective Constructs from the LASSI, MRP, and MRQ

Affective Constructs	**Factors (N = 158)**			
	Self-Regulation	Intrinsic Motivation	Study Habits	Extrinsic Motivation
LASSI Test Strategies	.761			
LASSI Concentration	.742			
LASSI Anxiety	.721			
LASSI Attitude	.710			
LASSI Time Management	.661			
LASSI Main Ideas	.580			
MRQ Reading Challenge		.812		
MRQ Reading Efficacy		.721		.480
MRQ Reading Curiosity		.717		
MRP Self Concept as a		.601		
MRP Value of Reading		.454		
LASSI Self-Testing			.824	
LASSI Study Aids			.648	
LASSI Motivation			.565	
LASSI Information			.562	
MRQ Competition in				.748
MRQ Recognition for				.723
MRQ Reading for Grades				.693
MRQ Compliance				.531
Means (Standard	0 (.93)	0 (.91)	0 (.90)	0 (.88)

The constructs loading on each of the four factors were examined based on the

test questions to find a common factor. A more complete description follows.

Factor 1 included six constructs from the LASSI (i.e., test strategies, concentration, anxiety, attitude, time management, and main ideas) that included questions about planning to study, creating a daily study schedule, and concentrating while studying. Five constructs were found for factor 2 from the MRQ (i.e., reading challenge, reading efficacy, and reading curiosity) and the MRP (i.e., value of reading, self-concept as a reader), which included questions related to intrinsic reading ability (i.e., I like hard, challenging books; I read to learn new information about topics that interest me). Factor 3 was comprised of four constructs from the LASSI (i.e., self-testing, study aids, motivation, and information processing) that included questions about the learners focus while studying (i.e., after a class, I look over my notes to help me understand the information; I use special study helps, such as italics and headings, that are in my textbook; I change the material I am studying into my own words). Five constructs from the MRQ (i.e., competition in reading, recognition for reading, reading for grades, compliance, and reading efficacy) were found in factor 4, which included questions such as: I try to get more answers right than my friends; I like having the teachers say I read well; and I look forward to finding out my reading grades. Reading efficacy loaded on two factors: intrinsic and extrinsic motivation.

Data Analyses

Research Question One

The first research question analyzed to what extent motivation-to-read affects the reading comprehension of secondary students with disabilities. A principal axis factor analysis with varimax rotation (IBM, 2014) identified four factors (i.e., self-regulation, intrinsic motivation, study habits, and extrinsic motivation). Because of the varimax

rotation, the four affective factors were basically uncorrelated, the correlations ranging from -.037 to .152. Unlike a principal components analysis, which directly estimates component scores, factor analysis produces correlated factor scores despite the orthogonal rotation. Reading comprehension was then regressed on to these four factors and the beta weights from the regression were examined to determine the relative importance of the motivation-to-read factors. This was possible because of the low correlations among the four factors.

Research Question Two

The second research question analyzed whether a relationship exists between the cognitive measures (i.e., working memory, vocabulary, prior knowledge, word recognition, and reading strategies) and reading comprehension. Multiple regression analysis allowed the researcher to identify the relationship between the variables and describe a model that explains the relationship.

Research Question Three

The four affective factors and the five cognitive constructs that explain the poor reading comprehension achievement of secondary students with disabilities were examined in this study. This study measured the single primary explanatory construct of each theory, and related measures of each construct, to measures of reading comprehension. A multiple regression allowed the researcher to look at causal relationships among and between the variables and analyze the relationship between each variable and reading comprehension and then explain any covariance or relationship among the independent variables.

Each of the constructs measured in this study are listed in Table 8 below.

Table 8

Cognitive Composite and Affective Factor Descriptors

Constructs	Composite Description
Reading Comprehension	The Reading Comprehension composite is comprised of five tests that measure a student's ability to: read passages and supply missing words, read short sentences and determine if they are true or false within a three-minute period, provide synonyms and antonyms to target words, and find relationships (analogies) between a group of three given words.
Working Memory	Four tests encompass the Working Memory composite. For verbal working memory, participants repeat and order by size animals and non-animals. For symbolic working memory, participants must repeat numbers and letters in correct numerical and alphabetical order and stimuli increase from three to seven items.
Vocabulary	Three tests comprise the Vocabulary composite. Students listen to a stimulus statement and determine which picture best represents the stimulus. Then students read short phrases and chose a synonym among five responses. Lastly, students read short sentences with a missing word and determine which of the five answer choices best completes the sentence.
Prior Knowledge	The Prior Knowledge composite is composed of questions answered prior to reading stories to measure understanding of the subject matter (i.e., voting, chemistry, communication).
Word Recognition	The Word Recognition composite consists of three tests that measure a student's word identification ability. For two tests, students have 45 seconds to read a group of sight words and a nonwords. Students also read a list of 20 9th grade words from a well-known reading inventory.
Reading Strategies	The Reading Strategies composite includes six tests that measure a student's prediction about the story prior to reading, and a series of inferential and evaluative questions answered after reading, which were derived from the three 9th grade reading prompts (i.e., Voter's Drive, Modern Chemistry, and Failure to Communicate).
Self-Regulation	The Self-Regulation composite is comprised of 6 constructs from the LASSI (i.e., test strategies, concentration, anxiety, attitude, time management, and main ideas).

Intrinsic Motivation	The Intrinsic Motivation composite is comprised of 3constructs from the Motivation-to-read Questionnaire (i.e., reading challenge, reading efficacy, and reading curiosity) and 2 constructs from the Motivation to Read Profile (i.e., value of reading and self-concept as a reader).
Study Habits	Study Habits consists of 4 constructs from the LASSI (i.e., self-testing, study aids, motivation, and information processing).
Extrinsic Motivation	The composite of Reading Involvement encompasses 5 constructs from the Motivation to Read Questionnaire (i.e., competition in reading, recognition for reading, reading for grades, compliance, and reading efficacy [loaded on two factors]).

Summary

This section has presented the proposed methodology for the study of the relationship between working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read and reading comprehension for secondary students with disabilities. The research design was presented as a multiple regression. A detailed description of the sample used in this study was provided. A detailed description of the test instruments was also provided, and the researcher has included copies of the proposed instruments as appendices. Preliminary data analysis and data analysis for the study were discussed. The research method of the study offered here was essential to answer the research questions.

CHAPTER FOUR

RESULTS

This study used multiple regression procedures to determine the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, self-regulation, intrinsic motivation, study habits, and extrinsic motivation to reading comprehension for secondary students with disabilities (SWD). Reading, and specifically comprehension, is a complex endeavor that requires a variety of skills. Numerous theorists (i.e., Guthrie), have sought to explain the specific skills that are most essential to reading comprehension, and several well-known theories (i.e., schema, information processing) identify variables as important for reading comprehension (i.e., vocabulary, prior knowledge, working memory). For the purpose of this study, the Construction Integration Model of Reading (CI) has been used because it recognizes that both cognitive and affective factors influence reading comprehension (Kintsch, 1988, 1994, 2013; Kintsch & Kintsch, 2005). Additionally, while the CI model does not use a hierarchy to explain reading comprehension, Kintsch does argue that both bottom-up and top-down processes are both needed to comprehend text (Kintsch, 2005). This study sought to identify which factor or factors are most integral to the reading comprehension of secondary SWD.

All 158 secondary SWD study participants receive special education services for mild/moderate disabilities. Students' disabilities ranged from learning disabilities, other health impaired, emotional disturbance, intellectual disability, traumatic brain injury, and multiple disabilities. Students were enrolled at two large northern California high schools and ranged in age from 14 to 19. Students have received special education services for

seven years, on average. Participants were 99 males and 59 females in grades 9 through 12.

The results of the study are described in four sections to answer the research questions. The first section presents the main findings for the relative importance of the four motivation-to-read constructs to reading comprehension for secondary SWD. The second section analyzes the importance of the five cognitive constructs (i.e., working memory, vocabulary, prior knowledge, word recognition, and reading strategies) to reading comprehension for secondary SWD. The third section examines the relative importance of both cognitive and affective constructs to the reading comprehension of secondary SWD. The fourth section describes additional analyses due to some unexpected findings, and the chapter concludes with a summary of the overall results. All analyses were conducted for a sample of $N = 158$.

Analysis Related to Research Question One

The first research question asked what is the relative importance of motivation to read to reading comprehension for secondary students with disabilities. To answer this question, a principal axis factor analysis with varimax rotation was employed to analyze the measures in the three motivation to read instruments described in Chapter 3, and reported in Table 6 (Field, Miles, & Field, 2012). Four factors were identified, self-regulation, intrinsic motivation, study habits, and extrinsic motivation, and factors scores on each factor are used here as predictors for reading comprehension in a regression model.

Table 9 shows the intercorrelations among the four affective predictors and reading comprehension as well as the means and standard deviations for each factor. As

described in Chapter 3, unlike principal component analysis with varimax rotation, which

does produce uncorrelated component scores, factor scores from factor analyses are not

necessarily uncorrelated despite the use of a varimax (orthogonal) rotation. Still, the

correlations among the predictors were relatively small (-.04 to +.15), a desirable feature

in multiple regression. There was a small statistically significant positive relationship

between intrinsic and extrinsic motivation, but no other significant relationships were

found among the remaining affective factors.

Table 9

Intercorrelations, Means, Standard Deviations (SD), and Significance between Reading Comprehension, Self-Regulation, Intrinsic Motivation, Study Habits, and Extrinsic Motivation

Construct	1	2	3	4	5
1. Reading Comprehension		-.123	.354	-.181	-.194
2. Self-Regulation			-.037	.097	.018
3. Intrinsic Motivation				.019	.152
4. Study Habits					.056
5. Extrinsic Motivation					
Means (*SD*)		0 (.90)	0 (.91)	0 (.90)	0 (.88)

Note. Correlations above .16 are statistically significant (Weatherington, Cunningham, & Pittenger, 2012, p. 452)

Reading comprehension was regressed onto the four factor scores; Table 10

summarizes the regression analysis. The multiple regression model with all four predictor

variables produced $R^2 = .227$, $F(4, 153) = 11.216$, $p < .000$. Table 11 shows that intrinsic

motivation, study habits, and extrinsic motivation are all statistically significant and

contributed to the multiple regression model while self-regulation did not. Intrinsic

motivation had the highest beta weight followed by extrinsic motivation and study habits.

A statistically significant positive relationship exists between reading comprehension and intrinsic motivation while statistically significant negative relationships exist between reading comprehension and study habits and extrinsic motivation. No statistically significant relationship was found between reading comprehension and self-regulation. The negative regression coefficients between three of the affective factors and reading comprehension were unexpected. Additional analyses are discussed later in the chapter to investigate these findings.

Table 10

Regression Model for Reading Comprehension and Predictor Variables of Self-Regulation, Intrinsic Motivation, Study Habits, and Extrinsic Motivation

Model	Sum of Squares	df	Mean Squares	F	Sig
Regression	35.598	4	8.899	11.216	.000
Residual	121.402	153	.793		
Total	157	157			

Table 11

Beta Weights (β), Standard Errors (SE), Statistical Significance (Sig), and the Multiple R from Regression of Reading Comprehension onto Self-Regulation, Intrinsic Motivation, Study Habits, and Extrinsic Motivation

Construct	β	SE β	Sig
Self-Regulation	-.088	.077	.219
Intrinsic Motivation	.391	.080	.000
Study Habits	-.166	.080	.021
Extrinsic Motivation	-.243	.082	.001
Multiple R	.476		

Analysis Related to Research Question Two

The second research question asked what is the relative importance of the cognitive measures of working memory, vocabulary, prior knowledge, word recognition, and reading strategies to reading comprehension. To answer this question, a different data

reduction procedure was followed. Because each of the six constructs were measured by from three to nine measures, a principal component analysis was completed on each set of measures for each construct, and the first unrotated principal component was taken as the measure for that construct. Thus, six separate principal component analyses were completed, one for each construct. For all six analyses, only a single component was identified; this single component was used to generate component scores on each construct: reading comprehension, working memory, vocabulary, prior knowledge, word recognition, and reading strategies. Appendix F presents the component loadings for each of the six constructs. This data analysis strategy reduced the number of measures for each construct to one while presumably providing a better assessment of each construct. As can be seen in Table 12, however, the procedure did not eliminate the correlations among the predictors the way a principal components analysis would have done.

Table 12 shows the intercorrelations between each of the five cognitive predictors and reading comprehension as well as the means and standard deviations for each factor. Reading comprehension has a moderate to large significant positive relationship with all five predictor variables. Additionally, all cognitive factors have moderate significant positive relationships between each other (i.e., vocabulary and working memory; word recognition and reading strategies).

Reading comprehension was regressed onto the five cognitive component scores; Table 13 summarizes the overall regression analysis. The multiple regression model with all five predictor variables produced significant results, $R^2 = .757$, $F(5, 152) = 94.514$, $p < .000$.

Table 12

Intercorrelations between Reading Comprehension, Working Memory, Vocabulary, Prior Knowledge, Word Recognition, and Reading Strategies

Construct	1	2	3	4	5	6
1. Reading Comprehension		.587	.741	.534	.726	.672
2. Working Memory			.491	.437	.445	.423
3. Vocabulary				.518	.558	.639
4. Prior Knowledge					.346	.481
5. Word Recognition						.469
6. Reading Strategies						

Note. Correlations above .16 are statistically significant (Weatherington, Cunningham, & Pittenger, 2012, p. #452);
Mean = 0; *SD* = 1

Table 13

Regression Model for Reading Comprehension and Predictor Variables of Working Memory, Vocabulary, Prior Knowledge, Word Recognition, and Reading Strategies

Model	Sum of Squares	*df*	Mean Squares	F	Sig
Regression	118.791	5	23.758	94.514	.000
Residual	38.209	152	.251		
Total	157.000	157			

Table 14 reports the results of the multiple regression. Working memory, vocabulary, word recognition, and reading strategies all had statistically significant beta weights. Word recognition had the largest beta weight, followed by vocabulary, reading strategies, and working memory. Prior knowledge did not make a statistically significant contribution to the regression model.

Table 14

Beta Weights (β), Standard Errors (SE β), and Statistical Significance (Sig) from regression of Reading Comprehension onto Working Memory, Vocabulary, Prior Knowledge, Word Recognition, and Reading Strategies

Construct	*B*	*SE β*	Sig
Working Memory	.157	.049	.002
Vocabulary	.271	.059	.000
Prior Knowledge	.094	.049	.058
Word Recognition	.372	.050	.000
Reading Strategies	.213	.054	.000
Multiple *R*	.870		

Note. Correlations above .16 are statistically significant (Weatherington, Cunningham, & Pittenger, 2012, p. #452)

Analysis Related to Research Question Three

The third research question asked what is the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, self-regulation, intrinsic motivation, study habits, and extrinsic motivation to the reading comprehension of secondary SWD. To answer this question, a total of 32 cognitive and affective measures were administered to 158 secondary SWD. Multiple regression analysis was employed with the cognitive components and affective factors to uncover the relationship among and between the criterion and predictor variables.

Table 15 shows the intercorrelations between all nine of the predictor variables and reading comprehension as well as the means and standard deviations for each factor. Reading comprehension had moderate to large statistically significant positive relationships with all five cognitive predictor variables and a small statistically significant positive relationship with intrinsic motivation. Reading comprehension also had small statistically significant negative relationships with study habits and extrinsic motivation. No statistically significant relationship was found between reading comprehension and self-regulation.

Working memory had moderate statistically significant positive relationships with vocabulary, prior knowledge, word recognition, reading strategies, and a small statistically significant positive relationship with intrinsic motivation. Small statistically significant negative relationships were also found between working memory and self-regulation and study habits. No statistically significant relationship was found between working memory and extrinsic motivation. Vocabulary had moderate statistically significant positive relationships with prior knowledge, word recognition, reading strategies, and intrinsic motivation. A small statistically significant negative relationship was discovered between vocabulary and extrinsic motivation. No statistically significant relationships were evidenced between vocabulary and self-regulation or study habits. Prior knowledge had moderate statistically significant positive relationships with word recognition and reading strategies, and a small statistically significant positive relationship with intrinsic motivation. No statistically significant relationships were found with self-regulation, study habits, or extrinsic motivation. Word recognition had a moderate statistically significant positive relationship with reading strategies and a small statistically significant positive relationship with intrinsic motivation. A small statistically significant negative relationship was found with study habits, but no statistically significant relationships were uncovered between word recognition and self-regulation and extrinsic motivation. Reading strategies had a small statistically significant positive relationship with intrinsic motivation and small statistically significant negative relationships with self-regulation and extrinsic motivation. No statistically significant relationship was found with study habits.

For the affective factors, intrinsic motivation had a small statistically significant positive relationship with extrinsic motivation. No other statistically significant relationships were found among the remaining affective factors.

Reading comprehension was regressed onto the five component and four factor scores; Table 16 summarizes the regression analysis. The multiple regression model with all nine predictor variables produced, $R^2 = .771$, $F(9, 148) = 55.287$, $p < .000$. Table 17 indicates that all five cognitive predictor variables (i.e., working memory, vocabulary, prior knowledge, word recognition, and reading strategies had small statistically significant positive beta weights. Word recognition had the largest beta weight followed by vocabulary, reading strategies, working memory, prior knowledge, and extrinsic motivation; however, extrinsic motivation had a small statistically significant negative beta weight. None of the other three affective factors (i.e., self-regulation, intrinsic motivation, and study habits) had a statistically significant relationship with reading comprehension.

Table 15

Intercorrelations, Means, and Standard Deviations between Reading Comprehension, Working Memory, Vocabulary, Prior Knowledge, Word Recognition, Reading Strategies, Self-Regulation, Intrinsic Motivation, Study Habits, and Extrinsic Motivation

Construct	1	2	3	4	5	6	7	8	9	10
1. Reading Comprehension		.587	.741	.534	.726	.672	-.123	.354	-.181	-.194
2. Working Memory			.491	.437	.445	.423	-.178	.200	-.131	-.111
3. Vocabulary				.518	.558	.639	-.100	.412	-.062	-.157
4. Prior Knowledge					.346	.481	-.123	.152	-.042	-.070
5. Word Recognition						.469	-.052	.311	-.130	-.015
6. Reading Strategies							-.200	.292	-.114	-.170
7. Self-Regulation								-.037	.097	.018
8. Intrinsic Motivation									.019	.152
9. Study Habits										.056
10. Extrinsic Motivation										
Mean	0	0	0	0	0	0	0	0	0	0
Standard Deviation	1	1	1	1	1	1	.93	.91	.90	.88

Note. Correlations above .16 are statistically significant (Weatherington, Cunningham, & Pittenger, 2012, p. #452)

Table 16

Regression Model for Reading Comprehension and Predictor Variables of Working Memory, Vocabulary, Prior Knowledge, Word Recognition, Reading Strategies, Self-Regulation, Intrinsic Motivation, Study Habits, and Extrinsic Motivation

Model	Sum of Squares	*df*	Mean Squares	*F*	Sig
Regression	121.008	9	13.445	55.287	.000
Residual	35.992	148	.243		
Total	157	157			

Table 17
Beta Weights (β), Standard Errors (SE β), and Statistical Significance (Sig) from regression of Reading Comprehension onto Working Memory, Vocabulary, Prior Knowledge, Word Recognition, Reading Strategies, Self-Regulation, Intrinsic Motivation, Study Habits, and Extrinsic Motivation

Construct	*β*	*SE β*	Sig
Working Memory	.145	.049	.003
Vocabulary	.244	.061	.000
Prior Knowledge	.107	.049	.029
Word Recognition	.372	.050	.000
Reading Strategies	.191	.055	.001
Self-Regulation	.008	.044	.847
Intrinsic Motivation	.054	.050	.234
Study Habits	-.069	.045	.089
Extrinsic Motivation	-.099	.047	.019
Multiple *R*	.878		

Additional Exploratory Analyses

Due to special education classifications in the sample, multiple regressions were run on several subgroups within the sample. In particular, multiple regression analyses were conducted for students with learning disabilities (LD), students without learning disabilities (non-LD), non-English Learners (non-EL), English Learners (EL), and for low and high comprehenders. To maintain as large a sample as possible, low comprehenders were defined as below the 45th percentile on reading comprehension and high comprehenders were defined as those scoring above the 55th percentile. This

procedure dropped the middle 15 students on reading comprehension. The additional exploratory analyses examined the relative importance of the cognitive components for each of the subgroups described above and is displayed in Table 18 below.

When the multiple regression was run on all participants (the same analysis reported in Table 14), the predictor variables in order of importance were word recognition, vocabulary, reading strategies, and working memory. Results were similar when participants with learning disabilities (LD) were regressed onto the cognitive components where all cognitive components, with the exception of prior knowledge, were statistically significant. The relative importance was the same as for the entire sample. Regression was also conducted for students without LD (i.e., Other Health Impaired, Emotional Disturbance). Results show that, in order of relative importance, word recognition, vocabulary, prior knowledge, and reading strategies were all statistically significant. Working memory was not statistically significant for this subgroup of students.

Analyses were also conducted for students who were English Language learners (EL) and those who were not EL learners. For EL learners the relative importance of the statistically significant cognitive components were word recognition, reading strategies, working memory, and vocabulary. Prior knowledge was not statistically significant. For non-EL learners, only three cognitive components were statistically significant: word recognition, vocabulary, and reading strategies. Both working memory and prior knowledge were not statistically significant.

Lastly, analyses were conducted for low and high comprehenders. Results for low comprehenders indicate statistically significant results for (in order of relative

importance) word recognition, reading strategies, prior knowledge, and working memory. Vocabulary was not statistically significant. The results for the high comprehenders differed from the low comprehenders. Statistically significant results were found for vocabulary, word recognition, and reading strategies. Non-significant results were found for working memory and prior knowledge.

Summary

In this study looking at the factors that affect the reading comprehension of secondary SWD, predictor variables of working memory, vocabulary, prior knowledge, word recognition, reading strategies, self-regulation, intrinsic motivation, study habits, and extrinsic motivation were regressed onto reading comprehension. First, reading comprehension was regressed onto the four affective factors: self-regulation, intrinsic motivation, study habits, and extrinsic motivation. A statistically significant relationship was shown when all four affective factors were included in the regression model; however, the results were anomalous as some of the factors had a positive relationship (i.e., intrinsic motivation) while others had a negative relationship (i.e., study habits and extrinsic motivation) and no statistically significant relationship was found between reading comprehension and self-regulation. A statistically significant positive relationship was found between intrinsic and extrinsic motivation.

The five cognitive factors were next regressed onto reading comprehension and a statistically significant positive relationship was found with working memory, vocabulary, word recognition, and reading strategies. Prior knowledge did not have a statistically significant relationship with any of the other cognitive factors nor add to the

Table 18

Beta Weights(β) from Regressing Reading Comprehension onto Working Memory, Vocabulary, Prior Knowledge, Word Recognition, and Reading Strategies for All Students, Students with Learning Disabilities (LD) and Students without Learning Disabilities (non-LD), English Language Learners (EL), Non-English Language Learners (Non-EL), and Low Comprehenders (below 45th percentile), and High Comprehenders (above 55th percentile)

Construct	All	LD	Non-LD	EL	Non-EL	Low	High
	N=158	*N*=109	*N*=49	*N*=39	*N*=119	*N*=71	*N*=72
Working Memory	.157	.201	.079	.259	.115	.162	.034
Vocabulary	.271	.256	.298	.204	.319	.032	.362
Prior Knowledge	.094	.067	.181	.126	.105	.206	-.021
Word Recognition	.372	.342	.429	.345	.368	.431	.266
Reading Strategies	.213	.224	.165	.273	.183	.298	.256
Multiple *R*	.870	.848	.912	.880	.867	.785	.685

regression model. Additionally, the intercorrelations between all cognitive factors were positive and statistically significant.

When all nine predictor variables were included into the regression model, a statistically significant relationship was found with reading comprehension. Intercorrelations between reading comprehension and the nine predictor variables show statistically significant positive relationships with working memory, vocabulary, prior knowledge, word recognition, reading strategies, and intrinsic motivation. Statistically significant negative relationships were found between reading comprehension and study habits and extrinsic motivation. No statistically significant relationship was found between reading comprehension and self-regulation.

Working memory had statistically significant positive relationships with vocabulary, prior knowledge, word recognition, reading strategies and intrinsic motivation, and statistically significant negative relationships with self-regulation and

study habits. No statistically significant relationship was found with extrinsic motivation. Vocabulary had statistically significant positive relationships with prior knowledge, word recognition, reading strategies, and intrinsic motivation. A statistically significant negative relationship was found with extrinsic motivation and no statistically significant relationships were found with self-regulation and study habits. Statistically significant positive relationships were found between prior knowledge and word recognition, reading strategies, and intrinsic motivation. No other statistically significant relationships were found with the remaining affective factors and prior knowledge. Word recognition had a statistically significant positive relationship with intrinsic motivation and a statistically significant negative relationship with study habits; no other statistically significant relationship was found between the other affective factors. Three statistically significant relationships were found between reading strategies and the affective factors. A statistically significant positive relationship was found with intrinsic motivation and negative relationships were found with self-regulation and extrinsic motivation. No statistically significant relationship was found with study habits.

CHAPTER FIVE

SUMMARY, LIMITATIONS, DISCUSSION, and IMPLICATIONS

The chapter presents the summary, limitations, discussion, and implications of the research study. The first section describes aspects of the study and includes an overview, the rationale, purpose, theoretical framework, research questions, methodology, and a summary of the findings. The second section describes the limitations of the study. The third and fourth sections discuss the findings and implications for future research and practice. A summary concludes the chapter.

Summary of the Study

Reading is an essential skill needed to foster autonomy. When students begin school, families expect their children to graduate high school, attend college, and get a job that will support them and their future families. Unfortunately, for 30 million Americans, these goals are never realized due to an inability to read (U.S. Department of Education, 2003). Literacy affects a person's life in myriad ways: from completing driver's license and job applications, to understanding health-related forms, to learning information about employment benefits. Without the ability to read, quality of life is impacted and earning potential is diminished especially for individuals with disabilities (Mellard & Patterson, 2008).

The joy children experience when they first begin school turns to frustration for students with disabilities (SWD). Reading difficulties often appear in elementary school, and a gap in ability emerges between those with and without disabilities (NCES, 2011). The reason for these gaps has been postulated throughout reading literature (Cattell, 1886; Snow, Burns, & Griffin, 1998; Thorndike, 1917; Watson, Gable, Gear, & Hughes,

2012), but the result is that reading for SWD is impeded by a variety of factors (National Reading Panel, 2000; Torgeson, 2002).

Research conducted by the National Reading Panel (NRP) identified several key skills that are necessary for students to become fluent readers: alphabetics (i.e., phonemic awareness, phonics), fluency, comprehension, and vocabulary (NRP, 2002). From this research, the nation changed how reading was taught as more focus was placed on these key components. One major flaw existed with this plan; the NRP completed an exhaustive review of the current reading literature for elementary school-aged children, and did not consider a variety of other factors such as how best to teach reading to secondary students and sociocultural roles of teaching reading. While there are many critics to the NRP report, for the purposes of this study, the main issue is that few studies reviewed by the panel included secondary students. The panel acknowledged SWD benefitted from the same instruction in alphabetics, fluency, and comprehension as those without disabilities. It should be noted that recommendations for how to teach reading focused on early literacy instruction, which has influenced teacher preparation, reading curriculum, and reading instruction.

Recent research has centered on a variety of factors that impact reading comprehension: working memory (Swanson, 2011; Swanson & Jerman, 2007), vocabulary (Cain & Oakhill, 2011; Gilbert, Goodwin, Compton, & Kearns, 2013), prior knowledge (Elbro & Buch-Iversen, 2013; Priebe, Keenan, & Miller, 2012), word recognition (Denton, et al., 2011; O'Connor, Swanson, & Geraghty, 2010), reading strategies, (Antoniou & Souvignier, 2007; Fritschmann, Deshler, & Schumaker, 2007), and motivation (Guthrie, Coddington, & Wigfield, 2009; Solheim, 2011). Most of the

research has studied each of these variables in isolation, while others have considered several factors that might impede successful text comprehension (Swanson, Kehler, & Jerman, 2009; Swanson, Trainin, Necoechea, & Hammill, 2003). Each study espouses a different theoretical framework to answer the question about what factors affect reading comprehension. Unfortunately, no clear consensus among the literature exists as to which factors are most important for reading comprehension and specifically reading comprehension for secondary SWD.

The purpose of this study was to examine the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read to the reading comprehension of secondary SWD. A multiple regression analysis was employed to study these constructs.

The present study drew from the work of Walter Kintsch's Construction-Integration Model of Reading. Comprehension, according to Kintsch, requires a series of interconnected cognitive processes such as working memory, activating prior knowledge, word recognition and knowledge, and strategic reading (i.e., inferring, predicting, summarizing). Additionally, reader interest is necessary to gain a deep understanding of the text. If any of these skills are deficient, the reader's comprehension is disrupted. These processes should be automatic allowing the reader to become actively engaged in reading.

Reading is not an automatic, fluent endeavor for many SWD. Consequently, reading comprehension is hampered. Reading becomes an arduous task of stopping and starting as students attempt to decode words and understand the text. Working memory is taxed and motivation plummets. According to Kintsch, unskilled readers engage in

problem solving strategies to comprehend, which weakens comprehension (Kintsch, 2013). Kintsch's theory analyzes the interaction of these cognitive processes rather than creating a hierarchical model of the processes of reading comprehension. Without an understanding of the cognitive and affective processes that are most important for secondary SWD, reading comprehension deficits will continue.

The study addressed the following three research questions:

1. What is the relative importance of motivation-to-read to the reading comprehension of secondary SWD?

2. What is the relative importance of working memory, vocabulary, prior knowledge, word recognition, and reading strategies to the reading comprehension for secondary SWD?

3. What is the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation to the reading comprehension for secondary SWD?

To answer these research questions multiple regression analyses were conducted. Preliminary data analysis included a principal component analysis with varimax rotation for the cognitive variables and a principal axis factor analysis with varimax rotation for the affective variables. Additional analyses were conducted to answer questions related to unexpected findings and to determine if there was a difference between the reading comprehension of various student groups (i.e., EL students, those with specific learning disabilities only).

Summary of Findings

The first research question examined the relative importance of motivation-to-read that was conceptualized through factor analysis as self-regulation, intrinsic motivation, study habits, and extrinsic motivation to the reading comprehension of secondary SWD.

Regression analysis indicated that reading comprehension was influenced by the affective factors. The first finding was that reading comprehension had 23% shared variance with self-regulation, intrinsic motivation, study habits, and extrinsic motivation. Several affective factors had both direct and indirect relationships with the reading comprehension for secondary SWD. Students who were intrinsically motivated had higher reading comprehension scores. Additionally, students with poor study habits and those who were extrinsically motivated to read had lower reading comprehension scores.

The second research question considered the relative importance of working memory, vocabulary, prior knowledge, word recognition, and reading strategies to the reading comprehension of secondary SWD. The second finding was that reading comprehension had 76% shared variance with the cognitive variables.

Several cognitive components were integral to the reading comprehension of secondary SWD. Listed in order of relative importance: word recognition, vocabulary, reading strategies, and working memory contributed to the reading comprehension of secondary SWD.

The third research question investigated the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, self-regulation, intrinsic motivation, study habits, and extrinsic motivation to the reading

comprehension of secondary SWD. The third finding was that reading comprehension had 76% shared variance with the affective factors and cognitive variables.

When all nine predictor variables were regressed onto reading comprehension, working memory, vocabulary, prior knowledge, word recognition, reading strategies, and extrinsic motivation contributed to the reading comprehension of secondary SWD. Reading comprehension scores were lower for students who were extrinsically motivated to read. The relative importance of the affective factors diminished when regressed with the cognitive variables.

Additional analyses were conducted to understand the relationship between the affective factors and working memory, vocabulary, prior knowledge, word recognition, and reading strategies. Individual regression analyses findings are discussed below. In addition, a variety of learner attributes (i.e., EL status, disability category) were regressed onto reading comprehension to determine the impact of each of these attributes to the reading comprehension scores of secondary SWD.

Regression analyses produced the fourth finding, which was that working memory, vocabulary, word recognition, and reading strategies were influenced by the affective factors. The relative importance of intrinsic motivation increased when regressed onto all the cognitive variables. The relative importance of self-regulation and extrinsic motivation decreased when regressed onto working memory and reading strategies. Extrinsic motivation lessened in importance when regressed with vocabulary.

Limitations

There were four major limitations in the study. The first limitation was in data collection. Students were tested in a 90-minute after school session, some results may be

inaccurate due to student fatigue. For SWD, after being at school all day, fatigue may have encouraged them to hurry up and finish the test, which could account for unreliable results. During the after school sessions, the researcher closely monitored all participants to watch for signs of fatigue. Additionally, reliability scores support that the scores were reliable. Future research should consider student fatigue when designing studies with numerous test instruments.

Another limitation was with the measurements. The test instruments chosen for the study might not have been the best instruments to measure the constructs in the study. The affective instruments were chosen based on common-use gleaned from the literature review (i.e., LASSI-HS, MRQ, MRP). These three test instruments report that 23 distinct constructs are measured. Factor analysis uncovered a total of 19 factors because 4 of the constructs had low factor loadings and were dropped from the analyses. In addition, scores for the affective measures were entered into the database consistent with the test manuals; however, the LASSI-HS and MRQ had numerous negatively-worded statements that might have confused the participants. The affective variables proved to be more problematic because when combined with the cognitive variables, their relative importance decreased.

To mitigate the negatively-worded questions, participants were encouraged to ask questions if they were confused about what the question stated. Participants were also encouraged to re-read any statement that was confusing to them to ensure they understood what was being asked.

Both the LASSI and MRQ test instruments were long (i.e., 76 and 53 questions respectively). Some SWD might become frustrated when they see the large number of

items, and not honestly answer the questionnaire. It was important to monitor each participant while taking these assessments to ensure they did not finish quickly indicating that they just circled an answer without considering it. Reliability scores allow confidence in the interpretation of the results.

Additionally, the summary test required students to write a short summary about the passage. A total of 21 points were possible, but the mean score was 4.9. The low score could have been a function of the format that students used to summarize (i.e., writing). Future studies might consider having students dictate responses to the researcher or highlight the key ideas in the passage.

A third limitation in the study was low reliability scores for four of the affective constructs (i.e., .35 - .45), which may also have affected the regression analyses. Only one of these constructs (MRQ Reading Work Avoidance) dropped from the final analysis. The other three (i.e., LASSI motivation, time management, and selecting main ideas) were all included in the final factor analysis, and had factor loadings (i.e., .57 to .66) that allow interpretation of the results with confidence.

The last limitation was the heterogeneity of the sample. The sample for this study were all SWD living in a large urban area from low socio-economic backgrounds, which may allow generalizability of the results only to other similar samples of SWD. Additionally, students were chosen to participate in this study due to their eligibility in special education and not solely due to having a reading disability. Any variability between subjects might be attributed to the learning differences between the subjects, which might hinder generalizability to other SWD.

Discussion of the Findings

The goal of reading is to comprehend what has been read. Students with disabilities often have language-based deficits that make comprehension difficult (Lyon, Shaywitz, & Shaywitz, 2003). Many theories have been suggested as a means of understanding why SWD exhibit deficits with comprehension (Ebro, 2010; Guthrie, 2008; Swanson, Edmonds, Hairrell, Vaughn, & Simmons, 2011; Taylor, et al., 2009; Was, 2010). Some theorists suggest that the underpinnings of comprehension deficits stems from an inability to read words with automaticity (Allen, 2010). Others suggest that lack of a strong vocabulary based or poor background knowledge lead to insufficient comprehension (Cain & Oakhill, 2011). While others suggest poor working memory and poor reading strategies inhibit reading comprehension (Swanson, Kehler, & Jerman, 2009). Motivation-to-read is another aspect that theorists posit impedes comprehension (Wigfield et al., 2008).

While there is evidence to suggest that each of these constructs plays a role in comprehension, it is unknown which factor or factors are most important to the reading comprehension of secondary SWD. Few studies have solely studied reading comprehension of only secondary SWD and none have been undertaken to look at the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read.

Affective factors. Three instruments, LASSI-HS, MRQ, and MRP, were used to measure motivation-to-read for secondary SWD. Each instrument was chosen because they have been used in prior research (Gambrell, Palmer, & Codling, 1996; Solheim, 2011; Wigfield, et al., 2008) and were deemed appropriate to measure the affective

aspects of reading comprehension. Principal axis factor analysis with varimax rotation was conducted to reduce the large number of constructs (i.e., 23) reported in the instruments to a workable amount. Four factors were produced from the analysis: self-regulation, intrinsic motivation, study habits, and extrinsic motivation.

The first result from the multiple regression analysis reveals an increase in reading comprehension when students are intrinsically motivated. Intrinsically motivated students are those who participate in an activity because of some innate interest or desire (Koestner & Losier, 2002). If students are interested in reading, they are more apt to pick up a book to read, which will help them become better comprehenders. This finding is consistent with Wigfield et al. (2008) who concluded that reading comprehension was higher for engaged students described as those who were internally motivated to read.

This finding was in contrast to a study conducted by Guthrie, Coddington, & Wigfield (2009). In their study, they found that reading comprehension and word recognition did not significantly correlate for African American students, but the reading achievement of Caucasian students was significantly correlated with intrinsic motivation. Participants in the study were 68% Caucasian and 20% African American. Students with disabilities comprised 10% of the elementary school-aged participants. In the current study, participants were 56% African American and 11% Caucasian, and 100% of the participants were secondary SWD.

The next finding from the affective factors was that reading comprehension was negatively correlated with extrinsic motivation. According to Deci & Ryan (2002), there are several types of external motivation that vary dependent upon the level of self-determination a student exhibits. At the basic level, external motivation exists when a

student is compelled to engage in an activity based on either reward or outside pressure (i.e., grades). These findings suggest that students' reading comprehension decreases when they do not have internalized motivation-to-read. The results are consistent with those found by Wigfield et al. (2008) who noted that less engaged readers used fewer reading strategies while reading and reading comprehension was hindered. Less engaged readers are also those who avoid reading and do not engage in the specific activities (i.e., word reading, strategic reading) needed to help improve comprehension. As Wigfield et al. (2008) relate, reading comprehension is influenced when students are engaged (i.e., intrinsically motivated). Extrinsically motivated students, in contrast, are those who are not actively engaged during reading, which negatively affects reading comprehension.

Lastly, study habits was negatively correlated with reading comprehension. The study habits factor was derived from four constructs from the LASSI (i.e., self-testing, study aids, motivation, and information processing). Each of these four constructs relate to how engaged a student is in a variety of ways including studying and preparing for tests, how efficiently the student processes information, and how motivated they are to complete assignments. While not specific to reading comprehension, this factor emphasized how engaged a learner is, which is related to a variety of academic outcomes including reading comprehension (Fredricks, Blumenfeld, & Paris, 2004). These results coincide with the research on how engagement is related to academic performance conducted by Fredricks et al. (2004).

While the findings show that the only factor that was positively correlated with the cognitive variables was intrinsic motivation, these results might be attributed to the negatively-worded statements. For the most part, the study participants each have

language-based deficits, and these negatively-worded statements might have confused

them; however, it is evident that students who were innately interested in reading were

more successful on measures of reading comprehension.

      Cognitive variables. This present study looked at five cognitive variables that

appear throughout reading research as important to reading comprehension (Cain &

Oakhill, 2011; Dennis, 2012; Elbro & Buch-Iversen, 2013; Fritschmann, Deshler, &

Schumaker, 2007; Swanson & Ashbaker, 2000). A total of 29 assessments were

administered to the 158 secondary students with disabilities to identify the relative

importance of working memory, vocabulary, prior knowledge, word recognition, and

reading strategies for these students. When taken together, the cognitive variables directly

contributed to 76% of the shared variance with the reading comprehension of secondary

SWD. The relationships between reading comprehension and the cognitive variables are

listed and discussed below in order of relative importance.

      Word recognition. Word recognition is the ability to decode words efficiently and

with automaticity (Wexler, Vaughn, Edmonds, & Reutebuch, 2008). According to

information processing theorists, attention has limited capacity (O'Connor, Swanson, &

Geraghty, 2010). Students who struggle to decode words use this limited capacity to

consciously decipher what they are trying to read. When this happens, limited capacity

stores are used to decode and are not available to attend to higher order reading skills like

understanding words, phrases, and the underlining meaning of what is read (O'Connor, et

al., 2010; LaBerge & Samuels, 1974). Numerous studies have focused on word

recognition as an integral step for early literacy in the elementary school grades, but little

research has focused on the importance of word recognition to reading comprehension for

secondary students and specifically secondary SWD (Denton, et al., 2011; Wexler et al., 2008).

In the current study, word recognition had a direct relationship with reading comprehension, indicating that comprehension is fostered when students are able to decode the text. Word recognition was measured using four instruments that assessed both real and nonwords. Two of the word recognition assessments were timed (i.e. students had 45 seconds to read the words), which might have confounded the overall results since many SWD are not fluent readers (O'Connor, et al., 2010).

At the secondary level, decoding and fluency are not the focus of instruction, which is important during elementary school, rather comprehension and vocabulary are essential for students to be successful in core academic courses (i.e., math, English, science) (Dennis, 2012; Denton, et al., 2011). For SWD who have language-based skill deficits, lack of word recognition presents a barrier to comprehension (Wexler, et al., 2008). This assertion is supported by the work of O'Connor, et al., (2010) who found that reading fluency mediated reading comprehension growth. A direct relation was seen between reading rate and comprehension: as reading rate improved, reading comprehension also improved, which is supported by the present findings.

The relationship between word recognition and comprehension was also supported through the work of Gilbert, Goodwin, Compton, & Kearns (2013). One aspect of their study was to look at the relationship between morphological awareness and reading comprehension. One finding from their study was that skilled word readers do not rely on morphological awareness because each word conveys meaning that affects comprehension. They note that both morphological and phonological awareness are

integral to fluent word reading and text comprehension (Gilbert et al., 2013).

Morphological and phonological awareness were not the focus of the present study;

however, numerous studies contend that phonological awareness is a precursor to word

reading, which in turn leads to comprehension (Adams & Osborn, 1990; Carson, Gillon,

& Boustead, 2013).

Vocabulary. Vocabulary develops in a variety of ways through both written and

oral communication, and is an essential aspect of reading comprehension (Cain &

Oakhill, 2011). Findings from the regression analysis indicate a direct relationship

between vocabulary and reading comprehension. These results suggest that while

students read, it is necessary for them to understand the meanings of the words they are

reading to foster deep understanding of the text. These findings are supported with the

work from Cain and Oakhill (2011) who found that students with poor vocabulary gains

had lower reading comprehension ability when compared to same-age peers with higher

vocabulary skills. They noted that differences were also noted in the students' reading

habits. One summation from their research was that both reading comprehension and

reading habits (i.e., amount of time spent reading, going to the library) fostered

vocabulary growth over and above general intelligence.

Similarly, Dennis (2012) conducted a hierarchical cluster analysis and found that

students who struggled with word meaning (i.e., termed struggling word callers) also

exhibited weak comprehension skills. Half of the students in this cluster were SWD,

higher than any of the other groups. Dennis also found that the struggling word callers

had higher comprehension scores when reading narrative text. While not a focus of the

present study, students were given both narrative and expository text to read as secondary

students encounter both types of text at school. Recent National Assessment of Educational Progress (NAEP) results indicate that SWD score significantly lower on vocabulary knowledge compared to students without disabilities (US Department of Education, 2015). As supported by the current study and research conducted by Dennis, Cain and Oakhill, as well as the NAEP reading results, this deficit is evidenced by lower reading comprehension ability.

   Reading Strategies. Proficient readers are strategic readers (Antoniou & Souvignier, 2007). Readers use a variety of strategies to comprehend, and for the purposes of this study, prediction, inference, and summarization were the focus. Consistent with Kintsch's CI Model of Reading, when reading, use of reading strategies aids the reader in constructing mental images from the text, which strengthens comprehension (Kintsch, 2013). As students were presented with a series of both narrative and expository text to read, they were required to predict and draw conclusions about what they read. These skills required them to reflect upon what they learned directly from the text, and integrate that with their general knowledge about the content (i.e., voting, chemistry, communication). Lastly, students were required to summarize each of the three stories by writing down as many key components as they remembered from the text. A total of 21 key ideas were identified by the four teachers who reviewed the stories. Students scored particularly low ($M = 4.94$; $SD = 3.53$), but the low scores could have been attributed to the added graphomotor component. Nevertheless, the ability to use reading strategies while reading did significantly assist students' comprehension.

These results are supported by the work of Antoniou and Souvignier (2007) who found that reading comprehension can be improved when SWD are taught how to use reading strategies while reading. Further they indicated that SWD require explicit strategy instruction and time to incorporate the strategies into their reading repertoire. To generalize the strategies to different content, students must learn how to use "cognitive and metacognitive comprehension skills" (Antoniou & Souvignier, 2007, pp. 52). Fritschmann, Deshler, and Schumaker (2007) also found a significant improvement in reading comprehension when SWD used an inference strategy. After 15 hours of intensive instruction in an inference strategy, students realized a 2.8 grade-level gain in reading comprehension. Berkeley, Mastropieri, and Scruggs (2011) had similar results to Fritschmann et al., and found that SWD received higher reading comprehension scores when they received explicit strategy instruction.

Strategy instruction was not a part of the current study; however, it is important to recognize that SWD do respond well to explicit strategy instruction, which translates to higher reading comprehension scores as evidenced by the present study.

Working memory. A plethora of research has been conducted to quantify the importance of working memory to reading in general and reading comprehension specifically (Alloway, Gathercole, Adams, & Willis, 2005; Ericsson, & Kintsch, 1995; Jeffries, & Everatt, 2004; McCallum, Bell, Wood, Below, Choate, & McCane, 2006). Working memory is the ability to store and process information simultaneously (Swanson & Ashbaker, 2000). Surprisingly, working memory contributed the least to the regression model in the current study; however, it was directly related to reading comprehension. In this study, working memory was measured using five different instruments. Three tasks

were auditory (students repeated non-words, and animals and non-animals from smallest to largest) and the remaining two tasks were visual (students pointed to numbers and letters in numerical and alphabetical order). In a comparison of the mean scores for both verbal and symbolic (visual) working memory, students had higher mean scores for the visual tasks. One conclusion that can be drawn from these results is that when students look at a stimulus (i.e., numbers or letters) their memory is enhanced. These results are similar to ones found by Caretti et al. (2009) who noted that the link between working memory and reading comprehension varied by the type of working memory task (i.e., verbal or visual). They noted that students with poor reading comprehension abilities performed poorly on verbal working memory tasks. Additionally, differences between proficient and non-proficient was mitigated by visual working memory tasks.

Similar findings were noted by Christopher et al. (2012) who indicated that working memory was a predictor to both word reading and reading comprehension and working memory is shared between both variables. They noted that as word reading improves so does reading comprehension, which may explain an increase in working memory. They posit that working memory may improve as a direct function of an increase in language skills (word reading and comprehension.). This view is supported with the present study where working memory was directly related to both reading comprehension and word recognition.

Prior Knowledge. One conclusion that could be made from the analysis of the non-significant results between prior knowledge and reading comprehension is that while prior knowledge aids comprehension, the other cognitive variables are more important. Prior knowledge, or background knowledge, helps not only reading comprehension but

word reading as well (Priebe, Keenan, & Miller, 2012). In the present study, word recognition was the best predictor of reading comprehension suggesting that prior knowledge was more beneficial in helping students decode/read words, which in turn improves comprehension. When word recognition and prior knowledge are regressed onto reading comprehension, prior knowledge does become significant; however, word recognition continues to be more highly predictive of reading comprehension. Whether prior knowledge plays a direct part in aiding reading comprehension or whether word recognition is aided from prior knowledge, the end result is the same, prior knowledge is important to reading comprehension.

These results are similar to ones found by Elbro and Iversen (2013). In their study, students were taught to use gap-filling inferences by using prior content knowledge. Students improved in both their ability to make gap-filling inferences, but also in reading comprehension of both narrative and expository text. Additionally, Priebe et al. (2012) found that prior knowledge aided word recognition, but only for poor readers. When poor readers had prior knowledge, they substituted less graphically similar words when reading (i.e., mountain read as maintain). Poor readers without prior knowledge relied more heavily on graphic information from the text rather than semantic (i.e., substituting a synonym). It was not shown in the present study, whether prior knowledge aids reading comprehension directly or mediates word recognition; however, prior knowledge did aid in the reading comprehension of secondary SWD.

Affective and cognitive variables. The ability to comprehend text requires inherent ability from the reader (Deshler, Hock, & Catts, 2006; Kintsch & Kintsch, 2005). These abilities are manifested through working memory, vocabulary, prior

knowledge, word recognition, reading strategies, and motivation-to-read. In the current study, these constructs were regressed onto reading comprehension to determine their relative importance to comprehension for secondary SWD. Factor analysis of the motivation-to-read variable produced factors that were identified as self-regulation, intrinsic motivation, study habits, and extrinsic motivation. When all learner-centered variables were entered into the regression analysis, all cognitive variables were directly related to reading comprehension. In order of importance, word recognition, vocabulary, reading strategies, working memory, and prior knowledge, the cognitive constructs accounted for 27% of the shared variance with reading comprehension. None of the affective factors were significantly related to reading comprehension with the exception of extrinsic motivation, which was indirectly related.

Several conclusions can be drawn from these results. First, reading comprehension is complex, and as such, numerous factors aid in comprehension that are innate in the reader. As a language-based activity, reading comprehension has stronger relationships with word recognition and vocabulary respectively. If a student is unable to decode words or understand their meaning, it follows that comprehension will be diminished. Strategic reading is also important to comprehension. Frequently, authors leave details out of text anticipating that a reader will infer the meaning. For SWD, this skill is not always robust and comprehension is affected. Working memory and prior knowledge are also needed to comprehend. According to Kintsch's CI Model of Reading (2013), these two skills are activated throughout the reading process (i.e., at both the micro- and macro-levels), and allow the reader to draw inferences and identify the main ideas or "gist" from what was read. Kintsch's model presumes the reader has automatized

word recognition ability. Unfortunately, for many secondary SWD, this skill is not realized, which negatively affects reading comprehension.

Secondly, motivation-to-read is a factor shown to relate positively to reading comprehension (Guthrie, Coddington, & Wigfield, 2009; Solheim, 2011; Wigfield, et al., 2008). In the present study, when the affective factors were regressed onto reading comprehension, intrinsic motivation had a statistically significant direct relationship. Additionally, both extrinsic motivation and study habits had statistically significant indirect relationships with reading comprehension. When all nine predictor variables were entered into the regression analysis, the importance of the affective factors declined. One explanation for the indirect relationship between extrinsic motivation and reading comprehension is that reading comprehension increases when a reader has an ingrained desire to read (intrinsically motivated). This claim is supported by self-determination theorists who posit that internally-motivated learners experience higher academic achievement and enjoy school more (Reeve, 2002). Wigfield et al. (2008) also support that less engaged (extrinsically motivated) readers are less motivated to read and are less strategic readers, which impedes reading achievement. The extent that the role of motivation plays in reading comprehension is unclear. However, it is clear that many secondary SWD are amotivated to read, which does hinder comprehension as noted by Guthrie et al. (2009).

Additional Analyses. Additional analyses were conducted to further understand the relationship of the cognitive components for different sub-groups of students. Some differences in the relative importance of the cognitive components emerged for several sub-groups of students. First, for non-LD students, word recognition, vocabulary, prior

knowledge, and reading strategies were all statistically significant. Working memory was not statistically significant. The main difference for non-LD students, when compared to all participants and those with LD, was the relative importance of prior knowledge for these students.

The next sub-group of students analyzed was English Language learners (EL). The relative importance of the cognitive components was the same for both EL and non-EL learners (i.e., word recognition, reading strategies, working memory, and vocabulary). The last sub-group analyzed was low- and high-comprehenders. Several differences were noted in the relative importance of the cognitive components. For low-comprehenders, word recognition, reading strategies, prior knowledge, and working memory were all statistically significant, and vocabulary did not aid in the comprehension for these students. Conversely the relative importance of the cognitive components for the high comprehenders was vocabulary, word recognition, and reading strategies. Working memory and prior knowledge were not statistically significant for high comprehenders.

Theoretical Framework. Multiple regression analyses confirm the relative importance of working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read (i.e., self-regulation, intrinsic motivation, study habits, and extrinsic motivation) to reading comprehension. While Kintsch's Construction-Integration (CI) Model of Reading does not include hierarchical ordering of the constructs important to reading comprehension, all of these constructs are related to the theoretical framework of this study. Additionally, Kintsch (2013, p. 836) states that "careful studies of the basic cognitive processes in comprehension are needed…"

Reading comprehension is a complex endeavor that requires both cognitive and affective factors. Each of the five cognitive constructs were important to the reading comprehension of the secondary SWD participants in the study, and these specific components are also delineated as essential to comprehension in the CI Model of Reading (Kintsch, 2013). Extrinsic motivation was the only affective factor that was significantly related to reading comprehension when all variables were considered. Extrinsic motivation was indirectly related to reading comprehension suggesting that a lack of internalized motivation affects comprehension. When the affective factors were regressed onto reading comprehension, intrinsic motivation was directly related to reading comprehension, which was also supported by the CI model (Kintsch, 2013). Kintsch noted that the more attentive and motivated the reader was, the better able they were to create a situation model from that text that identified the author's main ideas (gist). Accordingly, both cognitive and affective factors are important to reading comprehension.

Implications for Research

Results from the current study suggest that word recognition, vocabulary, reading strategies, working memory, and intrinsic motivation are important to the reading comprehension of secondary SWD. One focus of future research would be to investigate the type of instruction that yields the highest gains in reading comprehension for secondary SWD. As noted by Faggella-Luby and Deshler (2008), instruction in word recognition at the secondary level is needed for readers with deficits in this area along with vocabulary and reading strategy instruction. The results from this study consistently show that word recognition is a predictor of reading comprehension, and instruction in

this area should not be ignored. Additionally, future research should investigate multiple instructional methods to determine which ones produce the greatest gains in reading comprehension (i.e., direct instruction, multi-sensory).

At the inception of the current study, Confirmatory Factor Analysis (CFA) was a goal; however, there were not enough participants in the study to conduct the analyses. Therefore, future research should endeavor to conduct CFA to expand on the relationships between the cognitive and affective factors and reading comprehension. One way to increase the participants in the study would be to include both students with and without disabilities, which would also serve to identify variability between the two groups of students.

Another area of future research would be the role that self-determination bears on the reading comprehension of secondary students. Several aspects of self-determination theory are germane to reading comprehension, but specifically intrinsic motivation should be investigated because it was related to reading comprehension in the current study. Over time, as SWD struggle to read, they become amotivated to read (Guthrie, 2008; Guthrie, et al., 2009). This outcome is detrimental to improving reading comprehension. To that end, better motivation-to-read instruments are needed for secondary students especially for SWD. Two of the three instruments used in the present study posed issues in data analyses due to negatively worded statements, and the length of the instruments (i.e., 76 and 53 questions) was also a problem because the students in the study wanted to rush through completion and had to be reminded to do their best and take their time.

Students with disabilities, by their very nature, require specially designed instruction, which is a very broad term not easily described (US Department of Education, 2006). As such, instruction can vary dramatically depending on the expertise of the teachers, the district, and school site. According to Kim, Linan-Thompson, Misquitta (2012), meta-analyses of 14 studies from 1990 to 2010, identified two instructional methods that were effective for students with disabilities: instructional modifications and strategy instruction. Little research has been conducted on different types of instruction (i.e., multi-sensory, direct instruction, individual, small group) with secondary students with disabilities (Kim, Linan-Thomoson, & Miquitta, 2012). To combat the life-long effects of reading deficits, it will be important to understand what type of instruction will yield the largest effects in word recognition, vocabulary, reading strategies, working memory, and motivation-to-read, which were identified in this study as predictors of reading comprehension for secondary SWD.

Students do not read in isolation, and the role that context (i.e., school or home) influences reading comprehension should be explored. As Guthrie (2008) noted, a majority of students do not read for pleasure, do not go to libraries, and only read when they have to. Sadly, these behaviors have deleterious effects on reading achievement because motivated readers experience higher levels of reading achievement than amotivated readers (Guthrie, 2008). As parents of elementary school children can attest, their children are expected to read on a nightly basis. For SWD, this process can be quite challenging for parents who themselves may be averse to reading or have an undiagnosed reading deficit. Understanding how the home environment influences current and later reading habits is necessary to help strengthen the home-school reading connection.

Implications for Practice

Reading comprehension is necessary for students to become autonomous. To ensure secondary SWD are able to meet their post-secondary goals, explicit instruction is necessary to close the gap on these reading deficits. First, appropriate instruction to improve word recognition, vocabulary, reading strategies, and prior knowledge is needed. At the secondary level, SWD have few opportunities to increase deficits in these areas as instruction often focuses on comprehension. While the goal of reading is comprehension, if students are unable to decode words and further understand what the words mean, comprehension is impacted. Additionally, SWD frequently avoid reading, and both vocabulary and prior knowledge are hampered. As students read, an exposure to novel words and ideas increases, which helps strengthen these skills.

One way teachers can help SWD improve word recognition is to systematically teach students syllabication rules so that they are able to read the multi-syllabic words they will encounter as secondary students. Teaching students to become "word detectives" also helps students improve deficient skills. For instance, given the word "translate," students can "hunt" other words that begin with "trans." In this way, students become actively involved in their learning, and they will learn other words with Latin roots. As students become familiar reading grade-level words, an increase in vocabulary instruction will help students learn the meanings of the words they are reading. Students are often familiar with technology (i.e., computers, iPads), and these tools help mitigate poor vocabulary skill. Visual dictionaries (e.g., visuowords) enable students to learn the definitions and functions of words while using technology. Students can keep word journals or a Word Wall can be constructed in the classroom. Competitions between

groups of students who are the best "word detectives" would be another way to interest students while teaching basic word content. Class discussions are an important aspect of syllabication and learning new words. The more teachers are able to get students to talk about their learning, the more opportunities students will have of transferring this new knowledge to long-term memory for later use.

Interesting curriculum would facilitate student engagement. Many reading programs used with secondary students are inadequate to meet their needs because frequently these programs were created for use with younger students (Calhoun, et al., 2010; Slavin, Cheung, Groff, & Lake, 2008). One complaint secondary student often make is that they feel like they are reading "baby books." While books written at a student's instructional level is important, stories and topics of interest to them are necessary to ensure they remain interested long enough to learn how to become proficient readers. Many school publishers have low level-high interest books written specifically for secondary students. Sadly, many school districts do not purchase these materials as a focus is on state-adopted school curriculum. Additionally, some of the topics in these books are not relatable to the students for whom they are written. One way to ensure student interest would be to offer choices in reading material allowing students to pick which books they will read. This may cause more work for the teacher, but if students are reading the extra work will be worth it.

Results from the current study suggest that intrinsic motivation is important to the reading comprehension of secondary SWD. Students who have an innate desire to read had higher reading comprehension scores. Conversely, students who were extrinsically motivated had lower reading comprehension scores. These results have implications for

teachers who teach reading to struggling secondary SWD. In many special education programs, incentives are offered to students who read the required amount of pages or minutes per day. These incentives used to extrinsically motivate students are counter-productive in improving reading comprehension. One way teachers can quickly move from rewarding students for reading is to help students create their own incentives while reading. For instance, students can keep a reading log/journal where they track what they have read. The goal for students will be to increase the amount of time or pages that have been read. Students will learn to internalize their reading and not rely on outside rewards for reading.

Unfortunately, many special education teachers are not equipped to meet the reading needs of secondary students either through lack of understanding about how to meet the needs of older learners or ineffective teacher preparation (Brown, Welsh, Hill, & Cipko, 2008; Jones, 2007). An increase in how to teach reading to secondary students is essential in special education teacher preparation programs. While pre-service teacher are taught basic literacy skills, many programs do not focus on intensive intervention for students who read four or more years below grade level. Motivation-to-read is impacted when secondary students are not able to read well. A teacher who understands that his or her students are frustrated due to poor reading ability will be able to infuse humor, compassion, and patience into the reading curriculum as students build their reading skills.

Another implication for practice is to foster collaboration in reading between elementary and secondary general and special education teachers. Secondary SWD do not suddenly develop significant reading deficits upon entering high school; they bring their

reading deficits with them. Collaboration between elementary and secondary teachers would allow open dialogue about how to support struggling readers, as well as encourage a discussion about the shared experiences of their students, which could help produce higher academic outcomes for students with deficient reading skills (Van Garderen, Stormont, & Goel, 2012). Cross-grade professional development is one way to ensure that a partnership exists between teachers who teach SWD. As elementary teachers become familiar with the reading demands of secondary students, dialogue between stakeholders can help improve the literacy instruction for students. An understanding of which targeted interventions are beneficial for students would be one outcome that could help alleviate severe reading deficits of secondary students. Working together, teachers could design early intervention reading programs that will support students.

Response-to-Intervention is one framework that could be implemented more fully at the secondary level to mitigate reading deficits of both students with and without disabilities. While some secondary schools have created a system that meets the needs of all struggling readers, many school currently lack an infrastructure that supports these learners. Collaboration between secondary stakeholders is essential to combat this system-wide issue.

Professional development in reading for secondary English teachers is another area that is needed. English teachers have not been trained to teach reading, but many secondary students, both with and without disabilities, read significantly below grade level (U.S. Department of Education, 2009). Additionally, the Common Core State Standards (CCSS) place a stronger emphasis on critical reading for secondary students. Therefore, secondary teachers will need to ensure that their students are able to not only

read, but are able to gain deep understanding from what they have read. Many SWD enrolled in general education English classes are expected to meet the CCSS and appropriate professional development about how to teach critical reading strategies (i.e., inference, prediction) to support SWD is imperative. Likewise, collaboration between both general and special education teachers will become more imperative as SWD are held accountable to the new CCSS. One way to foster collaboration between general and special education English teachers is to increase the amount of co-taught English classes. Co-teaching allows teachers to co-plan, co-teach, and co-assess students. The co-planning component of this model would allow teachers to discuss the best way to meet the needs of all learners, and would allow teachers to specifically target deficient reading skills of SWD.

Lastly, programs are needed that focus on adult learners. In a perfect word, all children would leave school with the requisite skills they need to reach their full potential. Unfortunately, that does not always happen, and many adults are left with minimal post-secondary options because they cannot read efficiently (Mellard & Patterson, 2008). Quality programs are needed to bridge this gap and be accessible for adults. Just as there are differences in how reading should be taught to elementary and secondary students, adult students require programs that meet their unique needs (Mellard, Fall, & Woods, 2013).

Summary

The purpose of the present study was to investigate the relative importance of working memory, vocabulary, prior knowledge, word recognition, motivation-to-read, and reading strategies to the reading comprehension of secondary students with

disabilities (SWD). The results of the study indicate that both the motivation-to-read

factors and the cognitive components were successful in predicting reading

comprehension for secondary SWD. Additional analyses also showed a difference in the

factors that affect the reading comprehension of low- and high-comprehenders.

<div align="center">**Conclusions**</div>

Several conclusions can be drawn from the study. First, for the motivation-to-read

factors, intrinsic motivation, study habits, and extrinsic motivation were predictive of

reading comprehension. Both study habits and extrinsic motivation were predictive when

these constructs were depressed. The objective of reading is to comprehend, but if

students do not engage in the activity that can help improve their comprehension (i.e.,

reading), then the best lesson and activities will be ineffective. Reading is integral to

future success, and self-determined and intrinsically motivated students are more

successful readers. As students internalize motivation, an added benefit according to

Guthrie (2008) is "empowerment." This empowerment will help secondary students

graduate high school and pursue post-secondary goals.

Second, for the cognitive variables, word recognition was the strongest predictor

of reading comprehension followed by vocabulary, reading strategies, and working

memory. The more adept students were in decoding words (word recognition), the better

equipped they were to understand what they were reading. Similarly, without an

understanding of what words mean, comprehension is negatively affected. These two

variables were the most strongly related to reading comprehension and suggest that

interventions to improve word recognition and vocabulary will improve reading

comprehension. Reading strategies was also related to reading comprehension, which

suggests targeted strategy instruction (i.e., prediction, inference, and summarization) will yield an increase in reading comprehension as well. The last cognitive component that was related to reading comprehension was working memory. Working memory may have had the weakest relationship with reading comprehension in that working memory is used throughout the reading cycle (i.e., reading words, deciphering their meaning, inferring), and it is parsed between these cognitive processes. One goal would be to increase working memory so that SWD would have a greater ability to process the information needed to comprehend. According to Ericsson and Kintsch (1995), working memory may be expanded through a process of long term memory storage, as skills in a specific area are attained (i.e., chess, medicine) including reading, they are added to these long-term stores. As readers become more proficient, they would have then larger stores of data to draw from (i.e., lexical knowledge), which would positively impact reading comprehension.

Lastly, when the motivation-to-read factors were added to the regression equation, their predictive value was marginalized and only extrinsic motivation remained a predictor, albeit for respondent's who were less extrinsically motivated. Clearly, student motivation-to-read is important to reading in general and comprehension specifically (Guthrie, 2008). Without a desire to read, students will only pick up a book when absolutely necessary, many will not read one for pleasure. One reason for lack of motivation-to-read for secondary SWD is that reading is a cognitive task for them, it has not become automatized, and is difficult. Improvements in reading comprehension and general reading ability should therefore increase a student's motivation to read. Additionally, the instruments used to measure motivation-to-read should focus on fewer

constructs (i.e., student engagement, intrinsic motivation, extrinsic motivation) so that

better analyses can be rendered.

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Appendix A

District Approval Letters

MONTEREY TRAIL HIGH SCHOOL
Building A Future, Finding A Way

8661 Power Inn Road
Elk Grove, CA 95624
916-688-0050

May 2, 2014

Institutional Review Board for the Protection of Human Subjects
University of San Francisco
2130 Fulton Street
San Francisco, CA 94117

Dear Members of the Committee:

On behalf of Valley High School, I am writing this letter to confirm our consent to have Ms. Karen Sanford access participants for her research study, pending IRBPHS approval. The research study will be performed at Monterey Trail High School with students with mild-to-moderate disabilities. Ms. Sanford will administer assessments that will measure students' literacy abilities, motivation to read, and working memory in conjunction with the students' special education case managers and school psychologist. These assessments are ones that are typically used to measure students' academic and cognitive abilities. The research study will take place from May 2014 to May 2015.

If you have any questions or concerns, please feel free to contact me at (916) 688-0050.

Sincerely,

David Byrd
Principal

David Byrd, Principal   Charles Amey, Denise Soto, Cheryl Williams: Vice Principals   David Goodwin, Activities Director   Rick Arcuri, Athletic Director

ELK GROVE UNIFIED SCHOOL DISTRICT

Valley High School

Chelsea Bowler-Shelton, Principal

Don Gordon, Vice Principal
Roxanna Villasenor, Vice Principal
Mohammad Warrad, Vice Principal
Thomas Dickinson, Teacher-In-Charge
James Welcome, Academic Program Coordinator

6300 Ehrhardt Avenue
Sacramento, CA 95823
(916) 689-6500
FAX (916) 682-1528

May 1, 2014

Institutional Review Board for the Protection of Human Subjects
University of San Francisco
2130 Fulton Street
San Francisco, CA 94117

Dear Members of the Committee:

On behalf of Valley High School, I am writing this letter to confirm our consent to have Ms. Karen Sanford access participants for her research study, pending IRBPHS approval. The research study will be performed at Valley High School with students with mild-to-moderate disabilities. Ms. Sanford will administer assessments that will measure students' literacy abilities, motivation to read, and working memory in conjunction with the students' special education case managers and school psychologist. These assessments are ones that are typically used to measure students' academic and cognitive abilities. The research study will take place from May 2014 to May 2015.

If you have any questions or concerns, please feel free to contact me at (916) 689-6500.

Sincerely,

Chelsea Bowler-Shelton
Principal

ELK GROVE
Unified School District

Christine Hikido
Director
Research and Evaluation
Department

(916) 686-7764
FAX: (916) 686-7003
chikido@egusd.net

May 12, 2014

Karen Sanford
1921 Carmel Circle
Lodi, California 95242

RE: Research Request

Dear Ms. Sanford,

Your request to conduct research on "*Factors Affecting the Reading Comprehension of Secondary Students with Disabilities*" has been reviewed and approved. This approval authorizes you to conduct the study at Valley and Monterey Trail High Schools in accordance with the parameters of your research request, as submitted, with the requested modifications.

The respective high school principals have been notified of your study approval. Although your research proposal has been approved, please note the following:

1. The Research and Evaluation Department does not facilitate introductions or access to campus(es); and
2. School, teacher, student, and parent participation is voluntary.

Therefore, you must contact each principal to gain consent for your school-based study.

We look forward to learning about the findings of your research. Please contact me should you have any questions.

Sincerely,

Robin Martin
Research and Evaluation

cc: T. Penna
        C. Bowler
        D. Byrd

033.0514.468

Elk Grove Unified School District
Research and Evaluation Department

NONDISCLOSURE AGREEMENT

THIS NONDISCLOSURE AGREEMENT ("Agreement") is made and entered into as of the signature date below by
Karen Sanford ("Individual"), who is an employee, consultant or student of
University of San Francisco ("Company," "School," "Organization"), and the Elk Grove Unified School
District ("District") for the purpose of _collecting data to complete a doctoral_
dissertation and provide data to inform instructional practices
for special education teachers. ("Purpose"). In
consideration of the foregoing, Individual and District agree as follows:

Term/Termination – This Agreement shall be in force for the __1__ school year and shall terminate on July 31, 20_15_.
This Agreement is further subject to termination without cause of any kind by the Individual or the District provided one
Party delivers to the other Party written notice of the termination sixty (60) days prior to the effective date of the
termination. Neither party shall be liable to the other party for any costs, losses or damages resulting from such
termination.

Confidential Information/Material – "Confidential Information/Material" means written, graphic, electronic or
pictorial information and the medium in which it is contained (i.e., documents, reports, correspondence, photographs,
computer disks or tapes, etc.) that District designates or, in its judgment, would reasonably consider as being
confidential.

Individual's Obligation –

    A. Individual agrees that the Confidential Information/Material is to be considered confidential and proprietary to
District and Individual shall hold the same confidence and shall not use the Confidential Information/Material
other than for the Purpose of Agreement.

    B. Confidential Information/Material furnished in a tangible form shall not be duplicated by Individual except for
the Purpose of Agreement. Individual shall return all Confidential Information/Material received in tangible
form, including all copies, reproductions or other media containing such Confidential Information upon
completion of all work associated with the Purpose of Agreement or immediately upon request of District.

    C. Individual agrees to not reveal any individually identifiable information. Further, Individual agrees to not make
any disclosure or publication whereby the data furnished by or related to any particular person, school, or the
school district could be identified, unless the *Request for Publication Use* form has been completed, submitted,
and approved.

    D. Individual agrees to immediately notify District of any breach of this Agreement.

    E. Employees or consultants from Company designated above who are granted access to
Confidential Information/Material by Individual shall abide by the Obligations of the Individual.

Governing Law and Equitable Relief – This Agreement shall be governed and construed in accordance with the laws
of the United States and the State of California and Individual consents to the exclusive jurisdiction of the state courts
and U.S. federal courts located there for any dispute arising out of this Agreement. Individual agrees that in the event of
any breach or threatened breach by Individual, District may obtain, in addition to any other legal remedies which may be
available, such equitable relief as may be necessary to protect District against any such breach or threatened breach.

Elk Grove Unified School District

_____
(signature)

C. Penna
(printed name)

Associate Supt., Sec Ed
(title)

_5-8-14_
(date)

Individual

_____
(signature)

Karen L. Sanford
(printed name)

Doctoral Candidate
(title)

_4/16/2014_
(date)

033.0911.160

Appendix B

Reading Strategies Instruments

A Failure to Communicate

When two people speak the same first language, they occasionally misunderstand each other. Imagine the difficulty that interpreters have when they must first understand what the speaker of one language has said and then translate the message into another language.

Translators are challenged when the speaker makes a reference to an event or story character that is not known to listeners from another country. A speaker may refer to someone as a "Cinderella," meaning that a person was once poor and is now wealthy, but if the listeners do not know the story, the meaning is lost.

Translating quickly, while the person is speaking, is especially difficult. Yet, simultaneous translation is used today in about 85% of all international meetings. Not only are translators working with the United Nations, but they are employed for business, scientific, and educational meetings as well.

Computers are being programmed to translate languages. Although computers have great potential for speedy translations, they have some of the same problems that human translators have. In an early attempt to translate English into Russian, a computer translated "out of sight, out of mind" as "invisible idiot." In our global society we need to work hard to understand each other and keep a sense of humor.

Bader Reading Inventory—A Failure to Communicate

Predict

The title of this passage is "A Failure to Communicate." What do you think will happen in the passage?

_____

_____

_____

_____

Prior Knowledge

Before you read, answer these questions about the topic.

1. What does communicate mean? _____.

2. Do you speak more than one language? _____.

3. Have you ever had a difficult time communicating with someone? _____.

4. Why would it be difficult if you were not able to understand what someone was

    saying? _____.

After you read, answer the following multiple-choice questions.

1. What does a translator do?
a. answer telephones
b. works on computers
c. take a message from one language and give it to someone in another language
d. makes sure that a person understands what another person is saying

2. What kinds of challenges do translators have?
a. they might know the language
b. the person might speak too fast
c. they might not like talking
d. they always understand what the other person is saying

3. What is meant by referring to someone as "Cinderella"?
a. someone who was poor and is now wealthy
b. someone who was rich and is now poor
c. someone who was sad and is now happy
d. someone who was happy and is now sad

4. Where does the passage state that translators are employed?
a. United States
b. United Kingdom
c. United Arab Emirates
d. United Nations

5. What problem did a computer have in translating?
a. it did not know the language
b. it gave a literal translation for the proverb
c. it gave a figurative translation for the proverb
d. it translated the phrase very slowly

6. What does our global society require?
a. more translators
b. less translators
c. to be more serious
d. work to understand each other

7. Why do people who speak the same language have trouble understanding   each other sometimes?
a. because they do not work hard to understand the other person
b. because they do not understand the language
c. because they work hard to understand the other person
d. because they understand the language

Summary

Describe as many events from the story as you can in the space provided below.

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Modern Chemistry

One of the founders of modern chemistry was a wealthy Frenchman, Antione Lavoisier, who lived in the late eighteenth century. Lavoisier burned different substances in a closed chamber and proved that there was no change in their weight. This showed that the basic elements remained the same even though their appearance was completely altered.

To explain this phenomenon, an English chemist, John Dalton, proposed the atomic theory in 1810. According to Dalton's theory, all matter is composed of minute building blocks, which he called atoms. The atoms of the different elements vary in size and characteristics. Though the elements themselves can and do combine to form new substances, their atoms always remain the same.

Guided by this theory, a Russian scientist, Dmitry Mendeleyev, arranged all of the known elements in a table according to their atomic weights. He showed that the elements fell naturally into certain groups with similar properties. Since many gaps appeared in the table, chemists began to search for the missing elements.

The field of science contains many examples of discoveries being shared by people from different nations. Because lack of communication can be disastrous to the growth of knowledge, most scientists are eager to compare results and learn from each other.

Bader Reading Inventory—Modern Chemistry

Predict

The title of this passage is "Modern Chemistry." What do you think will happen in the passage?

_____

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_____

Prior Knowledge

Before you read, answer these questions about the topic.

1. Chemistry is the study of _____.

2. A person who studies chemistry is called a _____.

3. Have you ever taken a chemistry course in school? _____.

4. Why would it be important to study chemistry?

   _____.

After you read, answer the following multiple-choice questions.

1. Who was one of the founders of modern chemistry?
a. David Jamison
b. Antoine Lavoisier
c. Louis Pasteur
d. Bruce Jenner

2. What important discovery did he make?
a. The weight of basic elements changed.
b. Substances got heavier after they were burned since their appearance changed.
c. Basic elements remained the same even though their appearance changed.
d. Substances burned in a closed chamber.

3. Who proposed the atomic theory?
a. John Dalton
b. Daniel Jackson
c. Jack Davies
d. Dmitry Mendeleyev

4. In what year was the theory proposed?
a. 1895
b. 1710
c. 1776
d. 1810

5. What term did he use to describe atoms?
a. matter
b. elements
c. building blocks
d. atomic blocks

6. How do atoms vary?
a. by name
b. by size and characteristic
c. by place on the periodic table
d. by groups

7. Who arranged the elements in a table?
a. John Dalton
b. Daniel Jackson
c. Jack Davies
d. Dmitry Mendeleyev

8. What did the table show?
a. elements fell naturally into groups
b. elements were uniquely separate
c. all elements had been discovered
d. that all elements had dissimilar properties

9. What did chemists start searching for?
a. the names of groups
b. the unique properties of the elements
c. the missing elements
d. ways to rename the elements

10. Why is experimentation so important to a field like chemistry?
a. because no one understands chemistry
b. because experimentation is needed to explain the causes of certain phenomena
c. because experimentation can answer questions about all unknown events
d. because chemists like to conduct experiments

Summary

Describe as many events from the story as you can in the space provided below.

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Voter Drive

Soon after Jim moved to Plainfield, he received a telephone call from a person who asked if he was registered to vote in the coming election. Jim said that he hadn't thought about it. The caller said she was a member of a local organization that was sponsoring a voter drive. She didn't' represent any particular political party but only wanted to encourage people to register and to vote.

Since registration terms and procedures differ from one part of the country to another, the people working in the voter drive offered to explain the local procedures and tell people where they could register.

The caller explained that after Jim registered, he would be mailed a sample ballot for each election. The ballot would contain the names of the candidates and the measures to be voted on. Jim asked some questions and then thanked the caller for giving him information about voter registration.

Frequently people say that they don't bother to vote because one vote is not significant. Jim read that a presidential election, referred to as the Revolution of 1800, resulted in Burr and Jefferson having the same number of votes. Jim appreciated being reminded about voter registration when he recalled that important tie.

Bader Reading Inventory—Voter Drive

Predict

The title of this passage is "Voter Drive." What do you think will happen in the passage?

_____

_____

_____

_____

Prior Knowledge

Before you read, answer these questions about the topic.

1. What is the document people use to vote called? _____.

2. How is the president elected? _____.

3. What must a person do to be able to vote? _____ .

4. Do people in your family vote? _____.

5. How old must you be to vote? _____.

Comprehension

After you read, answer the following multiple-choice questions.

1. From whom did Jim receive a phone call?
a. his sister, Paige
b. someone from the local department store
c. someone form a local organization
d. his brother

2. Why was she calling?
a. she wanted to encourage people to vote
b. she wanted to encourage Jim to vote for the president
c. she wanted to encourage Jim to register as a Republican
d. she wanted to encourage Jim to register as a Democrat

3. What did the caller want Jim to do?
a. vote for the president
b. register to vote
c. register as a Republican
d. register as a Democrat

4. What services was she providing?
a. she was helping Jim complete his voter registration
b. she gave Jim the phone number to his local Congressman
c. she explained where he could register to vote
d. she told him when election day was

5. After he registers, what will Jim receive in the mail?
a. a sample registration card
b. a simple ballot
c. a sample ballot
d. the address of each of the candidates

6. Why would that information be helpful (see #5)?
a. because it would tell them who to vote for in the election
b. because a person could read and study the candidates and issues before the election
c. because Jim might want to write to the candidates
d. because Jim will need his registration card when he goes to vote

7. How does voting differ from one part of the country to another?
a. the information provided will be in a different language
b. people will vote for the president on a different day
c. voting does not occur in some states

d. there will be different procedures and registration forms
8. Why did Jim know one vote could be important?
a. he remembered the Burr-Jefferson election
b. he remembered the Eisenhower-Stevenson election
c. he remembered the Johnson-Goldwater election
d. he remembered the Nixon-Mondale election

9.   Why is it important to inform yourself about the candidates and issues before you vote?
a. because you will need to know where to go to vote
b. because you need to know what each candidate believes and what the details of the issues
c. because it is a responsible thing to do
d. because the candidates and issues might change before you vote

Summary

Describe as many events from the story as you can in the space provided below.

_____

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Appendix C

Adolescent Motivation to Read Profile

1. My friends think I am _____.

a. A very good reader
b. A good reader
c. An OK reader
d. A poor reader

2. Reading a book is something I like to do

a. Never
b. Not very often
c. Sometimes
d. Often

3. I read _____.

a. Not as well as my friends
b. About the same as my friends
c. A little better than my friends
d. A lot better than my friends

4. My best friends think reading is _____.

a. Really fun
b. Fun
c. OK to do
d. Not fun at all

5. When I come to a word I don't know, I can _____.

a. Almost always figure it out
b. Sometimes figure it out
c. Almost never figure it out
d. Never figure it out

6. I tell my friends about good books I read.

a. I never do this
b. I almost never do this

c. I do this some of the time
d. I do this a lot

7. When I am reading by myself, I understand _____.

a. Almost everything I read
b. Some of what I read
c. Almost none of what I read
d. None of what I read

8. People who read a lot are _____.

a. Very interesting
b. Interesting
c. Not very interesting
d. Boring

9. I am _____.

a. A poor reader
b. An OK reader
c. A good reader
d. A very good reader

10. I think libraries are _____.

a. A great place to spend time
b. An interesting place to spend time
c. An OK place to spend time
d. A boring place to spend time

11. I worry about what other kids think about my reading _____.

a. Every day
b. Almost every day
c. Once in a while
d. Never

12. Knowing how to read well is _____.
a. Not very important

b. Sort of important
c. Important
d. Very important

13. When my teacher asks me a question about what I have read, I _____.

a. Can never think of an answer
b. Have trouble thinking of an answer
c. Sometimes think of an answer
d. Always think of an answer

14. I think reading is _____.

a. A boring way to spend time
b. An OK way to spend time
c. An interesting way to spend time
d. A great way to spend time

15. Reading is _____.

a. Very easy for me
b. Kind of easy for me
c. Kind of hard for me
d. Very hard for me

16. As an adult, I will spend _____.

a. None of my time reading
b. Very little time reading
c. Some of my time reading
d. A lot of my time reading

17. When I am in a group talking about what we are reading, I _____.

a. Almost never talk about my ideas
b. Sometimes talk about my ideas
c. Almost always talk about my ideas
d. Always talk about my ideas

18. I would like for my teachers to read out loud in my classes _____.

a. Every day
b. Almost every day
c. Once in a while
d. Never

19. When I read out loud I am a(n) _____

a. Poor reader
b. OK reader
c. Good reader
d. Very good reader

20. When someone gives me a book for a present, I feel _____.
a. Very happy
b. Sort of happy
c. Sort of unhappy
d. Unhappy

Appendix D

Motivation to Read Questionnaire

Name
_____Date_____

Teacher _____

Motivations for Reading Questionnaire

We are interested in your reading.

The sentences tell how some students feel about reading. Listen to each sentence and decide whether it talks about a person who is like you or different from you. There are no right or wrong answers. We only want to know how you feel about reading.

<u>For many of the statements, you should think about the kinds of things you read in your class.</u>

Here are some ones to try before we start on the ones about reading:

I like ice cream.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

If the statement is **very different from you**, circle a 1.

If the statement is **a little different from you**, circle a 2.

If the statement is **a little like you**, circle a 3.

If the statement is **a lot like you**, circle a 4

I like spinach.

Very Different From Me 1	A Little Different From Me 2	A Little Like Me 3	A Lot Like Me 4

If the statement is **very different from you**, what should you circle?

If the statement is **a little different from you**, what should you circle?

If the statement is **a little like you**, what should you circle?

If the statement is **a lot like you**, what should you circle?

Okay, we are ready to start on the ones about reading. Remember, when you give your answers you should think about the things you are reading in your class. There are no right or wrong answers, we just are interested in YOUR ideas about reading. To give your answer, circle ONE number on each line. The answer lines are right under each statement.

Let's turn the page and start. Please follow along with me while I read each of the statements, and then circle your answer.

1. I like being the best at reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

2. I like it when the questions in books make me think.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

3. I read to improve my grades.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

4. If the teacher discusses something interesting I might read more about it.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

5. I like hard, challenging books.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

6. I enjoy a long, involved story or fiction book.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
   1   2   3   4

7. I know that I will do well in reading next year.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
   1   2   3   4

8. If a book is interesting I don't care how hard it is to read.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
   1   2   3   4

9. I try to get more answers right than others.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
   1   2   3   4

10. I have favorite subjects that I like to read about.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
   1   2   3   4

11. I visit the library often with others.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
   1   2   3   4

12. I make pictures in my mind when I read.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
1   2   3   4

13. I don't like reading something when the words are too difficult.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
1   2   3   4

14. I enjoy reading books about people in different countries.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
1   2   3   4

15. I am a good reader.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
1   2   3   4

16. I usually learn difficult things by reading.

Very   A Little
Different   Different   A Little   A Lot
From Me   From Me   Like Me   Like Me
1   2   3   4

17. It is very important to me to be a good reader.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

18. Others often tell me what a good job I am doing in reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

19. I read to learn new information about topics that interest me.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

20. If the project is interesting, I can read difficult material.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

21. I learn more from reading than most students in the class.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

22. I read stories about fantasy and make believe.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

23. I read because I have to.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

24. I don't like vocabulary questions.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

25. I like to read about new things.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

26. I often read to others.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

27. In comparison to other activities I do, it is very important to me to be a good reader.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

28. I like having the teacher say I read well.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

29. I read about my hobbies to learn more about them.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

30. I like mysteries.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

31. I like to trade things to read with others.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

32. Complicated stories are no fun to read.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

33. I read a lot of adventure stories.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

34. I do as little schoolwork as possible in reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

35. I feel like I make friends with people in good books.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

36. Finishing every reading assignment is very important to me.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

37. Others sometimes tell me I am a good reader.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

38. Grades are a good way to see how well you are doing in reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

39. I like to help others with their schoolwork in reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

40. I don't like it when there are too many people in the story.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me

41. I am willing to work hard to read better than others.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

42. I sometimes read to others.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

43. I like to get compliments for my reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

44. It is important for me to see my name on a list of good readers.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

45. I talk to others about what I am reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

46. I always try to finish my reading on time.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

47. I am happy when someone recognizes my reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

48. I like to tell others about what I am reading.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

49. I like being the only one who knows an answer in something we read.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

50. I look forward to finding out my reading grade.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

51. I always do my reading work exactly as the teacher wants it.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

52. I like to finish my reading before other students.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

53. Others ask me about my reading grade.

Very Different From Me	A Little Different From Me	A Little Like Me	A Lot Like Me
1	2	3	4

Appendix E

IRB Approval Letter

Protocol Exemption Notification

To: Karen Sanford

From: Terence Patterson, IRB Chair

Subject: Protocol #296 Date:

05/27/2014

The Institutional Review Board for the Protection of Human Subjects (IRBPHS) at the University of San Francisco (USF) has reviewed your request for human subjects approval regarding your study.

Your project (IRB Protocol #296) with the title Factors that affect the reading comprehension of secondary students with disabilities has been approved by the University of San Francisco IRBPHS as Exempt according to 45CFR46.101(b). Your application for exemption has been verified because your project involves minimal risk to subjects as reviewed by the IRB on 05/27/2014.

Please note that changes to your protocol may affect its exempt status. Please submit a modification application within ten working days, indicating any changes to your research. Please include the Protocol number assigned to your application in your correspondence.

On behalf of the IRBPHS committee, I wish you much success in your endeavors.

Sincerely,

Terence Patterson, Chair, Institutional Review Board for the Protection of Human Subjects IRBPHS
University of San Francisco IRBPHS@usfca.edu

Appendix F

Cognitive Component Analysis

Component Matrix[a]

	Component
	1
RC_PC	.868
VOCAB_PC	.826
STRATEGIES_PC	.766
WORDREC_PC	.758
KNOWLEDGE_PC	.688
WM_PC	.680

Extraction Method: Principal
Component Analysis.

a. 1 components extracted.