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Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits

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SPECIAL EDUCATION TEACHERS' SELF-EFFICACY REGARDING IMPROVING THE READING COMPREHENSION OF STUDENTS WITH WORKING MEMORY DEFICITS

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Oswald Chambers stated, Perseverance is more than endurance. It is endurance combined with absolute assurance and certainty that what we are looking for is going to happen. This journey has certainly required perseverance and endurance; not to mention patience, faith, and a whole lot of support.

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ABSTRACT

Significant discrepancies in reading comprehension rates exist for students with disabilities compared to their grade appropriate peers. Educational neuroscientists suggest that identifying breakdowns in the cognitive processes required for reading comprehension and applying specialized strategies have significant implications for improving the reading proficiency of students with working memory deficits. Despite the availability and implications of educational neuroscience, a significant gap between theory and classroom practice exists. The purpose of this explanatory sequential mixed methods research study was to examine special education teachers' self-efficacy regarding their ability to increase the reading comprehension of students with working memory deficits. The quantitative phase, an online survey, was completed by 23 out of 40 targeted special education teachers providing reading instruction in a rural, west central Georgia school district. The qualitative phase, a questionnaire and semi-structured interviews, was completed by 7 of the 23 quantitative phase participants. Quantitative results indicated that participants generally rated themselves as prepared and confident regarding these concepts; however, qualitative results revealed parameters to self-confidence and a lack of preparation regarding specialized instructional strategies addressing cognitive deficits. The implications for this study included improving the reading comprehension rates of students with disabilities by providing special education teachers pre-service and in-service training regarding cognitively-focused instruction, reading comprehension, and specialized instructional strategies for students with working memory deficits. Recommendations for targeted professional learning are provided.

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CHAPTER I

INTRODUCTION

Background of the Problem

The pressures of accountability and closing the achievement gap for students with disabilities have increased interest in nontraditional measures of educational reform (Fuchs, Fuchs, & Stecker, 2010; Sullivan & Castro-Villarreal, 2013; Zadina, 2015). Educational neuroscience, a branch of science that combines empirical findings on brain development and cognitive processes with educational practice and theory, has steadily gained momentum as a new discipline to bridge the gap between research and practice (Ansari, Coch, & De Smedt, 2011; Sigman, Pena, Goldin, & Ribeiro, 2014; Zadina, 2015). Theories and strategies regarding the cognitive effects of low working memory, poor nutrition, inadequate sleep, stress and anxiety, and early language acquisition have significant implications for improving student learning, especially in the areas of early literacy and reading (Ansari et al., 2011; Sigman et al., 2014; Zadina, 2015). Educational neuroscientists contend that working memory capacity is a critical component in the cognitive processes required to decode and comprehend text (Alloway, Gathercole, Kirkwood, & Elliott, 2009; Arina, Gathercole, & Stella, 2015; Garcia-Madruga et al., 2013; Kendeou, Broek, Helder, & Karlsson, 2014; Loosli, Buschkuehl, Perrig, & Jaeggi, 2012; Titz & Karbach, 2014). Despite the availability and implications of educational neuroscientific research, a significant gap between theory and classroom practice exists (Aldrich, 2013; Sigman et al., 2014).

Sigman and colleagues (2014) described reading as a transformational process in which written symbols are translated into phonemes, morphemes, and words. The processes of visual and verbal working memory come together to transform symbols into mental representations of text (Arina et al., 2015; Ansari et al., 2011; Dahlin, 2011; Kendeou et al., 2014). The most prominent theories on working memory were derived from Baddeley and Hitch's (1974) three-component model. Baddeley (2000) added a fourth component, the episodic buffer, to explain the brain's ability to combine information from the other systems and long-term memory into a single verbal and/or visual representation. This four-component model, when working effectively with adequate memory capacity within each component, facilitates learning (Baddeley, 2000, 2003, 2006).

Melby-Lervag and Hulme (2013) described working memory as a domain general storage system with limited space specific to modalities. Alloway and colleagues (2009) defined working memory as the cognitive ability to hold, apply, and manipulate information while performing other tasks. Working memory is essential for most academic tasks that require students to receive, process, and apply information (Gathercole & Alloway, 2008; Randall & Tyldesley, 2016). Working memory deficits are linked to deficiencies in the cognitive processes required for phonological awareness, decoding, and reading comprehension (Kendeou et al., 2014). Readers with low working memory are unable to hold critical information while receiving new text (Kendeou et al., 2014). Strategies for improving reading outcomes for students with working memory deficits are synonymous with strategies recommended by the National Reading Panel (NRP) for improving reading comprehension for all students (Allor,

Mathes, Jones, Champlin, & Cheatham, 2010; NICHD, 2000). These strategies include multiple comprehension strategy instruction, comprehension monitoring, cooperative learning, graphic/semantic organizers, question and answering, generating questions, story structure, and summarization (NICHD, 2000). Combining research-based reading practices with cognitively focused instruction can significantly improve the reading proficiency of learners who are at risk or receive special education services (Kendeou et al., 2014). Cognitively focused strategies, such as multi-modal presentation of text, adjusting text complexity to instructional purpose and student need, reciprocal questioning, and chunking information to reduce memory load were positively correlated to increased reading outcomes (Gathercole & Alloway, 2007).

Recent research indicated working memory training increases working memory capacity, with potential implications for increased student learning (Alloway et al., 2009; Dahlin, 2011; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Karbach, Strobach, & Schubert, 2013; Kearns & Fuchs, 2013; Loosli et al., 2012; Oakhill, Yuill, & Garnham, 2011; Randall & Tyldesley, 2016). Strategy training consists of direct instruction on effective strategies to encode, retain, and retrieve information from working memory (Lee, 2014; Morrison & Chein, 2011). Core training consists of activities involving the repetition of difficult working memory tasks, such as sequencing and updating memory (Lee, 2014; Morrison & Chein, 2011). Though positive effects on increased student achievement have been inconsistent, researchers suggest that the implications on overall student progress due to increased working memory capacity are significant (Alloway et al., 2009; Baddeley, 2012; Dahlin, 2011; Dunning, Holmes, & Gathercole, 2013; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Holmes,

Gathercole, & Dunning, 2009; Karbach et al., 2013; Kearns & Fuchs, 2013; Kendeou et al., 2014; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016).

Special education teachers serve students with varying learning disabilities and eligibilities (Ruppar, Neelson, & Dalsen, 2016). Regardless of the specific eligibility, working memory deficits are common among students with disabilities and reading difficulties (Alloway et al., 2009; Dunning et al., 2013; Kendeou et al., 2014; Loosli et al., 2012; Zadina, 2015). Though the gap has stabilized, significant discrepancies in reading comprehension rates exist for students with disabilities compared to their grade appropriate peers (Schulte, Stevens, Elliot, Tindal, & Nese, 2016). Effective reading instruction for students with working memory deficits requires a thorough understanding of the role that working memory plays in each stage of the reading process (Kendeou et al., 2014). Identifying breakdowns in the cognitive processes and applying specialized strategies and interventions have significant implications for improving the reading proficiency of students with working memory deficits (Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011). Interventions that target cognitive abilities (e.g., working memory) have significant implications for narrowing the achievement gap for at-risk learners, such as learners who demographically qualify as minorities, low socio-economic, or students who are served in special education programs (Alloway et al., 2009).

Several studies regarding teacher perceptions of working memory, executive function, or brain-based learning have been completed (Alloway, Doherty-Sneddon, & Forbes, 2012; Elliott, Gathercole, Alloway, Holmes, & Kirkwood, 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Findings from these studies suggest

that teachers' knowledge and self-efficacy on these concepts are limited (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Districts provided little or no professional learning on topics related to neuroscience or effective strategies to address cognitive deficits (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Teachers cited the absence of professional learning and opportunities to provide direct instruction on cognitive skills as causes of reduced teacher competency and effectiveness (Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). These gaps in opportunities for professional learning were often attributed to the gap that exists between neuroscience and education (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Teacher perceptions of their preparedness and instructional abilities had significant impact on their self-efficacy (Ruppar et al., 2016). Bandura (1997) suggested that increasing teachers' knowledge and experiences can improve self-efficacy, which directly relates to teacher effectiveness and positive student outcomes.

Researchers also cited changes in special education preparation programs as primary factors in reducing teacher self-efficacy (Brownell, Sindelar, Kiely, & Danielson, 2010). Categorical special education teacher preparation programs provided pre-service educators with intensive knowledge and specialization on eligibility-based student traits, cognitive or processing deficits, and effective instructional strategies (Brownell et al., 2010). Alternative and multi-certification programs are less efficient in producing quality educators with the knowledge and competency to address students' varying cognitive and processing abilities (Brownell et al., 2010; Green, 2012; Katsiyannis, Zhang, & Conroy, 2003; Lee, Patterson, & Vega, 2011; Ruppar et al.,

2016). Field experiences and opportunities to evaluate students and individualize instruction based on cognitive, social, emotional, behavioral, or physical deficits are minimal (Brownell et al., 2010; Lee et al., 2011). Special education teachers find themselves unprepared to implement specialized instructional strategies necessary to meet students' cognitive needs (Brownell et al., 2010). Furthermore, the changes in special education teacher preparation programs have had little impact on the large gap in reading achievement that exists between students who are served in general and special education (Brownell et al., 2010). Gaps in knowledge, limited opportunities to apply evidence-based instructional strategies effectively, and increased accountability have led to widespread concern regarding the self-efficacy, burn out, and shortage of special education teachers (Brownell et al., 2010; Green, 2012).

Effective principals provide continued professional learning, opportunities for collaboration, and scaffolding or coaching during implementation of specialized strategies to increase student achievement (Day, Gu, & Sammons, 2016; Elliott et al., 2010). These strategies and supports improve teacher competency, knowledge, and self-efficacy (Day et al., 2016; Elliott et al., 2010; Juvora, Chudy, Neumeister, Plischke, & Kvintova, 2015). Teachers with higher self-efficacy are motivated, put forth more effort, and challenge their students to meet higher expectations (Green, 2012; Poulou, 2007). Teachers with higher self-efficacy also believe that they can positively affect student motivation and performance (Green, 2012). Increased self-efficacy, competency, and knowledge provide teachers with the necessary tools to bridge the gap between research and classroom practice (Day et al., 2016; Elliott et al., 2010; Juvora et al., 2015). Bridging the gap between teacher self-efficacy and successful application of working

memory strategies can create a turning point in improving the reading proficiency of students who are served in special education (Alloway et al., 2009; Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011).

Statement of the Problem

Educational researchers established a significant connection between reading comprehension, student achievement, and long-term academic success (Garcia-Madruga et al., 2013; Hernandez, 2011; Kendeou et al., 2014). Statistics showed students who failed to attain grade-level reading comprehension rates by the end of third grade had decreased academic success in upper grades and often failed to obtain a high school diploma (Hernandez, 2011). State summary data for the Georgia Milestones 2016 Grade 3 English-Language Arts data indicated that only 51% of students achieved the grade appropriate Lexile rate of 650 (Georgia Department of Education, 2016). Regarding subgroup performance, 35% of all students, 24% of Hispanic students, 23% of Black students, and only 12% of students who are served in special education scored proficient and/or distinguished, indicating statewide problems in literacy instruction and reading levels for Grade 3 students (Georgia DOE, 2016). Improving reading proficiency rates, especially the rates of students with disabilities, had significant implications for academic success and post-secondary outcomes (Garcia-Madruga et al., 2013; Hernandez, 2011).

Special education teachers serve students with varying learning disabilities and eligibilities (Ruppar et al., 2016). Regardless of the specific eligibility, working memory deficits are common among students with disabilities and reading difficulties (Alloway

et al., 2009; Dunning et al., 2013; Kendeou et al., 2014; Loosli et al., 2012; Zadina, 2015). Researchers described working memory as a domain general storage system with the cognitive ability to hold, apply, and manipulate information while performing other tasks (Alloway et al., 2009; Melby-Lervag & Hulme, 2013). Working memory deficits were linked to deficiencies in the cognitive processes required for phonological awareness, decoding, and reading comprehension (Crain, Shankweiler, Macaruso, & Bar-Shalom, 1990; Dahlin, 2001; Kendeou et al., 2014; Leather & Henry, 1994; Lee, 2014). Deficits in working memory were linked to deficiencies in the processes required for reading comprehension. Readers with low working memory were unable to hold critical information while receiving new text (Dahlin, 2011; Kendeou et al., 2014).

Despite the availability and implications of educational neuroscientific research, a significant gap between theory and classroom practice exists. To improve effective reading comprehension instruction for students with working memory deficits, reading teachers should possess a thorough understanding of the role that working memory played in each stage of the reading process (Gathercole & Alloway, 2008; Kendeou et al., 2014; Randall & Tyldesley, 2016). Identifying breakdowns in the cognitive processes and applying specialized strategies and interventions had significant implications for improving the reading proficiency of students with working memory deficits (Kendeou et al., 2014).

Literature regarding teacher perceptions of working memory, executive function, or brain-based learning was reviewed by the researcher. These studies concluded that teachers' knowledge and self-efficacy on these concepts were limited. Many teachers cited the absence of professional learning and opportunities from districts to provide

direct instruction on cognitive skills as causes of reduced teacher competency and effectiveness. Therefore, the researcher examined special education teachers' experiences and perceptions, confidence and preparedness, and ability to increase the reading comprehension of students with working memory deficits. Study outcomes were used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory.

Purpose of the Study

A review of the literature indicated that working memory deficits were common among students with disabilities and reading difficulties. Effective reading instruction for students with working memory deficits required teachers possess a thorough understanding of the role that working memory plays in each stage of the reading process. Identifying breakdowns in the cognitive processes of reading and applying specialized strategies and interventions had significant implications for improving the reading proficiency of students with working memory deficits. A review of recent studies on teachers' perceptions of working memory, executive function, or brain-based learning revealed that teachers' knowledge and self-efficacy on these concepts were limited. Furthermore, special education teacher preparation programs and limited in-service professional learning were identified as factors affecting teacher self-efficacy regarding effective reading instruction for students with working memory deficits.

This explanatory sequential mixed methods research study examined special education teachers' experiences and perceptions, confidence and preparedness, and ability to increase the reading comprehension of students with working memory deficits.

In this study, a teacher survey was used to examine teacher preparedness and confidence levels for working memory and effective reading comprehension instruction for students who are served in grades kindergarten through high school special education programs. The qualitative phase of the study included two qualitative measures (i.e., self-efficacy questionnaire and interview), which explored special education teachers' perceptions of their ability to improve the reading comprehension of students with working memory deficits. The purpose of conducting this mixed methods research study was to obtain a complete understanding of the problem by using qualitative data to explain the quantitative findings.

Theoretical Framework

Green (2012) connected the work of Joseph Rotter and Albert Bandura, suggesting that Bandura's concept of self-efficacy originated from Rotter's social learning theory. Rotter (1954) suggested that a person's behavior, which is affected by ability, experience, and environment, is influenced by the belief and expectancy of a particular outcome. Rotter hypothesized that motivation and behavior were directly linked to the value that a person placed on a preferred outcome. External conditions or controls could be overcome or minimized by internal controls, such as motivation to create positive change and self-efficacy (Rotter, 1954). Bandura (1977) defined self-efficacy as the belief that one's ability and actions could produce desired outcomes. Researchers established a significant correlation between high teacher self-efficacy and student achievement (Allinder, 1995; Collier, 2005; Green, 2012). Teachers' self-efficacy was derived from their perception of their preparedness to teach and confidence

in their ability to improve student outcomes (Bandura, 1977; Darling-Hammond, Chung, & Frelow, 2002; Hoy & Spero, 2005; Protheroe, 2008; Ruppar et al., 2016).

Increasing teachers' knowledge, skill level, and self-efficacy had significant implications for improving student outcomes (Juvora et al., 2015). Teachers with high self-efficacy believed in their ability to perform specific educational tasks with a high rate of quality and success (Dellinger, Bobbett, Olivier, & Ellett, 2008). Confident teachers attributed higher self-efficacy and outcome expectancy to past success and positive experiences (Hoy & Spero, 2005; Protheroe, 2008). Rotter (1954) hypothesized that high self-efficacy and outcome expectancy could overcome external conditions that limit positive outcomes (Green, 2012). Figure 1 depicts the teacher self-efficacy cycle, which was designed by the researcher. The figure integrated the literature and Bandura's concept of self-efficacy. The figure is the researcher's visual representation of the self-efficacy theory or concept in relation to teacher self-efficacy. The diagram served as a blueprint devised to guide the researcher in examining and exploring the elements of teacher self-efficacy and the relationship between each element (Imenda, 2014).

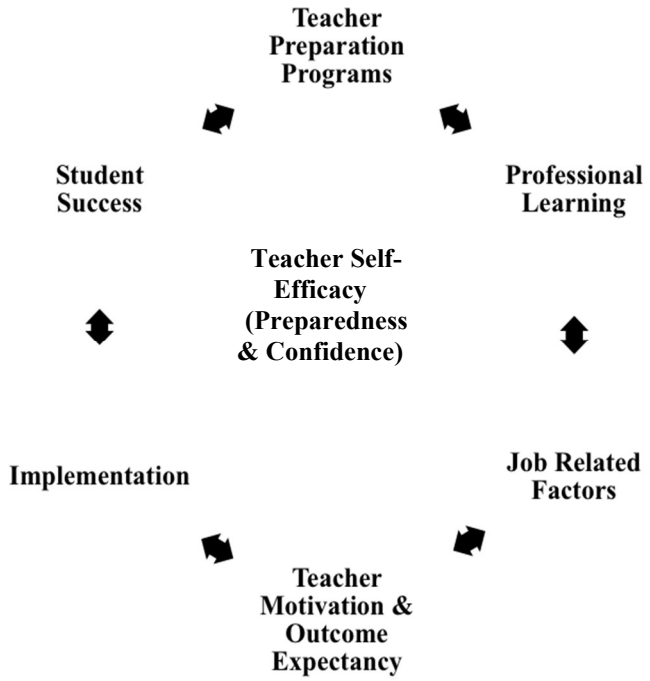


Figure 1. The Teacher Self-Efficacy Cycle.

Recent studies on special education teachers' self-efficacy, knowledge, and effective implementation of research-based reading comprehension strategies indicated a gap between research and classroom practice (Bishop, Brownell, Klingner, Leko, & Galman, 2010; Brownell et al., 2010; Dingle, Brownell, Leko, Boardman, & Hager, 2011). These lower self-efficacy rates and gaps between research and classroom practice were often attributed to insufficient teacher preparation and limited in-service professional learning (Bishop et al., 2010; Brownell et al., 2010; Ruppar et al., 2016; Sharpe, Brandt, Tuft, & Jay, 2016; Tschannen-Moran & Johnson, 2011). Bishop and colleagues (2010) found that beginning special education teachers' self-efficacy regarding engaging, effective reading instruction was limited due to insufficient preparation regarding theories and methods for reading comprehension instruction. Teachers with access to a well-articulated curriculum, instructionally focused administrators, and continued professional learning on literacy instruction reported

higher rates of self-efficacy (Bishop et al., 2010). Brownell and colleagues (2010) suggested that increasing special education teachers' self-efficacy for literacy instruction required additional preparation on the pedagogical content and practices in reading. Teacher preparation programs should provide more courses on cognitive strategy instruction to ensure that special education teachers develop a deep knowledge of language, literacy, and potential processing deficits (Brownell et al., 2010). King-Sears and Bowman-Kruhm (2011) discovered that middle school special education teachers had poor self-efficacy and knowledge regarding specialized reading instruction, describing specialized reading instruction as teaching reading through accommodations and modifications. Tschannen-Moran and Johnson (2011) found a stronger correlation between higher self-efficacy for literacy instruction and in-service professional learning than self-efficacy and higher levels of degree or years of experience.

Significant gaps between research and practice exist regarding instructional strategies that address the cognitive processes required for learning and reading comprehension (Aldrich, 2013; Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011; Sigman et al., 2014). Teacher perceptions and self-efficacy on these concepts and practices were limited (Alloway et al., 2012; Bishop et al., 2010; Brownell et al., 2010; Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016; Ruppar et al., 2016; Sharpe et al., 2016; Tschannen-Moran & Johnson, 2011). Because the study examined special education teachers' perceptions self-efficacy to improve the reading comprehension of students with working memory deficits, Bandura's (1977) self-efficacy theory was chosen as the theoretical framework.

Significance of Study

Kearns and Fuchs (2013) suggested that identifying interventions for improving student literacy had significant implications for narrowing the achievement gap for at-risk learners, especially learners who demographically qualify as minorities, low socio-economic, or students who are served in special education programs. This study examined the experiences, confidence, and perceptions of teachers charged with improving the reading comprehension of students with working memory deficits. This information was used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that improve reading comprehension and address deficits in working memory. Increasing special education teachers' knowledge and classroom practices regarding working memory can potentially narrow the reading achievement gap for students with disabilities. Additionally, training teachers to identify working memory deficits and apply appropriate strategies and interventions for specific cognitive and early literacy deficits, especially for primary school aged children, can possibly reduce the probability of a learning disability diagnosis in upper elementary or middle grades (Holmes et al., 2009).

Research Design

An explanatory sequential mixed methods research design allowed the researcher to utilize both qualitative and quantitative research design methods to examine the experiences, perceptions, and self-efficacy of teachers who provide reading instruction to students with working memory deficits. This mixed methods approach combined quantitative and qualitative phases of data collection and analysis to examine special

education teachers' perceptions of their background and experiences regarding working memory and reading comprehension and their ability to improve the reading comprehension of students with working memory deficits (Johnson & Christensen, 2010; Moustakas, 1994; Muscella, 2014; Patton, 2002; Starks & Trinidad, 2007). Quantitative data were used to examine participant background experiences, such as years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization as factors impacting teacher perceived self-efficacy in providing effective reading instruction for students with working memory deficits. Sequential triangulation of data obtained through the quantitative survey, qualitative self-efficacy questionnaire, and interview were used to obtain an in-depth understanding of special education teachers' perspectives and experiences regarding their knowledge, understanding, and self-efficacy regarding reading comprehension instruction and working memory deficits (Creswell, 2014). This design allowed the researcher to explore generalizations, multiple viewpoints, and develop a narrative of descriptive material on a specific topic or phenomenon (Adelman, Jenkins, & Kemmis, 1980). The mixed methods research design was chosen to obtain a complete understanding of the problem by using qualitative data to explain the quantitative findings.

Research Questions

In terms of identifying special education teachers' self-efficacy regarding improving the reading comprehension of students with working memory deficits, this study investigated the following research questions:

1. How do special education teachers' experiences and perceptions of working memory and reading comprehension explain their preparedness and confidence for teaching reading comprehension effectively?
2. How do special education teachers perceive their ability to improve the reading comprehension of students with working memory deficits?

Methodology

An explanatory sequential mixed methods research design allowed the researcher to utilize both qualitative and quantitative research design methods to examine the experiences, confidence, and perceptions of teachers charged with improving the reading comprehension of students with working memory deficits (Fetters, Curry, & Creswell, 2013; Ivankova, Creswell, & Stick 2006). This mixed methods approach combined quantitative, non-experimental survey methodology of gathering data on teacher beliefs about preparedness and confidence with two qualitative measures, self-efficacy questionnaire and interview, which explored individuals' self-efficacy (Johnson & Christensen, 2010; Moustakas, 1994; Muscella, 2014; Patton, 2002; Starks & Trinidad, 2007). This design was selected to improve the validity of the research and connect theory and practice regarding neuroscientific and cognitively-focused instructional practices (Johnson & Christensen, 2010).

Purposive sampling was used to select certified, special education teachers who serve students in kindergarten through high school special education programs in a rural school district as participants in this study. Purposive sampling allowed the researcher to target participants with specific knowledge and experiences regarding the phenomenon of literacy instruction for students with working memory deficits (Creswell & Plano

Clark, 2011; Patton, 2002). This school district was chosen due to the researchers' proximity and professional relationships with supervising administrators within the district. Participants included special education teachers who served students in collaborative instruction and resource settings. The participants served students within the following special education eligibility categories: Specific Learning Disability, Other Health Impaired, Emotional/Behavioral Disorder, Traumatic Brain Injury, Speech Language Disorder, Mild Intellectual Disability, Moderate Intellectual Disability, and Significant Developmental Delay. Teachers specifically serving self-contained Severe and/or Profound Intellectual Disability students were not selected to participate in this study. Teachers of severe and profound students were excluded because this population of students generally possess significant cognitive impairments that allow for an adapted curriculum and alternative measures of numeracy and literacy skills.

Quantitative data were collected using a quantitative survey distributed via school emails, which included a Survey Monkey link. The recruitment email provided an informed consent form, introduction for the study, purpose of the study, data collection methods, and information regarding confidentiality and voluntary participation. Phase 1, the quantitative survey, included an adaptation of the 2012 Council for Exceptional Children (CEC) Initial Level Special Educator Preparation Standards survey (Caniglia, 2016). The original survey was developed by Dr. Cyndi M. Caniglia (2016) in her dissertation on special education teacher preparedness and confidence presented to Washington State University. The survey consisted of Likert-type ratings that examined teacher perceptions of their preparedness and confidence to implement the 2012 CEC Initial Level Special Educator Preparation Standards. The

original survey consisted of 63 skill and knowledge statements clustered into eight domains: Learner Development and Individual Learning Differences, Learning Environments, Curricular Content Knowledge, Assessment, Instructional Planning and Strategies, Augmentative and Assistive Technology and Communication, Professional Learning and Ethical Practice, and Collaboration (Caniglia, 2016). Dr. Cyndi Caniglia granted the researcher permission to use and adapt the surveys created in her dissertation. The Caniglia survey was adapted to focus primarily on special education teachers' preparedness and confidence regarding learner development and individual learning differences, curricular content knowledge, assessment, instructional planning, and strategies related to teaching reading comprehension to students with working memory or cognitive deficits. The researcher conducted an item analysis to connect the survey items to research presented in the literature review.

Phase 2, the quantitative phase, included a descriptive research design. This design was selected to examine participants' beliefs of their confidence and preparedness levels regarding reading instruction for students with working memory deficits. In Phase 2, quantitative data obtained through Survey Monkey was analyzed descriptively using SPSS software. Results of the web-based survey were analyzed to inform the questions for the qualitative self-efficacy questionnaire and interviews, which was Phase 3 of the study. In Phase 3, which included an exploratory case study, participants were selected purposefully from participants who completed the quantitative survey, scored in each quartile using ordered composite mean scores, and agreed to participate in in the qualitative phase of the study. Two participants from each quartile of

the composite mean scores were asked to participate in the qualitative phase of the study.

In Phase 3, an exploratory case study methodology was conducted to explore special education teacher perceptions of their ability, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. The qualitative phase of the study allowed the researcher to engage with a small number of participants with first-hand knowledge on teaching students with identified working memory deficits. In Phase 4, qualitative data obtained through the self-efficacy questionnaire and interview were analyzed separately. The researcher, with the assistance of an external data analyst (Sutton & Austin, 2015), used an *open coding* process to generate a list of relevant codes from each qualitative measure (Charmaz, 2006). Codes from each measured were categorized into corresponding themes and subthemes (Creswell, 2012b). Data from each measure were analyzed separately; however, because the interviews resulted in narrative data similar to the questionnaire, a cumulative analysis of both qualitative measures is presented in Chapter IV. The cumulative analysis revealed seven themes: (1) effective reading comprehension strategies, (2) teacher preparation, (3) teacher knowledge and ability, (4) teacher confidence, (5) job related factors, (6) teacher effectiveness, and (7) outcome expectancy. Data were reported using tables, as well as in narrative form (Bryman, 2008).

In Phase 5, the researcher integrated the quantitative and qualitative data in several different ways. First, the data were connected through sampling. Participants in the qualitative phase of the study were purposefully sampled from survey participants

and represented specific groups based on ordered composite mean scores (Fetters et al., 2013). Second, the integration occurred through building, a process in which the researcher uses quantitative database to inform the data collection process of another approach (Fetters et al., 2013). Finally, data integration occurred by merging the results of the quantitative and qualitative phases for analysis and comparison (Fetters et al., 2013).

An explanatory sequential mixed methods design was chosen to examine special education teachers' experiences and perceptions, confidence and preparedness, and ability to increase the reading comprehension of students with working memory deficits. Quantitative data were collected to examine teachers' beliefs of their preparedness and confidence regarding working memory and reading comprehension. The qualitative data were collected to explore special education teacher perceptions of their ability, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. The two phases were connected by purposefully sampling the survey participants to participate in the qualitative phase. Lastly, the qualitative findings were used to support or contradict the quantitative findings. This information was used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory.

Limitations

Because participants were selected from a small rural school district, randomized sampling procedures were not used. Data analysis and conclusions from this research should be limited in relevance to districts with similar demographics. Purposeful and

convenience sampling were used for the targeted population pool; however, participants volunteered for the qualitative phase of the study. Responses from volunteers may not have been representative of the targeted population or a broader special education teacher population. Perceptions, experiences, and beliefs of participants in this study are similar to perceptions, experiences, and beliefs of participants in studies cited within the literature review.

Limited literature was found addressing special education teachers' perceptions of self-efficacy and outcome expectancy in relation to their ability to improve the reading comprehension levels of students with working memory deficits effectively. Therefore, establishing a clear connection to prior research was quite difficult. Results of the study indicated that access and opportunities for professional learning on research-based practices for improving the reading comprehension rates of students with working memory deficits was limited. Limited access to professional learning and cognitively focused resources may not exist in school districts with more formalized professional learning plans and greater financial resources; however, access to professional learning and resources related to addressing cognitive deficits was also found in the body of the research.

The survey, an adapted version of the 2012 CEC Initial Level Special Educator Preparation Standards survey, was significantly revised and remained quite lengthy. The use of a long, three-part survey may have threatened the internal validity and response rates of participants. Even though the original survey was significantly revised, the measure consisted of 24 multi-part questions. The quantitative phase was followed by

two qualitative measures that required additional time and commitment from participants, which may have affected participation attrition from the study.

Finally, regarding questions specifically related to the identified research-based practices for teaching reading to students with memory deficits, participants may not have fully understood the research questions and terminology. Caution should be used in interpreting and generalizing the results of this study. Significant gaps in knowledge related to participants' understanding of strategies to increase working memory or the use of collaborative comprehension strategies to increase reading comprehension may be reflective of misunderstandings related to terminology as opposed to a reflection of participant skill or knowledge.

Definition of Terms

Terms specific to the purpose and significance of the study include:

Categorical Teacher Preparation: Special education teacher preparation programs that provided specific certification and licensing on specific disabilities, such as Emotional Behavioral Disorder, Intellectual Disabilities, Specific Learning Disabilities (Brownell et al., 2010).

Central Executive: Component of the working memory system that coordinates efforts of the phonological loop and visuo-spatial sketchpad, retrieves information from long-term memory, and allocates attention (Baddeley, 2007; Baddeley & Hitch, 1974).

Cognitively Focused Instruction: Instruction that targets cognitive processes, such as working memory, attention, fluid processing/metacognition, language/auditory processing, motor processing, planning, processing speed, successive processing, and visual processing (Kearns & Fuchs, 2013).

Educational Neuroscience: A branch of science that combines empirical findings on brain development and cognitive processes with educational practice and theory (Zadina, 2015).

Executive Function: Cognitive processes that regulate and control human behavior while performing tasks (Diamond, 2014).

Integrated Teacher Preparation: Special education certification programs that provide dual certification in special education and regular education (Brownell et al., 2010).

Metacognitive Strategies: Strategies that allow readers to monitor and evaluate their comprehension and performance of cognitive tasks before, during, and after reading (Dole, Nokes, & Drit, 2009).

Non-categorical Teacher Preparation: Special education certification programs that provide generalized information on non-specific, special education disabilities, assessments, special education law, instructional strategies, and basic curriculum (Brownell et al., 2010).

Outcome Expectancy: The subjective probability that certain outcomes or reinforcers are the result of specific behaviors and levels of expectancy (Green, 2012; Rotter, 1954).

Phonological Awareness: The ability to segment and manipulate sounds (Lee, 2014).

Phonological Loop: Component of working memory systems that stores and rehearses verbal information (Baddeley & Hitch, 1974).

Response to Intervention (RTI): A three-tiered problem-solving model proposed by the 2002 President's Commission on Excellence in Special Education proposed to reduce the number of students identified for special education that includes high quality

instruction, universal screeners, evidence-based interventions, and data-based decision making (Sullivan & Castro-Villarreal, 2013).

Self-Efficacy: The belief that one's ability and actions could produce desired outcomes (Bandura, 1977).

Visuo-Spatial Sketchpad: Component of working memory that stores and rehearses visual information (Baddeley & Hitch, 1974).

Working Memory: A domain general storage system with limited space specific to modalities (Melby-Lervag & Hulme, 2013); the cognitive ability to hold, apply, and manipulate information while performing other tasks (Alloway et al., 2009).

Summary

A significant connection exists between reading comprehension ability, student achievement, and long-term academic success (Garcia-Madruga et al., 2013; Hernandez, 2011; Kendeou et al., 2014). Statistics have shown that students reading below grade level by the end of third grade often suffer from limited academic success and lower graduation rates (Hernandez, 2011). Neuroscientists contend that working memory capacity is a critical component in the cognitive processes required in reading comprehension (Alloway et al., 2009; Arina et al., 2015; Garcia-Madruga et al., 2013; Kendeou et al., 2014; Loosli et al., 2012; Titz & Karbach, 2014). Despite the availability and implications of research regarding effective cognitively-focused instructional practices that improve reading comprehension, a significant gap between theory and classroom practice exists (Aldrich, 2013; Sigman et al., 2014).

This explanatory sequential mixed methods research design examined the special education teachers' self-efficacy regarding improving the reading comprehension of

students with working memory deficits. In this study, a quantitative teacher survey was used to examine teacher preparedness and confidence levels for working memory and effective reading comprehension instruction for students who are served in grades kindergarten through high school special education programs. The qualitative data sources (i.e., interview and questionnaire) explored special education teachers' perceptions of effective working memory strategies in classroom practice and identify gaps in teacher preparedness or professional learning related to effective reading comprehension instruction. The explanatory sequential design was chosen to obtain a holistic understanding of how special education teachers' experiences and perceptions of working memory and reading comprehension explain their preparedness and confidence for teaching reading comprehension effectively.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Educational reform initiatives changed the role of building principals (Day et al., 2016). The administrative responsibilities of principals evolved from building managers and disciplinarians to transformational and instructional leaders. School districts, pressured by legislators seeking increased accountability, charged principals with duties that included improving organizational structure, school climate, teacher self-efficacy, classroom instruction, and student achievement (Day et al., 2016). In fact, principal evaluation scores included student achievement growth data in 19 U.S. states (Doherty & Jacobs, 2015). The demand for principals to become effective, instructional leaders increased the expectation that principals possess significant knowledge and understanding of the use of data, research, and effective instructional practices or programs (Day et al., 2016). Day and colleagues (2016) suggested that effective principals built instructional climates using data, research, classroom observations, and diverse learning opportunities for staff and students. Diverse learning opportunities for staff included collaborative planning and leadership, comprehensive professional learning, preservice training, and pupil-centered learning strategies (Day et al., 2016). Successful leaders were sensitive to teachers' self-efficacy and provided support and professional learning (Meyer & Behar-Horentstein, 2015). Teacher perceptions of their knowledge and teaching ability had significant impact on their self-efficacy (Ruppar et al., 2016). Teachers engaged in ongoing professional learning in critical areas, such as

Response to Intervention (RTI) or specialized instructional strategies built more self-efficacy (Meyer & Behar-Horenstein, 2015).

The combined pressure on schools regarding underperforming subgroups of students, such as students with disabilities, increased interest in non-traditional, innovative methods of improving student outcomes, such as brain-based education and cognitively focused instruction (Fuchs et al., 2010; Sullivan & Castro-Villarreal, 2013; Zadina, 2015). Over the past decade, neuroscientific researchers provided great insight into the most optimum times in child development to implement interventions (Sigman et al., 2014; Wachs, Georgieff, Cusick, & McEwen, 2013). An understanding of brain development and the cognitive functions required for academic success were suggested to increase educators' efforts to close the achievement gap for at-risk learners (Kovalcíková, 2015; Sigman et al., 2014; Zadina, 2015). Knowledge concerning brain-based research and neuroscience were recommended to educators to increase the effectiveness of instructional strategies, evidence-based interventions, and curriculum changes necessary to reform student outcomes (Feifer, 2008; Zadina, 2015). Using elements of neuroscience to implement multi-disciplinary RTI frameworks were recommended to improve the early identification of cognitive and academic deficits and selection of effective, research-based interventions (Feifer, 2008; Zadina, 2015). Additionally, increasing special education teachers' knowledge and classroom practices regarding cognitive instructional strategies could potentially narrow the reading achievement gap for students with disabilities (Kearns & Fuchs, 2013).

A significant amount of research surfaced in the last few decades linking working memory levels with student achievement (Alloway et al., 2005; Alloway,

Gathercole, Willis, & Adams, 2004; Baddeley, 2012; Decker, 2011). Horn (1968) suggested that working memory capacity was directly linked to fluid intelligence, the ability to encode things into memory, solve problems, and reason (Decker, 2011). Working memory deficits were commonly identified in students with disabilities (Alloway et al., 2009). These deficits were correlated to an inability to create and maintain phonological representations and weaknesses in domain general working memory capacity (Decker, 2011; Hambrick, Wilhem, & Engle, 2001). Understanding working memory and its implications on learning correlated to improving student outcomes (Gathercole & Alloway, 2008). Numerous studies indicated that early interventions that targeted improving working memory were positively associated to growth in student achievement (Alloway et al., 2009; Dahlin, 2011; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Karbach et al., 2013; Kearns & Fuchs, 2013; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016).

Teacher self-efficacy had a significant impact on teacher effectiveness (Bandura, 1997; Ruppar et al., 2016). Teachers engaged in ongoing professional learning in critical areas, such as RTI or specialized instructional strategies, built more self-efficacy (Dingle et al., 2011; Meyer & Behar-Horenstein, 2015). Researchers recommended that teacher education and pre-service programs include specific courses on principles relevant to both neuroscience and education (Anasari et al., 2011; Sigman et al., 2014; Zadina, 2015). Ansari and colleagues (2011) proposed that courses on educational neuroscience should be embedded within continued learning and professional development opportunities within school districts. School districts that provided continued professional learning, opportunities for collaboration, and scaffolding during

implementation of specialized, cognitive strategies improved teacher competency (Elliott et al., 2010). Ongoing professional learning and scaffolding during implementation assisted special education teachers in appropriately addressing students' cognitive deficits and constructing effective instructional environments that facilitated students' ability to create knowledge and meaning from new information (Ertmer & Newby, 2013; Powell & Kalina, 2009).

Ruppar and colleagues (2016) recommended further research regarding special education teachers' perceptions of their preparedness to teach students with various disabilities. Developing a theory of self-efficacy and proficiency for special education teachers required additional research on teachers' perceptions, classroom practice, and professional development (Ruppar et al., 2016). A review of the literature indicated that teacher preparation programs that provided a foundation in neuroscience and continued professional learning on cognitive processes and strategies might potentially bridge the gap between teacher competencies and effective classroom practice (Alloway et al., 2009; Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011).

Educational Neuroscience

Over the last few decades, a greater emphasis on cognitive theories of learning and neuroscience created a shift in instructional design systems (Ertmer & Newby, 2013). Cognitive theories focused on cognitive processes, knowledge acquisition, and mental structures. Cognitive theorists contended that memory was significant in the learning process. Theorists suggested that learning occurred when information was stored, assimilated, or connected to prior knowledge and retrieved in an applicable

manner (Ertmer & Newby, 2013). Teachers' knowledge of the cognitive processes required for learning have significant implications for improving student outcomes (Ertmer & Newby, 2013; Lutz & Huitt, 2003). Despite these implications, a significant gap between research and practice exists (Aldrich, 2013; Sigman et al., 2014). Studies regarding the instructional implications of cognitive processes and cognitively-based instruction indicated that teacher perceptions and self-efficacy on these concepts and practices were limited (Alloway et al., 2012; Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016).

Educational neuroscience developed from a partnership between neuroscientific and educational researchers, united by a common interest in the brain's plasticity, or ability to repair, reform, adapt, and improve (Aldrich, 2013). Researchers suggested that educational neuroscience, defined as a branch of science used to apply empirical findings and theories about brain development and cognitive processes to educational theory and practice, had significant implications for improving student learning and academic outcomes (Ansari et al., 2011; Sigman et al., 2014; Zadina, 2015). Though extensive research on educational neuroscience was found, a significant gap the application of educational neuroscientific theories and classroom practice existed (Aldrich, 2013).

Interest and experimentation in neuroscience and its potential for improving some of the problems that plagued education gained momentum among educational practitioners (Ansari et al., 2011; Sigman et al., 2014). Despite the potential, both neuroscientists and educational theorists warned that without an appropriate bridge connecting the two disciplines, a poor understanding and misapplication of

neuroscientific theories and empirical findings might lead to a lost opportunity that could revolutionize education (Ansari et al., 2011; Sigman et al., 2014; Zadina, 2015). Ansari and colleagues (2011), Sigman and colleagues, (2014), and Zadina (2015) suggested that a new educational discipline, composed of research and principles relevant to both neuroscience and education, be established within teacher education and pre-service programs. Furthermore, Ansari and colleagues (2011) recommended that courses on educational neuroscience be embedded within continued learning and professional development opportunities within school districts. Proponents of educational neuroscience suggested that maintaining continued collaboration between neuroscientists and educators, collaboration that produced a common language and dual roles in research and application, had the greatest implications on learning (Ansari et al., 2011; Sigman et al., 2014; Zadina, 2015).

The dawn of educational neuroscience increased interest and research in the cognitive processes required for retaining and processing information (Kendeou et al., 2014). Deeper understanding of the cognitive processes required for thinking, learning, and coping with anxiety and stress improved the effectiveness of school reform, curriculum, instructional strategies, and interventions (Zadina, 2015). Educational neuroscientists focused heavily on language acquisition and reading comprehension, especially for infants and primary age children (Adlrich, 2013). They established significant connections between reading comprehension, student achievement, and long-term academic success (Dahlin, 2011; Hernandez, 2011). Hernandez's (2011) results indicated that students who failed to attain grade-level reading comprehension rates by the end of third grade experienced decreased academic success in upper grades and often

failed to obtain a high school diploma. The implications for improving reading comprehension rates through brain-based or cognitively focused instruction, especially for students with disabilities, could significantly change long-term student outcomes and reform education (Kendeou et al., 2014).

Working Memory

Melby-Lervag and Hulme (2013) described working memory as a domain general storage system with limited space specific to modalities. Alloway and colleagues (2009) defined working memory as the cognitive ability to hold, apply, and manipulate information while performing other tasks. The ability to hold and apply information during various learning activities facilitated learning (Alloway et al., 2009; Baddeley, 2003). Recent research identified a significant correlation between working memory and reading achievement (Garcia-Madruga et al., 2013; Kendeou et al., 2014). Regarding early literacy skills, working memory was critical in establishing phonological awareness, the ability to segment and manipulate spoken words (Lee, 2014; Siegel, 1993). Researchers suggested that deficits in phonological awareness were indicators of reduced working memory capacity (Leather & Henry, 1994; Lee, 2014). Because phonological memory was required to store phonemes and apply those sounds when decoding, deficits in working memory posed a significant barrier in developing required phonics skills (Crain et al., 1990; Lee, 2014). Deficits in phonemic awareness and phonics were correlated to poor reading fluency and comprehension (Decker, 2011; Muter, Hulme, Snowling, & Stevenson, 2004). Alloway and colleagues (2009) suggested that students with reduced working memory capacity required increased instructional support and working memory training to meet academic targets and goals.

Description and Theories

The most prominent and accepted theories of working memory originated from Alan Baddeley and Graham Hitch's 1974 research (Baddeley, 2012; Holmes et al., 2009; Randall & Tyldesley, 2016). Baddeley and Hitch (1974) proposed that working memory operated within a three-component system: a) a *phonological loop* that held speech-based or verbal short-term memory, b) a *visuo-spatial sketchpad* that held visual and spatial short-term memory, and c) the *central executive,* which controls attention and decision making, converting both visual and verbal short-term memory to working memory (Baddeley, 2007, 2012; Randall & Tyldesley, 2016). Baddeley and Hitch's model (1974) model of working memory described a three-component system that, when working effectively with adequate memory capacity within each component, facilitated learning. The phonological loop temporarily stored and rehearsed verbal information (Baddeley & Hitch, 1974). The visuo-spatial sketchpad stored and rehearsed visual information. The central executive coordinated efforts of the phonological loop and visuo-spatial sketchpad, retrieved information from long term memory, and allocated attention (Baddeley, 2007; Baddeley & Hitch, 1974). The episodic buffer, added by Baddeley in 2000, merged information from the other systems and long-term memory into a single verbal and/or visual representation (Baddeley, 2006). This component bound visual, spatial, and verbal information in chronological order to assist in the development of semantic meaning and relevance (Baddeley, 2006). Additionally, Baddeley (2006) proposed that the episodic buffer directly encoded information into long term memory and was used to search long term memory data bases. Though Baddeley's (2003, 2006) research indicated that the episodic buffer was critical in the

encoding of information into long term memory, very little literature existed on linking the episodic buffer to reading comprehension.

The phonological loop. Verbal working memory included speech and/or verbal information stored in the phonological loop (Baddeley, 2003; Baddeley & Hitch, 1974). Crain and colleagues (1990) described verbal working memory as a system primarily responsible for manipulating, storing, processing, and analyzing verbal information. The primary task of the working memory system included formulating meaningful representations of information stored in phonological short-term memory (Crain et al., 1990; Lee, 2014).

Verbal information, stored in either the phonological short-term memory or long-term memory, was retrieved through a complex, meaning-based process. Assessing verbal working memory primarily involved complex memory tasks (Crain et al., 1990; Lee, 2014). These tasks often required learners to process and store information simultaneously (Baddeley & Logie, 1999; Crain et al., 1990; Lee, 2014). Practitioners also identified deficits in verbal working memory through reading span tasks, such as tasks developed by Daneman and Carpenter in 1980 (Lee, 2014). These tasks required participants to read aloud sentences and recall the final word in each sentence. These tasks also required storage and processing of information (Daneman & Carpenter, 1980; Lee, 2014). Another complex memory span task used to assess verbal working memory included the Digit Span Backward subtest of the *Weschler Intelligence Scale for Children* (Lee, 2014).

Visuo-spatial sketchpad. Baddeley and Hitch (1974) suggested that information regarding location and objects was stored in the visuo-spatial sketchpad. This storage of

information was called visual working memory (Baddeley & Hitch, 1974). Alloway and colleagues (2009) described visual working memory as a highly cognitive memory system that required both short-term and long-term memory to manipulate and transform information. Visual working memory was often assessed by counting span or visual span tasks that presented visual arrays or a series of images (Loosli et al., 2012). Loosli and colleagues (2012) created a visual span task that assessed the learner's ability to store and attend to visual information. Learners were shown a series of animals one at a time. The orientation of the animal (i.e., right-side up or upside-down) varied. Participants were required to recall the animals in the order that they were presented (Loosli et al., 2012).

Central executive. Miyake, Friedman, Rettinger, Shah, and Hegarty (2001) described the central executive as the central component of working memory that manages the other memory systems. This component coordinated the storage and processing of verbal and visuo-spatial information (Miyake et al., 2001). In addition, their research indicated that processes, such as mental arithmetic and high-level cognitive strategies, were coordinated by the central executive (Miyake et al., 2001). Baddeley (2000) theorized that the central executive did not possess its own storage capacity and was not domain specific like the phonological loop or visuo-spatial sketchpad. The *n*-back task (*n* was equivalent to the number of stimuli), introduced by Kirchner (1958), was commonly used to assess the central executive component of working memory. This task presented participants with several stimuli, which required the learner to store and manipulate information (Miyake et al., 2001).

Information processing theory. George A. Miller (1956), a leader in cognitive psychology, originated the information processing theory and metaphor between the human brain and a computer (Heyck-Crowther, 1999). This theory differed from behaviorist theories that suggested human behavior was a response to external stimuli. Miller proposed that cognitive processing was limited by immediate memory; however, the amount of information stored could be increased by chunking smaller bits of information into larger chunks by recoding (Heyck-Crowther, 1999).

The most prominent model of the information processing theory, developed by Atkinson and Shiffrin (1968), included a three-staged processing model that consisted of sensory memory, working memory, and long-term memory (Lutz & Huitt, 2003). In the information processing theory, external stimuli entered the sensory memory and became information. This information was transferred into the working memory. During this stage, information was held in short-term memory, where the information was quickly lost or processed into working memory through rehearsal or encoding. Information that was encoded with meaning transitioned into the long-term memory, where the information was permanently stored and retrieved as needed (Lutz & Huitt, 2003). Figure 2 provides a visual representation of Information Processing Theory.

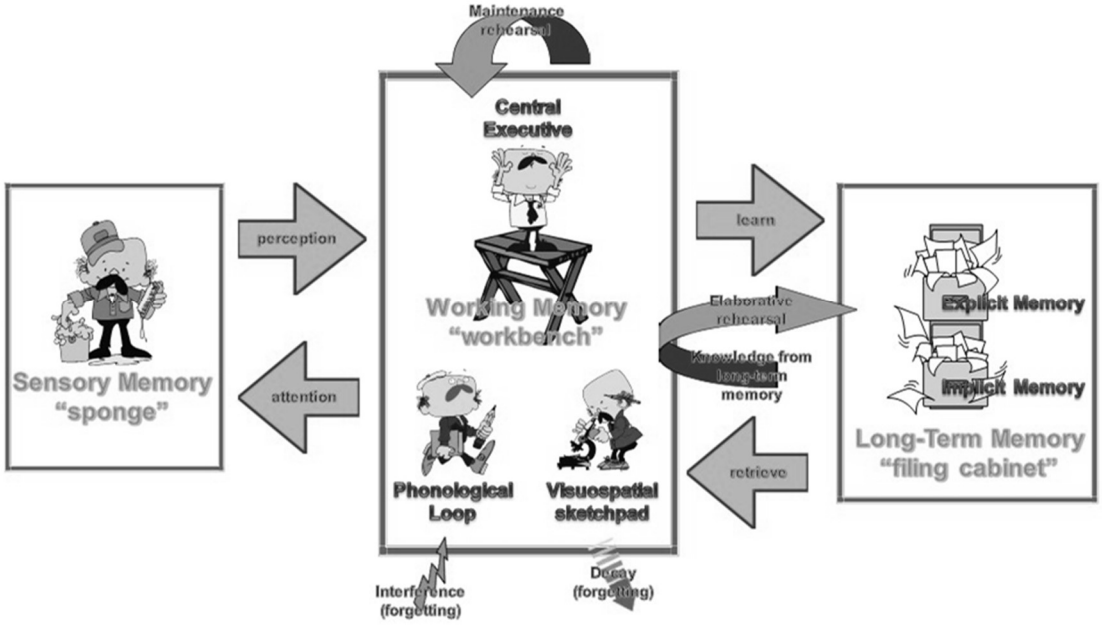


Figure 2. Information Processing Theory Model from Brown (2017). Permission was granted from Dr. Jennifer L. Brown to reprint this graphic.

Swanson (1987) suggested that the information processing theory provided a framework for understanding the cognitive deficits and performance of students diagnosed with a learning disability. Like students without a disability, students with learning disabilities learn through cognitive stages, such as encoding, storing, and reconstructing information (Swanson, 1987); however, students with learning disabilities were considered to have deficits in information processing. Swanson (1987) described an *instructional continuum* for students with learning disabilities that begins with teachers evaluating students' stages of cognitive processing and devising activities to strengthen those processes. Training on deficient information processing components as well as strategies on self-regulation and metacognition have resulted in positive student outcomes (Swanson, 1987).

Working Memory Deficits and Academic Impact

Cognitive neuroscientists suggested working memory played a significant role in cognitive processes required for reading comprehension (Baddeley, 2012; Dahlin, 2011; Dunning et al., 2013; Garcia-Madurga et al., 2013; Holmes et al., 2009; Kendeou et al., 2014). Researchers advised that a clear understanding and knowledge of the complex processes of working memory were necessary to improve instruction and increase academic outcomes (Gathercole & Alloway, 2008; Randall & Tyldesley, 2016). Alloway and colleagues (2009) investigated the academic and behavioral characteristics of students with low working memory in relation to the school environment. Their research supported previous findings that indicated that working memory capacity was critical when acquiring new information and skills (Alloway et al., 2009; Loosli et al., 2012). Working memory was essential for everyday academic tasks that required students to store, process, and manipulate new information (Gathercole & Alloway, 2008; Randall & Tyldesley, 2016). Working memory levels directly linked to academic achievement and were often identified as high-risk factors for learning problems in reading and math (Alloway et al., 2009; Dunning et al., 2013; Loosli et al., 2012; Zadina, 2015). Gathercole and Alloway (2007) reported that 70% of students with disabilities and decreased reading proficiency were identified as having working memory deficits. Though students' cognitive or general abilities developed appropriately, deficits in working memory contributed to below age or grade appropriate academic performance (Alloway et al., 2009). Alloway and colleagues (2009) suggested that working memory deficits were cumulative during development and resulted in greater deficits in learning as students aged. These working memory levels were related

to deficiencies within the visuo-spatial domain. Deficiencies within this domain were correlated to difficulty and inability to successfully apply strategies that required long-term memory, such as storytelling and visual representation. Students who successfully applied a working memory strategy in one area were unable to apply that strategy in other content areas. Furthermore, they suggested that academic difficulties for students with low working memory levels increased as students progressed into higher grade levels because instructional support and direct instruction on reading comprehension, math problem-solving, and/or learning strategies were less available as the focus shifted to higher-level, content learning (Alloway et al., 2009).

Working Memory Deficits and Behavioral Impact

Alloway and colleagues (2009) found that students with low working memory levels were described as having similar behavioral characteristics, such as inattentiveness, easily distractible, and forgetful. Teacher surveys indicated that the students with low working levels had difficulty remembering multi-step verbal instructions, made careless mistakes in writing and problem-solving, and often failed to complete tasks (Alloway et al., 2009). The teachers also noted that these students often lost focus during whole group, teacher-led activities or activities that demanded higher levels of cognitive processing. Activities that required these students to process mentally and store information frequently resulted in high failure rates. Strategies or specific training to increase working memory capacity, especially for younger students, were recommended to assist in improving academic achievement and behavior (Alloway et al., 2009).

Working Memory Deficits and Reading Achievement

Reading comprehension is a cognitive process that requires working memory and attention (Kendeou et al., 2014). During reading comprehension, working memory is used to retain information while new information is processed and applied to previous text (Garcia-Madruga et al., 2013; Kendeou et al., 2014). Teachers' knowledge of the cognitive processes required for reading comprehension, from lower level processes like decoding to higher-level processes like making inferences, had significant implications for improving students' reading comprehension (Kendeou et al., 2014). Researchers recommended that special education teachers, especially those teachers working with elementary and middle school students, receive intensive preparation and ongoing professional learning regarding literacy instruction (Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011; Sharpe et al., 2016).

Kendeou and colleagues (2014) described reading comprehension as a process that involved varying levels of cognitive processes and executive functions. Executive functions included cognitive processes that governed and manipulated a person's attention, actions, and application of learning (Diamond, 2014; Kendeou et al., 2014). Working memory and attention were cited as two critical processes required for reading comprehension (Kendeou et al., 2014). During reading comprehension, working memory was used to retain information while new information was processed and applied to previous text (Garcia-Madruga et al., 2013; Kendeou et al., 2014). Kendeou and colleagues (2014) suggested that readers with poor working memory were unable to create a clear, mental depiction of the text. Text information could not be retained and

prior information could not be easily applied, making inferencing a difficult task for readers with poor working memory (Kendeou et al., 2014).

Deficits in the phonological loop that stored verbal information were suggested as possible causes of reading comprehension difficulties (Dahlin, 2011). Phonological awareness, a process that transferred letters into sounds that were momentarily stored until all the letters were combined into a word, required working memory (Titz & Karbach, 2014). Kendeou and colleagues' (2014) research indicated deficits within the phonological loop, which directly impacted decoding, exhausted working memory capacity before the brain could transition to higher-level processes of reading comprehension.

Deficits in working memory were linked to inability to make inferences, organize information, and recall facts and details (Kendeou et al., 2014). Studies indicated that readers with lower working memory levels did not have the capacity to remember information while processing new information (Kendeou et al., 2014; Titz & Karbach, 2014). Reading comprehension was primarily attained through two levels of cognitive processing (Kendeou et al., 2014). Phonological processing, letter identification, decoding, reading fluency, and vocabulary recognition were listed as lower level cognitive processes of comprehension (Dahlin, 2011; Kendeou et al., 2014). Making inferences, organizing and recalling information, attending to specific information, and understanding content were described as higher level cognitive processes (Kendeou et al., 2014). Deficiencies in lower level reading processes, such as decoding and phonological processing, impeded the higher cognitive processes necessary to apply meaning to text (Kendeou et al., 2014). Deficits in higher level

reading processes, such as making inferences, discarding irrelevant information, and attention allocation, were correlated to difficulties making connections between text and prior knowledge, recognizing main idea, and monitoring comprehension (Kendeou et al., 2014). Cognitive deficits at either level compromised the process of combining language units into a clear, understandable mental representation (Kendeou et al., 2014). Even if a mental representation was established, deficits in higher level cognitive processing resulted in a representation that was vague or of poor quality (Kendeou et al., 2014).

Arina and colleagues (2015) suggested that reading comprehension and reading accuracy were impacted by both visual and verbal memory. Visual memory was required to recognize words according to their spelling; however, verbal memory was utilized to decode words based on their phonological order (Arina et al., 2015). Though phonological awareness was reported as a significant factor in learning to read and reading fluency, verbal memory was suggested as a key factor in attaining phonographic mapping abilities and storing sequential phonemes while analyzing and synthesizing text (Arina et al., 2015). Determining the function of specific working memory components facilitated the identification of a reading disorder or future reading comprehension difficulties (Arina et al., 2015). Deficits in working memory were also predictors of poor reading fluency, which directly impacted reading comprehension (Lee, 2014).

Oakhill and colleagues (2011) investigated the relationship between different types of working memory (i.e., verbal, numerical, and spatial) and their effect on reading accuracy and comprehension. Other goals of their study included determining whether a link existed between working memory and reading ability, whether links in reading ability and working memory were primarily related to reading comprehension, and

whether the level of difficulty of the verbal or numerical task affected the connection between the task and reading ability (Oakhill et al., 2011). Their study included 197 students, who were 6 to 11 years of age. Each participant was given a reading accuracy assessment, a reading comprehension assessment, and working memory tests that addressed verbal, numerical, and spatial domains (Oakhill et al., 2011). The reading accuracy and comprehension assessment included oral reading passages that became progressively difficult. Reading accuracy was charted, and the students were corrected on misreads or words that they could not read. If the oral reading errors reached a pre-determined number, the oral reading assessment stopped to ensure that accuracy did not affect comprehension. The comprehension questions addressed both factual and inferential material from the text (Oakhill et al., 2011).

The working memory assessments included five tests that demanded participants store and process information simultaneously (Oakhill et al., 2011). The visual working memory tests consisted of two assessments, *Odd Word Out* and Aural reading span. The *Odd Word Out* assessment required students to listen a sequence of four single or two syllables words. One word within the group of four would not fit in the given category. The Aural reading span assessment required students to listen to three unconnected sentences and provide the last word in the sentence. After reading the third sentence and providing the last word, the participants were asked to recall all three words to assess each participant's ability to store and process information simultaneously. The reading span also required verbal encoding, phonological looping, sentence processing, and vocabulary skills (Oakhill et al., 2011).

The numerical working memory assessments also included two tests (Oakhill et al., 2011). The first numerical test required participants to choose the highest number from a set of three numbers read aloud and recall the three highest numbers chosen at the end of the third set. The second numerical test asked the participants to read three sets of three-digit numbers and recall the last digit in the number. The final test included a spatial working memory test. This test consisted of a three-dimensional version of tic-tac-toe. The participants were required to participate in several games where they were required to show where the final dot was needed to attain three in a row, or tic-tac-toe. After determining where the winning dot was needed, the participants were required to use a color strip that matched the color of the winning dot and place it in the correct position of the winning line (Oakhill et al., 2011).

The researchers concluded that the verbal working memory tests were greater predictors of reading comprehension than the numerical tests; however, the difference was not significant (Oakhill et al., 2011). Specifically, the numerical working memory test that required participants to recall the final digit was almost as high as a predictor of reading comprehension as the reading span test. Results of the spatial memory assessments were not conclusive enough to determine a strong correlation between spatial working memory ability and reading comprehension. The outcomes of the research provided evidence that working memory was impacted by tasks that required students to store and process information simultaneously. Assessments of working memory that included processing tasks were greater predictors of reading comprehension levels than vocabulary or word recognition. The outcome and implications of this study indicated that identifying deficits in working memory at an

early age and providing cognitive training had positive results on reading comprehension levels (Oakhill et al., 2011).

Effective Reading Comprehension Strategies

Effective reading instruction strategies for students with learning or intellectual deficits aligned with research presented by the National Institute of Child Health and Human Development (NICHD; Allor et al., 2010). In 2000, the NICHD released the NRP Report (NICHD, 2000). The NRP suggested eight, evidence-based practices to improve reading comprehension for struggling readers. These strategies included multiple comprehension strategy instruction through reciprocal teaching strategies, comprehension monitoring (metacognitive strategies), collaborative reading strategies, graphic/semantic organizers, question generating, question answering, story structure, and summarization (NICHD, 2000). Students with cognitive deficits or learning disabilities benefitted from new instructional strategies (Accardo, 2015; Basil & Reyes, 2003). Students with working memory deficits and/or learning disabilities needed a combination of research-based reading practices as well as cognitively focused instruction (Kendeou et al., 2014).

National Reading Panel Strategies

For students with working memory or cognitive deficits to be successful, Powell and Kalina (2009) suggested that educators construct learning environments that supported and built upon students' current mental structures. Teachers that implemented collaborative reading strategies created environments where students worked in groups to scaffold and support each other's comprehension of text (Klingner, Vaughn, Arguelles, Hughes, & Leftwich, 2004). Classrooms that implemented collaborative

reading strategies saw significant growth on grade level comprehension pretests and posttests (Klingner et al., 2004). Instructional strategies, such as structuring or organizing information, scaffolding processing, and strategically sequencing the presentation of information, proved effective in optimizing students' processing and working memory levels (Ertmer & Newby, 2013; Wooley, 2001). The use of graphic organizers, story maps, mnemonics illustration, and study guides facilitated comprehension for students with cognitive deficits (Elleman & Compton, 2017; Griffin, Malone, & Kameenui, 1995; Jitendra & Gajria, 2011). Griffin and colleagues (1995) discovered that students receiving explicit instruction using graphic organizers had higher posttest and recall scores than students in the control group. Students receiving explicit instruction on graphic organizers also had highest transfer measure scores (Griffin et al., 1995). Story mapping or story structure instruction utilizes graphic organizers to teach students story elements or a framework for understanding narrative text (Alves, Kennedy, Brown, & Sollis, 2015). Alves and colleagues (2015) found a significant correlation between increased reading comprehension, explicit instruction, and interventions on story mapping.

Cognitive theorists also recommended that students become active participants through reciprocal teaching strategies and self-monitoring comprehension to improve their ability to store, activate, and apply learning (Boulware-Gooden, Carreker, Thornhill, & Joshi, 2007; Ertmer & Newby, 2013; Jitendra & Gajria, 2011; Lysynchuk, Pressley, & Vye, 1990; Powell & Kalina, 2009; Wooley, 2001). Elousa, Garcia-Madraga, Vila, Gomez-Veiga, and Gill (2013) recommended that teachers train students with working memory deficits to use metacognitive strategies to monitor their reading

comprehension. Metacognitive strategies are practices and techniques that allow students to monitor and evaluate their performance in completing a cognitive task (Boulware-Gooden et al., 2007; Dole et al., 2009; Elousa et al., 2013). Iwai's (2016) review on metacognitive reading strategies suggested that explicit instruction on metacognitive strategies used before, during, and after reading resulted in increases in reading comprehension rates for at-risk learners. Self-monitoring or metacognitive strategies combined with summarization strategies had significant implication for improving the reading comprehension of students with learning disabilities (Jitendra, Hoppes, & Xin, 2000). Summarization strategies draw students' attention to the main idea and significant events in the text (Jitendra et al., 2000).

Reciprocal questioning or question generation, which included students developing their own questions about a reading selection, improved reading comprehension for students with learning or cognitive disabilities (Davey & McBride, 1986; Jitendra & Gajria, 2011; Wooley, 2001). Question-answer strategies taught students to identify relationships between comprehension questions, the text to which the question referred, and the reader's knowledge base applicable to the question (Raphael & Pearson, 1985). Readers were trained to identify questions where answers were found explicitly in text, answers were integrated in text, and answers were a combination of text and the reader's prior knowledge. Raphael and Pearson (1985) found that these strategies were particularly effective for average and low ability readers. Table 1 presents an overview of the evidence-based strategies recommended by the NRP (NICHD, 2000)

Table 1

Evidence-Based Strategies for Reading Comprehension

PRACTICE	STUDY	PURPOSE	PARTICIPANTS	OUTCOMES
Collaborative Reading Strategies (CRS)	Klingner et al. (2004)	• Determine effectiveness of CRS for enhancing reading comprehension of students with learning disabilities • Measure strategic knowledge acquired by students in CRS classrooms • Measure teacher implementation of CRS • Determine ways in which teacher characteristics influence their learning and use of comprehension strategies	• 10 classroom teachers from five schools in a large metropolitan district in the southeast United States • 211 students, predominantly Hispanic	• Students in CRS classrooms showed statistically significant gains in reading comprehension • Teacher implementation of CRS varied perhaps due to experience, knowledge, and confidence
Metacognitive Strategies	Boulware-Gooden et al. (2007)	• Determine the effectiveness of systematic direct instruction using multiple metacognitive strategies to improve students' reading comprehension	• 119 third-grade students from two urban elementary schools in the southeast United States	• Metacognitive reading instruction significantly improved academic achievement of third-grade students in domains of vocabulary and comprehension
Graphic and Sematic Organizers	Griffin et al. (1995)	• Investigate whether instruction on graphic	• 97 elementary school students from a small, Midwestern city	• Students receiving explicit instruction using graphic

		organizers improves comprehension, recall, and transfer of information from expository text • Investigate what degree of explicit instruction is necessary for independent generation and use of graphic organizers		organizers had highest posttest and recall scores • Students receiving explicit instruction and graphic organizers also had highest transfer measure scores.
Question Generating	Davey & McBride (1986)	• Explore effects of training students to generate questions on comprehension performance	• 125 sixth-grade students	• Significant effects of training in question generation on nature of questions generated, accuracy of comprehension question responses, and on accuracy between actual and predicted comprehension question performance.

Question Answering	Raphael & Pearson (1985)	• Examine role of knowledge of information sources in students' question-answering abilities through the examination of an instructional program designed to heighten their awareness of information sources	• 59 sixth-grade students with various reading ability levels	• Instruction on question and answer relationships improved students' awareness of task demands • Instruction improved quality of students' answers • Students demonstrated greater consistency between their recognition of a QAR category and the source of information used to answer questions
Summarization	Jitendra et al. (2000)	• Investigate effectiveness of a main idea strategy and self-monitoring instructional procedure for improving reading comprehension in students with learning and behavioral disabilities	• 33 middle school students with disabilities	• Students in experimental group outscored students in control group • Increased reading comprehension on posttest and delayed posttest measures

Reciprocal Teaching Strategies	Lysynchuk et al. (1990)	• Investigate reading comprehension growth for students taught reading comprehension using reciprocal teaching strategies (i.e., prediction, clarification, question generation, and summarization)	• 72 Grade 4 poor readers	• Greater increase from before to after training on standardized test of reading comprehension
Story Structure	Alves et al. (2015)	• Investigate the effectiveness of story grammar instruction as a means to improve the reading comprehension of students with learning disabilities and who were struggling students	• eight students (six Grade 3; two Grade 5) identified as students with disabilities or struggling readers	• Explicit instruction on story grammar improved reading comprehension of all participants

Additional Cognitively-Focused Strategies

Several theorists recommended direct instruction of reading comprehension strategies to assist students with working memory deficits or learning disabilities (Elleman & Compton, 2017; Jitendra & Gajria, 2011; Kendeou et al., 2014). Multi-modal presentation of content was recommended to support reading comprehension skills and strategies (Elleman & Compton, 2017; Kendeou et al., 2014). Presenting text orally required less working memory because struggling readers were not asked to decode, apply specific vocabulary levels, or read fluently (Kendeou et al., 2014). Reduction of memory load or chunking reduced the amount of information to be stored, manipulated, and retrieved at one time (Gathercole & Alloway, 2007).

Selecting appropriate levels of text was suggested as another cognitive approach to improving reading comprehension (Elleman & Compton, 2017; Kendeou et al., 2014). Cognitive research indicated that selecting appropriate levels of text based on the purpose of use could improve academic outcomes for struggling readers. If the purpose of instruction was to improve reading skills, teachers were advised to choose Lexile levels closest to the student's ability level and steadily increase the level of difficulty as students became more proficient in the comprehension skill or strategy. If the purpose of instruction was content mastery, selecting reading material that required less cognitive processes or presented important material explicitly and close together were recommended (Elleman & Compton, 2017; Kendeou et al., 2014). Finally, a multi-strategy framework of instruction, which combined visual and verbal cognitive processes with reading instruction, improved reading comprehension (Elleman & Compton, 2017; Jitendra & Gajria, 2011; Wooley, 2001).

Kendeou and colleagues (2014) suggested that teachers select appropriate materials that supported students' working memory deficits and mastery of reading comprehension skills and strategies. Making inferences was described as a higher-level cognitive process that allowed the reader to build connections between the text and relevant background knowledge (Kendeou et al., 2014; Oakhill, Cain, & Bryant, 2003). Inability to make inferences was cited as a significant factor in comprehension difficulties because readers were unable to make connections that constructed a clear understanding of text representations (Kendeou et al., 2014). Making effective inferences required background knowledge. When applying interventions to increase students' ability to make inferences, Kendeou and colleagues (2014) suggested that the

texts chosen for instruction should not require background knowledge that the students did not possess. The researchers recommended that new information be presented gradually, with significant scaffolding and support to ensure that the students developed a clear representation of the new knowledge that was applied to a connected text (Kendeou et al., 2014). Clearing up content misconceptions or incorrectly learned prior knowledge was also suggested as an intervention that improved students' ability to make inferences (Kendeou et al., 2014).

Finally, a clear understanding of the cognitive processes required during reading comprehension improved the selection and implementation of appropriate intervention strategies (Kendeou et al., 2014). Kendeou and colleagues (2014) recommended that teachers be well informed on the cognitive processes required for reading comprehension, from lower level processes like decoding to higher-level processes like making inferences. Kendeou and colleagues (2014) suggested early identification of working memory and processing deficits and knowledge of interventions that assisted students in activating the correct cognitive process at the right time to affect reading comprehension positively (Kendeou et al., 2014).

Working Memory Training

Over the last 20 years, educational researchers investigated the implications of working memory training or interventions that improved working memory, cognitive functioning, attention allocation, and academic achievement (Randall & Tyldesley, 2016). Morrison and Chein (2011) identified two working memory training approaches: strategy training and core training. Strategy training involved the instruction and rehearsal of domain-specific strategies to assist learners in retaining information (Lee,

2014; Morrison & Chein, 2011). Core training, often implemented through computer-based programs and software, included practicing and repeating cognitively difficult tasks that strengthened the central executive (Lee, 2014; Morrison & Chein, 2011). Numerous studies indicated that working memory training, especially those participants who trained using adaptive software, resulted in significant gains in working memory levels (Alloway et al., 2009; Dahlin, 2011; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Karbach et al., 2013; Kearns & Fuchs, 2013; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016). Furthermore, adaptive working memory training programs provided transfer effects that improved reading comprehension (Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011). Though several studies found no evidence of transfer of increased working memory levels to academic gains, the implications of computer-based interventions that increased working memory levels were profound (Baddeley, 2012; Dunning et al., 2013; Holmes et al., 2009; Kendeou et al., 2014).

Strategy training. Strategy training consisted of direct instruction on effective strategies to encode, retain, and retrieve information from working memory (Lee, 2014; Morrison & Chein, 2011). The foundational theory of strategy training developed from Flavell, Beach, and Chinsky's (1966) research concluded articulatory rehearsal of information increased memory retrieval (Lee, 2014). Flavell and colleagues (1966) suggested that success on working memory tasks required mental rehearsal (Lee, 2014). Strategy training evolved to include the rehearsal of strategies to assist in encoding information and utilizing mnemonic devices to assist in retrieving information (Lee, 2014; St. Clair-Thompson, Stevens, Hunt, & Bolder, 2010).

St. Clair-Thompson and colleagues (2010) explored using memory strategy training to improve classroom performance. Participants included 250 students with ages 5 to 8 years old (St. Clair-Thompson et al., 2010). These participants were given pre-test assessments that targeted the effectiveness and capacity of the phonological loop, visuo-spatial sketchpad, and central executive. Selected groups of participants were assessed on their ability to follow instructions, demonstrate mental arithmetic, and perform on standardized subtests involving both reading and mathematics. The experimental group participated in working memory strategy training using *Memory Booster*, a computerized program to enhance students' memory by training them to chunk information. The control group was not provided with any specific training to improve working memory. Posttests on memory and ability measures as well as the standardized tests were also administered after the experiment. The students who participated in working memory strategy training showed significant improvements on memory and ability measures, following directions, and demonstrating mental arithmetic. No significant increases in student performance on the standardized assessments were noted (St. Clair-Thompson et al., 2010).

Garcia-Madruga and colleagues (2013) investigated whether working memory training resulted in positive reading comprehension gains for primary students. The study consisted of two experiments (Garcia-Madruga et al., 2013). Experiment 1 included 31 third-grade students, who were assigned randomly to an experimental or control group. The same reading assessment, which measured prior knowledge, text memory, making inferences, and integration of prior and new text information, was used for pretest and posttest measures. Pretest and posttest levels of working memory and

nonverbal fluid intelligence were evaluated. Working memory training was integrated into regular classroom reading instruction, 50 minutes daily for 12 days. The training program focused on four primary executive functions (i.e., focusing, switching, connecting, and inhibition control). Training included explicit instruction on the executive function required to complete each task, modeled examples, scaffolded practice, and independent practice. The level of difficulty of each task and text items were increased during the experimental period. The control group continued normal reading comprehension instruction during the same period. Results of Experiment 1 indicated significant increases in reading comprehension, intelligence, and working memory for students participating in the experimental group. A small number of participants, a weak measure of working memory, and a large time span between the pretests and posttests were listed as limitations for Experiment 1 (Garcia-Madruga et al., 2013).

Experiment 2 consisted of a more in-depth study that investigated the efficacy of the tasks and interventions selected, expose any effects of reading comprehension abilities among participants, and examine effects of working memory training on specific components of reading comprehension (Garcia-Madruga et al., 2013). Participants included 40 students, who were divided into two groups based on reading comprehension abilities. Pretest and posttest measures included the same reading comprehension and intelligence assessments used in Experiment 1; however, an analogy test for working memory, a semantic updating test, and a visuospatial working memory test were used in Experiment 2. The training program used in Experiment 1 was applied after revisions to address efficacy, frequent misunderstandings, level of difficulty, and

amount of guided and independent practice. Results indicated increases in several components of reading comprehension, including reading memory, making inferences, and content integration. The participants also showed significant increases on the intelligence test, analogies working memory test, semantic updating test, and visuospatial span test. The group with lower initial reading comprehension scores showed greater gains in reading comprehension abilities than the higher group. Students with higher initial reading comprehension rates showed greater gains on the fluid intelligence assessment. The limitations of the study, when applying the results to other studies addressing a positive correlation between working memory training and improved reading comprehension, consisted of (a) a greater focus on training on the executive processes of working memory as opposed to working memory storage, (b) the use of a single measure to evaluate fluid intelligence or reading comprehension abilities, and (c) the use of a control group who did not receive any additional contact to balance the amount of additional contact and support received by the experimental group (Garcia-Madruga et al., 2013).

Core training. Core training consisted of activities and tasks that involved the repetition of difficult working memory tasks, such as sequencing and updating memory (Lee, 2014; Morrison & Chein, 2011). These tasks repeatedly targeted verbal and/or visual memory to strengthen the attention allocation, decision making, and conversion of verbal or visual short term memory to working memory. Several studies identified a positive correlation between core memory training and increased working memory capacity (Dahlin, 2011; Dunning et al., 2013; Holmes & Gathercole, 2014; Holmes et al., 2009; Karbach et al., 2013; Loosli et al., 2012; Melby-Lervåg & Hulme, 2013).

Stockholm University professor, Karin Dahlin, conducted a study on the effects of working memory training on the reading comprehension rates of 57 primary school students with diagnosed learning disabilities and Attention Deficit Hyperactivity Disorder (ADHD; Dahlin, 2011). The experimental group, consisting of 42 students, participated in computerized working memory training 30 to 40 minutes daily for 5 weeks. *RoboMemo,* selected because of the specific focus on visuo-spatial and working memory activities, consisted of adaptable levels of difficulty based on participants' responses. The control group, comprised of 15 students, continued the services, schedule, and instructional programs determined prior to the study with no specialized training on working memory. All students who were selected participated in pretests that evaluated nonverbal reasoning ability, verbal working memory, visual-spatial working memory, inhibition control, reading comprehension, decoding, and spelling. Posttests were given to both groups at 6 weeks and at 6 to 7 months after working memory training was completed for the experimental group (Dahlin, 2011).

Results of Dahlin's (2011) study indicated that reading comprehension could be improved by working memory training. Though the working memory did not directly affect the decoding or spelling scores, the training resulted in a significant growth in working memory levels and reading comprehension for the experimental group (Dahlin, 2011). Two primary limitations were suggested in Dahlin's study. First, the number of participants was minimal, and the experimental group was almost three times larger than the control group. Second, the participants selected for the experimental group were provided more attention and support than the control group. This argument was refuted because significant improvements were only found in reading comprehension

assessments related to working memory as opposed to all assessment measures. Despite limitations, Dahlin's results confirmed the significance of working memory on reading comprehension. Dahlin suggested determining students' working memory abilities to assist in identifying students at risk for learning difficulties. Early screening for working memory ability was suggested as an alternative to a clinical evaluation for specialized instruction that might also suggest working memory deficits. Though the students who participated in the study were previously identified as students who are served in special education programs, results of the study indicated that working memory interventions might also benefit all students with identified reading and attention deficits (Dahlin, 2011).

Loosli and colleagues (2012) conducted a study on the impact of cognitive training interventions, such as working memory training, on elementary-aged students near Bern, Switzerland. The study consisted of an experimental and control group that participated in pretests and posttests (Loosli et al., 2012). The assessments evaluated nonverbal intelligence and oral reading fluency, which included the oral reading of pseudowords, familiar and compound words, and a short story. The experimental group participated in 10, brief sessions of computer-based interventions that consisted of a two-part working memory span task. In part one, participants were presented with a picture of an animal shown upside-down or in normal position. Participants were to respond if the presentation was correct or upside down. In part two, participants were asked to arrange the animals according to the sequence presented in part one. The presentation of animals was random in each task, with the level of difficulty adapted based on correct or incorrect student response. The researchers theorized that the task

would increase the participants' attention allocation and working memory level (Loosli et al., 2012).

Results of the study indicated significant growth for participants in the experimental group regarding performance on the working memory training tasks and oral reading fluency for single words and text (Loosli et al., 2012). The researchers attributed growth on the transfer task (i.e., improved reading of words and text) to the training task provided as an intervention. The intervention consisted of complex span tasks, which were associated with memory retrieval. The task improved the participants' memory retrieval rate, which resulted in increased oral reading fluency of single words and short text. The greatest gains were found in the oral reading fluency of short texts with semantic content, which required the greatest amount of working memory capacity. Though an inactive control group and a brief intervention period were listed as limitations, the results provided additional evidence supporting the use of cognitive interventions to improve reading achievement. The research occurred in a school-based setting, and the implications for the use working memory interventions to improve the reading ability of elementary students were significant (Loosli et al., 2012).

German researchers Karbach and colleagues (2013) extended the research conducted by Loosli and colleagues (2012) regarding investigating whether working memory training impacted reading ability. This research included three primary questions: (a) Does adaptive (level of difficulty of tasks adapts to participant response) working memory training result in greater benefits than non-adaptive (level of difficulty was simple and consistent) training; (b) Do the benefits of working memory training transfer to executive control tasks (i.e., updating, task switching, and inhibition); and, (c)

Do the benefits of working memory training transfer to academic performance on reading and math (Karbach et al., 2013).

Participants included 28 elementary students between 7 to 9 years of age, evenly divided into an experimental and control group (Karbach et al., 2013). Age and gender, as well as a baseline pretest that measured processing speed, working memory levels, and reading and math abilities, were balanced within the experimental and control groups. A posttest was administered after the 14 working memory training sessions as well as a 3-month follow-up test. Like other studies referenced within this review, this method of working memory training consisted of computerized tasks. Each working memory training session lasted for 40 minutes. Results of their investigation indicated that adaptive working memory training provided greater benefit to participants than non-adaptive training regarding improving success on tasks that required working memory. Regarding the transfer effects of working memory training on executive functions, results indicated that adaptive training improved specific executive control tasks, such as updating but did not improve task switching or inhibition. The most significant and relevant data presented within this study was the direct relationship between adaptive working memory training and increases in reading achievement scores (Karbach et al., 2013).

The results of Karbach and colleagues' (2013) experiment concurred with those results presented by Loosli and colleagues (2012) regarding the transfer of adaptive working memory training on increased academic domains such as reading. When comparing the individual differences, participants with working memory deficits and low reading pretest scores showed the greatest transfer benefits, which suggested that

cognitive interventions in clinical and/or school-based settings had significant implications for improving student achievement (Karbach et al., 2013). Though working memory training did not result in transfers to increased mathematics ability, the researchers attributed the results to the type of working memory targeted during the training sessions. Working memory training that focused on both verbal and visuospatial working memory would have resulted in better data regarding mathematics achievement. The experimental group also showed significant increases in their performance on untrained working memory tasks (Karbach et al., 2013). This outcome correlated with other studies (Klingberg et al., 2005; Klingberg, Forssberg, & Westerberg, 2002) that indicated that working memory ability was improved by working memory training. These results had significant implications for improving cognitive plasticity, the brain's ability to change during childhood (Karbach et al., 2013).

Holmes and Gathercole (2014) attempted to replicate laboratory studies on increasing working memory levels using schools and classroom teachers. The experiment consisted of two trials (Holmes & Gathercole, 2014). Trial 1 focused on using school staff and computerized working memory training software to improve students' working memory capacity. Trial 2 sought to determine whether working memory training implemented in school environments could lead to improvements in student learning (Holmes & Gathercole, 2014).

Trial 1 included 22 students with an average age of 8 years (Holmes & Gathercole, 2014). The students participated in 20 to 25 computerized working memory-training sessions in a school computer lab. The participants' regular classroom teacher led the training with the assistance of a school paraprofessional. Both the teacher and

paraprofessional participated in specialized training on the use and purpose of the software prior to the experiment. The participants were assessed on their working memory levels before and after the training. Over 90% of the participants completed the recommended training protocol. The post-experiment assessment included gains in all eight areas of working memory assessed with the greatest gains in visuo-spatial short-term memory, verbal memory, and visuo-spatial working memory (Holmes & Gathercole, 2014).

Trial 2 included 50 participants, evenly distributed in Grades 5 and 6, with identified areas of academic difficulty based on teacher assessments and observations during the prior school year (Holmes & Gathercole, 2014). The study also included an experimental group of students with similar assessment scores and demographics as a control group. The 50 students in the experimental group participated in the same computerized, working memory training program utilized in Trial 1. Academic gains were evaluated using the school's required growth model, which consisted of the curriculum levels and national standards for English and mathematics. In the United Kingdom, each content area had 10 progressive levels students must reach as they progress through the educational program. Within each level, there were three sublevels. Students were expected to move at least two sublevels during each academic year. In comparison with the control group, participants in the Grade 5 experimental group made greater academic gains in math; however, the experimental group showed greater gains in English. In the Grade 6, the experimental group showed greater gains in English and mathematics than the control group (Holmes & Gathercole, 2014).

Though the transfer of working memory training to increased student achievement in specific contents varied, Holmes and Gathercole's (2014) study had significant implications for improving student learning. Results indicated that working memory training could be successfully implemented in classrooms to large numbers of students with positive outcomes correlated with increased working memory levels and academic achievement (Holmes & Gathercole, 2014). The researchers suggested that schools and districts utilize working memory training as a cost-efficient, early intervention strategy to improve student-learning outcomes (Holmes & Gathercole, 2014).

Opposing viewpoints: Studies with contrary findings. Holmes and colleagues (2009) investigated the sustained effects of adaptive working memory training on elementary-aged students with identified deficits in working memory. Participants included an experimental group of 22 students provided with an adaptive, computerized training on working memory tasks (Holmes et al., 2009). The control group consisted of similar demographics; however, the group participated in a non-adaptive, computer program. Pretest and posttest assessments included measures that evaluated short term and working memory levels (i.e., verbal and visuo-spatial), verbal and performance intelligence quotient (IQ), reading ability, and mathematical reasoning. Training, which consisted of at least twenty 35-minute sessions, occurred in a school environment. A compensated research assistant supervised the computerized training sessions, which were administered in small groups of four or five students (Holmes et al., 2009).

Results of the study indicated that the experimental group, which participated in the adaptive, computerized program, increased their working memory levels on the

posttest and on a follow-up screener 6 months later (Holmes et al., 2009). The greatest gains on working memory assessments not associated to tasks within the computer program were visuospatial material storage and tasks that involved storing and manipulating visuospatial or verbal information simultaneously. These tasks required attention allocation, a function of the central executive component of working memory. This finding had significant implications for learning because the inability to appropriately store or process information simultaneously was strongly correlated to learning disabilities. Though the results included increases in working memory and executive control functions, the researchers found no correlation between working memory training and immediate increases in academic ability. Improvements were noted in math performance scores on the 6-month follow-up assessments for participants receiving adaptive training. The researchers suggested that the significant gains in working memory increased the neural plasticity of participants, which had profound implications for elementary-aged learners (Holmes et al., 2009).

Dunning and colleagues (2013) extended their investigation in determining whether working memory training led to long-term, academic gains for elementary-aged participants. A randomized controlled trial was performed to investigate whether adaptive working memory training transferred to improvements on non-trained working memory tasks and classroom activities that required large amounts of working memory, such as following instructions, sentence word-counting and recall, and detecting rhymes (Dunning et al., 2013). Ninety-four, elementary-aged participants were selected based on working memory screening measures that indicated the participants were within the bottom 15th percentile of the 810 students who were screened (Dunning et al., 2013).

The participants were divided into three groups: adaptive treatment group, non-adaptive treatment group, and control group. Both the adaptive and non-adaptive group participated in a computer-based program called *Cogmed Working Memory Training* (CWMT). The pretest and posttest assessments measured performance on classroom-based tasks, working and short-term memory screeners, ability tests (i.e., verbal and performance IQ, math reasoning, and reading ability), and cognitive assessments. Working memory training for both control groups consisted of 20 to 25 sessions of CWMT, which lasted 30 to 45 minutes per session. Training was provided to small groups of students within a school environment. Both groups received motivational rewards for participation with comparable time on task (Dunning et al., 2013).

The randomized controlled trial resulted in significant gains in performance on non-trained working memory tasks, such as those tasks that required visuospatial short-term memory and verbal and visuospatial working memory (Dunning et al., 2013). In addition, gains in verbal working memory were noted in 1-year follow-up assessments. Like the earlier Holmes and colleagues (2009) study, adaptive working memory training did not result in gains in verbal short-term memory. Unlike the earlier study, the adaptive treatment group did not show improvement in classroom tasks, such as following instructions. No significant improvements were noted in participants' scores on non-verbal IQ, reading or math standardized assessments, or attention allocation. The researchers suggested that the implications for using working memory training as an early intervention to improve student learning were significantly enhanced by providing direct instruction on the application working memory on every day, academic tasks that required working memory (Dunning et al., 2013).

Melby-Lervåg and Hulme (2013) conducted a meta-analytic review of 23 studies related to the theory that working memory training leads to both near and far transfer effects on working memory capacity and other skills, such as reading or mathematics ability. The researchers established clear criteria in selecting studies in their review to ensure the validity of the overall results (Melby-Lervåg & Hulme, 2013). Primarily, studies included an experimental group, a treated or untreated control group, and pretest and posttest assessment. Experimental group included participants of various ages, languages, and cognitive abilities; however, most of the participants were of average cognitive and developmental ability. Treatment methods consisted of a minimum of a 2-week intervention period that included computer-based or task-specific working memory training. Results of the meta-analysis indicated that working memory training led to near transfer effects regarding verbal and visuospatial working memory. Transfer effects were not evident in follow-up screening. No significant results were noted regarding far transfer effects on word decoding, verbal ability, or math ability (Melby-Lervåg & Hulme, 2013).

Banales, Kohnen, and McArthur (2015) sought to determine the link between poor verbal working memory and poor reading accuracy. The study was used to test whether working memory training improved reading accuracy or verbal working memory ability (Banales et al., 2015). The researchers also tested whether reading training improved reading accuracy or verbal working memory. Participants included four students who were 9 to 10 years of age in Grades 3 through 5 and were identified with both poor verbal working memory and reading accuracy abilities. Each student participated in 8 weeks of verbal working memory training and 8 weeks of reading

accuracy training. The results gathered on the final assessment period indicated that verbal working memory training increased verbal working memory but not reading accuracy for two of the four students. Reading training increased reading accuracy for all four students but did not increase verbal working memory (Banales et al., 2015).

The eligibility measures included assessments on sight word reading, decoding, and verbal working memory assessments (Banales et al., 2015). Additional screeners were also used throughout the study that evaluated sight word and decoding fluency, comprehension, irregular and nonsense word spelling, vocabulary, verbal short-term memory, visuospatial short-term memory, nonverbal intelligence, hyperactivity, and attention. Interaction with the participants was broken into four 8-week periods: baseline period with no training, verbal working memory training period, washout/consolidation period with no training, and reading training period. Assessments and experimental tests were given before and after each period (Banales et al., 2015).

Verbal working-memory training and the reading training program were administered by the same researcher (Banales et al., 2015). Verbal working memory training consisted of two parts: *Animal N-Back*, a series of animals was listed orally, and participants were asked to recall the last animal listed; and, *Listening Recall*, one or more sentences were read orally, and participants were asked to state whether each sentence was true or false. The reading training program utilized was the *Reading Tutor Program* by MultiLit®. This program included training on work attack skills that focused on accuracy, fluency, and spelling; sight word recognition that included irregular words; and, reinforced reading, which consisted of participants orally reading texts appropriate to their reading level. When the participants made an oral reading error,

they were provided corrective prompts or given the correct word by the trainer. When the participant utilized the prompt to self-correct, they were praised. After completing the oral reading passage, the participants were asked four to five general comprehension questions (Banales et al., 2015).

As mentioned earlier, two of the four participants showed increases in verbal working memory ability after 8 weeks of verbal working memory training (Banales et al., 2015). All four participants showed increases in some form of reading accuracy after reading training. None of the participants demonstrated an immediate or delayed increase in reading accuracy due to working memory training. Therefore, the results of this study did not support results from previous studies cited above (i.e., Dahlin, 2011; Holmes & Gathercole, 2014; Loosli et al., 2012; Oakhill et al., 2011) that indicated that working memory training positively correlated to increases in specific literacy components. Several limitations were noted within the study. First, only four participants were chosen for the study. Second, the reading training program was evidence-based as opposed to the experimental, working memory training tasks that were designed by the researchers. Finally, two participants did not respond to working memory training or reading training, which suggested that these participants required a more intensive intervention for both working memory and reading accuracy improvement (Banales et al., 2015). Table 2 presents a summary of the studies related to working memory research discussed in the literature review.

Table 2

Studies Related to Working Memory

STUDY	PURPOSE	PARTICIPANTS	DESIGN/ ANALYSIS	OUTCOMES
Holmes et al. (2009)	Investigated whether computer-based working memory training programs could increase working memory levels, IQ, and academic achievement in reading and math.	42 students (mean age 9); 22 adaptive program; 20 non-adaptive program	Quantitative: Experimental Design, Pretest/ Posttest, Non-randomized	• Increased visuo-spatial working memory for students in adaptive program. • No significant impact on verbal working memory for students in either program. • Significant boost in math performance for students in adaptive program 6 months after study.
St. Clair-Thompson et al. (2010)	Explored working memory training programs to improve academic performance.	250 students (ages 5 to 8)	Quantitative: Experimental, Non-randomized; Pretest/Posttest (5-month follow-up)	• Participants showed improvements in working memory tasks. • No significant improvements found regarding academic performance.
Oakhill et al. (2011)	Investigated relationship between different types of working memory (i.e., verbal, numerical, spatial) and the impact on reading accuracy and comprehension.	197 students (ages 6 to 11)	Quantitative: Non-experimental, non-randomized, Correlational and Regression Analyses	• Correlations were found between deficient scores on working memory tasks that required processing and poor reading comprehension. • Screening primary aged students using working memory tasks that require symbolic processing and providing intensive cognitive and reading interventions can positively impact reading comprehension.
Dahlin (2011)	Investigated the effects of working memory training on improved reading comprehension ability.	42 students (elementary aged); diagnosed learning disability and ADHD)	Quantitative: Experimental Design, Pretest/Posttest Non-randomized	• Reading comprehension and working memory levels significantly improved with working memory training.

Loosli et al. (2012)	Studied the impact of working memory training and interventions on working memory levels and non-trained academic measures such as reading performance.	60 students (ages 9 to 11)	Quantitative: Experimental Design, Pretest/Posttest Matched control group, non-randomized	• Significant improvements on training working memory tasks and oral reading fluency for single words and text. • Increased working memory retrieval rate.
Dunning et al. (2013)	Explored benefits of working memory training beyond standard working memory tasks to typical classroom activities such as following instructions, detecting rhymes, sentence counting, and recall.	94 students (ages 7 to 9) with low working memory levels	Quantitative: Experimental, Randomized, controlled design. Pretest/Posttest	• Adaptive working memory training was associated with improved working memory skills. • No improvements in typical classroom tasks or cognitive assessments. • Gains in verbal working memory were sustained after one year.
Garcia-Madruga et al. (2013)	Investigated working memory training effects on reading comprehension.	31 students (ages 8 to 9)	Quantitative: Intervention/ Experimental Design, Pretest/Posttest Randomization	• Experiment 1: Training on executive process were correlated to improvements in reading comprehension, fluid intelligence, and working memory. • Experiment 2: Increases in reading memory, making inferences, and content integration. • Students with lower working memory levels prior to intervention showed the greatest gains.
Karbach et al. (2013)	Investigated effects of adaptive and non-adaptive working memory training. Investigated transfer effects of working memory training on executive control tasks (e.g.,	28 students (ages 7 to 9)	Quantitative: Experimental, Pretest/Posttest Design, randomized experimental and control groups	• Adaptive working memory training was positively correlated to improvements i the executive function of updating information. • Adaptive working memory training was positively correlated to increases in reading achievement.

	updating, task switching, and inhibition) and academic performance.			
Holmes & Gathercole (2014)	Investigated whether computerized working memory training increases working memory levels and academic performance.	Trial 1: 22 students (ages 8 to 9) Trial 2: 100 students (ages 8 to 9); 50 experimental group, 50 control group	Quantitative: Trial 1: Experimental, Pretest/Posttest Design (no control group; non-randomization) Trial 2: Experimental, Pretest/Posttest Design, non-randomization, matched control group	• Trial 1: Significant gains across several areas of working memory were noted after working memory training. • Increases in visuo-spatial short-term memory and verbal and visuo-spatial working memory. • Trial 2: Significant correlation between adaptive, computerized working training program and improved reading and math achievement.
Banales et al. (2015)	Used working memory and reading interventions to determine a causal link between verbal working memory and reading accuracy.	four students (ages 9 to 10)	Quantitative: Experimental, Pretest, Posttest Design, no control group, non-randomization	• Verbal working memory tasks improved for 50%. • One participant had sustained verbal working memory 8 weeks after training. • No significant improvements in reading accuracy after working memory training. • All participants improved in reading accuracy after reading accuracy training. • One participant showed improvements in working memory after reading accuracy training.

Special Education Teacher Self-Efficacy

Research

Studies regarding teacher self-efficacy originated from Rotter's research on social learning theory and Bandura's concept of self-efficacy (Green, 2012). Rotter's

social learning theory centered around outcome expectancy, the perception that positive or negative outcomes were the result of specific behaviors (Green, 2012). Rotter (1954) hypothesized that motivation and behavior were influenced by the value that a person placed on a preferred outcome. Internal controls, or beliefs, and motivation overcame external controls and created positive change (Green, 2012; Rotter, 1954). Bandura's (1977) definition of self-efficacy formalized from his social cognitive theory. Bandura (1977) defined self-efficacy as the belief that one's ability and actions could produce desired outcomes. People with higher self-efficacy executed greater effort (Bandura, 1977; Green, 2012). Maddux, Sherer, and Rogers' (1982) research suggested that people who believed that a behavior was likely to result in a preferred outcome expressed greater confidence in their ability to perform the behavior than people who perceived a relatively weak relationship between the behavior and its outcome. Bandura (1982) theorized that expected outcomes influenced self-efficacy.

One of the earliest studies on teacher self-efficacy included Armour and colleagues' (1976) evaluation of elementary reading programs, sponsored by the RAND Corporation. This study, based on Rotter's (1954) social learning theory and outcome expectancy, required teachers to discern whether externals controls (home environment) or internal controls (teacher motivation and effort) had the greatest impact on student learning (Armour et al., 1976; Green, 2012). The researchers found that teacher self-efficacy was a strong predictor of student success (Armour et al., 1976; Green, 2012). Several studies followed that found significant correlation between high teacher self-efficacy and student achievement (Allinder, 1995; Collier, 2005; Green, 2012).

Tschannen-Moran, Hoy, and Hoy (1998) designed a model of teacher self-efficacy. Tschannen-Moran and colleagues (1998) suggested that teacher self-efficacy was specific to the context and situation. Teachers' self-efficacy was influenced by the content, setting, students, and outcomes (Tschannen-Moran et al., 1998). Tschannen-Moran and colleagues (1998) proposed using the self-efficacy model as a tool for identifying the factors behind the development, adaptability, and improvement of self-efficacy. Collier (2005) described teacher self-efficacy as a belief system that heavily impacted teacher behavior and, subsequently, student achievement. Tournaki and Podell (2005) found that teachers with higher self-efficacy were more likely to adapt to students' needs and provide individualized instruction. Similarly, Poulou (2007) suggested that teachers with high self-efficacy had higher expectations for their students, challenged them to meet goals, and believed that they could alter student motivation and performance. Muscella (2014) concluded that teacher perceptions and experiences affected their methods of instruction and construction of a high academic, learning environment. Juvora and colleagues (2015) reported that classroom instruction and the interaction between teachers and students were affected by teacher competency, personality, knowledge, and practical skills. School leaders that provided opportunities for teachers to increase their knowledge, skill level, and self-efficacy improved student outcomes (Juvora et al., 2015).

Teacher preparedness. Teacher perception of their preparedness to teach was the greatest predictor of their teacher efficacy (Bandura, 1977; Darling-Hammond et al., 2002; Ruppar et al., 2016). If teachers were not prepared to implement effective practices, their self-efficacy and willingness to attempt tasks were affected (Bandura,

1977; Ruppar et al., 2016). A review of literature on special education teacher preparedness included a focus on teacher preparedness during pre-service and the first 3 years of teaching as well as special education teachers' preparedness related to RTI (Caniglia, 2016). As with research on teacher understanding of working memory, the literature review revealed a significant gap between special education teachers' perceptions of their preparedness to teach students with disabilities effectively and their classroom practice (Bishop et al., 2010; Caniglia, 2016). Bishop and colleagues (2010) found that, overall, special education teachers describe themselves as being sufficiently prepared for their duties and instructional responsibilities as special education teachers; however, many participants indicated that their preparation regarding reading instructional methods and theories were insufficient. Bishop and colleagues' (2010) outcomes differed from Little and Dieker (2009), who reported that special education teachers stated that they were well-prepared to implement diverse instructional methods and learning strategies.

Though special education teachers generally perceived themselves as well-prepared, several areas were identified as a need for additional preparation (Caniglia, 2016). Special education teachers reported that they needed additional preparation on core curriculum to provide their students access to the general curriculum effectively (Bean & Lillenstein, 2012; Caniglia, 2016; Condermann & Johnston-Rodriguez, 2009). Special education teachers also reported deficiencies in their preparedness in knowledge about reading instruction (Bishop et al., 2010; Caniglia, 2016). Brownell and colleagues (2010) suggested that special education teachers receive additional preparation on the pedagogical content and practices in reading.

Teacher confidence. Teacher self-efficacy is derived from a teacher's belief in their ability to perform specific educational tasks with a high rate of quality and effectiveness in relation to improving student outcomes (Dellinger et al., 2008). High teacher self-efficacy was linked to high self-confidence in their skills and abilities as a teacher (Lee et al., 2011). Teacher confidence about their ability to improve student learning was derived from past experiences or school culture (Protheroe, 2008). Hoy and Spero (2005) suggested that teachers may feel adequately prepared to teach specific concepts; however, because they lacked positive experiences that resulted in success, they were not confident in their ability. Administrators who promoted mastery experiences for teachers and thoughtfully designed professional development experiences had staff members with a higher sense of teacher efficacy and confidence (Goddard, Hoy, & Hoy, 2000; Protheroe, 2008).

Self-Efficacy and Reading Instruction

Recent studies on special education teachers' self-efficacy, knowledge, and effective implementation of research-based reading comprehension strategies indicated an additional gap between research and classroom practice (Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011). These lower self-efficacy rates and gaps between research and classroom practice were often attributed to insufficient teacher preparation and limited in-service professional learning (Bishop et al., 2010; Brownell et al., 2010; Ruppar et al., 2016; Sharpe et al., 2016; Tschannen-Moran & Johnson, 2011). Bishop and colleagues (2010) found that beginning special education teachers' self-efficacy regarding engaging, effective reading instruction was limited due to insufficient preparation regarding theories and methods for reading comprehension instruction.

Teachers with access to a well-articulated curriculum, instructionally focused administrators, and continued professional learning on literacy instruction reported higher rates of self-efficacy (Bishop et al., 2010). Brownell and colleagues (2010) suggested that increasing special education teachers' self-efficacy for literacy instruction required additional preparation on the pedagogical content and practices in reading. Teacher preparation programs should provide more courses on cognitive strategy instruction to ensure that special education teachers develop a deep knowledge of language, literacy, and potential processing deficits (Brownell et al., 2010). King-Sears and Bowman-Kruhm (2011) discovered that middle school special education teachers had poor self-efficacy and knowledge regarding specialized reading instruction, describing specialized reading instruction as teaching reading through accommodations and modifications. Tschannen-Moran and Johnson (2011) found a stronger correlation between higher self-efficacy for literacy instruction and in-service professional learning than self-efficacy and higher levels of degree or years of experience. Table 3 presents a summary of studies related to teachers' self-efficacy regarding literacy instruction for students with disabilities.

Table 3

Studies Related to Teachers' Self-Efficacy Regarding Literacy Instruction for Students with Disabilities

STUDY	PURPOSE	PARTICIPANTS	OUTCOMES
Bishop et al. (2010)	• Determine similarities and differences in personal attributes and school environment among special education teachers with various	• 25 beginning elementary special education teachers	• Most struggled to provide engaging, effective reading instruction • Preparation regarding theories and methods for

	instructional abilities in reading		teaching reading was insufficient • Factors, such as well-articulated curriculum materials, instructionally focused administrators, and continued professional learning, positively impacted reading instruction
Dingle et al. (2011)	• Improve special education teachers' knowledge and implementation of reading instruction for upper-elementary students with reading disabilities • Monitor effectiveness of reading instruction after targeted professional development	• three special education teachers with varying levels of certification, prior knowledge in reading instruction, years of experience, and quality of professional development implementation in classroom	• Professional development positively impacted teachers' reading instruction • Teacher motivation and self-efficacy increased after professional development
King-Sears & Bowman-Kruhm (2011)	• Investigate middle and high school special education co-teachers' perception of planning and delivering specialized reading instruction for students with learning disabilities in co-taught classes	• 66 middle school and high school special education teachers	• Mixed responses regarding whether students whose IEP's require specialized instruction receive that instruction in co-taught classes • 67% stated these students receive specialized reading instruction some other time during the day • Majority of teachers felt more specialized reading

			instruction was needed • Poor understanding of specialized reading instruction
Ruppar et al. (2016)	• Examine special education teachers' perceptions of their preparedness to teach students with severe cognitive disabilities	• 104 special education teachers of students with severe cognitive disabilities	• Teachers felt prepared to complete IEP's and collaborate with peers • Less prepared to support students' physical and medical needs • Less prepared to incorporate universal design for learning and assistive technology
Sharp et al. (2016)	• Investigate relationship between pre-service teachers' self-efficacy of literacy instruction and knowledge of literacy essentials	• 70 pre-service elementary teachers • four males, 66 females	• Self-efficacy rates increased over time during literacy professional learning • Knowledge rate increased • Knowledge did not predict self-efficacy, nor did self-efficacy predict knowledge rate
Tschannen-Moran & Johnson (2011)	• Explored antecedents of self-efficacy beliefs for literacy instruction and the relationship between those beliefs and self-efficacy for teaching in general	• 648 teachers at 20 elementary schools and six middle schools in Virginia, Kansas, and Arkansas	• Teacher preparation regarding literacy has a significant correlation to self-efficacy for literacy instruction • Higher level of degree was not significantly correlated to self-efficacy for literacy instruction • In-service professional

			learning and collaborative study were significantly correlated to higher self-efficacy • Grade taught is significantly correlated to self-efficacy for literacy instruction • Self-efficacy for general instruction and literacy instruction are related constructs

Causes of low self-efficacy for special education teachers. Special education teacher preparation shifted significantly since the 1950s (Brownell et al., 2010). These shifts were caused by changes in the perceptions regarding teachers and learning, increased pressures of accountability, and extensive research on inclusion and instructional delivery (Brownell et al., 2010). Brownell and colleagues (2010) suggested that special education teacher preparation progressed through three eras: categorical, noncategorical, and integrated. The categorical era, designed to provide special education teachers with knowledge regarding the characteristics, assessments, and interventions for specific disabilities, produced high quality teachers, licensed and certified in specific programs. Research shifted to focus on a behavioral, process-product approach to teacher preparation that emphasized instructional strategies. Increased interest in curriculum, assessments, and interventions, combined with a shortage in certified special education teachers, caused most states to shift to a noncategorical, cross licensure teacher preparation program. The push for inclusion led to the integrated era of

teacher preparation. General education teachers needed more preparation on attending to individual differences and teaching students with disabilities. Special education teachers needed more training on collaboration, curriculum, and content driven learning. Integrated programs trained both general and special education teachers in the same program. Special education programs adopted constructivist principles that aligned teacher quality with teachers who could embed meaning and purpose into lessons to improve student outcomes. Schools that once offered disability specific programs evolved to "assembly lines" that produced dual-certified, collaborative partners for inclusive classrooms (Brownell et al., 2010).

Though alternative and dual certification programs improved the special education teacher shortage, the number of special education teachers certified and licensed in specific or multi-disabilities decreased due to attrition (Katsiyannis et al., 2003). Several researchers argued that noncategorical and integrated certification programs diminished the quality and skill set necessary for specialized instruction (Brownell et al., 2010; Green, 2012; Katsiyannis et al., 2003; Lee et al., 2011; Ruppar et al., 2016). These alternative certification programs also minimized the exposure to students with disabilities and opportunities to plan individualized instruction based on cognitive, social, emotional, behavioral, or physical deficits (Lee et al., 2011). Brownell and colleagues (2010) argued that the changes in special education teacher preparation programs did little to close the large achievement gap between students who were served in general and special education. Finally, Ruppar and colleagues (2016) suggested that special education teachers were unprepared to implement the myriad of specialized instructional strategies required for students who were served in special education.

Ruppar and colleagues (2016) recommended further research regarding special education teachers' perceptions of their preparedness to teach students with various disabilities. Research on teachers' perceptions, classroom practice, and professional development were recommended to develop a theory of teacher self-efficacy and proficiency (Ruppar et al., 2016). Brownell and colleagues (2014) designed a framework for measuring special education teacher quality using three variables: teacher qualification, teacher knowledge and classroom practice, and student outcomes. Providing targeted professional learning to improve special education teacher quality has significant implications for improving teacher self-efficacy and student outcomes (Brownell et al., 2014).

Self-Efficacy for Addressing Working Memory Deficits

Though extensive research on working memory deficits, interventions, and implications for learning existed, limited research specifically related to special education teachers' self-efficacy regarding addressing students' working memory deficits (Elliott et al., 2010). Morgan-Borkowsky (2012) investigated teachers' perceptions of the role that executive function skills played in student success. When asked to list the executive functions most critical to student success, general and special education teachers listed critical thinking and motivation (Morgan-Borkowsky, 2012). In fact, most responses were related to executive functions related to academic behaviors, such as analyzing, allocating attention, and making decisions. Only nine percent of participants listed memory as essential to student academic success. Only 39% of special education teachers listed *holding and working information in mind* significant to learning, and 53% of special education teachers reported that increasing memory

capacity could be taught with some difficulty. Finally, 21% of special education teachers stated they were unsure about the relationship between executive functions and student success or they were unfamiliar with the term (Morgan-Borkowsky, 2012).

Alloway and colleagues (2012) investigated teacher perceptions of working memory and classroom behavior. Their research indicated that teachers' understanding of working memory and self-efficacy was very low (Alloway et al., 2012). Few participants identified signs of working memory failure and effective strategies. The results indicated that participants were aware of working memory as a concept and easily identified problems in student behavior; yet, they were unable to provide the students with support (Alloway et al., 2012).

Muscella's (2014) qualitative study researched teachers' perceptions of brain-based learning instruction. Data indicated that the teachers were unfamiliar with brain-based learning strategies and methods (Muscella, 2014). Participants recognized mnemonics and classroom environment as significant components in brain-based learning. Though the participants indicated that their school districts had not provided formal training, six participants independently acquired brain-based learning training. Teacher perception data suggested that participants were willing and responsive to further their self-efficacy regarding brain-based strategies to increase the academic outcomes of students with disabilities (Muscella, 2014).

Reed's (2016) study on teachers' perceptions of executive functions rendered similar results to Morgan-Borkowsky (2012). Only 18% of participants indicated that they had sufficient knowledge on the impact of executive functions on learning (Reed, 2016). Participants stated that they were addressing executive functions deficits without

formal professional learning. Information regarding effective strategies to improve students' executive functions was provided by outside sources. Furthermore, 58% of participants rated themselves as equipped to teach executive function skills. These skills primarily included task completion and organization. Finally, 90% of participants stated that students need more instruction on executive function skills to increase academic success (Reed, 2016).

Elliott and colleagues (2010) studied the effectiveness of classroom-based interventions to improve working memory and academic achievement levels. One purpose of the study was to determine the most effective ways to prepare teachers with the necessary knowledge, skills, and understanding of working memory to implement effective interventions (Elliott et al., 2010). Though the findings did not reveal a relationship between working memory training and academic achievement, findings revealed key factors in preparing teachers to design a responsive environment for working memory training. Participant survey data indicated that their perceptions of their knowledge and classroom practices improved due to the professional learning provided during the study. They also reported that the students made progress; however, the progress was not noted on the standardized assessment, which was not uncommon when implementing innovative classroom interventions (Elliott et al., 2010).

Gathercole and Alloway (2007) provided practical suggestions for improving teacher self-efficacy and the implementation of cognitive strategies:

- Provide information on the purpose, use, and types of working memory.

- Provide information on academic tasks that required the use of working memory (i.e., mental arithmetic, reading comprehension, and following verbal directions).
- Provide information on limits or things that hindered the use of working memory (i.e., inattentiveness, trying to process too much information at one time, and cognitively difficult tasks).
- Provide information on the characteristics of working memory deficits (i.e., avoid answering questions, difficulty following directions, perceived inattentiveness, inability to retain information presented orally or in text, easily distractible, and poor academic progress in reading and/or math).
- Provide information on assessing working memory levels (i.e., Working Memory Checklist for Children, Working Memory Test Battery for Children, Automated Working Memory Assessment, and Working Memory Rating Scale). The Working Memory Checklist for Children was a teacher-friendly document that assessed student behaviors commonly associated with working memory deficits.
- Provide ongoing training and support on strategies to address working memory problems (i.e., identify working memory deficits, plan activities that demand less working memory space, reduce or chunk assignments, plan relevant or meaningful tasks, use memory aids, repeat important information, train the students to use memory strategies, and reduce tasks that require simultaneous processing; Gathercole & Alloway, 2007).

Gathercole and Alloway (2008) followed their classroom guide with a more specific text that provided insight on the practical and theoretical principles most effective in addressing students' working memory deficits (St. John, 2010).

Summary

Recent research suggested that teachers and administrators were under tremendous pressure regarding disproportionate numbers of minorities in special education, social promotion of at-risk learners, and closing the achievement gap among subgroups (Fuchs et al., 2010; Sullivan & Castro-Villarreal, 2013; Zadina, 2015). This pressure increased interest in non-traditional measures of educational reform (Fuchs et al., 2010; Sullivan & Castro-Villarreal, 2013; Zadina, 2015). Theories and strategies proposed by educational neuroscience had significant implications for improving student learning and academic outcomes (Ansari et al., 2011; Sigman et al., 2014; Zadina, 2015). Despite the availability of abundant research, studies indicated that a significant gap between educational neuroscientific theories and classroom practice existed (Aldrich, 2013; Ansari et al., 2011; Sigman et al., 2014; Zadina, 2015).

Research indicated that working memory was required for most academic tasks (Gathercole & Alloway, 2008; Randall & Tyldesley, 2016). Working memory deficits were linked to deficiencies in the processes required for reading comprehension (Kendeou et al., 2014). Readers with low working memory were unable to hold critical information while receiving new text (Kendeou et al., 2014). Effective strategies to improve reading outcomes for students with disabilities reflected many of the strategies recommended by the NRP (Allor et al., 2010; NICHD, 2000). These strategies included reciprocal teaching strategies, metacognition/comprehension monitoring, cooperative

learning, graphic/semantic organizers, question answering, question generating, story structure, and summarization (NICHD, 2000). Kendeou and colleagues (2014) suggested combining research-based reading practices with cognitively focused instruction to improve the reading proficiency of students with disabilities and at-risk. Cognitively focused interventions and instruction to improve reading outcomes included multi-modal presentation of text, adapting text complexity to instructional purpose and student needs, reciprocal questioning, and reduction of memory load or chunking (Gathercole & Alloway, 2007).

Studies on working memory training revealed that working memory training resulted in higher working memory levels (Alloway et al., 2009; Dahlin, 2011; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Karbach et al., 2013; Kearns & Fuchs, 2013; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016). Strategy training included direct instruction on effective strategies to encode, retain, and retrieve information from working memory (Lee, 2014; Morrison & Chein, 2011). Core training consisted of activities and tasks that involved the repetition of difficult working memory tasks, such as sequencing and updating memory (Lee, 2014; Morrison & Chein, 2011). Despite insignificant correlation between working memory training and increased student achievement, researchers overwhelmingly suggested that the implications on overall student progress were significant (Alloway et al., 2009; Baddeley, 2012; Dahlin, 2011; Dunning et al., 2013; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Holmes et al., 2009; Karbach et al., 2013; Kearns & Fuchs, 2013; Kendeou et al., 2014; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016).

Ruppar and colleagues (2016) found that special education teachers served students with varying learning disabilities. Working memory deficits were common among students with disabilities regardless of their specific eligibility (Alloway et al., 2009). Working memory deficits were also common characteristics of students with reading difficulties (Alloway et al., 2009; Dunning et al., 2013; Kendeou et al., 2014; Loosli et al., 2012; Zadina, 2015). Improving teachers' understanding of the impact of working memory on reading comprehension had significant implications for increasing reading proficiency (Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011). Continued professional learning, opportunities for collaboration, and scaffolding during implementation of specialized strategies improved teacher competency (Elliott et al., 2010). Effective principals provided teachers with the necessary tools to bridge the gap between research and classroom practice (Day et al., 2016). Bridging the gap between teacher competencies and successful application of working memory strategies have the potential to create a turning point in improving the reading proficiency of students who are served in special education (Alloway et al., 2009; Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011).

Several studies concluded that teacher self-efficacy was a strong predictor of student success (Armour et al., 1976; Green, 2012). Researchers established a significant correlation between high teacher self-efficacy and student achievement (Allinder, 1995; Collier, 2005; Green, 2012). Teachers with higher self-efficacy possessed more motivation and challenged their students to meet their high expectations (Green, 2012; Poulou; 2007). These teachers put forth more effort to increase student motivation and

performance (Green, 2012). Competency, knowledge, and experience affected teacher self-efficacy (Juvora et al., 2015). Juvora and colleagues (2015) suggested continued professional learning to maintain teacher competency and self-efficacy. Teachers' self-efficacy was derived from their perception of their preparedness to teach and confidence in their ability to improve student outcomes (Bandura, 1977; Darling-Hammond et al., 2002; Hoy & Spero, 2005; Protheroe, 2008; Ruppar et al., 2016). Though some teachers perceived themselves as adequately prepared to teach, because of a lack of positive teaching experience and student success, they did not indicate a high level of confidence in their ability (Hoy & Spero, 2005).

Alternative certification programs reduced the quality and skill set necessary for specialized instruction once provided by categorical special education teacher preparation programs (Brownell et al., 2010; Green, 2012; Katsiyannis et al., 2003; Lee et al., 2011; Ruppar et al., 2016). These programs minimized field experiences and opportunities to evaluate students and individualize instruction based on cognitive, social, emotional, behavioral, or physical deficits (Brownell et al., 2010; Lee et al., 2011). Changes in special education teacher preparation programs failed to close the large achievement gap between students who are served in general and special education (Brownell et al., 2010). Special education teachers found themselves unprepared to implement specialized instructional strategies necessary to meet students' needs (Brownell et al., 2010). Elliott and colleagues (2010) recommended that school districts that provide continued professional learning, opportunities for collaboration, and scaffolding during implementation of specialized, cognitive strategies improved teacher competency.

Several studies were conducted regarding teacher perceptions of working memory, executive function, or brain-based learning (Alloway et al., 2012; Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Researchers concluded that teachers' knowledge and self-efficacy of these concepts were limited (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Participants indicated that districts provided little or no professional learning on topics related to neuroscience or effective strategies to address cognitive deficits (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Most teachers recommended professional learning and direct instruction on improving cognitive skills to increase academic outcomes (Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016).

In summary, a review of literature regarding special education teachers' self-efficacy regarding reading instruction and cognitively focused instruction were limited (Alloway et al., 2012; Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011; Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016; Tschannen-Moran & Johnson, 2011). An extensive amount of research exists regarding evidence-based practices to improve the reading comprehension of struggling readers and students with learning disabilities. Extensive research also exists regarding neuroscience and cognitively focused strategies that address comprehension and processing difficulties created by working memory deficits; however, significant gaps between theory and practice exist. The current research addressed these gaps by (1) examining special education teachers' background and experiences related to these evidence-based

practices and (2) exploring their self-efficacy to improve the reading comprehension of students with working memory deficits.

CHAPTER III

METHODOLOGY

Introduction

The purpose of the explanatory sequential mixed methods research study was to examine special education teachers' perceptions of their background and experiences, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. Quantitative methods consisted of an adapted version of Dr. Cynthia Caniglia's Special Educator Preparation Standards survey (2016), which was used to collect data on teachers' perceptions of their preparedness and confidence to improve the reading comprehension of students with working memory deficits. Additionally, this measure was used to investigate participant background experiences, such as years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization on preparedness and confidence levels. Qualitative data were collected to explore special education teachers' perceptions of self-efficacy using an open-ended questionnaire and interviews. In this chapter, the rationale for the selected design is presented. Furthermore, the selection of participants, setting, instrumentation, procedures, and methods of data analysis are described.

Research Questions

In terms of identifying special education teachers' self-efficacy regarding improving the reading comprehension of students with working memory deficits, this study investigated the following research questions:

1. How do special education teachers' experiences and perceptions of working memory and reading comprehension explain their preparedness and confidence for teaching reading comprehension effectively?
2. How do special education teachers perceive their ability to improve the reading comprehension of students with working memory deficits?

Research Design

To collect data regarding special education teachers' perceptions of their background and experiences regarding working memory, reading comprehension, and their ability to improve the reading comprehension of students with working memory deficits, an explanatory sequential mixed methods approach served as the research design for this study. This research design allowed the researcher to utilize both qualitative and quantitative research design methods to examine the experiences and beliefs of teachers working with students with working memory deficits. A mixed methods approach involved more than collecting qualitative and quantitative data (Creswell, 2009). This approach also involved the use of both approaches in tandem so that the strength of the overall study was greater than either qualitative or quantitative research (Creswell, 2009). This explanatory sequential approach combined a quantitative, descriptive survey methodology to gather data regarding teacher perceived preparedness and confidence with a qualitative, exploratory case study design, which explored individuals' perceptions, experiences, and self-efficacy (Johnson & Christensen, 2010; Patton, 2002). The explanatory sequential research design was selected to improve the validity of the research and connect theory and practice regarding neuroscientific and cognitively-focused instructional practices.

Research Method and Design Appropriateness

Mixed methods research provides researchers the opportunities to confirm hypotheses and explore theories within the same study by collecting multiple kinds of data (Johnson & Turner, 2003; Teddlie & Tashakkori, 2009). According to Johnson and Onwuegbuzie (2004), mixed methods research is defined as a type of research that mixes various techniques, methods, or approaches into a single study to strengthen the validity of the study. Mixed methods research legitimizes the use of multiple approaches to answering questions to allow a more expansive form of research (Johnson & Onwuegbuzie, 2004). This design allows researchers to diversify their approach to method selection, designing, and conducting research (Johnson & Onwuegbuzie, 2004). Mixed methods research design has the potential to yield more in-depth results from which researchers may ascertain stronger, more credible inferences (Johnson & Onwuegbuzie, 2004). Combining qualitative with quantitative data provides researchers with in-depth perceptions and explanations that result in a deeper understanding of the topic of the investigation (Teddlie & Tashakkori, 2009).

The explanatory sequential design (Creswell, 2003) was selected as the mixed methods approach for the present study. This design included two data collection phases that occurred chronologically (Harwell, 2011; Teddlie & Tashakkori, 2009). The explanatory sequential research design included the collection and analysis of quantitative data in the first phase followed by the collection and analysis of qualitative data in the second phase (Creswell, 2009, Harwell, 2011). The qualitative data were used to explore and clarify the quantitative data (Creswell, 2009; Harwell, 2011). In general, this design was easy to implement, describe, and report because it occurred in clear steps

or phases (Creswell, 2009). The greatest disadvantage to the explanatory sequential design is that the research was time consuming (Creswell, 2009). The quantitative phase included a descriptive research design. Descriptive research is often used to describe or summarize a phenomenon (Nassaji, 2015). This design was used to summarize what happened rather than examine factors that explain how or why something happened (Nassiji, 2015). In descriptive research, survey tools are often used to gather data regarding frequencies, percentages, and statistical data to establish relationships (Gall, Gall, & Borg, 2007). In the quantitative phase, a survey was used to examine participants' beliefs about their confidence and preparedness regarding reading instruction for students with working memory deficits. The qualitative phase included exploratory case study methodology. Figure 3 shows a visual graphic of Creswell's (2003) Explanatory Sequential Research Design, which was adapted by Creswell in 2009.

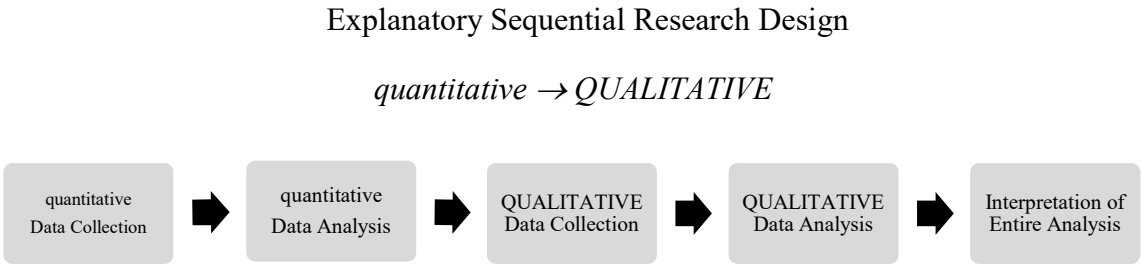


Figure 3. Explanatory Sequential Research Design (Creswell, 2009. Adapted from Creswell, 2003).

The qualitative phase of this research study included an exploratory case study. Case study methodology is an approach that allows researchers to explore individuals or groups who are connected to a specific phenomenon (Baxter & Jack, 2008). Case study methodology assisted the researcher in conducting an in-depth examination of a case within its real-life context, thus allowing the development of insights into participants'

perceptions and experiences (Baxter & Jack, 2008; Yin, 2005). The primary purpose of exploratory research was to discover thoughts and ideas related to a phenomenon (Yin, 2003). The exploratory research process was generally flexible and unstructured to facilitate the development of questions and strategies that may support further research (Mills, Durepos, & Wiebe, 2010). The qualitative phase of this research was an exploratory case study because the researcher explored a topic or phenomenon, such as teacher perceptions, without clearly defined outcomes (Baxter & Jack, 2008; Yin, 2003).

Qualitative data, collected through an open-ended questionnaire and interview, were used to explore teachers' perceptions, experiences, and self-efficacy. The purpose of this qualitative phase of the study was to conduct an in-depth investigation of special education teachers' perceptions of their background and experiences regarding working memory and reading comprehension and their ability to improve the reading comprehension of students with working memory deficits (Baxter & Jack, 2008). The researcher used the Case Study Process, adapted by Baskarada (2014) from Yin (2009), as a guide for conducting and reporting the results of the qualitative phase of the study. See Figure 4 below.

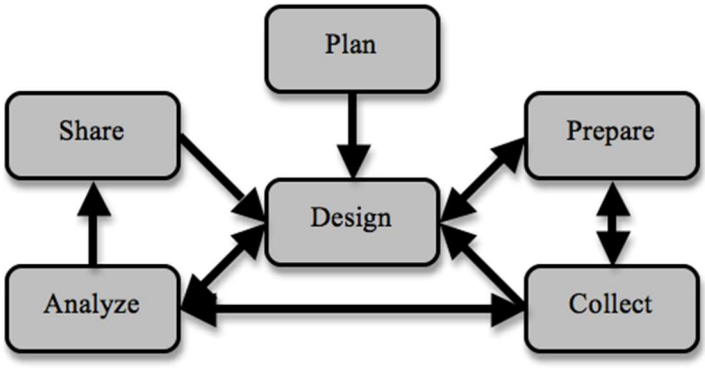


Figure 4. The Case Study Process, adapted from Baskarada (2014) and Yin (2009).

Participants

Purposive sampling was used to select certified, special education teachers who served students in kindergarten through high school special education programs in a rural school district as participants in this study. Purposive sampling allowed the researcher to target participants with specific knowledge and experiences regarding the phenomenon of literacy instruction for students with working memory deficits (Creswell & Plano Clark, 2011; Patton, 2002). Participants included special education teachers who served students in collaborative instruction and resource settings. The participants served students within the following special education eligibility categories: Specific Learning Disability, Other Health Impaired, Emotional/Behavioral Disorder, Traumatic Brain Injury, Speech Language Disorder, Mild Intellectual Disability, Moderate Intellectual Disability, and Significant Developmental Delay. Teachers specifically serving self-contained Severe and/or Profound Intellectual Disability students were not selected to participate in this study. Teachers of severe and profound students were excluded because this population of students generally possess significant cognitive impairments allowing for an adapted curriculum and alternative measures of numeracy and literacy skills.

Setting and sample participants. The setting for this mixed methods research study included a rural school district in west central Georgia. The school district served approximately 4,040 students, with a special education population of 12% (GOSA, 2018). Though the district had a high 4-year graduation rate of 87.4% in 2017, only 46% of third-grade students achieved a Lexile level considered to be a grade level target on the 2017 Georgia Milestones for English-Language Arts (GOSA, 2018). This school

district was selected conveniently due to the researchers' proximity and professional relationships with supervising administrators within the district.

The targeted participant pool for the quantitative phase of the study consisted of 40 certified special education teachers in a rural, Central Georgia district who provided reading instruction to students in kindergarten through high school classrooms in a collaborative or resource setting. Of the 40 participants targeted for the study, 23 completed the first phase of the study, an online confidence and preparedness survey based on personal experiences and beliefs of working memory and reading comprehension. The Confidence and Preparedness Survey was sent to the targeted population pool via direct email, which included a hyperlink to the Survey Monkey survey. The hyperlink, which remained open for approximately three weeks, included a brief introduction, consent to participate prior to beginning the survey, and a participation incentive.

Upon completion of the survey, participants were asked for voluntary participation in the next phase of data collection. The composite score, which included preparedness and confidence subscale scores, was ordered from least to greatest and divided into quartiles. A quartile is one of four groups of a list of ordered numbers that have been divided into four equal parts (Weisstein, 2018). Participants from each composite quartile who volunteered to participate in the qualitative phase of the study were recruited to complete a qualitative self-efficacy questionnaire and interview. Despite several attempts to secure at least eight participants for the qualitative phase of the study, only seven participants completed Phase 2. This sample size provided the researcher with enough participants with similar experiences within a similar

environment to develop an in-depth understanding of the phenomenon without reaching saturation (Creswell, 2012a). Patton (2002) stated no exact rules existed for sample size in a qualitative study. Sample size in a qualitative study is dependent the topic being studied, time constraints, availability of resources, and usefulness and credibility of participants (Patton, 2002).

Quantitative phase. Of the 40 participants emailed, 23 responded resulting in a 57.5% response rate. Most of the participants (26.08%) have 16 to 20 years of teaching experience, with an equal number of participants (17.39%) serving students for 0 to 5, 11 to 15, or 21 to 25 years of service. Regarding level of degree, an equal number of participants (34.78%) obtained either a master's or specialist degree. Most participants served students in a resource/separate class setting (60.86%). The largest number of participants served Grades 3 through 5 (30.43%). Dual certification in special education and general curriculum (56.52%) was the greatest area of certification with a small number of participants attaining a degree, certification, or endorsement in reading or language arts (30.43%). Of 23 participants, 17 agreed to participate in the qualitative phase of the study. Table 4 presents professional demographic frequencies and percentages regarding years of services and level of degree, Table 5 presents professional demographic frequencies and percentages regarding instructional setting and grade bands taught, and Table 6 presents professional demographic frequencies and percentages regarding area of teaching certification and reading specialization.

Table 4

Teaching Experience and Level of Degree for Quantitative Survey Participants

Experience	*N*	%
0 to 5 Years	4	17.39
6 to 10 Years	3	13.04
11 to 15 Years	4	17.39
16 to 20 Years	6	26.08
21 to 25 Years	4	17.39
26+ Years	2	8.69
Level of Degree	*N*	%
Bachelor's Degree	7	30.43
Master's Degree	8	34.78
Specialist's Degree	8	34.78

Table 5

Instructional Setting and Grade Band for Quantitative Survey Participants

Instructional Setting	*N*	%
Resource/Separate Class	14	60.86
Collaborative Teaching	9	39.13
Grade Band	*N*	%
Grades K-2	5	21.74
Grades 3-5	7	30.43
Grades 6-8	5	21.74
Grades 9-12	6	26.09

Table 6

Teaching Certification and Reading Specialization for Quantitative Participants

Teaching Certification	*N*	%
Special Education- General Consultative	4	17.39
Special Education- Adapted Curriculum	2	8.69
Special Education- Interrelated	2	8.69
Dual Certification- Special & General Education	13	56.52
Other (Multiple Special Education Certification Areas)	2	8.69
Reading Specialization	***N***	**%**
Yes	7	30.43
No	16	69.56

Qualitative phase. Results of the web-based survey were analyzed to inform and revise the preliminary questions created for the qualitative self-efficacy questionnaire and semi-structured interviews, which was Phase 3 of the study. Qualitative participants were selected from those participants who completed the quantitative survey, scored in each quartile using ordered composite mean scores, and agreed to participate in the qualitative phase of the study. Participants from each composite quartile who volunteered to participate in the qualitative phase of the study were recruited to complete a qualitative self-efficacy questionnaire and interview. Despite several attempts to secure at least eight participants for the qualitative phase of the study, only seven participants completed Phase 2. This qualitative phase of the study explored special education teacher perceptions of their ability, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. The qualitative phase of the study allowed the researcher to engage with a small

number of participants with first-hand knowledge on teaching students with identified working memory deficits.

Most of the qualitative participants served students in Grades K through 5 (86%), with only one participant serving students in Grades 6 through 8. Teaching experience was high with 57% of participants completing 15 or more years of service and only one participant with less than 5 years of experience. An equal number of participants attained a master's or specialist degree in education with only one participant attaining a bachelor's degree. Dual certification in both special education and general education was the greatest certification area with four participants (57%) followed by interrelated (29%). Two participants completed an endorsement or certification in reading. Professional demographic data of qualitative participants are presented in Table 7.

Table 7

Professional Demographics Statistics for Qualitative Participants

Participant Number	Years of Experience	Degree	Setting	Grade Band	Certification	Reading Specialization	Composite Score
1	11-15	Specialist	Co-Teach	K-2	Interrelated	Yes	73
4	6-10	Masters	Resource	6-8	Dual Certification	Yes	112
5	21-25	Masters	Co-Teach	K-2	Multiple Sped Cert	No	66
13	21-25	Specialist	Co-Teach	K-2	Dual Certification	No	45
15	0-5	Masters	Resource	3-5	Dual Certification	No	74
20	21-25	Bachelors	Co-Teach	3-5	Interrelated	No	82
23	16-20	Specialist	Resource	3-5	Dual Certification	No	84

Qualitative participants with the lowest subscale and composites scores had 20 to

25 years of teaching experience, served students in a collaborative teaching environment, and taught students in Grades 1 and 2. Participants serving students in higher grade bands had higher composite scores; however, participants serving students in Grades 9 through 12 did not participate in the qualitative phase of the survey. Participants teaching Grades 9 through 12 had the lowest survey composite scores; therefore, a relationship between grade band and confidence and preparedness cannot be established using qualitative data. Participant 4, who obtained the highest subscale and composite scores, served students in Grades 6 to 8 collaborative setting, had 11 to 15 years of experience, and obtained a reading specialist. Participant 13, who obtained the lowest subscale and composite scores, served students in Grades K through 2 in a collaborative setting, had 20 to 25 years of experience, and obtained a specialist in education. Descriptive statistics from the survey collected from qualitative participants are presented in Table 8.

Table 8

Descriptive Statistics for Qualitative Participants

Participant Number	Working Memory Confidence	Working Memory Preparedness	Reading Comprehension Confidence	Reading Comprehension Preparedness	Composite Score
1	18 (75%)	20 (83%)	15 (47%)	20 (63%)	73
4	24 (100%)	24 (100%)	32 (100%)	32 (100%)	112
5	16 (67%)	16 (67%)	17 (53%)	17 (53%)	66
13	14 (58%	6 (25%)	13 (54%)	12 (38%)	45
15	14 (58%)	14 (58%)	24 (75%)	22 (69%)	74
20	17 (71%)	17 (71%)	24 (75%)	24 (75%)	82
23	18 (75%)	18 (75%)	24 (75%)	24 (75%)	84

Informed consent. The study was reviewed by the Columbus State University (CSU) Institutional Review Board (IRB) and granted exempt status (Appendix A). The researcher met with the district Superintendent and four building principals personally to explain the purpose of the study as well as the benefits and implications for addressing literacy gaps due to working memory deficiencies and improving professional learning opportunities. A formal letter was submitted to the district Superintendent to gain permission and consent to conduct the proposed study and access to the schools and employees (Appendix B). This formal letter was followed by the CSU Informed Consent Form from the IRB (Appendix C). The inform consent form included a description of the researcher, the purpose and procedures of the study, and the role of special education teachers as research participants. Benefits of the study, information regarding anonymity, and assurance of confidentiality, as well as a description of how to discontinue participation in the proposed study, was included in the informed consent letter. Confidentiality in reporting district, school, and staff information is paramount in securing informed consent and adequate numbers of participants in a study (Creswell, 2012a). A formal letter of participation was provided by the school district (Appendix D).

Once informed consent was obtained from the district Superintendent, the researcher requested email addresses of the building principals and targeted, special education teacher pool. An email was sent by the researcher directly to the building principals (Appendix E) and each participant who met the targeted population description (Appendix F). The email included information regarding consent to participate, the purpose of the study, the impact of volunteering or refusing, and

assurance of confidentiality of participation (Creswell, 2012a). Informed consent (Appendix G) was embedded into the first part of the online confidence and preparedness survey (Appendix H). Participants completing the confidence and preparedness survey were asked to volunteer consent prior to answering demographic and content questions. A $5.00 gift card was provided to participants who completed the survey. Participants who completed the questionnaire were asked to participate in the qualitative phase regarding the topic of study. Volunteers were asked to provide their email address so that the researcher could contact each participant regarding the two qualitative measures. Informed consent to participate in the qualitative measures was emailed to each volunteer. Volunteers were asked to sign the informed consent, scan the form into an electronic format, and email it to the researcher.

Ethical concerns. Biases in qualitative research are not considered detrimental if the background, assumptions, and interests are clearly stated (Harry, Sturges, & Klingner, 2005). The researcher served as an administrator within the selected school district. The researcher had an established working relationship with the quantitative phase and qualitative phase participants; however, unlike the participants purposely sampled based on their background and experiences in special education, the researcher has a general education background and does not possess certification in special education. Though the researcher served as an administrator in the district, the researcher did not participate in the Georgia teacher evaluation system or have any access to the Teacher Keys Effectiveness System (TKES) platform containing observation or portfolio data for the targeted population pool.

Data Collection and Procedures

An explanatory sequential mixed methods research design allowed the researcher to utilize both qualitative and quantitative research design methods to examine the experiences, perceptions, and self-efficacy of teachers providing reading instruction to students with working memory deficits. This mixed methods approach combined quantitative phases of data collection and analysis, which included a quantitative survey to gather data regarding participants' preparedness and confidence, with qualitative phases of data collection and analysis using a self-efficacy questionnaire and interview, which explored individuals' perceptions of their background and experiences, self-efficacy, and understanding of evidence-based strategies to improve reading comprehension of students with working memory deficits (Johnson & Christensen, 2010; Patton, 2002). In addition, quantitative data were used to investigate participant background experiences, such as years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization as factors impacting teacher perceived self-efficacy in providing effective reading instruction for students with working memory deficits. Sequential triangulation of data obtained through a quantitative survey, qualitative self-efficacy questionnaire, and qualitative interview were used to obtain an in-depth understanding of special education teachers' perceptions and experiences regarding their knowledge, understanding, and self-efficacy regarding reading comprehension instruction and working memory deficits (Creswell, 2014). This design allowed the researcher to explore generalizations, multiple viewpoints, and develop a narrative of descriptive material on a specific topic or phenomenon (Adelman et al., 1980). The mixed methods

research design was chosen to obtain a complete understanding of the problem by using qualitative data to explain the quantitative findings (Creswell, 2009; Harwell, 2011). This information could be used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory.

Quantitative Method of Data Collection

The level of credibility in a research study is enhanced by proper data collection procedures (Creswell, 2009). Due the absence of manipulation of an independent variable and randomization, descriptive research design was implemented for the quantitative portion of the current study (Johnson & Christensen, 2010). Survey methodology was chosen to collect descriptive data regarding special education teachers' beliefs of their preparedness and confidence regarding working memory and reading comprehension (Creswell, 2014). A web-based survey was selected to obtain quantitative data regarding teachers' beliefs regarding a specific topic and population (Creswell, 2014). Cost and time restraints were factors in selecting a web-based survey as opposed to other quantitative data measures (Dillman, Smyth, & Christian, 2014). Participant background experiences, such as years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization, were examined as factors impacting teacher perceived self-efficacy in providing effective reading instruction for students with working memory deficits.

The confidence and preparedness survey (Appendix H) included an adaptation of the 2012 CEC Initial Level Special Educator Preparation Standards survey (Caniglia,

2016). This survey was developed by Dr. Cyndi M. Caniglia (2016) in her dissertation on special education teacher preparedness and confidence presented to Washington State University. The survey consists of descriptive, Likert-type ratings that examined teacher beliefs of their preparedness and confidence to implement the 2012 CEC Initial Level Special Educator Preparation Standards. The original survey consisted of 63 skill and knowledge statements clustered into eight domains: Learner Development and Individual Learning Differences, Learning Environments, Curricular Content Knowledge, Assessment, Instructional Planning and Strategies, Augmentative and Assistive Technology and Communication, Professional Learning and Ethical Practice, and Collaboration (Caniglia, 2016). Dr. Cyndi Caniglia granted the researcher permission to use and adapt the survey created in her dissertation (Appendix I). The Caniglia survey was adapted to focus primarily on special education teachers' preparedness and confidence regarding learner development and individual learning differences, curricular content knowledge, assessment, and instructional planning and strategies related to teaching reading comprehension to students with working memory or cognitive deficits.

The confidence and preparedness survey was sent to the building principals and special education teachers within targeted population pool via a direct email from the researcher. The email included a welcome statement, description of the purpose and importance of the study, data collection methods, timelines for participation, information regarding confidentiality and anonymity, and a hyperlink to the Survey Monkey survey. The CSU informed consent form was embedded into the survey and was accessed through the hyperlink. The hyperlink, which remained open for approximately three

weeks, included a brief introduction, consent to participate prior to beginning the survey, and a participation incentive. The incentive included a $5.00 online gift card to a local restaurant upon completion of the survey. Participants were asked to provide an email address after completing the survey to receive the gift card via email. A reminder email was sent to participants after 1 week after the initial recruitment email (Appendix J).

Instrumentation. The confidence and preparedness survey consisted of 24 questions divided into three sections. There were six questions related to participant demographics (Section I), eight questions related to participants' confidence and preparedness regarding working memory (Section II), and 10 questions related to participants' confidence and preparedness regarding reading comprehension (Section III). After Sections II and III, participants were asked to identify teacher preparation or professional learning sources that influenced their level of confidence and preparedness. Participants were asked to identify areas where additional support or professional learning was needed.

Section I included six questions related to participant background experiences (i.e., years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization). Section II included eight items related to participants' confidence and preparedness regarding their understanding of working memory:

- I understand the role of the working memory in the learning process.
- I understand the role of working memory in verbal reasoning.
- I understand the role of working memory in developing early literacy skills.
- I understand the role of working memory in reading comprehension.

- I understand and implement research-based strategies to increase working memory levels.
- I use my understanding of working memory and information on students' working memory levels to adapt instruction.

Participants were asked to rate their preparedness and confidence levels using a Likert-type scale that ranged from 1 to 4 (i.e., 1 represents *Not Confident/Not Prepared*, 2 represents *Somewhat Confident/Somewhat Prepared*, 3 represents *Confident/Prepared*, and 4 represents *Very Confident/Very Prepared*). After Section II, participants were asked to identify the sources behind responses of prepared or very prepared. The sources included teacher preparation program, teacher preparation program and professional development, professional development through the school district, graduate school specialization, collaboration with colleagues, self-study, and/or other. In addition, participants were asked to describe their needs for additional training or support in any area related to working memory.

Section III included 10 items related to participants' preparedness and confidence regarding reading comprehension instruction. Participants were asked to rate their preparedness and confidence using the same Likert-type scale utilized in Section II. Statements included:

- I understand collaborative comprehension strategies well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.

- I understand story structure and story grammar well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.
- I understand metacognitive/comprehension monitoring strategies well enough to teach them as an effective strategy to teach reading comprehension to students with working memory deficits.
- I understand reciprocal teaching strategies or multiple strategy instruction (prediction, clarification, question generation, and summarization) well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.
- I understand the question generating strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.
- I understand the question answering strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.
- I understand graphic/semantic organizers well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.
- I understand the summarization strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.

Like Section II, participants were asked to disclose the sources that correlated to prepared and/or very prepared responses as well as professional learning needs related to reading comprehension. Survey responses were removed from the researcher's private Survey Monkey account and stored in an online, password protected storage system that was only accessible by the researcher. Data collected using the survey and information regarding the identity or email of participants will be destroyed after the publication of the study or within one calendar year.

Survey validity. The researcher made several attempts to minimize common survey errors, which included coverage error, sampling error, nonresponse error, and measurement error (Dillman et al., 2014). To control for coverage error, an error caused when the sample is not representative of the target population (Dillman et al., 2014), the researcher emailed each teacher listed on the targeted population pool email list provided by the district directly. Recruitment and reminder emails were sent to the entire target population. Purposeful sampling of one rural district cannot be considered representative of the instructional special education staff within the region, state, or southeastern United States.

Sampling error occurs when data are obtained from some rather than all participants within a given population (Dillman et al., 2014). Special education teachers of Severe and/or Profound Intellectually Disabled teachers were not included in the target population. Furthermore, the researcher could not control the timelines regarding when teachers read and responded to their emails, email malfunction, or broken hyperlinks created upon merged email accounts or non-compatible email servers. Thus, the researcher could not guarantee that sampling error did not occur.

An incentive was provided to participants who completed the survey to control for non-response error. Dillman and colleagues (2014) described non-response error as the difference in the data estimate created when only some of the participants respond compared to all. This error also occurs when the responses from participants differ significantly from non-responders (Dillman et al., 2014). To further control non-response error, the researcher drafted reminder emails to be emailed to participants during Week 1 and Week 2 of the survey time window.

Dr. Cynthia Caniglia (2016), the author of the confidence and preparedness survey, utilized several methods to ensure the validity of the survey. Construct validity, the degree to which a scale measures the construct or attribute being measured (Lamb, Vallett, & Annetta, 2014), was measured using Messick's (1998) measurement framework of validity (Caniglia, 2016). Messick's (1998) framework identified six aspects of construct validity: content validity, substantive validity, structural validity, generalizability, external validity, and consequential validity. Content validity was addressed by aligning the survey items with evidence in the literature review. A peer reviewer with expertise in special education and the development of the CEC standards analyzed the survey items to ensure content and substantive validity (Caniglia, 2016). Substantive and structural validity were addressed using the Rasch measurement model, which allowed the researcher to evaluate how well the items measured the special education teachers' self-efficacy or confidence and preparedness (Caniglia, 2016; Lamb et al., 2014). Structural validity was measured through a factor analysis using Varimax rotation (Caniglia, 2016). Generalizability, the consistency in scoring if the survey was given to similar participants outside of the sample (Leininger, 1994), was addressed by

allowing all special education teachers with a Regional Education Service Agency (RESA) to complete the survey; however, because convenience sampling was used, generalizability may have been compromised. External validity was controlled due to the use of the 2012 CEC Initial Special Educator Preparation Standards, which apply to all special education teachers nationwide. Finally, Caniglia considered the consequential validity low because self-efficacy was a low consequence measure (Caniglia, 2016).

Survey reliability. The internal consistency of the survey, the consistency of participants' responses on a multi-question measure, was measured using Cronbach's alpha coefficient (Price, Jhangiani, & Chiang, 2015). A value of .80 or greater generally indicates internal consistency (Price et al., 2015). Caniglia measured internal consistency of the questionnaire using Cronbach's alpha coefficient (α), which resulted in $\alpha = .95$ for the composite, $\alpha = .95$ for the preparedness subscale, and $\alpha = .96$ for the confidence subscale (Caniglia, 2016). The four subscales for the Confidence and Preparedness Survey, as measured by the researcher, was determined to be internally consistent. A reliability analysis of all four subscales, which included the working memory confidence scale (WMConfidence), reading confidence (RDGConfidence), working memory preparedness (WMPreparedness), and reading preparedness (RDGPreparedness), had alpha coefficients of .88 or higher. The survey composite had an alpha coefficient of .97.

Qualitative Methods of Data Collection

Qualitative research forms a complete overview of what is being studied by analyzing words, reporting detailed views of the participants involved, and conducting the study in a natural setting (Creswell, 2012b). Merriam (2009) stated that qualitative research focuses on the meaning and understanding of the topic. In this qualitative phase

of the study, the researcher was the primary instrument for data collection (Merriam, 2009). Results of the web-based survey were analyzed to inform and revise the preliminary questions created for the qualitative self-efficacy questionnaire and semi-structured interviews, which was Phase 3 of the study. Qualitative participants were selected from those participants who completed the quantitative survey, scored in each quartile using ordered composite mean scores, and agreed to participate in the qualitative phase of the study. Participants from each composite quartile who volunteered to participate in the qualitative phase of the study were recruited to complete a qualitative self-efficacy questionnaire and interview. Despite several attempts to secure at least eight participants for the qualitative phase of the study, only seven participants completed the qualitative phase of the study. This qualitative phase of the study explored special education teacher perceptions of their ability, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. The qualitative phase of the study allowed the researcher to engage with a small number of participants with first-hand knowledge on teaching students with identified working memory deficits.

Self-efficacy questionnaire. The use of questionnaires in qualitative research is dependent on type of research questions and the focus of the research (Yin, 2009). Questionnaires are useful when answering how or why questions, when there is limited control over the actual behavioral events, and when the focus of the study is on contemporary rather than historical events (Yin, 2009). Questionnaires are generally cost effective, easy to develop, participant friendly, and more efficient than other qualitative data collection methods (Baker, 2012; Kerlinger, 1973). Disadvantages of using

questionnaires include participant refusal or undesirable responses that do not align with the researcher's theory or hypothesis (Hart, 1987). An unstructured, open-ended questionnaire was selected to allow participants to provide original responses written at a preferred time and location (Baker, 2012; Bogdan & Biklen, 2003).

The self-efficacy questionnaire (Appendix L) was adapted from the Reading Teacher Efficacy Instrument (RTEI), developed by Szabo and Mokhtari (2004). Dr. Susan Szabo granted the researcher permission to use and adapt the RTEI for the research study (Appendix M). The RTEI, which was created to assess pre-service teacher self-efficacy in teaching reading, has established construct validity (Szabo & Mokhtari, 2004). The original two-part survey measured teacher self-efficacy in relation to teacher attitudes and beliefs toward their ability to teach reading, teacher outcome expectancy, and teacher attitudes and beliefs toward their ability to improve student reading. The survey measured self-efficacy and outcome expectancy using 16 questions presented with a five-point Likert-type scale with response choices ranging from *strongly disagree* to *strongly agree*. This survey was easily accessible and available for use as a tool to provide administrators with a better understanding of teachers' self-efficacy, attitudes, and behaviors regarding reading instruction and facilitate in the development of strategies to improve teachers' knowledge and student outcomes (Szabo & Mokhtari, 2004). The number of questions was reduced, and the Likert-type scale responses were removed to create open-ended questions. The open-ended questions, or *nondirective* and *flexibly structured* questions, were designed to solicit open, honest responses (Bogdan & Biklen, 2003). Open-ended questions, as opposed to forced-choice options, were more aligned with qualitative research and allowed the researcher to

explore and discover meaning (Bogdan & Biklen, 2003). The statements below were adapted into open-ended questions:

- I will know several ways to teach reading effectively.
- I understand the process of reading well enough to teach reading effectively.
- Students' achievement in reading is directly related to their teacher's effectiveness in the teaching of reading.
- I will find it difficult to teach students with reading problems (Szabo & Mokhtari, 2004).

A questionnaire item analysis occurred to align the protocol with research presented in the literature review (Appendix N).

The questionnaire was emailed from the researcher directly to the qualitative participants (Appendix O). The questionnaire was created using a Word document, which allowed the participants to answer the questions at their leisure. Participants returned the completed questionnaire to the researcher in an email attachment. An informed consent preceded the questionnaire (Appendix P). Participants were given 1 week to complete the brief questionnaire. An email reminder was sent to participants who have not completed the questionnaire in the allotted time (Appendix Q). Data provided in the questionnaire were only accessible by the researcher and an external data analyst. The data were stored in a password protected online storage system that was only accessible by the researcher. Each person completing the qualitative phase of the study was provided with their original participant number from the online survey to ensure confidentiality and anonymity. Questionnaire responses were removed from the researcher's private email account and stored in an online, password protected storage

system that was only accessible by the researcher. Data collected using the questionnaire and information regarding the identity or email of participants will be destroyed after the publication of the study or within one calendar year.

Interview. The seven questionnaire participants participated in the second data collection measure in Phase 4, which included semi-structured interviews (Merriam, 2009). A semi-structured interview is a qualitative measure in which the interviewer directly interacts with respondents, navigating through questions focused on a specific topic (Creswell, 2012b). This type of interview is somewhat structured, meaning the questions are prepared prior to the interview; however, the interview allows for open discussion based on interviewee responses (Merriam, 2009). Interview participants received an email from the researcher requesting available dates and times (Appendix R). The selection for preferred locations for each interview was deferred to the interviewee to assist in keeping the participant comfortable and willing to participate. Locations were dependent on each participant's instructional location, which included the primary, elementary, middle, or high school.

To improve the validity of the measure and data analysis, the researcher developed an interview protocol (Appendix S). The interview protocol was also used to ensure that the questions posed solicited responses relevant to the researcher's interest in the social phenomenon (Agee, 2009). The interview protocol consisted of three questions, which were aligned to the two research questions and literature presented in the study (Appendix T). The interview protocol was revised after analyzing the quantitative data and qualitative questionnaire to gain further insight and depth in answering the research questions. After receiving IRB approval for the interview

protocol revisions (Appendix U), the revised interview protocol was used in all seven interviews. The revised questions focused on three areas: factors behind successful and unsuccessful efforts to improve reading comprehension, outcome expectancy, and measuring teacher effectiveness. These questions were designed to increase the researcher's understanding of participant experiences, series of events, and/or perceptions (Agee, 2009; Creswell, 2012b).

The interview, which was preceded by the quantitative survey and qualitative, self-efficacy questionnaire, provided the researcher the opportunity for direct interaction with participants to explore their background, perceptions, and experiences regarding reading instruction and working memory deficits (Patton, 2015). The interviews occurred after instructional and duty hours on a school-based campus within the participating school district. The researcher sent an email to each interview participant to remind them of the date and time (Appendix V). The researcher interviewed participants using face-to-face interviews, which allowed the researcher the opportunity observe and adapt to body language, voice cues, fatigue, or disinterest (Brinkmann & Kvale, 2015).

The interviews were recorded using the researcher's personal, password protected iPhone 8. The average interview session lasted 5 minutes and 29 seconds. The minimum interview session lasted 4 minutes and 2 seconds. The maximum interview session lasted 8 minutes and 6 seconds. A significant amount of data were collected using the quantitative survey and self-efficacy questionnaire. These data prompted the researcher to revise the interview protocol so that questioning would not be redundant. The questions were very specific, resulting in very precise answers from participants. The researcher transcribed the recording and emailed the transcription to each

participant for their review and feedback (i.e., member checking). Of the seven participants, four participants acknowledged receiving the transcription; however, no corrections or suggestions were returned.

The audio recordings were downloaded to a web-based storage system, which was password protected and accessible by the researcher only. The audio recording was transcribed by the researcher directly. The transcription was stored within the web-based storage system. Charts and tables, including coded themes and subthemes of the qualitative data sources using Microsoft Word software, were stored in the web-based storage system. Lists of questionnaire participants, interview participants, audio recordings of the interviews, transcriptions of the interviews, and specific data or materials related to participants or the school district will be destroyed after study publication or within one calendar year.

Reliability and Validity

Reliability and validity are critical aspects of good research (Brink, 1993). Yin (2003) recommended four tests that are commonly used to assess the quality of social science research: (1) construct validity, (2) internal validity, (3) external validity, and (4) reliability. Brink (1993) suggested that there are four primary sources of error or threats to validity and reliability in qualitative research: (1) the researcher, (2) the participants, (3) the setting or social context, and (4) the methods of data collection and analysis. Harrell and Bradley (2009) suggested that most of the validity issues that arise during the implementation and analysis of qualitative data occurred due to moderator bias, non-descriptive questions, participant bias or hostility, and misinterpretation or prejudice during data coding.

Reliability. Reliability exists within a study if the same results can be obtained by replicating the instrumentation and data collection procedures (Baskarada, 2014; Merriam, 2009). Triangulation of data, peer examination, reflexivity, and clarification of the researcher's position can improve the reliability of a qualitative study (Merriam, 2009). To address reliability or dependability, the researcher reported the data collection methods, instrumentation, and data analysis in specific detail (Shenton, 2004). Reliability can be improved by implementing strategies, such as peer review (i.e., additional researcher or peer assisting in the design and methods of the study), peer debriefing (i.e., additional researcher or peer assisting in reviewing the insights or themes that emerge from the data and data analysis), utilizing rigorous and well-described procedures (i.e., systematic sampling, data collection, and data analysis), and member checking (i.e, allowing research participants to review transcripts, charts, and narrative descriptions of the themes; Hanson, Balmer, & Giardino, 2011).

Clear, rigorous procedures for each measure regarding sampling, data collection, and analysis for the qualitative measures were provided to address reliability (Hanson et al., 2011). Reliability was addressed by using the same open-ended questionnaire and interview protocol for all qualitative participants (Merriam, 2009). The researcher attempted to address questionnaire reliability by choosing an originally quantitative self-efficacy measure with high reliability. The reliability of the original measure was relatively strong with an alpha coefficient of .83 on the self-efficacy component and .70 on the outcome expectancy component. The quantitative measure was adapted significantly into a brief, open-ended questionnaire.

The reliability of questionnaire and interview was addressed by securing a peer, who served as an adjunct professor of research methods and design, to review the content of both qualitative measures. Reliability of the data obtained through the interview was ensured by establishing an interview protocol and asking each participant the same questions. Member or participant checking, which included each participant reviewing the transcript and themes from their interview, was used to establish reliability. Participants provided feedback or clarification regarding their interview transcript and the coded themes. Reliability of the coding process was improved by partnering with an external data analyst to establish a list of relevant codes for each qualitative measure (Merriam, 2009; Sutton & Austin, 2015). The external data analyst, the adjunct professor mentioned above, had an extensive background in special education and had taught graduate courses regarding research methods and design.

Validity. Qualitative researchers can increase validity by providing honest, realistic, and sensible descriptions of the perceptions, experiences, and backgrounds of participants who encounter a phenomenon daily (Plummer-D'Amato, 2008). Validity or credibility of the qualitative measure helps to connect the phenomenon or paradigm with the data (Yin, 2003). Merriam (2009) defined validity, also known as credibility and trustworthiness, as the truthfulness and authenticity of the measure or study. Yin (2003) suggested that social science researchers test the construct, internal, and external validity of their research to ensure quality. Construct validity ensures that researcher use the proper measure for the topic being studied (Yin, 2003). Internal validity, or credibility, is established by the researcher when the results of the study are credible or believable from the perspective of the participant (Hanson et al., 2011; Leininger, 1994; Merriam,

2009; Plummer-D'Amato, 2008). Several strategies, such as triangulation of data, gathering an abundance of detailed data, and skillful interview techniques, were suggested as qualitative research criteria for internal validity (Hanson et al., 2011; Merriam, 2009). External validity in qualitative research refers to the ability to transfer the results of one study to other settings (Hanson et al., 2011; Merriam, 2009). The findings must be representative of the participants' honest perceptions and beliefs (Leininger, 1994; Plummer-D'Amato, 2008). Therefore, researchers must make every attempt to make participants feel comfortable and safe (Plummer-D'Amato, 2008).

Researchers must also control participant bias, conformity, and censorship (Plummer-D'Amato, 2008). Participant censorship occurs when participants withhold their opinions because of discomfort, lack of trust, or bias from other participants or the researcher (Brink, 1993; Plummer-D'Amato, 2008). Participant conformity occurs when participants alter their comments or viewpoints based on their perception of the researcher's position or perceived bias (Brink, 1993). Other validity errors occur when the researcher fails to consider the context from which comments are made (Plummer-D-Amato, 2008). Finally, the researcher's relationship with the participants, status or position of the researcher, and the researcher's overall demeanor and interaction with participants can impact the reliability and validity of the research (Brink, 1993).

Construct validity was addressed by aligning the questions in the quantitative measures with the literature review and research questions. Discriminant validity of the four subscales from the quantitative survey was addressed by conducting a Pearson *r* correlation to ensure the subscales were conceptually distinct measures (Hair, Black, Babin, Anderson, & Tatham, 2006). The internal validity of the qualitative phase of the

study was addressed using several methods. First, triangulation, gathering more than one source of data (Hanson et al., 2011), occurred by using one quantitative and two qualitative measures. Detailed evidence and a thorough literature review was provided to establish a strong understanding of the topic of study (Hanson et al., 2011). Using data from the quantitative phase of the study to inform and construct the questions and protocols for the qualitative phase addressed validity. External validity was addressed by providing clear descriptions of the sample, setting, and results to assist readers in replicating the study or auditing the study and obtaining similar results (Hanson et al., 2011; Plummer-D'Amato, 2008). Finally, validity of the coding analysis was addressed by asking an external researcher or data analyst to code both qualitative measures and work collaboratively with the researcher to establish codes, themes, and subthemes (Merriam, 2009; Sutton & Austin, 2015).

To address the impact of participant bias or non-disclosure on the validity of the qualitative phase of the study, the researcher reminded participants of anonymity and research confidentiality. Participants were reminded that their participation was voluntary and exclusion from the group could occur at any time. The researcher made every attempt to establish a climate of trust to control for censorship and conformity. To control for censorship, the researcher reminded participants of the purpose of the study, how the data would be used, and confidentiality. Because the participants were interviewed separately, conformity was not a validity concern (Plummer-D'Amato, 2008).

Data Analysis

Phase 1: Quantitative

Demographic data for survey participants were aggregated and represented using a table (Caniglia, 2016). Descriptive statistics were grouped according to participants' levels of preparedness and confidence and the source of teacher preparation to facilitate comparison. SPSS software was used to conduct descriptive statistics to summarize the composite scores, preparedness scales, and confidence scales for all quantitative participants. Data were disaggregated using the participant background experiences (i.e., years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization). The descriptive statistics included the mean, standard deviation, minimum, and maximum scores for each scale. In addition, SPSS software was used to determine each participants' composite mean scores, which included means from the confidence and preparedness subscales. Participant composite scores were ordered from least to greatest and divided into four equal quartiles. Two questionnaire participants from each quartile were invited to participate in the two data collection measures of Phase 2, which included a qualitative self-efficacy questionnaire and interview.

Phase 2: Qualitative Data

Qualitative research focuses on the researcher obtaining meaning and understanding of a social experience (Merriam, 2009). To obtain this understanding, Merriam (2009) suggested that the researcher serve as the primary instrument for data collection and analysis, which could ensure that the study concluded with a descriptive summary. In qualitative research, the researcher seeks to explore participants'

perceptions, behaviors, and opinions, which are molded by their background and experiences (Creswell, 2009). The researcher used data analysis to uncover systematic meaning (Creswell, 2009). Data were connected and interpreted by recognizing patterns, categories, or themes (Johnson & Christensen, 2010). Words or phrases that appear multiple times established a pattern (Creswell, 2009). This pattern was expanded into a theme or group of connected words and phrases. Themes were organized later into categories and displayed graphically. A greater picture and deeper understanding of the phenomenon or problem was developed through coding, recognizing patterns, and identifying relationships (Creswell, 2009).

Questionnaire analysis. Coding is a shorthand transcription of words or phrases that appear frequently throughout the data (Creswell, 2012b; Merriam, 2009). Coding is a process of categorizing data that will be later linked to implications and details related to those categories (Creswell, 2009). The first measure in the qualitative phase included a questionnaire. The questionnaire, an adapted version of a reading teacher efficacy survey, included five questions, which aligned with the research presented in the literature review. To secure at least two participants from each composite survey quartile, the researcher emailed questionnaires to survey participants within each composite quartile who volunteered to participate in the qualitative phase of the study. Despite several efforts and emails to other participants within the third quartile, only seven participants returned the completed questionnaire.

Analysis of the questionnaire data occurred in several stages. Stage one of Bryman's (2008) data analysis included the researcher reading each questionnaire multiple times and attaching comments to significant words within each participant's

response. During stage two of data analysis, words or phrases that were highlighted, color-coded, underlined, or marked as significant were retyped into another Microsoft Word document (Bryman, 2008). This process of open coding the seven questionnaire transcripts resulted in 51 codes (Charmaz, 2006). To establish reliability within the coding process, an external data analyst analyzed the seven questionnaire transcripts using the researcher's 51 codes (Sutton & Austin, 2015). The external data analyst, an adjunct professor of research methods and design, reported a slightly higher number of codes (54). Minor discrepancies were noted between the researcher and external data analyst's interpretation of codes primarily related to different interpretations of terminology related to comprehension and assessment strategies and teacher preparation programs (Sutton & Austin, 2015). For example, the researcher grouped *close reading*, *read aloud/think aloud*, *annotations* and *interacting with text* under metacognition as opposed to the data analyst's coding of each term as separate codes. The researcher coded *guided questions* and *question answering* as question answering, an evidence-based comprehension strategies discussed in the literature review; however, the external data analyst coding the terms separately. Furthermore, the researcher identified terms such as *bachelor's program*, *undergraduate program*, and *college* as undergraduate teacher preparation programs and *reading specialist*, *master's degree*, and *specialist program* as graduate teacher preparation programs. The external data analyst coded phrases related to all undergraduate and graduate preparation programs as college. A comparison of the codes developed by the researcher and the external data analyst resulted in an 94% overlap or reliability. The researcher and external data analyst discussed discrepancies in terminology and negotiated a list of 51 codes that would be

categorized in stage three of Bryman's qualitative analysis (2008) and developed into themes and subthemes (Creswell, 2009; Creswell, 2012b; Sutton & Austin, 2015).

In stage three of Bryman's qualitative analysis (2008), words and phrases collected from the questionnaire responses were organized into categories based on the content and connectivity of the text (Vaismoradi, Jones, Turunen, & Snelgove, 2016). The questionnaire questions were used to guide the researcher in categorizing the questionnaire codes based on the context and purpose of the question. For example, *highlighting*, *summarizing*, *using graphic organizers*, *making predictions*, and *close reading* were grouped under the category of reading comprehension strategies. Terms or phrases, such as *district reading training*, *Wilson reading training*, *Bookworms professional learning*, *system trainings*, *RESA training*s, and *strategies provided through the special education department*, were grouped under in-service professional learning. Phrases, such as *I am not as confident on teaching reading comprehension, I feel that I understand strategies and programs we have been given, if I had a deeper understanding then I could be a better reading teacher than I am currently,* and *I struggle with knowing how to solve the problem,* were categorized as weaknesses in teacher knowledge or ability. References to *lack of instructional resources or tools*, *needing more training on specialized instructional strategies*, and *needing more training on reading instruction* were categorized as job-related factors affecting teacher confidence and self-efficacy. When asked if asked about the relationship between student reading achievement and teacher effectiveness, participants listed seven codes, such as *evidence of student growth*, *relationships with students*, and *mastery of subject matter* as characteristics of effective teachers. Three general statements were provided

regarding teacher confidence. Three participants stated that they were very confident in their knowledge and ability to teach students with reading problems. Four participants stated that their confidence was limited to a specific domain of reading, such as phonics, the current reading programs, or a need for more specialized instructional strategies.

After the identified words and phrases were categorized, the researcher read the questionnaire responses again to validate the coding process and categories (Vaismoradi et al., 2016). Using the questionnaire item analysis (Appendix N), which connected the questionnaire questions to the literature review, the researcher constructed themes by applying meaning and relating the categories to established knowledge (Vaismoradi et al., 2016). For example, terms or phrases related to teacher training, whether pre-service or in-service, were used to establish the abstract theme of teacher preparation. Phrases related to the category of instructional weaknesses, which included statements suggesting a *lack of knowledge of specialized reading comprehension strategies*, *limited knowledge or understanding of the reading process*, and *inability to reach a lower learners* were used to establish the abstract theme of teacher knowledge and ability. Words or phrases related to the category of student factors, such as *significant cognitive deficits, decoding deficits,* and *limited background/prior knowledge,* were categorized under the theme of job-related factors. The codes and categories were organized into six themes: (1) effective reading comprehension strategies, (2) teacher preparation, (3) teacher knowledge and ability, (4) teacher confidence, (5) job related factors, and (6) teacher effectiveness. Using the agreed upon list of codes, themes, and subthemes, the researcher reviewed questionnaire responses again to validate the number of participants

referring to each theme, subtheme, and code. Table 9 depicts the themes, categories, and descriptors derived from the questionnaire analysis.

Table 9

Themes and Subthemes Identified Through Questionnaire Data Analysis (N=7)

Theme	Category	Descriptor
Effective reading comprehension strategies	Evidence-based comprehension Strategies (6)	Summarizing (4) Reciprocal teaching/making predictions (4) Question answering/guided questioning (4) Metacognition (3) Graphic organizers (3) Story structure (story boards, timelines) (2)
	General comprehension strategies (7)	Activating prior knowledge (4) Making connections (4) Student illustrations (4) Motivating/purpose for reading (3) Making inferences (3) Visualization (3) Explicit, direct instruction (2) Highlighting details (2) Sequencing (2) Scaffolding reader (2) Multiple reads (1) Vocabulary instruction (1)
Teacher preparation	Sources of teacher preparation (7)	In-service professional development-literacy (5) Graduate programs (4) Teaching experience (2) Reading/ELA certification (2) Undergraduate programs (2) Peer collaboration (1)
Teacher knowledge and ability	Strengths (5)	In-depth knowledge of reading process (5) Ability to diagnose and address deficits (3) Prior success (3) Knowledge/use of reading skills/strategies (2) In-depth knowledge of specialized instructional strategies (2) Ability to address different learning styles (1)
	Weaknesses (4)	Lack of success with significantly low readers (2) Limited knowledge of specialized reading strategies (2)

		Inability to correctly diagnose and address reading deficits (1) Limited understanding of reading process (1)
Teacher confidence	High self-confidence (2)	Confident in knowledge and ability to teach student with reading problems (2)
	Confidence with parameters (5)	Confidence limited to specific reading domains (1) Confidence limited to current reading programs (1) Need more knowledge on specialized reading instruction (2)
Job related factors	Instructional or professional needs (5)	Additional resources/tools (5) PL on reading process (5) PL on specialized instructional strategies (cognitive/processing/etc.) (5)
	Student factors (3)	Significant cognitive deficits (1) Decoding deficits (1) Limited background/prior knowledge (1)
Teacher effectiveness	Characteristics of teacher effectiveness (7)	Understanding instructional strategies (6) Evidence of student growth (4) Diagnosing and addressing deficits (4) Bridging gaps in reading ability and content (4) Building student relationships (2) Mastery of subject matter (2)

Interview data analysis. Because the interview participant responses were similar to narratives provided in the questionnaire regarding the themes of teacher preparation, teacher knowledge and ability, job related factors, and teacher effectiveness, the 51 codes, 10 categories, and six themes constructed from the questionnaire analysis were used to assist the researcher in analyzing the interview transcripts. The interview questions did not address reading comprehension strategies, characteristics of teacher effectiveness, or specifically address teacher confidence; therefore, the 18 codes related to reading comprehension, seven codes related to characteristics of effective teachers, and four codes related to teacher confidence did not apply or correlate to the interview responses.

Analysis of the interview transcripts was conducted in the same manner as the questionnaire. The researcher read the interview transcripts multiple times, highlighting, underlining, circling, and color-coding significant key words and phrases (Bryman, 2008). Codes were organized and categorized based on content and connectivity to the text (Vaismoradi et al., 2016). Two codes related to teacher preparation, graduate programs and reading certification, did not surface in the interview transcripts; however, content planning became a new code under teacher preparation. Of the six codes related to strengths in teacher knowledge and ability identified in the questionnaire transcripts, only five codes were found in the interview transcripts. Two additional codes related to strengths in teacher knowledge and ability were identified, *consistency in instructional practice* and *relationships with students*. All four codes related to weaknesses in teacher knowledge and ability identified in the questionnaire transcripts were found in the interview transcripts. All three codes related to job related factors related to instructional or professional needs identified in the questionnaire transcripts were found in the interview transcripts. The three codes related student factors identified in the questionnaire were also found in the interview transcripts; however, four additional codes related to student factors were found in the interview transcripts, socioeconomic issues, lack of reading fluency, low IQ, and student behavior. Three new categories (i.e., measuring teacher effectiveness, high outcome expectancy, and low outcome expectancy) and one additional theme (i.e., outcome expectancy) emerged from the interview analysis. Analysis of interview transcripts resulted in six codes related to measuring teacher effectiveness, such as using the student growth model, student screeners, and progress monitoring Individualized Education Plan (IEP) goals. Two new

categories emerged related to outcome expectancy. Two participants indicated that they had high outcome expectancy regarding their students meeting expected objectives or outcomes. Five participants stated that students meeting expected outcomes was not likely, below grade level, or a long-term possibility.

A thorough analysis of the interview transcripts using the coding table from the questionnaire as a guide resulted in 36 interview codes, which included the removal of 33 codes from the questionnaire analysis and addition of 18 new codes from the interview analysis. A comparison of the codes, categories, and themes developed by the researcher and the external data analyst resulted in an 100% overlap or reliability. Table 10 depicts the themes, categories, and descriptors derived from the interview analysis.

Table 10

Themes and Subthemes Identified Through Interview Data Analysis (N=7)

Theme	Category	Descriptor
Teacher preparation	Sources of teacher preparation (6)	In-service professional development-literacy (5) Teaching experience (2) Undergraduate programs (2) Peer collaboration (2) Content planning (1)
Teacher knowledge and ability	Strengths (5)	Knowledge/use of reading skills/strategies (3) In-depth knowledge of specialized instructional strategies (3) Ability to diagnose and address deficits (2) Prior success (2) Relationship with students (2) Ability to address different learning styles (1) Consistency in instructional practice (1)
	Weaknesses (3)	Lack of success with significantly low readers (3) Limited knowledge of specialized reading strategies (3) Limited understanding of reading process (2) Inability to correctly diagnose and address reading deficits (1)

Teacher effectiveness	Measuring Teacher Effectiveness (7)	Student growth model (4) Student screeners (3) IEP growth data (1) Daily interaction/observation (2) Self-reflection (1)
Job related factors	Instructional or professional needs (5)	Additional resources/tools (5) PL on reading process (5) PL on specialized instructional strategies (cognitive/processing/etc.) (5)
	Student factors (7)	Working memory deficits (4) Gaps in background knowledge (2) Significant cognitive/processing deficits (2) Not fluent readers (2) Low IQ (1) Socioeconomics (1) Student behavior (1)
Outcome expectancy	High outcome expectancy (2)	Expected outcomes are likely or met (2)
	Low outcome expectancy (5)	Low expectancy rate (5) Below grade level (4) Higher for short-term goals (4) Long-term, not immediate growth (2)

Cumulative analysis of qualitative data. Though the questionnaire and interviews were analyzed and coded separately, similar narratives regarding teacher knowledge of reading comprehension strategies, teacher preparation, teacher knowledge and ability, job related factors, and teacher effectiveness emerged from the interview analysis. Codes and categories from the analysis of each qualitative measure were cross-referenced and compared to create a cumulative presentation of codes (68), categories (13), and themes (7) to facilitate the narratives and tables presented in Chapter IV (Appendix W). A cumulative analysis of qualitative data resulted in seven themes: (1) effective reading comprehension strategies, (2) teacher preparation, (3) teacher knowledge and ability, (4) teacher confidence, (5) job related factors, (6) teacher effectiveness, and (7) outcome expectancy. Tables 23 through 33 display themes and subthemes of the cumulative

analysis of both measures.

Quantitative and Qualitative Data Integration

In mixed methods research, integration is used to strengthen value and validity (Bryman, 2006; Creswell & Plano Clark, 2011; Fetters et al., 2013). Data integration within this study occurred using several different approaches. First, data integration occurred within the study design level (Fetters et al., 2013). The researcher's implementation of explanatory sequential design utilized quantitative data to inform qualitative data and collection (Creswell, 2009; Fetters et al., 2013). The qualitative data were used to develop a deeper understanding of the quantitative data (Creswell, 2009; Fetters et al., 2013). Second, data integration occurred during the methods of data collection and analysis (Creswell, Klassen, Plano Clark, Smith, & Working Group Assistance, 2011; Fetters et al., 2013). Integration occurred through *connecting*, data were linked through the sampling frame (Fetters et al., 2013). Qualitative measures participants were selected from the targeted pool of participants completing the quantitative measure. Integration occurred through *building*, which included one data collection measure being used to inform the data collection of the following measure. In this study, the data obtained from the quantitative phase of the study were used to formulate questions for the qualitative phase. Finally, integration occurred at the interpretation and reporting level through a narrative. The researcher used the contiguous approach to summarize the findings of the quantitative and qualitative measures in different sections of the study; however, the researcher merged the findings together in the discussion summary to report findings on a thematic or conceptual basis and answer the research questions (Fetters et al., 2013).

Summary

A review of the literature indicated that working memory deficits were common among students with disabilities and reading difficulties. Teachers perceptions of working memory, executive function, or brain-based learning are limited, which created a gap between research and practice. This gap was attributed to insufficient emphasis on cognitively focused instructional strategies and research-based reading comprehension strategies in teacher education programs as well as limited in-service professional learning. This explanatory sequential mixed methods research design examined the experiences and perceptions of special education teachers charged with improving the reading comprehension of students with working memory deficits. A survey collected quantitative data on participant background experiences, preparedness, and confidence related to their understanding working memory, and teacher beliefs of their preparedness and confidence related to research-based strategies for reading comprehension. Results of the survey were used to organize participants into four equal quartiles. Two participants from each quartile were invited to participate in the qualitative phase of the study. The qualitative phase included two measures: a self-efficacy questionnaire and an interview. Questions presented in the questionnaire and interview protocol were influenced by the data obtained from the quantitative survey and aligned to the two research questions. Utilizing data from quantitative and qualitative measures provided the researcher with enough data to develop an in-depth view of the topic of study. The purpose of the explanatory sequential mixed methods research study was to examine special education teachers' perceptions of their background and experiences, self-

efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits.

CHAPTER IV

RESULTS

Introduction

Recent studies on special education teachers' self-efficacy, knowledge, and effective implementation of research-based reading comprehension strategies indicated a significant gap between research and classroom practice (Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011). Several studies regarding teacher perceptions of working memory, executive function, or brain-based learning were also reviewed (Alloway et al., 2012; Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Findings from these studies suggest that teachers' knowledge and self-efficacy on these concepts are limited (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Significant gaps between research and practice regarding instructional strategies that address the cognitive processes required for learning and reading comprehension were also identified (Aldrich, 2013; Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011; Sigman et al., 2014). Lower self-efficacy rates and gaps between research and classroom practice were often attributed to insufficient teacher preparation and limited in-service professional learning (Bishop et al., 2010; Brownell et al., 2010; Ruppar et al., 2016; Sharpe et al., 2016; Tschannen-Moran & Johnson, 2011).

An explanatory sequential mixed methods research design, with a web-based survey (quantitative phase) followed by a questionnaire and semi-structured interviews (qualitative phase), was used to collect data regarding special education teachers'

perceptions of their background and experiences regarding working memory and reading comprehension and their ability to improve the reading comprehension of students with working memory deficits. Results from the web-based survey were used to inform the questionnaire and interview questions and determine participant selection in the qualitative phase.

Research Questions

In terms of identifying special education teachers' perceptions regarding their background and experiences, self-efficacy, and understanding of research-based instructional strategies to improve the reading comprehension of students with working memory deficits, this study investigated the following research questions:

1. How do special education teachers' experiences and perceptions of working memory and reading comprehension explain their preparedness and confidence for teaching reading comprehension effectively?
2. How do special education teachers perceive their ability to improve the reading comprehension of students with working memory deficits?

The quantitative results are presented first followed by the qualitative results from the questionnaires and semi-structured interviews.

Research Design

An explanatory sequential mixed methods research design allowed the researcher to utilize both qualitative and quantitative research design methods to examine the experiences, perceptions, and self-efficacy of special education teachers providing reading instruction to students with working memory deficits. This mixed methods approach combined quantitative and qualitative phases of data collection and analysis to

examine special education teachers' perceptions of their background and experiences regarding working memory and reading comprehension and their ability to improve the reading comprehension of students with working memory deficits (Johnson & Christensen, 2010; Moustakas, 1994; Muscella, 2014; Patton, 2002; Starks & Trinidad, 2007). Quantitative data were also used to examine participant background experiences, such as years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization as factors impacting teacher perceived self-efficacy in providing effective reading instruction for students with working memory deficits. Sequential triangulation of data obtained through the quantitative survey, qualitative self-efficacy questionnaire, and interview were used to obtain an in-depth understanding of special education teachers' perspectives and experiences regarding their knowledge, understanding, and self-efficacy regarding reading comprehension instruction and working memory deficits (Creswell, 2014). This design allowed the researcher to explore generalizations, multiple viewpoints, and develop a narrative of descriptive material on a specific topic or phenomenon (Adelman et al., 1980). The mixed methods research design was chosen to obtain a complete understanding of the problem by using qualitative data to explain the quantitative findings.

Description, Analysis, and Interpretation of Results

An explanatory sequential mixed methods research design was chosen to examine special education teachers' perceptions of their ability, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. This mixed methods approach combined

quantitative and qualitative phases of data collection and analysis. Quantitative data were used to collect data on teachers' beliefs of their preparedness and confidence regarding working memory and reading comprehension. Qualitative data were collected to explore special education teachers' perceptions of their self-efficacy using an open-ended questionnaire and interviews. The two phases were connected by purposefully sampling the survey participants to participate in the qualitative phase.

Quantitative Phase

Data were disaggregated using the participant background experiences (i.e., years of experience, college degree, instructional setting, grade band assignments, special education certification, and reading specialization). SPSS software was used to conduct a reliability analysis, conduct bivariate correlations, calculate subscale and composite scores, and conduct descriptive and frequency statistics. Descriptive statistics were grouped according to participants' levels of confidence regarding working memory (WMConfidence), preparedness regarding working memory (WMPreparedness), confidence regarding reading comprehension (RDGConfidence), preparedness regarding reading comprehension (RDGPreparedness). The descriptive statistics also included the mean, standard deviation, minimum, and maximum scores for each subscale. Frequency statistics included participant response rates on each subscale. Information regarding participant sources of preparation and confidence as well as needs for further professional learning to increase self-efficacy were also presented. Finally, SPSS software was used to order participant composite scores from least to greatest and divide into four equal quartiles. Two questionnaire participants from each quartile were invited

to participate in the two data collection measures of the qualitative phase, which included self-efficacy questionnaires and interviews.

Reliability analysis. SSPS software was used to conduct reliability analyses on the confidence and preparedness subscales as well as the composite scale. Each subscale included 14 questions, which combined for 28 questions. Participants answered all survey questions within each subscale resulting in a 100% case processing summary for the composite survey. The alpha coefficient was determined to be good at $\alpha = .97$ for the composite. The alpha coefficients for the subscales of WMConfidence ($\alpha = .88$), RDGConfidence ($\alpha = .92$), WMPreparedness ($\alpha = .92$), and RDGPreparedness ($\alpha = .93$) were determined to be good. The composite, confidence, and preparedness scales were deemed to be internally consistent. Table 11 provides a summary of the data determined from the reliability analyses.

Table 11

Alpha Coefficients and Descriptives for the Confidence and Preparedness Survey

Scale	*α*	*M*	*SD*
WMConfidence	.88	17.23	3.77
RDGConfidence	.92	20.57	5.54
WMPreparedness	.92	16.82	4.15
RDGPreparedness	.93	20.26	5.58
Composite	.97	74.87	17.01

Validity analysis. To measure discriminant validity, a series of Pearson *r* correlations was conducted using the four subscales (i.e., WMConfidence, RDGConfidence, WMPreparedness, and RDGPreparedness) from the Confidence and Preparedness Survey. The correlation coefficients ranged from .57 to .95. The criterion

for discriminant validity was a correlation coefficient less than .90 to ensure the subscales were conceptually distinct measures (Hair et al., 2006). The relationship between Reading Confidence and Preparedness was strong (r = .95), meaning these two subscales were not sufficiently different. The two subscales remained in the descriptive analyses because the results were not inferential. Table 12 displays a correlational matrix of the Confidence and Preparedness Survey subscales.

Table 12

Correlational Matrix for Confidence and Preparedness Subscales

Variable	1	2	3	4
1. WMConfidence	--			
2. RDGConfidence	.57**		--	
3. WMPreparedness	.86**	.62**		
4. RDGPreparedness	.60**	.95**	.69**	--

Note: * = $p < .05$; ** = $p < .01$.

Descriptives. The descriptives, the means of each response of each background experience, were conducted using SPSS software. Participants with 11 to 15 years of teaching experience had the highest composite mean (M = 80.25), while participants with 21 to 25 years had the lowest composite mean (M = 60.75). Regarding highest degree obtained, participants with bachelor's degrees had a higher composite mean (M = 77.28) than participants with specialist's degrees (M = 68.12). Participants serving students in a resource/separate class setting had a higher composite mean (M = 75.35) than participants serving students in a collaborative teaching setting (M = 71.66). Participants serving students in Grades 3 through 5 had the highest composite mean (M = 80.85), while participants serving students in Grades 9 through 12 had the lowest composite mean (M = 66.33). Participants certified in special education adapted

curriculum had the highest composite mean (*M* = 78.50). Participants with multiple areas of special education certification had the lowest mean (*M* = 69.50). Finally, participants with a certification, endorsement, or specialist in reading or language arts had a higher composite mean (*M* = 79.42) than participants without any additional training in reading or language arts (*M* = 71.50). The descriptives for teaching experience and level of degree are presented in Table 13, the descriptives for instructional setting and grade band are presented in Table 14, and the descriptives for instructional setting and grade band are presented in Table 15.

Table 13

Descriptives for Teaching Experience and Level of Degree

Experience	*M*	*SD*	*min*	*max*
0-5 Years	77.75	7.90	61.09	94.41
6-10 Years	76.66	9.12	57.43	95.91
11-15 Years	80.25	7.90	63.59	96.91
16-20 Years	73.83	6.45	60.23	87.44
21-25 Years	60.75	7.90	44.09	77.41
26+ Years	76.00	11.17	52.43	99.57
Level of Degree	*M*	*SD*	*min*	*max*
Bachelor's	77.28	5.84	65.11	89.47
Master's	76.75	5.46	65.37	88.14
Specialist	68.12	5.46	56.73	79.52

Table 14

Descriptives for Instructional Setting and Grade Band

Instructional Setting	*M*	*SD*	*min*	*max*
Resource	75.35	4.17	66.69	84.03

Collaborative	71.66	5.20	60.85	82.48
Grade Band	*M*	*SD*	*min*	*max*
Grades K-2	69.40	6.75	55.28	83.52
Grades 3-5	80.86	5.70	68.92	92.79
Grades 6-8	77.80	6.75	63.68	91.92
Grades 9-12	66.33	6.16	53.44	79.23

Table 15

Descriptives for Teaching Certification and Reading Specialization

Certification	*M*	*SD*	*min*	*max*
Consultative	71.00	8.37	53.42	88.58
Adapted	78.50	11.84	53.63	103.37
Interrelated	77.50	11.84	52.63	102.37
Dual	74.23	4.64	64.48	83.99
Multi	69.50	11.84	44.63	94.37
Reading Specialization	*M*	*SD*	*min*	*max*
Yes	79.43	5.76	67.45	91.41
No	71.50	3.81	63.58	79.43

Descriptive analysis. The descriptive statistics for the Confidence and Preparedness Survey were obtained by applying a four-point scale to levels of confidence and/or preparedness: *Not Confident/Prepared* (1), *Somewhat Confident/Prepared* (2), *Confident/Prepared* (3), and *Very Confident/Prepared* (4). The highest possible score on the each of the working memory subscales for confidence and preparedness scales was 24. The highest possible score on each of the reading comprehension subscales for confidence and preparedness scales was 32. The highest possible score on the composite scale, which was a sum of all four subscales, was 112.

Participants tended to rate themselves similarly for confidence (*M* = 17.21; *SD* = 3.78) and preparedness (*M* = 16.83; *SD* = 4.15) regarding working memory. Likewise, confidence regarding reading comprehension strategy instruction (*M* = 20.56; *SD* = 5.54) was rated higher than preparedness (*M* = 20.26; *SD* = 5.59). A large gap existed between the minimum composite score (*min* = 36) and maximum composite score (*max* = 112), which yielded a large standard deviation of 17.01. The mean, standard deviation, minimum, and maximum scores for each subscale and composite scale are presented in Table 16.

Table 16

Descriptive Statistics for Quantitative Survey

Scale	*M*	*SD*	*min*	*max*
WM Confidence	17.21	3.78	10	24
WM Preparedness	16.83	4.15	6	24
RDG Confidence	20.56	5.54	8	32
RDG Preparedness	20.26	5.59	8	32
Composite Score	74.87	17.01	36	112

Frequency analysis. Percentage of responses on survey items were grouped according to participants reported levels of confidence and preparedness. Tables 17 and 18 present the reported percentages of participant confidence regarding both working memory and reading comprehension instruction. Table 19 and 20 depict the reported percentages of participant preparedness regarding both working memory and reading comprehension.

Participant responses included a high number of *Confident* and *Very Confident* ratings related to understanding the role of working memory in learning, verbal

reasoning, early literacy, and reading comprehension. In fact, 86.96% of participants reported that they were *Confident* or *Very Confident* regarding their understanding of the role of working memory in reading comprehension. The lowest levels of confidence were found on survey items addressing strategies to increase working memory levels and using teacher knowledge and understanding of working memory to adapt instruction. Table 17 displays that 47.82% of participants rated themselves as *Not Confident* or *Somewhat Confident* regarding their understanding and implementation of strategies to increase students' working memory levels.

Table 17

Confidence Standard Items for Working Memory

Working Memory	Not Confident	Somewhat Confident	Confident	Very Confident
I understand the role of working memory in the learning process.	0.00%	21.74%	52.17%	26.09%
I understand the role of working memory in verbal reasoning.	0.00%	26.09%	60.87%	13.04%
I understand the role of working memory in developing early literacy skills.	4.35%	21.74%	56.52%	17.39%
I understand the role of working memory in reading comprehension.	0.00%	13.04%	60.87%	26.09%
I understand and implement research-based strategies to increase working memory levels.	13.04%	34.78%	39.13%	13.04%
I use my understanding of working memory and information on students' working memory levels to adapt instruction.	8.70%	30.43%	34.78%	26.09%

Participant confidence ratings regarding reading comprehension instruction were slightly lower than items addressing working memory, indicating greater percentages of

Not Confident or *Somewhat Confident*. Table 18 displays that 63.91% of participants rated themselves *Confident* or *Very Confident* regarding their knowledge and use of the summarization strategy to improve student reading comprehension levels, while 52.17% of participants rated themselves *Not Confident* or *Somewhat Confident* regarding their understanding of using collaborative comprehension strategies to improve student reading comprehension levels. Additionally, 52.17% of participants rated themselves as *Not Confident* or *Somewhat Confident* regarding metacognition and comprehension monitoring strategies. The lowest rating of participant confidence regarding reading comprehension was found on the items addressing the metacognition and question generating strategy (21.74%). Of the 23 participants, 4.34% of participants rated themselves as *Not Confident* within the confidence working memory subscale; whereas, 15.21% of the participants rated themselves as *Not Confident* on the reading comprehension subscale. Table 18 presents percentages for the confidence standard items for reading comprehension.

Table 18

Confidence Standard Items for Reading Comprehension

Reading Comprehension	Not Confident	Somewhat Confident	Confident	Very Confident
I understand collaborative comprehension strategies well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	17.39%	34.78%	43.48%	4.35%
I understand story structure and story grammar well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	8.70%	26.09%	60.87%	4.35%

I understand metacognition/comprehension monitoring strategies well enough to teach them as an effective strategy to teach reading comprehension to students with working memory deficits.	21.74%	30.43%	43.48%	4.35%
I understand reciprocal teaching strategies or multiple strategy instruction (prediction, clarification, question generation, and summarization) well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	17.39%	13.04%	56.52%	13.04%
I understand the question generating strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.	21.74%	17.39%	47.83%	13.04%
I understand the question answering strategy well enough to use it an effective strategy to teach reading comprehension to students with working memory deficits.	17.39%	17.39%	56.52%	8.70%
I understand graphic/semantic organizers well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	8.70%	21.74%	52.17%	17.39%
I understand the summarization strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.	8.70%	17.39%	60.87%	13.04%

Percentages of participant preparedness related to working memory and reading comprehension instruction are presented in Tables 19 and 20. Response rates for *Not Prepared* were higher than the *Not Confident* ratings presented in Tables 17 and 18. Higher preparedness ratings were given on items, such as understanding the role of

working memory in reading comprehension (i.e., 82.61% *Prepared* or *Very Prepared*) and the learning process (i.e., 73.91% *Prepared* or *Very Prepared*). Like the confidence ratings, participants indicated that they were less prepared (i.e., 43.83% *Not Prepared* or *Somewhat Prepared*) to understand or implement research-based strategies to improve working memory levels.

Regarding reading comprehension instruction, Table 18 displays that 69.57% of participants were *Prepared* or *Very Prepared* regarding using reciprocal teaching and summarization strategies. Participant ratings indicated that 65.22% felt *Prepared* or *Very Prepared* in their understanding and use of graphic/semantic organizers. The lowest ratings for participant preparedness were on items addressing understanding and implementation of metacognition (i.e., 56.52% *Not Prepared* or *Somewhat Prepared*) and collaborative strategies (i.e., 47.82% *Not Prepared* or *Somewhat Prepared*) to improve reading comprehension. Table 19 presents the preparedness standard percentages for working memory, and Table 20 presents the preparedness standard percentages for reading comprehension.

Table 19

Preparedness Standard Items for Working Memory

Working Memory	Not Prepared	Somewhat Prepared	Prepared	Very Prepared
I understand the role of working memory in the learning process.	4.35%	21.74%	52.17%	21.74%
I understand the role of working memory in verbal reasoning.	4.35%	26.09%	56.52%	13.04%
I understand the role of working memory in developing early literacy skills.	8.70%	21.74%	56.52%	13.04%
I understand the role of working memory in reading comprehension.	4.35%	13.04%	65.22%	17.39%

I understand and implement research-based strategies to increase working memory levels.	13.04%	30.43%	43.48%	13.04%
I use my understanding of working memory and information on students' working memory levels to adapt instruction.	8.70%	30.43%	34.78%	26.09%

Table 20

Preparedness Standard Items for Reading Comprehension

Reading Comprehension	Not Prepared	Somewhat Prepared	Prepared	Very Prepared
I understand collaborative comprehension strategies well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	17.39%	30.43%	47.83%	4.35%
I understand story structure and story grammar well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	13.04%	26.09%	52.17%	8.70%
I understand metacognition/comprehension monitoring strategies well enough to teach them as an effective strategy to teach reading comprehension to students with working memory deficits.	21.74%	34.78%	39.13%	4.35%
I understand reciprocal teaching strategies or multiple strategy instruction (prediction, clarification, question generation, and summarization) well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	17.39%	13.04%	60.87%	8.70%
I understand the question generating strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.	17.39%	26.09%	47.83%	8.70%

I understand the question answering strategy well enough to use it an effective strategy to teach reading comprehension to students with working memory deficits.	13.04%	30.43%	52.17%	4.35%
I understand graphic/semantic organizers well enough to use them as an effective strategy to teach reading comprehension to students with working memory deficits.	8.70%	26.09%	43.48%	21.74%
I understand the summarization strategy well enough to use it as an effective strategy to teach reading comprehension to students with working memory deficits.	8.70%	21.74%	60.87%	8.70%

Sources of teacher preparation and areas for continued support or training. Table 21 displays participant responses regarding the most effective source of teacher preparedness regarding their understanding of working memory. Only 21 participants responded to this question. In response to their greatest source of preparation, 42.86% of participants attributed their sense of preparation to teaching experience. Of the nine participants that indicated teaching experience was their greatest source of confidence or preparedness, 67% had 11 or more years of experience in education. The second highest rating of *Prepared* or *Very Prepared*, 23.81% of participants was collaboration with colleagues (e.g., professional learning communities, book studies). Table 21 displays that 14.29% of participants that indicated their undergraduate, teacher preparation program was the greatest source of their sense of preparedness. Self-study and in-service professional development through the school district were the lowest areas with 0% of participants selecting that option.

Table 21

Source of Teacher Preparation Regarding Working Memory

Responses	*N*	%
My teacher preparation program.	3	14.29
In-service professional development through my school district.	0	0.00
My teacher preparation program AND in-service professional development.	2	9.52
Graduate school specialization.	1	4.76
Collaboration with colleagues (Professional Learning Communities, book studies, etc.)	5	23.81
Self-Study	0	0.00
Teaching Experience	9	42.86
Other	1	4.76

Question 11 on the Confidence and Preparedness Survey asked participants to identify support or training that they need to improve their confidence and preparedness regarding working memory. Out of the 16 participants that responded, 10 indicated that additional training on addressing working memory deficits was needed. Other responses included two participants that suggested teachers needed to be provided with more in-depth data regarding each student's working memory level and other cognitive deficits. One participant stated that he/she worked at the high school and had little experience with beginning literacy-aged children. Not applicable or N/A was provided by three participants.

Table 22 displays participant responses regarding the most effective source of preparedness regarding reading comprehension instruction. According to Table 22, teaching experience provided the greatest source of teacher preparation (27.78%). Experience was followed by in-service professional development through the school district with 22.22% of participants. An equal percentage of participants (16.67%)

selected their teacher preparation program or collaboration with colleagues as a source of preparation. No responses were recorded regarding graduate school specialization or self-study.

Table 22

Sources of Teacher Preparation Regarding Reading Comprehension Instruction

Responses	*N*	%
My teacher preparation program.	3	16.67
In-service professional development through my school district.	4	22.22
My teacher preparation program AND in-service professional development.	2	11.11
Graduate school specialization.	0	0
Collaboration with colleagues (Professional Learning Communities, book studies, etc.)	3	16.67
Self-Study	0	0
Teaching Experience	5	27.78
Other	1	5.56

Qualitative Phase

Exploratory case study methodology was used in the qualitative phase of the explanatory sequential mixed methods research study. Self-efficacy questionnaires followed by semi-structured interviews were used to expand upon data collected in the quantitative phase. As mentioned above, qualitative participants were selected purposefully from those participants who completed the quantitative survey, scored in each quartile using ordered composite mean scores, and agreed to participate in the qualitative phase of the study. Qualitative results. The cumulative analysis revealed seven themes: (1) effective reading comprehension strategies, (2) teacher preparation, (3) teacher knowledge and ability, (4) teacher confidence, (5) job related factors, (6) teacher effectiveness, and (7) outcome expectancy. Data were reported using tables, as

well as in narrative form (Bryman, 2008). The number of participants referring to each theme and code, along with sample quotations are presented in Table 23 through Table 33.

Effective reading comprehension strategies. An analysis of the questionnaire and interview transcripts revealed two subthemes under Theme 1, teacher knowledge of evidence-based reading comprehension strategies and teacher knowledge of general reading comprehension strategies. Regarding evidence-based reading comprehension strategies, six out of seven participants (86%) referenced one or more of the evidence-based practices presented in the literature review. Summarizing, making predictions, and guided questioning were mentioned by 57% of participants. Metacognition strategies, one of the most effective evidence-based strategies (NICHD, 2000), were mentioned by three (43%) participants. Participant 4 described teaching students to use metacognitive strategies in her classroom.

> Another strategy I feel is most effective for improving comprehension is teaching students to interact with text. Throughout my teaching career, I have seen this addressed in many ways. My first years teaching, we focused on doing a "Read Aloud/Think Aloud". Teacher reading aloud for students and stopping to think (aloud) as you read the text. For my very low readers, I found this to be very beneficial.

Participants with greater knowledge of evidence-based reading comprehension strategies (29%) referenced targeted professional learning not associated with a specific reading program. Question generating, a strategy that requires students to generate questions as they read (Davey & McBride, 1986), and collaborative reading strategies (Klingner et

al., 2004) were not mentioned. Table 23 presents the themes or codes, number of participants, and sample quotations from Theme 1a, teacher knowledge of evidence-based reading comprehension strategies.

Table 23

Theme 1a. Teacher Knowledge of Evidence-Based Reading Comprehension Strategies

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 1a: Teacher knowledge of evidence-based reading comprehension strategies	6 (86%)	
Summarizing	4 (57%)	Have students write summaries of what they have read.
Reciprocal strategies (making predictions, etc.)	4 (57%)	I teach students to make predictions to increase interaction with the text.
Question answering/guided questioning	4 (57%)	A balance of explicit and implicit questions should be asked during and after reading a text.
Metacognition	3 (43%)	More recently, we began teaching students to annotate and close read. Both strategies are another version of metacognition that accompanies reading and thinking aloud.
Using graphic organizers	3 (43%)	Using graphic organizers to organize details, show cause and effect, and/or chronologically sequence events in the text.
Using story structure	2 (29%)	Teach mini-lessons on story elements and sequencing to assist students in understanding the parts of the story.
Question generating	0 (0%)	Not mentioned.
Collaborative reading strategies	0 (0%)	Not mentioned.

Participants referenced 12 general comprehension strategies to improve reading comprehension. Activating prior knowledge (57%), making real world connections (57%), and using student illustrations (57%) were mentioned most often. Participant 1 described her use of direct instruction on story elements and sequencing to improve instruction.

> I teach mini-lessons on story elements and sequencing to assist students in understanding the parts of the story.

Table 24 provides the subthemes or codes, number of participants, and sample quotations from Theme 1b, teacher knowledge of general reading comprehension strategies.

Table 24

Theme 1b. Teacher Knowledge of General Reading Comprehension Strategies

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 1b: Teacher knowledge of general reading comprehension strategies	7 (100%)	
Activating prior knowledge	4 (57%)	For students to be successful in reading material at or above their independent reading level, they must have knowledge about the topic they are reading.
Making real world connections	4 (57%)	When I think about reading comprehension, the first thing that comes to my mind is relating the text to a real-life experience I have had.
Student illustrations	4 (57%)	I teach students to draw pictures to retell information from the story.
Using visualization	3 (43%)	In order to build concept imagery, teachers should have students visualize (i.e., close your eyes and imagine what is happening).

Motivating purpose	3 (43%)	Peeking their interest allows the students to have a purpose for reading; therefore, they are engaged in the text.
Making Inferences	3 (43%)	Direct instruction on making inferences should be taught to assist students in answering implicit questions.
Scaffolding	2 (29%)	SOS or Stop-Orient-Scaffold/Support can be used to improve student reading comprehension.
Highlighting details	2 (29%)	Highlighting important details is an effective reading comprehension strategy.
Sequencing	2 (29%)	Teach mini-lessons on story elements and sequencing to assist students in understanding the parts of the story.
Explicit, direct instruction	2 (29%)	Explicit instruction and modeling of the strategies is required to increase student use of comprehension strategies.
Multiple reads	1 (14%)	Multiple readings should occur to improve comprehension.
Vocabulary instruction	1 (14%)	Use word study to preview difficult words and break the words apart to make them easier to read.

Teacher preparation. In-service professional development provided by a school district or employer was listed as the primary source of teacher preparation regarding reading comprehension instruction (100%). Participant 20 implied that the district had recently increased the opportunities for professional learning and literacy resources. She stated,

> The system in the past few years has provided training that has allowed us to learn techniques and strategies that will help promote literacy and has given us more to work with than what special needs teachers have had in the past. Mainly, we were just running with what we had, not always having curriculum that we needed. We were [begging], borrowing, and stealing whatever we could find. It

> may not have been exactly what the students needed, it was just what we had to work with.

An equal number of participants listed training provided in graduate courses and teacher experience (43%). Participant 4 described specialized reading instruction training provided through her graduate program at the University of Central Oklahoma.

> As part of the college of education requirements, all education majors were required to take a minimum of two reading classes. One class was the diagnosis and interventions for reading difficulties [course]. This class covered varying levels of reading difficulties and what they looked like. The second class was a lab, in which we were required to tutor a student who had a diagnosed reading difficulty. This was invaluable to a college student-no matter what area of focus.

One participant referenced specific training through the school system, which resulted in a reading endorsement. Only one participant referred to in-service professional learning provided by the district's department of special education; however, these trainings were related to a software program used in a remedial reading course provided to students in sixth through eighth grade. Participant 4 stated,

> I have learned about teaching reading and effective reading comprehension strategies through the special education department. As a reading connections teacher in the special education department, I was sent to various trainings for both very low and just below grade level readers.

Table 25 presents sample quotations and the number of participants related to Theme 2, teacher preparation.

Table 25

Theme 2. Teacher Preparation

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 2: Teacher preparation	7 (100%)	
In-service professional learning (reading)	7 (100%)	We are really learning to build that background knowledge, providing pictures and videos and lots of things to sort of boost their knowledge to aid comprehension.
Teaching experience	4 (57%)	I have been exposed to many different methods of increasing student reading ability in both the general and special education setting, as well as intense, explicit instruction in strictly reading comprehension.
Graduate School	4 (57%)	I learned a lot about reading in my Teaching of Reading class for my master's degree.
Colleagues/peer collaboration	2 (29%)	I've learned a lot from veteran teachers.
Undergraduate/pre-service	2 (29%)	When I was at Valdosta State University for my undergraduate degree, I learned about many different comprehension strategies.
Reading specialization	2 (29%)	I learned a lot about teaching reading through my reading certification: MoocEd.
In-service professional learning (working memory)	0 (0%)	None.

Teacher knowledge and ability. Two categories related to teacher knowledge and ability emerged from the qualitative data. Participants indicated eight strengths in their knowledge and ability related to reading comprehension and working memory. In-depth knowledge of the reading process, ability to diagnose and address deficits, and prior success were mentioned by 71% of participants. Only three participants (43%) felt that they had in-depth knowledge of specialized instructional strategies. Finally, one

participant felt that her strengths came from consistency in instructional practice. Table 26 depicts strengths in participants' knowledge and ability to increase the reading comprehension of students with working memory deficits.

Table 26

Theme 3a: Strengths in Teacher Knowledge and Ability

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 3a: Strengths	5 (71%)	
In-depth knowledge of reading process	5 (71%)	I understand the five essential components of reading instruction and the progressive way you teach students to become fluent readers with the ability to comprehend material.
Ability to diagnose and address deficits	5 (71%)	I have the knowledge to assess students for strengths and weaknesses and develop an instructional plan.
Prior success	5 (71%)	We have had a lot of success with the Wilson Reading Program.
Knowledge/use of reading skills/strategies	3 (43%)	If you know how to use different reading strategies, you can reach most students.
In-depth knowledge of specialized instructional strategies	3 (43%)	I'm able to reach them through specialized instructional strategies.
Relationships with students	2 (29%)	Talking to students, listening to students. You know, understanding why they don't get it. Asking them and finding where the breakdown is.
Ability to address different learning styles	1 (14%)	You have to know their learning styles.
Consistency in instructional practice	1 (14%)	I think consistency is a key component to any successful academic strategy.

The second category under teacher knowledge and ability included four weaknesses in participants' knowledge and ability to increase the reading

comprehension levels of students with working memory deficits. Lack of success with significantly low readers what mentioned by 4 (57%) of participants. Participant 1 stated,

> The special education teachers and I have had many conversations regarding students who have been given best practices in reading instruction for a significant amount of time but are still unable to grasp/retain the ability to read. How can we help them?

Limited knowledge regarding specialized reading instructional strategies was also mentioned by four participants (57%). Table 27 presents sample quotations and the number of participants related to theme 3b: Teacher knowledge and ability: Weaknesses.

Table 27

Theme 3b. Weaknesses in Teacher Knowledge and Ability

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 3b: Weaknesses	4 (57%)	
Lack of success with significantly low readers	4 (57%)	I feel unsuccessful when working with [students] have delayed, sequential processing and they are not able to tap out sounds.
Limited knowledge of specialized reading strategies	4 (57%)	I think that it would help to have professional learning in reading instruction that targets specific deficits (i.e., these are ways to target working memory deficits or processing deficits).
Limited understanding of reading process	3 (43%)	I feel that I have a general understanding of the reading process, but I do feel if I had a deeper understanding, I could be a better reading teacher.
Inability to diagnose and address reading deficits correctly	1 (14%)	When students get stuck, I struggle with knowing how to solve the problem.

Teacher confidence. Confidence in their knowledge and understanding of the reading process was high with five participants (71%) initially describing themselves as confident; however, three of those five participants indicated additional training, strategies, and resources were needed to ensure greater student outcomes. Only two participants, 29%, indicated that they were confident to teach students at different grades and within different stages of the reading process. One participant stated that she was more confident in teaching foundational literacy strategies as opposed to other strategies addressing reading comprehension. Finally, 57% of participants indicated that despite their confidence and ability teach reading, some students are not successful in improving their reading comprehension skills. Participant 13 stated,

> I feel as though I am effective with the programs we have been trained in; however, some students do not learn well with those programs, and I am at a loss as to what to do with students that are not successful with what we have been given to utilize.

The youngest teacher with the least teaching experience, Participant 15, stated that she felt that she could be "more effective if [she] had a deeper understanding of the reading process." Only two participants maintained a high level of confidence throughout the qualitative phase. Table 28 presents sample quotations and the number of participants related to Theme 4, teacher confidence.

Table 28

Theme 4. Teacher Confidence

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 4: Teacher confidence	7 (100%)	
Confident	2 (29%)	I am confident in my ability to teach students with reading problems because I have worked with students of all disabilities in a variety of settings, which has helped me understand how to meet the individual needs of students.
Confident with parameters	5 (71%)	I feel as though I am effective with the programs we have been trained in; however, some students do not learn well with those programs and I am at a loss as to what to do with students that are not successful with what we have been given to utilize.

Job related factors. Participants indicated that specific job related factors affect their ability to increase the reading comprehension rates of students with working memory deficits. Two categories emerged regarding job related factors, instructional or professional needs and student factors. Participants indicated three areas of instructional or professional need, additional tools and resources, professional learning on the reading process, and professional learning on specialized reading instructional strategies. Seven job related factors related to student factors were identified.

Instructional or professional needs. Several participants (57%) suggested that a lack of student success in reading was related to lack of access to additional reading programs. Participant 13 stated,

> Some students do not learn well with those programs and I am at a loss to what to do with students that are not successful with what we have been given to utilize.

Five participants (71%) stated that they need additional training regarding the reading process. Finally, five participants stated that they needed professional learning on specialized instructional strategies to increase student and teacher success. Participant 15 became very frustrated stating,

> Some of the issues that I find are, once I pinpoint one problem and then they are still not making the progress, it's hard for me to know where to go from there. Once I think that I've found the problem; and then, realistically, I question if that is the true problem or not. But, I don't know where to go from there because I don't want to go backwards and bring the kids backwards if they have already learned a certain skill. Does that make sense?

Table 29 depicts job related factors such as instructional or professional needs that affect teacher success and confidence.

Table 29

Theme 5a. Job Related Factors: Instructional or Professional Needs

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 5a: Instructional or professional needs	5 (71%)	
Additional resources/tools	5 (71%)	There are pockets of children that are not successful with the phonetic reading program, so we need an alternate approach for these kids.
Professional learning of reading process	5 (71%)	When I have students that get stuck, or do not understand something I am trying to teach them with the reading process, I

		struggle with knowing how to solve the problem.
Professional learning on specialized instructional strategies	5 (71%)	I think that it would help to have professional learning in reading instruction that targets specific deficits (i.e., these are ways to target working memory deficits or processing deficits).

Student factors. All seven of the participants referenced student factors that affect reading comprehension proficiency. Four participants (57%) mentioned working memory deficits or the inability to retain information while reading. Three participants (29%) explained that student with significant or multiple cognitive deficits have great difficulty with reading comprehension. Decoding deficits and lack of reading fluency were mentioned by two participants (29%). Table 30 depicts student factors that affect participants' perception of their ability to increase reading comprehension for students with working memory deficits.

Table 30

Theme 5b. Job Related Factors: Student Factors

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 5b: Student factors	7 (100%)	
Working memory deficits	4 (57%)	Even with some kids that we have, once they read the passage, even sometimes when I read it to them and we go back to try to answer the comprehension questions, they have no idea what the answers are because they just can't hold on to it long enough.
Significant cognitive deficits	3 (43%)	We have a lot of students with sequential processing deficits and low IQ's. Some of our programs are not designed for students whose IQ is below 80.

Limited background/prior knowledge	3 (43%)	I think the lack of student success comes primarily from the lack of background knowledge.
Decoding deficits	2 (29%)	They may know the sounds, but they are not able to blend them back together.
Lack of reading fluency	2 (29%)	Students have a hard time with comprehension because they are not yet fluent readers.
Socioeconomics	1 (14%)	Socioeconomic status in the community affects student success because students are not exposed to experiences outside of school.
Student behavior	1 (14%)	It's difficult whenever they come with the mindset that they don't want to do anything or they've had a bad day.

Teacher effectiveness. Two subthemes emerged related to teacher effectiveness, characteristics of teacher effectiveness and measuring teacher effectiveness. All questionnaire participants stated that a direct connection existed between students' reading achievement and teacher effectiveness, with 71% indicating that student progress was correlated to teacher knowledge of the reading instructional strategies (86%) and diagnosing student deficits (57%). When asked to explain the relationship between students' reading achievement and teacher effectiveness, Participant 15 stated,

> When a student is struggling and the teacher can effectively diagnose the problem and use strategies to assist the student, the student is more likely to succeed than a student that does not have an effective teacher.

Building student relationships and being masters of subject matter were mentioned by two participants (29%), respectively. Table 31 presents sample quotations and the number of participants related to Theme 6a, characteristics of teacher effectiveness.

Table 31

Theme 6a. Characteristics of Teacher Effectiveness

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 6a: Characteristics of teacher E effectiveness	7 (100%)	
Understanding instructional strategies	6 (86%)	I am comfortable with teaching strategies such as making inferences and predictions, locating the central idea, and justifying with textual evidence.
Student growth	4 (57%)	If the teacher is not effective, then the student will not show as much achievement growth in reading.
Diagnosing and addressing deficits	4 (57%)	I have the knowledge to assess students for strengths and weaknesses to help develop an instructional plan that will allow me to effectively guide and instruct the students I teach.
Bridging gaps in learning	4 (57%)	Students' reading achievement is directly related to teacher effectiveness, especially if the teacher is unaware of how to bridge the gap between low reading achievement and content area standards.
Building student relationships	2 (29%)	Teachers must build relationships with their students and instill a love for literacy in every student to maximize a student's potential.
Mastery of subject matter	2 (29%)	Many factors contribute to students' academic performance, but I feel that teacher effectiveness and mastery of the subject matter play a major role in students' reading achievement.

Measuring teacher effectiveness. When asked how teachers measure their success and effectiveness, 57% of participants alluded to the student growth model. Participant 23 stated,

> You would have to base your success on the small gains that you would get from knowing where the child started when they entered your classroom, throughout the year, and then look at the overall progress for the end of the year. Even if it was small, there was a gain, so there was success.

Measuring growth using student data through academic screeners was reported by 43% of participants. Two participants reported using daily interaction or observation to measure effectiveness. Self-reflection and monitoring IEP goals were reported equally at 14%. Several participants seemed very frustrated and emotional when answering this question. Participant 13 stated,

> Well, I really, to be honest with you, I really don't know. Because, really, I can teach them to highlight. I can teach them to go back and reread and try to summarize for me. But, in the end, the only thing that I have to gauge it from is whether or not they got the answer right. So, a lot of times, I don't feel successful with reading comprehension because they don't do well with that.

Table 32 presents sample quotations and the number of participants related to Theme 6b, measuring teacher effectiveness.

Table 32

Theme 6b. Measuring Teacher Effectiveness

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 6b: Measuring teacher effectiveness	7 (100%)	
Student growth model	4 (57%)	I think you look at the growth model versus them attaining a whole goal.

Student screeners	3 (43%)	For what I'm teaching, I feel that growth on the DIBELS (Dynamic Indicators of Basic Early Literacy Skills) is what I look at.
Daily interaction/ observation	2 (29%)	I measure my effectiveness by seeing successes in social studies and science. When I see [students] in those other content areas, putting things into application and seeing improvement there, I feel effective.
IEP growth data	1 (14%)	I look at the data when I progress monitor the IEP goals.
Self-reflection	1 (14%)	I gauge it by, a lot of times, self-reflection. I look back on the day and think, was I successful?

Outcome expectancy. Self-efficacy is based on one's belief that their behaviors or actions can produce a specific outcome (Bandura, 1977). In describing the likelihood that students with working memory deficits would achieve the desired reading comprehension outcomes, 71% of participants stated that their outcome expectancies were low. Long-term growth, measuring students' abilities before and after instruction on a daily, quarterly, or yearly basis, was expected by 29% of participants. Participant 4 stated,

> I think that most of our students that I serve do reach that desired outcome, maybe not with every assessment or assignment. But, I think that in the long term, you know what they take away, it is an improvement, it is working towards improving their comprehension.

Participant 20 stated,

> I feel like, [with] most of the students that have that deficit area, it takes time, and we may not end up with the outcome that we wanted as quickly as we

> wanted. It takes time to build on their skill deficits. So, I think through the years we will see them grow and develop.

Additionally, 57% indicated that student growth targets and goals were below the grade level standards. One participant stated that motivation and student behavior were primary factors in student outcomes. Participant 15,

> I feel like a lot of times, with the group that I have this year, it also depends a lot on their mindset whenever they come to the classroom. If they are wanting to learn that day, I [have to] find a fun way to get them interested in the lesson in order to get the outcome that I want to have. But then sometimes, it's difficult whenever they come with the mindset that they don't want to do anything or they've had a bad day or [something happens] 5 seconds before walking in the hall and they get in here and they are still upset about it. It's hard to reach them with the lesson that I am trying to give and get that outcome that I want.

Table 33 presents sample quotations and the number of participants related to Theme 7, outcome expectancy.

Table 33

Theme 7. Outcome Expectancy

Theme or Code	Total/percentage ($N = 7$)	Example participant quotes
Theme 6: Outcome expectancy	7 (100%)	
Low expectancy rate	5 (71%)	I would say for an average class size, about 20% of the entire class would meet the expected goal throughout a year long process.
Below grade level	4 (57%)	They are not going to achieve the milestones that third graders do, but they are going to grow within from where they are, hopefully, and build from there.

Short term goals	4 (57%)	I measure their overall growth that they have made in a 9-week period versus a year.
Long-term, not immediate growth	2 (29%)	But, I think that in the long term, you know what they take away, there is an improvement that is working toward improving their reading comprehension.

Integration of Quantitative and Qualitative Data

An explanatory sequential mixed methods research study consisting of one quantitative (survey) and two qualitative (questionnaire and interview) measures were used to answer research questions related to special education teachers' self-efficacy regarding improving the reading comprehension of students with working memory deficits. Quantitative data from an online survey was used to answer Research Question 1: How do special education teachers' experiences and perceptions of working memory and reading comprehension explain their preparedness and confidence for teaching reading comprehension effectively? Two qualitative measures followed to expand upon data collected regarding to Research Question 1 and answer Research Question 2: How do special education teachers perceive their ability to improve the reading comprehension of students with working memory deficits?

Research Question 1

When analyzing composite means within the professional demographic groups, responses were contrary to expectations. Participants with 15 or more years of experience had lower composite means than participants with 14 or fewer years. Participants with 0 to 5 years had the second highest composite mean. Participants with a bachelor's degree had higher composite scores than participants with a specialist degree. Participants serving students in Grades 9 through 12 and Grades K

through 2 had the lowest composite scores. Participants with a specialization in reading had higher composite scores than those participants without a reading endorsement, certification, or advanced degree in reading. Finally, participants with a degree in adapted curriculum had the highest composite means.

Overall, quantitative participants rated themselves more confident and prepared regarding their understanding of working memory as opposed to reading comprehension. Fewer ratings of *Not Confident* were provided on the working memory subscale as opposed to the reading comprehension subscale. Higher ratings of *Very Confident* were shown on the working memory subscale compared to the reading comprehension subscale.

Confidence and preparedness ratings varied on items within the subscales. Higher levels of confidence and preparedness were noted on items related to the role of working memory in learning, verbal reasoning, early literacy, and reading comprehension. Lower confidence and preparedness levels were indicated on items related to implementing strategies to increase working memory and using working memory levels to adapt reading instruction. Participants indicated higher ratings of confidence and preparedness regarding their knowledge and use of the summarization strategy to improve student reading comprehension levels. The lowest ratings of teacher confidence and preparedness regarding reading comprehension were found on the items addressing metacognition and collaborative comprehension strategies.

Participants indicated that they were more confident than prepared on items related to working memory and reading comprehension. On the working memory subscale items, 20.29% of participants rated themselves as *Very Confident* as opposed to

17.39% who rated themselves as *Very Prepared*. On the reading comprehension subscale items, 9.78% of participants rated themselves as *Very Confident* with a slightly lower percentage, 8.69%, indicating that they were *Very Prepared*. Contrarily, 37.50% of participants rated themselves *Not Confident* or *Somewhat Confident* as opposed to 40.76% of participants who rated themselves as *Not Prepared* or *Somewhat Prepared*.

When asked to rate sources that led to higher levels of preparation regarding working memory, the highest rated response was teaching experience followed by collaboration with colleagues. None of the quantitative participants indicated that preparation regarding working memory was provided through in-service professional development within the school district. Ratings regarding sources of preparation for reading comprehension instruction included teaching experience followed by in-service professional development.

Qualitative data were used to expand on the quantitative data obtained regarding Research Question 1. The questions posed on the questionnaire and interview protocol were designed to develop a deeper understanding of participants' experiences and perceptions to explain their preparedness and confidence to teach reading comprehension effectively. Quantitative data indicated that participants were more confident in their understanding of working memory as opposed to reading comprehension; however, when asked about their confidence to increase the reading comprehension of students with working memory deficits, 71% of qualitative participants stated their confidence was limited to their use of current reading programs, grade band, or reading domains. Specifically, 71% of participants stated that they needed additional training on specialized instructional strategies related to cognitive deficits.

Only two participants, who also obtained the highest composite scores on the survey, stated that they were confident in their abilities and resources to teach students with reading problems. Teaching experience and recent in-service professional learning provided through general education were listed as the primary factors of confidence and preparedness. Only one participant, Participant 4, cited specialized training in graduate school related to diagnosing cognitive deficits and applying interventions or strategies. None of the participants cited in-service professional learning related to addressing students' cognitive deficits, which validated the data collected on the survey.

Like the quantitative survey, qualitative participants indicated a limited understanding and awareness of the evidence-based reading comprehension strategies presented in the NRP report (NICHD, 2000). Only two participants, who also maintained high confidence levels throughout the qualitative phase, mentioned four evidence-based reading comprehension strategies. The remaining three participants mentioned one or two of the NRP strategies. Despite experience and in-service training, 57% of participants have expressed frustration with their limited knowledge of strategies and inability to help some students. For example, three participants became emotional when describing their experiences with students who do not respond to available strategies and reading programs.

Research Question 2

Two qualitative measures were used to explore participants' self-efficacy and outcome expectancy for improving the reading comprehension rates of students with working memory deficits. A cumulative analysis of both measures revealed six themes directly related to teachers' self-efficacy: knowledge of effective reading comprehension

strategies, teacher preparation, teacher confidence, teacher effectiveness, teacher success, and outcome expectancy. As mentioned under Research Question 1, survey participants were generally confident in their knowledge of evidence-based reading strategies and knowledge of the reading process; however, when asked to describe the evidence-based strategies used to increase reading comprehension levels, questionnaire participants referenced a minimal number of evidence-based strategies. All participants reported that in-service professional learning and additional literacy resources attributed to their confidence and preparation; however, several participants (57%) indicated that the current literacy resources were not effective for a specific student population. This population was described as having large gaps in knowledge, background, and reading ability. More than half of the participants suggested that additional training (71%) and resources (57%) were needed to meet the literacy needs of students who are severely at-risk.

Throughout the qualitative phase, participants' confidence levels decreased. During the questionnaire, participants were asked if they felt confident in their knowledge of the reading process and their ability to teach reading effectively. Initially, all participants stated that they were confident; however, several participants (71%) limited their level of confidence to knowledge regarding the current literacy programs, certain stages of the reading process, or specific grade bands. In describing their ability to teach students with reading problems, only 29% felt like they had the ability to teach students with reading problems successfully. The remaining 71% stated that they felt like they had the ability to utilize the current literacy programs and strategies but did not have the ability to reach students who did not respond to the given programs. When

asked about the factors behind their lack of success regarding reading comprehension, 71% indicated a lack of training on cognitive deficits, additional reading programs, and knowledge of specialized instructional strategies for students with working memory deficits. Only two out of seven participants attributed their lack of success to student related issues, such as socioeconomics and limited background knowledge.

Though initial confidence levels were high, outcome expectancy for 86% of the qualitative participants was low. Participant 4, who obtained the highest composite score on the survey, indicated that the likelihood of her students meeting expected outcomes was high. The remaining 86% indicated that students would either not meet expected outcomes (57%) or progress toward meeting those outcomes would be significantly delayed (29%). Most of the participants (57%) used the growth model to gauge their success or effectiveness.

Summary

Analysis of quantitative data revealed that most participants rated themselves as *Confident* or *Very Confident* and *Prepared* or *Very Prepared* on both the working memory and reading comprehension subscales. Participants rated themselves as more confident than prepared regarding their understanding of working memory. Almost half (42.86%) of the participants who rated themselves as confident or prepared attributed this rating to teaching experience; however, participants with 15 or more years of teaching experience had lower composite score than participants with less experience. Only two participants attributed their level of confidence or preparedness regarding working memory to in-service professional development. When asked to identify different areas of support needed regarding working memory, 71% indicated that

additional professional learning related to specialized strategies to address working memory and other cognitive deficits was needed. Lower confidence and preparedness ratings were found on items related to participants' ability to increase working memory and adapt reading instruction to working memory levels.

Participants' confidence and preparedness ratings regarding reading comprehension were slightly lower than those ratings addressing working memory. On the reading comprehension subscales, participants had lower ratings on items addressing participants' understanding and implementation of metacognition and collaborative strategies to improve reading comprehension. More than half of the participants (52.17%) rated themselves as *Not Confident* or *Somewhat Confident* on items regarding metacognition and comprehension monitoring strategies. More ratings of *Not Confident* and *Not Prepared* were found on the reading subscale as opposed to the working memory subscale. Like the working memory subscale, most participants attributed their confidence and preparation to experience; however, 33% of the participants stated that in-service professional development affected their levels of confidence and preparedness regarding reading instruction.

On the qualitative self-efficacy questionnaire, participants indicated that they were confident in their knowledge of the reading process and their ability to increase the reading comprehension ability of students with working memory deficits; however, further questioning revealed parameters and factors limiting their confidence levels. When asked to describe the current reading strategies used in their classrooms, responses were primarily limited to the use of summarizing, making predictions, question answering, and graphic organizers. Like the quantitative measure, participants'

responses revealed gaps in their knowledge of more effective reading comprehension strategies, such as metacognition, collaborative comprehension strategies, and using story structure. Some participants felt more confident and effective teaching reading domains related to foundational literacy, such as phonics and phonemic awareness. Participants currently serving students at higher grade bands felt more confident and effective teaching vocabulary and comprehension instruction. Confidence levels were also limited to available resources. Of the seven participants, four stated that they were not confident in their ability to improve the reading comprehension ability of students who did not respond to the current reading programs. Outcome expectancy rates were significantly lower than confidence levels with 57% of participants indicating that the probability of students reaching expected grade level outcomes or goals was very low or significantly delayed. Participants attributed their low outcome expectancy to the inability to close student gaps in knowledge, ability, and background and the lack of training regarding specialized reading strategies related to specific cognitive deficits.

CHAPTER V

DISCUSSION

Educational researchers established a significant relationship between reading comprehension ability, student achievement, and long-term academic success (Garcia-Madruga et al., 2013; Hernandez, 2011; Kendeou et al., 2014). Students reading below grade level by the end of third grade often suffer from limited academic success and lower graduation rates (Hernandez, 2011). Working memory capacity is a critical component in the cognitive processes required in reading comprehension (Alloway et al., 2009; Arina et al., 2015; Garcia-Madruga et al., 2013; Kendeou et al., 2014; Loosli et al., 2012; Titz & Karbach, 2014). Despite the availability and implications of research regarding effective cognitively-focused instructional practices for improved reading comprehension, a significant gap between theory and classroom practice exists (Aldrich, 2013; Sigman et al., 2014).

Working memory deficits are common among students with disabilities and student with reading difficulties (Alloway et al., 2009; Dunning et al., 2013; Kendeou et al., 2014; Loosli et al., 2012; Zadina, 2015). Significant discrepancies in reading comprehension rates exist for students with disabilities compared to their grade appropriate peers (Schulte et al., 2016). Providing effective reading instruction to students with working memory deficits requires a thorough understanding of the role that working memory plays in each stage of the reading process (Kendeou et al., 2014). The ability to identify breakdowns in the cognitive processes and apply specialized strategies and interventions has significant implications for improving the reading

proficiency of students with working memory deficits (Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011).

Findings from studies related to teacher perceptions of working memory suggest that teachers' knowledge and self-efficacy on these concepts were limited (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Researchers contended that districts provided little or no professional learning on topics related to neuroscience or effective strategies to address cognitive deficits (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). The absence of professional learning and opportunities to provide direct instruction on cognitive skills were reported as factors behind reduced teacher competency and effectiveness (Elliott et al., 2010; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Gaps in opportunities for professional learning were directly correlated to the gap that exists between neuroscience and educational practices (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016). Teacher perceptions of their preparedness and instructional abilities had significant impact on their self-efficacy (Ruppar et al., 2016). Increasing teachers' knowledge and experiences can improve self-efficacy, which directly relates to teacher effectiveness and positive student outcomes (Bandura, 1997). Interventions that targeted cognitive abilities, such as working memory, had significant implications for narrowing the achievement gap for at-risk learners, such as students served in special education programs (Alloway et al., 2009).

Brownell and colleagues (2010) suggested that changes in special education preparation programs were a primary factor in reducing teacher self-efficacy. Special education teacher preparation programs have diverted from categorical programs, which

provided pre-service educators with intensive knowledge and specialization on eligibility-based student traits, cognitive or processing deficits, and effective instructional strategies, toward alternative or dual certification programs (Brownell et al., 2010). Alternative and dual certification programs are less efficient in producing quality educators with the knowledge and competency to address students' varying cognitive and processing abilities (Brownell et al., 2010; Green, 2012; Katsiyannis et al., 2003; Lee et al., 2011; Ruppar et al., 2016). Field experiences and opportunities to evaluate students and individualize instruction based on cognitive, social, emotional, behavioral, or physical deficits were minimal (Brownell et al., 2010; Lee et al., 2011). Brownell and colleagues (2010) stated that the shifts in teacher preparation programs were correlated to special education teachers lack preparation and ability to implement specialized instructional strategies necessary to meet students' cognitive needs. These changes in special education teacher preparation programs have had little impact on the large gap in reading achievement that exists between students served in general education and students served in special education (Brownell et al., 2010). Gaps in knowledge, limited opportunities to apply evidence-based instructional strategies, and increased accountability have led to widespread concern regarding the self-efficacy, burn out, and shortage of special education teachers (Brownell et al., 2010; Green, 2012).

Review of Methods

Quantitative Phase

The researcher used a web-based survey to examine special education teachers' beliefs of their confidence and preparedness regarding working memory and reading

comprehension instruction. The confidence and preparedness survey consisted of three sections related to participant demographics, confidence and preparedness regarding working memory, and confidence and preparedness regarding reading comprehension. Participants were asked to identify teacher preparation or professional learning sources that influenced their level of confidence and preparedness. In addition, participants were asked to identify areas that need more support or professional learning.

The targeted population pool consisted of 40 special education teachers in Grades K through 12 currently providing reading instruction to students served in special education programs in a rural, Central Georgia district. Of the 40 participants targeted, 23 teachers participated in the quantitative phase resulting in a 57.5% response rate. Most of the participants (52.16%) have served students with disabilities for 16 or more years. Many participants (69.56%) have obtained a master's degree or higher. Most participants served students in a resource/separate class setting (60.86%). The largest number of participants served Grades 3 through 5 (30.43%). Dual Certification in Special Education and General Curriculum (56.52%) was the greatest area of certification with a small number of participants attaining a degree, certification, or endorsement in Reading or Language Arts (30.43%). Data were analyzed and disaggregated using SPSS software.

Qualitative Phase

The qualitative phase of the study consisted of two measures (i.e., questionnaire and interview). Qualitative participants were selected purposefully from those participants who completed the quantitative survey, scored in each quartile using ordered composite mean scores, and agreed to participate in in the qualitative phase of

the study. Despite several efforts to secure qualitative participants, only seven teachers participated in the qualitative phase of the study. Most of the participants served students in Grades K through 5 (86%), with only one participant serving students in Grades 6 through 8. Teaching experience was high with 57% of participants completing 15 or more years of service, and only one participant with less than 5 years of experience. An equal number of participants attained a master's or specialist degree in education with only one participant attaining a bachelor's degree. Dual certification in both special education and general education was the greatest certification area with four participants (57%) followed by interrelated (29%). Two participants completed an endorsement or certification in reading. Qualitative data obtained from the questionnaire and interviews were analyzed separately by coding transcriptions of words and phrases that appeared frequently throughout the data (Bryman, 2008) data analysis process. An external data analyst assisted in validating the codes, themes, and subthemes established using qualitative data.

Summary of Findings

To study special education teachers' self-efficacy regarding improving the reading comprehension of students with working memory deficits, the researcher utilized an explanatory sequential mixed methods research design. Quantitative and qualitative data were triangulated to answer the research questions. This chapter includes an elaboration and interpretation of results provided in Chapter IV of this study. Results are discussed in sequence and relative to each research question. Implications, suggestions for future research, and limitations are also discussed.

Research Question 1

How do special education teachers' experiences and perceptions of working memory and reading comprehension explain their preparedness and confidence for teaching reading comprehension effectively?

Teachers' beliefs of their preparedness to teach and confidence in their ability to improve student outcomes directly affects their self-efficacy (Bandura, 1977; Darling-Hammond et al., 2002; Hoy & Spero, 2005; Protheroe, 2008; Ruppar et al., 2016). Most participants rated themselves as *Confident* or *Very Confident* and *Prepared* or *Very Prepared* on both the working memory and reading comprehension subscales. These data coincided with literature, which indicated that special education teachers generally perceive themselves as prepared for their roles and responsibilities (Bishop et al., 2010). Participants with advanced degrees had lower composite scores than participants with bachelor's degrees. This finding is consistent with Tschannen-Moran and Johnson's (2011) research that concluded that there is no significant correlation between level of certification and teacher self-efficacy.

Working memory. Protheroe (2008) suggested that teacher confidence in their ability to improve student learning was derived from past experiences or school culture (Protheroe, 2008). Participants rated themselves more confident than prepared regarding their understanding of working memory. This confidence level was attributed primarily to teaching experience and collaboration with colleagues; however, participants with 15 or more years of teaching experience had lower composite scores than participants with less experience. These findings were consistent with research from Tschannen-Moran, Hoy, and Hoy (1998), which suggested that *mastery experiences*, or experiences that

resulted in student accomplishment, made the greatest impact on teacher self-efficacy. Teacher confidence about their ability to improve student learning was derived from past experiences or school culture (Protheroe, 2008). Hoy and Spero (2005) suggested that teachers may feel adequately prepared to teach specific concepts; however, because they have not have had positive experiences that resulted in success, they were not confident in their ability. Teacher preparation provided through in-service professional development was not selected. These data aligned with research indicating that districts provided little or no professional learning on topics related to neuroscience or effective strategies to address cognitive deficits (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016).

Confidence and preparedness ratings varied on items within the working memory subscales on the quantitative measure. Higher levels of confidence and preparedness were noted on items related to the role of working memory in learning, verbal reasoning, early literacy, and reading comprehension. Lower confidence and preparedness levels were indicated on items related to teachers' ability to increase working memory and adapt reading instruction with working memory levels. These data corresponded to Alloway and colleagues (2012) findings that teachers were aware of working memory as a concept and easily identified problems in student academics and behavior; yet, they were unable to provide the students with support. Ratings related to *Not Confident* or *Somewhat Confident* and *Not Prepared* or *Somewhat Prepared* on strategies related to increasing working memory levels were significantly higher than other areas addressing working memory. These findings are consistent with literature on special education teachers' preparedness and confidence regarding cognitively focused strategies that

suggested teacher knowledge of effective strategies to increase or address working memory deficits were limited (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016).

Qualitative measures allowed for an in-depth study into participants' experiences and perceptions of working memory. Like the quantitative measure, qualitative participants initially described themselves as confident in their ability to improve the reading comprehension of students with working memory deficits; however, participants placed parameters around their level of confidence. Confidence levels were limited to grade levels, specific stages of the reading process, or knowledge and use of the current literacy programs. Only 29% felt confident in their ability to teach students with significant reading problems, such as working memory deficits, multiple cognitive deficiencies, and/or low IQ. These data contradict the data collected in the quantitative phase. Most of the participants (71%) indicated that additional professional learning on specialized instructional strategies for address cognitive deficits were needed to improve student outcomes. These responses were consistent with research that indicated gaps in teacher knowledge and lower self-efficacy were often related to districts failure to provide professional learning on topics related to neuroscience or effective strategies to address cognitive deficits (Alloway et al., 2012; Morgan-Borkowsky, 2012; Muscella, 2014; Reed, 2016).

Reading comprehension. In-service professional learning was listed as the primary source of teacher preparation in both the quantitative and qualitative measures addressing reading comprehension. Despite in-service professional learning, quantitative participants rated themselves less confident and prepared regarding reading

comprehension instruction. These findings align with research presented in the literature review (Bishop et al., 2010; Brownell et al., 2016; Caniglia, 2016). Though in-service professional learning was reported as the second highest source of preparedness for reading instruction, participants indicated that they perceived themselves as less prepared and less confident about reading instruction (Bishop et al., 2010; Caniglia, 2016). Brownell and colleagues (2010) suggested that special education teachers receive additional preparation on the pedagogical content and practices in reading. These findings contradict with Tschannen-Moran and Johnson's (2011) who suggested that self-efficacy was strongly correlated to professional development.

Responses on the reading comprehension subscales indicated higher ratings of confidence and preparedness regarding summarization strategies and using graphic organizers. Lower ratings were reported on items addressing metacognition and collaborative comprehension strategies. Like the quantitative survey, qualitative participants indicated a limited understanding and awareness of the evidence-based reading comprehension strategies presented in the NRP report (NICHD, 2000). Participants described themselves as confident in their understanding of the reading process; however, more than 50% of the qualitative participants felt they did not have the ability or resources to reach at-risk learners who did not respond to the current literacy resources and strategies. These responses aligned with Bishop and colleagues (2010) who found that, overall, special education teachers describe themselves as being sufficiently prepared for their duties and instructional responsibilities as special education teachers; however, many participants indicated that their preparation regarding reading instructional methods and theories were insufficient.

Research Question 2

How do special education teachers perceive their ability to improve the reading comprehension of students with working memory deficits?

Self-efficacy. As mentioned under Research Question 1, analysis of both quantitative and qualitative data indicated gaps in teacher knowledge regarding evidence-based reading comprehension strategies presented in the NRP report (NICHD, 2000). These findings are consistent with recent studies on special education teachers' self-efficacy, knowledge, and effective understanding of research-based reading comprehension strategies that identified gaps between research and classroom practice (Bishop et al., 2010; Brownell et al., 2010; Dingle et al., 2011). Though participants primarily attributed successful efforts to increase reading comprehension rates to in-service professional learning and additional resources, more than half of the participants indicated that the current literacy programs and instructional strategies were not effective for students with significant cognitive deficits, wide gaps in reading ability, or limited background knowledge. Participant 13 stated,

> I feel as though I am effective with the programs we have been trained in; however, some students do not learn well with those programs and I am at a loss as to what to do with students that are not successful with what we have been given to utilize.

Participants stated that further professional learning on specialized instructional strategies and additional resources were required to increase the reading comprehension rates for students with working memory deficits. These responses are consistent with Brownell and colleagues (2010) recommendation that in-service professional learning on

cognitive strategy instruction be provided to ensure that special education teachers develop a deep knowledge of language, literacy, and potential processing deficits. Effective instruction for students with cognitive deficits or learning disabilities included a blend of evidence-based and well as cognitively-focused reading instruction (Accardo, 2015; Basil & Reyes, 2003; Kendeou et al., 2014).

Outcome expectancy. Rotter's social learning theory (1954) centered around outcome expectancy, the perception that positive or negative outcomes were the result of specific behaviors. People that believe that certain behaviors can result in favorable outcomes express greater confidence than people who perceive a weak relationship between a behavior and outcome (Maddux et al., 1982). Bandura (1982) stated that greater outcome expectancy was causally connected to greater self-efficacy. When asked to describe whether teachers expected students with working memory deficits to achieve the desired reading comprehension outcomes, 57% of participants stated that their outcome expectancies were low. If outcome expectancy is linked causally to self-efficacy, a reasonable inference can be made that participants have lower self-efficacy levels than originally determined on the quantitative survey (Bandura, 1982; Maddux et al., 1982).

Teacher effectiveness. Questionnaire participants indicated that a direct connection existed between students' reading achievement and teacher effectiveness. Participants indicated that their effectiveness was based on their ability to "bridge the gap" by diagnosing deficits and applying appropriate instructional strategies. Participant 15 stated,

> I believe there is a relationship between students' reading achievement and teacher effectiveness when it comes to reading. When a student is struggling and the teacher can effectively diagnose the problem and use strategies to assist the student, the student is more likely to succeed than a student that does not have an effective teacher.

An analysis and review of both the quantitative and qualitative measures revealed gaps in teacher knowledge regarding effective evidence-based reading comprehension strategies and strategies to address working memory deficits. Gaps in knowledge related to literacy and cognitively-focused instruction have significant implications regarding student outcomes and teacher quality (Brownell et al., 2014).

When asked how participants gauge their success and effectiveness, discrepancies were found in how participants measured student growth. Participants suggested that teacher effectiveness was often measured by student growth, suggesting that any amount of growth from the beginning of the IEP cycle or during instructional periods is a positive student outcome. Others indicated the use of academic screeners and communication with the students; however, none of the participants indicated that grades, summative assessments, or standardized assessments were used to measure student growth or teacher effectiveness. This finding is consistent with research suggesting that measuring the achievement of students served in special education programs using standardized testing is problematic and questionable at best (Caniglia, 2016).

Implications for Practitioners

The targeted audience for this study included faculty designing curriculum for pre-service programs, school administrators, special education teachers, and special education directors. Results of the current study imply that integrating neuroscientific research and pre-service practice in identifying and addressing cognitive deficits related to reading comprehension into the curriculum of teacher preparation programs have significant implications for improving student outcomes and teacher self-efficacy (Anasari et al., 2011; Sigman et al., 2014; Zadina, 2015). Findings also suggest that screening students in primary grades and applying interventions to increase working memory have significant implications for improving long-term reading and academic outcomes (Alloway et al., 2009; Dahlin, 2011; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Karbach et al., 2013; Kearns & Fuchs, 2013; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016). Based on findings from the current study, the researcher concurs with the recommendations of Brownell and colleagues (2013) that school districts provide teachers with scaffolded support and ongoing training related to research-based practices, differentiated instruction, and comprehension of text. Findings imply that professional development should be accompanied by high levels of support from administrators and financial resources to accommodate student and faculty needs (Brownell et al., 2014).

Inferences derived from the triangulation of quantitative and qualitative measures led to several implications and suggestions for future research. Most of the quantitative participants rated themselves as confident and prepared on items related to working memory and reading comprehension. These findings are largely consistent with the

literature; however, as previously discussed, results from the present study and literature revealed gaps in special education teachers' knowledge related to literacy and cognitively-focused instruction (Brownell et al., 2010). Recommendations for further professional development for special education teachers include: specific courses with teacher education and pre-service programs that include research and principles relevant to both neuroscience and education (Anasari et al., 2011; Sigman et al., 2014; Zadina, 2015); in-service and professional learning opportunities related to educational neuroscience within school districts (Ansari et al., 2011); continued professional learning, opportunities for collaboration, and scaffolding during implementation of specialized, cognitive strategies to improve teacher competency (Elliott et al., 2010; Ertmer & Newby, 2013; Powell & Kalina, 2009); in-service professional learning on cognitive strategy instruction to ensure that special education teachers develop a deep knowledge of language, literacy, and potential processing deficits (Brownell et al., 2010); additional preparation on the pedagogical content and practices in reading (Brownell et al., 2010); training regarding evidence-based strategies for improving reading comprehension (Bishop et al., 2010; Caniglia, 2016); and professional learning regarding identifying and targeting cognitive processes required for reading comprehension from lower level processes like decoding to higher-level processes like making inferences (Kendeou et al., 2014). Administrators should also monitor self-efficacy before and after providing in-service professional learning (Sharp et al., 2016). A review of the literature indicated that teacher preparation programs that provided a foundation in neuroscience and continued professional learning on cognitive processes and strategies may potentially bridge the gap between teacher competencies and

effective classroom practice (Alloway et al., 2009; Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011); however, limited research exists on teacher perception and self-efficacy regarding these strategies.

Recommendations for Further Research

Given the complex role of special education teachers and the variance among students' academic and cognitive abilities, school districts should evaluate teachers' self-efficacy regarding reading comprehension and addressing cognitive deficits to provide targeted professional learning accordingly (Brownell et al., 2010; Caniglia, 2016). In this study, special education teachers emphasized the impact of teaching experience on their feelings of confidence and preparedness, or teacher self-efficacy; however, teachers with the most experience had significantly lower composite means than teachers with minimal teaching experience. This finding aligns with Tschannen-Moran and Johnson's (2011) study which revealed a greater correlation between teacher self-efficacy and professional learning than self-efficacy and teaching experience. Tschannen-Moran and Hoy (2007) determined that, to make the strongest contribution on teacher self-efficacy, these experiences must be mastery experiences that resulted in student accomplishment. Further qualitative research is needed to explore the differences between the pre-service preparation, field experience, and in-service professional development that exists between less experienced and more experienced special education teachers, especially in reading comprehension. Furthermore, additional research regarding principals' and special education directors' perceptions of their role in providing professional learning directly linked to positive student outcomes and increased teacher self-efficacy is recommended. Further research on teacher self-efficacy and professional learning

measured by pretest and posttest and classroom observations could expand upon research presented by Tschannen-Moran and Johnson (2011). Finally, in this study, participants indicated that teaching experience impacted their preparedness and confidence. Additional research is needed to determine what specific factors in teaching experience have the greatest impact on special education teachers providing reading instruction in Kindergarten through Grade 12.

The researcher concurred with recommendations provided by Ruppar and colleagues (2016). Further research is needed regarding special education teachers' perceptions of their preparedness to teach students with various disabilities. Additional qualitative research on teachers' perceptions, classroom practice, and professional development was recommended to develop a theory of teacher self-efficacy and proficiency for special education teachers (Ruppar et al., 2016). Significant research exists regarding the implications of improving students' working memory capacity through working memory training. Though the effects of working memory training on increased student achievement is inconsistent, the implications on overall student progress due to increased working memory capacity are significant (Alloway et al., 2009; Baddeley, 2012; Dahlin, 2011; Dunning et al., 2013; Garcia-Madruga et al., 2013; Holmes & Gathercole, 2014; Holmes et al., 2009; Karbach et al., 2013; Kearns & Fuchs, 2013; Kendeou et al., 2014; Loosli et al., 2012; Oakhill et al., 2011; Randall & Tyldesley, 2016). Further research regarding special education teacher self-efficacy for improving the reading comprehension of students with working memory deficits is also warranted.

Limitations

Though the study resulted in some useful findings, there were also limitations. Because participants were selected from a small rural school district, randomized sampling procedures were not used. Data analysis and conclusions from this research should be limited in relevance to districts with similar demographics; however, the perceptions and beliefs of the participants within this study mirror perceptions and beliefs found in literature regarding addressing working memory deficits and reading comprehension instruction.

The survey, an adapted version of the 2012 CEC Initial Level Special Educator Preparation Standards survey, was significantly revised and remained quite lengthy. The length and difficulty of the survey may have resulted in response errors that directly affected confidence and preparedness ratings. The quantitative phase was followed by two qualitative measures, which included voluntary participation. Though participants were selected from each quartile, securing a valid number of participants for the qualitative phase was difficult, especially from the third composite quartile. Failure to secure a valid number of participants may have resulted in a lack of representation from special education teachers with higher self-efficacy and preparation in improving the reading comprehension of students with working memory deficits. Furthermore, the researcher's inability to secure qualitative participants from serving Grades 9 through 12 may have impacted generalizability.

Though purposive sampling was used for the overall population pool, participants volunteered for the qualitative phase of the study. The responses of the volunteers may not have been reflective of the broader special education teacher

population. Furthermore, the current study included three measures, which required a lot of time and commitment from participants. The researcher sensed participant frustration during the third measure, which may have affected their responses and interview duration.

Limited literature was found addressing special education teachers' perceptions of self-efficacy and outcome expectancy in relation to their ability to improve the reading comprehension levels of students with working memory deficits effectively. Therefore, establishing a clear connection to prior research was quite difficult. Results indicated that access and opportunities for professional learning on research-based practices for improving the reading comprehension rates of students with working memory deficits were limited. The limited access to targeted professional learning on working memory and evidence-based reading comprehension strategies may differ among neighboring districts or larger districts with more formalized professional development protocols; however, limited access to professional learning was also found in the body of research included in this study.

Finally, the survey included very specific terminology related to working memory deficits and comprehension strategies. Gaps in participants' understanding of the terminology used in each measure may have impacted the confidence and preparedness ratings within the purposively sampled population. Furthermore, because participants had various field experiences, undergraduate or graduate training, and in-service professional learning, the researcher could not determine which factor had the greatest impact on self-efficacy. Caution should be used in interpreting and generalizing the results of this study in that while the quantitative participants indicated significant

deficits on subscale questions related to working memory, such as strategies to increase working memory and metacognitive strategies to increase reading comprehension, the deficits may be reflective of a misunderstanding related to terminology as opposed to a reflection of their skills and knowledge.

Concluding Thoughts

The purpose of this explanatory sequential mixed methods research study was to examine special education teachers' experiences and perceptions, confidence and preparedness, and ability to increase the reading comprehension of students with working memory deficits. This study is relevant to addressing the lack of literature regarding bridging the gap between teacher competencies and successful application of working memory strategies to improve the reading proficiency of students who are served in special education (Alloway et al., 2009; Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011). The present study solicited input regarding special education teachers' beliefs and experiences regarding working memory and reading comprehension. The study also explored special education teachers' perceptions of their ability to improve the reading comprehension of students with working memory deficits. Results indicated that teachers generally rated themselves as prepared and confident regarding these concepts; however, qualitative measures revealed parameters to their self-confidence and a lack of preparation regarding specialized instructional strategies for students with disabilities and addressing cognitive deficits.

Qualitative data also revealed that the majority of participants had low outcome expectancy regarding students with disabilities meeting grade level expectations. High

outcome expectancy has been linked to positive student outcomes (Friedrich, Flunger, Negangast, Jonkmann, & Trautwein, 2014). Bandura (1982) suggested outcome expectancy was causally connected to self-efficacy. Increasing teacher confidence in their teaching ability can significantly improve their belief that students will attain desired outcomes (Newton, Evans, Leonard, & Eastburn, 2012). Continued professional learning, opportunities for collaboration, scaffolding or coaching during implementation of specialized strategies, and consistent administrative support are research-based strategies and supports improve teacher competency, knowledge, and self-efficacy (Day et al., 2016; Elliott et al., 2010; Juvora et al., 2015). Increasing teacher self-efficacy, outcome expectancy, and successful application of working memory strategies can create a turning point in improving the reading proficiency of students who are served in special education (Alloway et al., 2009; Dahlin, 2011; Green, 2012; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011).

This study highlighted the implications for improving the reading comprehension rates of students with disabilities by providing special education teachers pre-service and in-service training regarding identifying breakdowns in the cognitive processes required for reading comprehension and applying specialized strategies and interventions (Dahlin, 2011; Holmes & Gathercole, 2014; Karbach et al., 2013; Loosli et al., 2012; Oakhill et al., 2011). The findings within this study were largely consistent with research within the literature regarding gaps in special education teachers' knowledge and understanding of cognitively focused strategies related to addressing working memory deficits and reading comprehension instruction (Brownell et al., 2010). Recommendations for addressing these gaps included embedding information regarding

educational neuroscience, cognitively-focused reading instruction, intensive preparation regarding pedagogical content and practices in reading, and evidence-based reading comprehension strategies into teacher preparation programs, in-service professional learning, and graduate programs for special education teachers (Ansari et al., 2011; Bishop et al., 2010; Brownell et al., 2010; Caniglia, 2016; Elliott et al., 2010; Ertmer & Newby, 2013; Kendeou et al., 2014; Powell & Kalina, 2009; Sigman et al., 2014; Zadina, 2015).

REFERENCES

Accardo, A. L. (2015). *Effective practices and teacher self-efficacy in teaching reading comprehension to learners with autism spectrum disorder* (Order No. 3739344). Available from ProQuest Dissertations & Theses Global. (1746692037). Retrieved from http://ezproxy.columbusstate.edu:2048/login?url=https://search.proquest.com/docview/1746692037?accountid=10196

Adelman, C., Jenkins, D., & Kemmis, S. (1980). Rethinking case study: Notes from the second Cambridge Conference. In H. Simons (Ed.), *Towards a Science of the Singular: Essays about Case Study in Educational Research and Evaluation* (pp. 47-61). Norwich: Centre for Applied Research in Education, University of East Anglia.

Agee, J. (2009). Developing qualitative research questions: A reflective process. *International Journal of Qualitative Studies in Education, 22*(4), 431-447.

Aldrich, R. (2013). Neuroscience, education, and the evolution of the human brain. *History of Education, 42*(3), 396-410.

Allinder, R. M. (1995). An examination of the relationship between teacher efficacy and curriculum-based measurements and student achievement. *Remedial and Special Education, 16*(4), 247-254.

Allor, J. H., Mathes, P. G., Jones, F. G., Champlin, T. M., & Cheatham, J. P. (2010). Individualized research-based reading instruction for students with intellectual disabilities: Success stories. *Teaching Exceptional Students, 42*(3), 6-12.

Alloway, T. P., Doherty-Sneddon, G., & Forbes, L. (2012). Teachers' perceptions of classroom behavior and working memory. *Educational Research and Review, 7*(6), 138-142. doi: 10.5897/ERR11.223

Alloway, T. P., Gathercole, S. E., Adams, A., Willis, C., Eaglen, R., & Lamont, E. (2005). Working memory and phonological awareness as predictors of progress towards early learning goals at school entry. *British Journal of Developmental Psychology*, *23*, 417-426.

Alloway, T. P., Gathercole, S. E., Kirkwood, H., & Elliott, J. (2009). The cognitive and behavioral characteristics of children with low working memory. *Child Development, 80*(2), 606-621.

Alloway, T. P., Gathercole, S. E., Willis, C., & Adams, A. (2004). A structural analysis of working memory and related cognitive skills in young children. *Journal of Experimental Child Psychology, 87*(2), 85-106. doi: 10.1016/j.jecp.2003.10.002

Alves, K. D., Kennedy, M. J., Brown, T. S., & Sollis, M. (2015). Story grammar instruction with third and fifth grade students with learning disabilities and other struggling readers. *Learning Disabilities: A Contemporary Journal, 13*(1), 73-93.

Ansari, D., Coch, D., & De Smedt, B. (2011). Connecting education and cognitive neuroscience: Where will the journey take us? *Educational Philosophy and Theory, 43*(1), 37-42.

Arina, S., Gathercole, S., & Stella, G. (2015). The role of the working memory in the early phases of learning to read. *Applied Psychology Bulletin, 63*(273), 31-52.

Armour, D., Conry-Oseguera, P., Cox, M., King, N., McDonnell, L., Pascal, A., Pauly, E., & Zillman, G. (1976). *Analysis of the school preferred reading program in selected Los Angeles minority schools*. Santa Monica, CA: RAND Corporation.

Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory. A proposed system and its control processes. In K. W. Spence, & J. T. Spence (Eds.), *The psychology of learning and motivation* (Vol. 2, pp. 89-195). New York, NY: Academic Press. doi: 10.1016/S0079-7421(08)60422-3

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

Baddeley, A. D. (2003). Working memory: Looking back and looking forward. *Nature Reviews Neuroscience, 4*, 829-839.

Baddeley, A. D. (2006). Working memory: An overview. In S. Pickering (Ed.), *Working memory and education* (pp. 1-31). New York, NY: Academic Press.

Baddeley, A. D. (2007). *Working memory, thought and action.* Oxford, England: University Press.

Baddeley, A. D. (2012). Working memory: Theories, models, and controversies. *Annual Review of Psychology, 63*, 1-29.

Baddeley, A. D., & Hitch, G. (1974). Working memory. In G. A. Bower (Ed.), *Recent advances in learning and motivation*, *Vol.8* (pp. 47-89). New York, NY: Academic Press.

Baddeley, A. D., & Logie, R. H. (1999). Working memory: The multiple-component model. In A. Miyake & P. Shah (Eds.), *Models of working memory: Mechanisms*

of active maintenance and executive control (pp. 28-61). New York, NY: Cambridge University Press. doi:10.1017/CBO9781139174909.005

Baker, R. A. (2012). The effects of high-stakes testing policy on arts education. *Arts Education Policy Review, 113*(1), 17-25. doi:10.1080/10632913.2012.626384

Banales, E., Kohnen, S., & McArthur, G. (2015). Can verbal working memory improve reading? *Cognitive Neuropsychology, 32*(3-4), 104-132.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 101-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*, 122-147.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman.

Basil, C., & Reyes, S. (2003). Acquisition of literacy skills by children with severe disability. *Child Language Teaching and Therapy, 19*, 27-48. doi: 10.1191/0265659003ct2420a

Baskarada, S. (2014). Qualitative case study guidelines. *The Qualitative Report, 19*(40), 1-18.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*(4), 544-559.

Bean, R., & Lillenstein, J. (2012). Response to intervention and the changing roles of schoolwide personnel. *The Reading Teacher, 65*(7), 491-501.

Bishop, A. G., Brownell, M. T., Klingner, J. K., Leko, M. M., & Galman, S. A. C. (2010). Differences in beginning special education teachers: The influence of

personal attributes, preparation, and school environment on classroom reading practices. *Learning Disability Quarterly, 33*(2), 75-92.

Bogdan, R., & Biklen, S. (2003). *Qualitative research for education: An introduction to theories and methods* (4th ed.). Boston, MA: Pearson Education Group.

Boulware-Gooden, R., Carreker, S., Thornhill, A., & Joshi, R. M. (2007). Instruction of metacognitive strategies enhances reading comprehension and vocabulary achievement of third-grade students. *The Reading Teacher, 61*(1), 70-77. doi: 10.1598/RT.61.1.7

Brink, H. I. L. (1993). Validity and reliability in qualitative research. *Curationis, 16*(2), 35-38.

Brinkmann, S., & Kvale, S. (2015). *Interviews: Learning the craft of qualitative research interviewing* (3rd ed.). Los Angeles, CA: Sage.

Brown, J. L. (2017). *Brown's useful guide: Where theory becomes applicable to classroom practice* (3rd GA ed.). Columbus, GA: CSU ePress. Retrieved from http://csuepress.columbusstate.edu/textbooks/2

Brownell, M. T., Sindelar, P. T., Kiely, M. T., & Danielson, L. C. (2010). Special education teacher quality and preparation: Exposing foundations, constructing a new model. *Exceptional Children, 76*(3), 357-377.

Brownell, M. T., Steinbrecher, T. D., Kimerling, J., Park, Y., Bae, J., & Bendict, A. (2014). Dimensions of teacher quality in general and special education. In P. Sindelar, E. D. McCray, M. T. Brownell, & B. Lignugaris/Kraft (Eds.), *Handbook of Research on Special Education Teacher Preparation* (pp. 423–444). New York, NY: Routledge, Taylor, & Francis.

Bryman, A. (2006). Integrating quantitative and qualitative research: How is it done? *Qualitative Inquiry, 6*(1): 97–113.

Bryman, A. (2008). *Social research methods* (3rd ed.). Oxford, England: Oxford University Press.

Caniglia, C. M. (2016). *Special education teachers' reported preparedness and confidence to implement the 2012 CEC initial level special educator preparation standards* (Order No. 10139774). Available from ProQuest Dissertations & Theses Global. (1820732034). Retrieved from http://ezproxy.columbusstate.edu:2048/login?url=https://search.proquest.com/docview/1820732034?accountid=10196

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Sage.

Collier, M. D. (2005). An ethic of caring: The fuel for high teacher-efficacy. *Urban Review, 37*(4), 351-359. doi: 10.1007/s11256-005-0012-4

Condermann, G., & Johnston-Rodriguez, S. (2009). Beginning teachers' views of their collaborative roles. *Preventing School Failure: Alternative Education for Children and Youth, 53*(4), 235-244.

Crain, S., Shankweiler, D., Macaruso, P., & Bar-Shalom, E. (1990). Working memory and comprehension of spoken sentences: Investigations of children with reading disorder. In G. Vallar, & T. Shallice (Eds.), *Neuropsychological impairments of short-term memory* (pp. 477-508). Cambridge, NY: Cambridge University Press.

Creswell, J. W. (2003). Qualitative, quantitative, and mixed methods approaches (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. (2009). Research design: Qualitative, quantitative, and mixed methods approaches. (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. (2012a). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Upper Saddle River, NJ: Pearson.

Creswell, J. W. (2012b). Qualitative inquiry and research design: Choosing among the five traditions. Thousand Oaks, CA: Sage.

Creswell, J. W. (2014). *Research designs: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W., Klassen, A. C., Plano Clark, V. L., Smith, K. C., & Working Group Assistance. (2011). *Best practices for mixed methods research in the health sciences.* Washington, DC: Office of Behavioral and Social Sciences Research (OBSSR), National Institutes of Health (NIH). Retrieved from http://obssr.od.nih.gov/mixed_methods_research

Dahlin, K. I. E., (2011). Effects of working memory training on reading in children with special needs. *Reading & Writing, 24*(4), 479-491.

Daneman, M., & Carpenter, P. A. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior*, *19*, 450-466.

Darling-Hammond, L., Chung, R., & Frelow, F. (2002). Variation in teacher preparation: How well do different pathways prepare teachers to teach? *Journal of Teacher Education, 53*, 286-302. doi: 10.1177/0022487102053004002

Davey, B., & McBride, S. (1986). Effects of question-generation training on reading comprehension. *Journal of Educational Psychology, 78*(4), 256-262.

Day, C., Gu, Q., & Sammons, P. (2016). The impact of leadership on student outcomes: How successful school leaders use transformational and instructional strategies to make a difference. *Educational Administration Quarterly, 52*(2), 221-258. doi: 10.1177/0013161X15616863

Decker, J. E. (2011). *Linking developmental working memory and early academic skills* (Order No. 3445221). Available from ProQuest Dissertations & Theses Global. (860773831). Retrieved from http://ezproxy.columbusstate.edu:2048/login?url=https://search.proquest.com/docview/860773831?accountid=10196

Dellinger, A. B., Bobbett, J. J., Olivier, D. F., & Ellett, C. D. (2008). Measuring teachers' self-efficacy beliefs: Development and use of the TEBS-Self. *Teaching and Teacher Education, 24*(3), 751-766.

Diamond, A. (2014). Executive functions: Insights into ways more children thrive. *Zero to Three, 35*(2), 9-17.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). Hoboken, NJ: Wiley.

Dingle, M. P., Brownell, M. T., Leko, M. M., Boardman, A. G., & Hager, D. (2011). Developing effective special education reading teachers: The influence of professional development, context, and individual qualities. *Learning Disability Quarterly, 34*(1), 87-103.

Doherty, K. H., & Jacobs, S. (2015). *State of the states: Evaluating teaching, leading, and learning.* Washington, DC: National Council on Teacher Quality. Retrieved from http://www.nctq.org/dmsView/StateofStates2015

Dole, J. A., Nokes, J. D., & Drits, D. (2009). Cognitive strategy instruction. In S. E. Israel & G. G. Duffy (Eds.), *Handbook of research on reading comprehension* (pp. 347-372). New York, NY: Routledge.

Dunning, D. L., Holmes, J., & Gathercole, S. E. (2013). Does working memory training lead to generalized improvements in children with low working memory? A randomized controlled trial. *Developmental Science, 16*(6), 915-925.

Elleman, A. M., & Compton, D. L. (2017). Beyond comprehension strategy instruction: What's next? *Language, Speech, and Hearing Services in Schools, 48*, 84-91.

Elliott, J. G., Gathercole, S. E., Alloway, T. P., Holmes, J., & Kirkwood, H. (2010). An evaluation of a classroom-based intervention to help overcome working memory difficulty and improve long-term academic achievement. *Journal of Cognitive Education and Psychology, 9*(3), 227-250.

Elousa, M. R., Garcia-Madruga, J. A., Vila, J. O., Gomez-Veiga, J., & Gil, L. (2013). Improving reading comprehension: From metacognitive intervention on strategies to the intervention on working memory executive process. *Universitas Psychologica, 12*(5), 2-35.

Ertmer, P. A., & Newby, T. J. (2013). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 26*(2), 43-71.

Feifer, S. G. (2008). Integrating response to intervention (RTI) with neuropsychology: A scientific approach to reading. *Psychology in the Schools, 45*(9), 812-825.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods design-Principles and practices. *Health Services Research, 48*(6), 2134-2156.

Flavell, J. H., Beach, D. R., & Chinsky, J. M. (1966). Spontaneous verbal rehearsal in a memory task as a function of age. *Child Development, 37*(2), 283-299.

Friedrich, A., Flunger, B., Nagengast, B., Jonkmann, K., & Trautwein, U. (2014). Pygmalion effects in the classroom: Teacher expectancy effects on students' math achievement. *Contemporary Educational Psychology*, *41*, 1-12. doi:10.1016/j.cedpsych.2014.10.006

Fuchs, D., Fuchs, L. S., & Stecker, P. M. (2010). The "blurring" of special education in a new continuum of general education placements and services. *Exceptional Children, 76*(3), 301-323.

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational research: An introduction* (8th ed.). Boston, MA: Pearson.

Garcia-Madruga, J., Elosua, M. R., Gil, L., Gomez-Veiga, I., Vila, J. O., Orajales, I., Contreras, A., Rodriguez, R., Melero, M. A., & Duque, G. (2013). Reading comprehension and working memory's executive processes: An intervention study in primary school students. *Reading Research Quarterly, 48*(2), 155-174.

Gathercole, S. E., & Alloway, T. P. (2007). *Understanding working memory: A classroom guide*. London, England: Harcourt Assessment. Retrieved from

https://www.mrc-cbu.cam.ac.uk/wp-content/uploads/2013/01/WM-classroom-guide.pdf

Gathercole, S. E., & Alloway, T. P. (2008). *Working memory and learning: A practical guide for teachers.* London, England: Sage.

Gay, L. R., & Airasian, P. (2003). *Educational research: Competencies for analysis and application.* Columbus, OH: Merrill Prentice Hall.

Georgia Department of Education (2016). *Spring 2016 Georgia Milestones end-of-grade state assessment.* Retrieved from http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-2015-2016-Statewide-Scores.aspx.

Goddard, R. D., Hoy, W. K., & Hoy, A. W. (2000). Collective teacher efficacy: Its meaning, measure, and impact on student achievement. *American Educational Research Journal, 37*(2), 479-507.

Governor's Office of Student Achievement (GOSA) (2018). *Georgia school grades reports.* Retrieved from https://schoolgrades.georgia.gov/thomaston-upson-county

Green, S. (2012). A qualitative study of special education certification methods and how they affect teacher efficacy. *Journal of the American Academy of Special Education Professionals, Winter,* 88-100.

Griffin, C. G., Malone, L. D., & Kameenui, E. J. (1995). Effects of graphic organizer instruction on fifth grade students. *The Journal of Educational Research, 89*(2), 98-107.

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate data analysis* (6th ed.). Upper Saddle River, NJ: Pearson.

Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2001). The role of working memory in learning disabilities. *Issues in Education, 7*(1), 87.

Hanson, J. L., Balmer, D. F., & Giardino, A. P. (2011). Qualitative research methods for medical educators. *Academic pediatrics, 11*(5), 375-386.

Harrell, M. C., & Bradley, M. A. (2009). *Data collection methods: Semi-structured interview and focus groups.* Santa Monica, CA: RAND National Defense Research Institute.

Harry, B., Sturges, K. M., & Klingner, J. K. (2005). Mapping the process: An exemplar of process and challenge in grounded theory analysis. *Educational Researcher, 34*(2), 3-13. doi: 10.3102/0013189X034002003.

Hart, S. (1987). The use of the survey in industrial market research. *Journal of Marketing Management*, *3*, 25-38. doi:10.1080/0267257X.1987.9964025

Harwell, M. R. (2011). Research design in qualitative/quantitative/mixed methods. In C. F. Conrad & R. C. Serlin, *The SAGE handbook for research in education: Pursuing ideas as the keystone of exemplary inquiry* (pp. 147-164). Thousand Oaks, CA: Sage. doi: 10.4135/9781483351377

Hernandez, D. J. (2011). *Double jeopardy: How third grade reading skills and poverty influence high school graduation*. Baltimore, MD: Anne Casey Foundation. Retrieved from http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED518818

Heyck-Crowther, H. (1999). George A. Miller, language, and the computer metaphor of mind. *History of Psychology, 2*(1), 37-64. doi: 10.1037/1093-4510.2.1.37

Holmes, J., & Gathercole, S. E. (2014). Taking working memory training from the laboratory into schools. *Educational Psychology, 34*(4), 440-450.

Holmes, J., Gathercole, S. E., & Dunning, D. L. (2009). Adaptive training leads to sustained enhancement of poor working memory in children. *Developmental Science, 12*(4), 9-15.

Horn, J. L. (1968). Organization of abilities and the development of intelligence. *Psychological Review, 75*(3), 242.

Hoy, A. W., & Spero, R. B. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and Teacher Education: An International Journal of Research and Studies, 21*(4), 343-356.

Imenda, S. (2014). Is there a conceptual difference between theoretical and conceptual frameworks? *Journal of Social Sciences, 38*(2), 185-195.

Iwai, Y. (2016). Promoting strategic readers: Insights of preservice teachers' understanding of metacognitive reading strategies. *International Journal for the Scholarship of Teaching and Learning, 10*(1), 1-9.

Ivankova, N. V., Creswell, J. W., & Stick, S. (2006). Using mixed-methods sequential explanatory design: From theory to practice. *Field Methods, 18*(1), 3-20.

Jitendra, A. K., & Gajria, M. (2011). Reading comprehension instruction for students with learning disabilities. *Teaching Exceptional Children, 43*(8), 1-16.

Jitendra, A. K., Hoppes, M. K., & Xin, Y. P. (2000). Enhancing main idea comprehension for students with learning problems: The role of a summarization

strategy and self-monitoring instruction. *The Journal of Special Education, 34*(3), 127-139.

Johnson, R. B., & Christensen, L. B. (2010). *Educational research.* Los Angeles, CA: Sage.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, *33*, 14–26.

Johnson, R. B., & Turner, L. A. (2003). Data collection strategies in mixed methods research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 297–319). Thousand Oaks, CA: Sage.

Juvora, A., Chudy, S, Neumeister, P., Plischke, J., & Kvintova, J. (2015). Reflection of constructivist theories in current educational practice. *Universal Journal of Educational Research, 3*(5), 345-349.

Karbach, J., & Strobach, T., & Schubert, T. (2013). Adaptive working-memory training benefits reading, but not mathematics in middle childhood. *Child Neuropsychology, 21*(3), 285-301.

Katsiyannis, A., Zhang, D., & Conroy, M. (2003). Availability of special education teachers: Trends and issues. *Remedial and Special Education, 24*(4), 246-253.

Kearns, D. M., & Fuchs, D. (2013). Does cognitively focused instruction improve the academic performance of low-achieving students? *Exceptional Children, 79*(3), 263-290.

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

Kerlinger, F. N. (1973). *Foundations of behavioral research* (2nd ed.). Austin, TX: Holt, Rinehart, and Winston, Inc.

King-Sears, M. E., & Bowman-Kruhm, M. (2011). Specialized reading instruction for adolescents with learning disabilities: What special education co-teachers say. *Learning Disabilities Research & Practice, 26*(3), 172-184.

Kirchner, W. K. (1958). Age differences in short-term retention of rapidly changing information. *Journal of Experimental Psychology, 55*(4), 352-358.

Klingberg, T., Fernell, E., Olesen, P. J., Johnson, M., Gustafsson, P., Dahlström, K., Gillberg, C. G., Forssberg, H., & Westerberg, H. (2005). Computerized training of working memory in children with ADHD—A randomized, controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*(2), 177–186. doi:10.1097/00004583-200502000-00010

Klingberg, T., Forssberg, H., & Westerberg, H. (2002). Increased brain activity in frontal and parietal cortex underlies the development of visuo-spatial working memory capacity during childhood. *Journal of Cognitive Neuroscience, 14*(1), 1–10. doi:10.1162/089892902317205276

Klingner, J. K., Vaughn, S., Arguelles, M. E., Hughes, M. T., & Leftwich, S. A. (2004). Collaborative strategic reading: "Real world" lessons from classroom teachers. *Remedial and Special Education, 25*(5), 291-302.

Kovalčíková, I. (2015). From dynamic assessment of cognitive abilities to educational interventions: Trends in cognitive education. *Journal of Pedagogy, 6*(1), 5-21.

Lamb, R. L., Vallett, D., & Annetta, L. (2014). Development of a short-form measure of science and technology self-efficacy using Rasch analysis. *Journal of Science*

Education and Technology, *23*(5), 641–657.

Leather, C. V., & Henry, L. A. (1994). Working memory span and phonological awareness tasks as predictors of early reading ability. *Journal of Experimental Child Psychology, 58*(1), 88-111.

Lee, S. E. (2014). *The impact of working memory training on third-grade students' reading fluency and reading comprehension performance* (Order No. 3684696). Available from ProQuest Dissertations & Theses A&I. (1660540556). Retrieved from http://ezproxy.columbusstate.edu:2048/login?url=http://search.proquest.com/docview/1660540556?accountid=10196

Lee, Y., Patterson, P. P., & Vega, L. A. (2011). Perils to self-efficacy perceptions and teacher-preparation quality among special education intern teachers. *Teacher Education Quarterly, 38*(2), *61-76.*

Leininger, M. (1994). Evaluation criteria and critique of qualitative research studies. In J. M. Morse (Ed.), *Critical issues in qualitative research methods* (pp. 95-115). Thousand Oaks, CA: Sage.

Little, M. E., & Dieker, L. (2009). Co-teaching: Two are better than one. *Principal Leadership: Middle Level Edition, 9*(8), 42-46.

Loosli, S. V., Buschkuehl, M., Perrig, W. J., & Jaeggi, S. M. (2012). Working memory training improves reading processes in typically developing children. *Child Neuropsychology, 18*, 62-78.

Lutz, S. T., & Huitt, W. G. (2003). Information processing and memory: Theory and applications. *Educational Psychology Interactive.* Valdosta, GA: Valdosta State

University. Retrieved May 9, 2018 from http://edpsycinteractive.org/papers/infoproc.pdf

Lysynchuk, L. M., Pressley, M., & Vye, N. J. (1990). Reciprocal teaching improves standardized reading comprehension performance in poor comprehenders. *The Elementary School Journal, 90*(5), 469-484.

Maddux, J. E., Sherer, M., & Rogers, R. W. (1982). Self-efficacy expectancy and outcome expectancy: Their relationship and their effects on behavioral intentions. *Cognitive Therapy and Research, 6*(2), 207, 211.

Melby-Lervåg, M., & Hulme, C. (2013). Is working memory training effective? A meta-analytic review. *Developmental Psychology, 49*, 270-291.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* New York, NY: Wiley.

Messick, S. (1998). Test validity: A matter of consequence. *Social Indicators Research*, *45*(1-3), 35–44.

Meyer, M. D., & Behar-Horenstein, L. S. (2015). When leadership matters: Perspectives from a teacher team implementing response to intervention. *Education and Treatment of Children, 38*(3), 383-402.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits in our capacity for processing information. *Psychological Review, 63*, 81-97.

Mills, A. J., Durepos, G., & Wiebe, E. (2010). *Encyclopedia of case study research*. Thousand Oaks, CA: Sage.

Miyake, A., Friedman, N. P., Rettinger, D. A., Shah, P., & Hegarty, M. (2001). How are visuospatial working memory, executive functioning, and spatial abilities

related? A latent-variable analysis. *Journal of Experimental Psychology: General*, *130*(4), 621-640. doi: 10.1037/0096-3445.130.4.621

Morgan-Borkowsky, L. (2012). *Executive functions in schools: What do teachers know about executive functions and how they impact student progress?* PCOM Psychology Dissertations. Paper 230.

Morrison, A. B., & Chein, J. M. (2011). Does working memory training work? The promise and challenges of enhancing cognition by training working memory. *Psyhonomic Bulletin & Review, 18*(1), 46-60. doi: 10.3758/s13423-010-0034-0

Moustakas, C. (1994). *Phenomenological research methods*. Thousand Oaks, CA: Sage.

Muscella, M. W. (2014). *Educators' perceptions of brain-based learning instruction within the diverse middle school inclusive classroom* (Order No. 3578711). Available from ProQuest Dissertations & Theses Global. (1501736527). Retrieved from http://ezproxy.columbusstate.edu:2048/login?url=http://search.proquest.com/docview/1501736527?accountid=10196

Muter, V., Hulme, C., Snowling, M. J., & Stevenson, J. (2004). Phonemes, rimes, vocabulary, and grammatical skills as foundations of early reading development: Evidence from a longitudinal study. *Developmental Psychology, 40*(5), 665-681. doi: 10.1037/0012-1649.40.5.665

Nassiji, H. (2015). Qualitative and descriptive research. *Language Teaching Research, 19*(2), 129-132.

National Institute of Child Health and Human Development. (2000). Report of the National Reading Panel. Teaching children to read: An evidence-based

assessment of the scientific research literature on reading and its implications for reading instruction. (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office. Retrieved from https://www.nichd.nih.gov/publications/pubs/nrp/Pages/ack.aspx Newton, K., Evans, B., Leonard, J., & Eastburn, J. (2012). Preservice elementary teachers' mathematics content knowledge and teacher efficacy. *School Science and Mathematics, 112*(5), 289-299. doi:10.1111/j.1949-8594.2012.00145.x

Oakhill, J., Cain, K., & Bryant, P. E. (2003). The dissociation of word reading and text comprehension: Evidence from component skills. *Language and Cognitive Processes, 18*(4), 443-468.

Oakhill, J., Yuill, N., & Garnham, A. (2011). The differential relations between verbal, numerical and spatial working memory abilities and children's reading comprehension. *International Electronic Journal of Elementary Education, 4*(1), 83-106.

Patton, M. Q. (2015). *Qualitative evaluation and research methods: Integrating theory and practice* (4th ed.). Thousand Oaks, CA: Sage.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Plumer-D'Amato, P. (2008). Focus group methodology Part 1: Considerations for design. *International Journal of Therapy & Rehabilitation, 15*(2), 69-73.

Poulou, M. (2007). Personal teaching efficacy and its sources: Student teachers' perceptions. *Educational Psychology, 27*(2), 191-218.

Powell, K. C., & Kalina, C. J. (2009). Cognitive and social constructivism: Developing tools for an effective classroom. *Education, 130*(2), 241-250.

Price, P. C., Jhangiani, R. S., & Chiang, I. A. (2015). *Research methods in psychology* (2nd ed.). Washington, DC: Saylor Academy. Retrieved from https://opentextbc.ca/researchmethods/

Protheroe, N. (2008). Teacher efficacy: What is it and does it matter? *Principal, 87*(5), 42-45.

Randall, L., & Tyldesley, K. (2016). Evaluating the impact of working memory training programmes on children-a systematic review. *Educational & Child Psychology, 33*(1), 34-50.

Raphael, T. E., & Pearson, P. O. (1985). Increasing students' awareness of sources of information for answering questions. *American Educational Research Journal, 22*(2), 217-235.

Reed, S. L. E. (2016). *A qualitative case study: Teacher perceptions of executive function* (Order No. 10010909). Available from ProQuest Dissertations & Theses Global. (1766580300). Retrieved from http://ezproxy.columbusstate.edu:2048/login?url=https://search.proquest.com/docview/1766580300?accountid=10196

Ruppar, A. L., Neelson, L. S., & Dalsen, J. (2016). Special education teachers' perception of preparedness to teach students with severe disabilities. *Research and Practice for Persons with Severe Disabilities, 41*(4), 273-286.

Rotter, J. B. (1954). *Social learning and clinical psychology.* New York, NY: Prentice Hall.

Schulte, A. C., Stevens, J. J., Elliott, S. N., Tindal, G., & Nese, J. T. (2016). Achievement gaps for students with disabilities: Stable, widening, or narrowing on a state-wide reading comprehension test? *Journal of Educational Psychology, 108*(7), 925-942. doi:10.1037/edu0000107

Sharpe, A. C., Brandt, L., Tuft, E. A., & Jay, S. (2016). Relationship of self-efficacy and teacher knowledge for prospective elementary education teachers. *Universal Journal of Educational Research, 4*(10), 2432-2436.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information, 22*, 63-75.

Siegel, L. S. (1993). The development of reading. In H. W. Reese (Ed.), *Advances in child development and behavior, Vol. 24* (pp. 63-97). San Diego, CA: Academic Press.

Sigman, M., Pena, M., Goldin, A. P., & Ribeiro, S. (2014). Neuroscience and education: Prime time to build the bridge. *Nature Neuroscience, 17*(4), 497-502.

St. Clair-Thompson, H., Stevens, R., Hunt, A., & Bolder, E. (2010). Improving children's working memory and classroom performance. *Educational Psychology, 30*(2), 175-190.

St. John, P. (2010). Review of working memory and learning: A practical guide for teachers. *Child Language and Therapy, 26*(2), 199-200. doi:10.1177/0265659010026002080 4

Starks, H., & Trinidad, S. B. (2007). Choose your method: A comparison of phenomenology, discourse analysis, and grounded theory. *Qualitative Health Research, 17*(10), 1372-1380.

Sullivan, J. R., & Castro-Villarreal, F. (2013). Special education policy, response to intervention, and the socialization of youth. *Theory into Practice, 52*(3), 180-189.

Sutton, J., & Austin, Z. (2015). Qualitative research: Data collection, analysis, and management. *The Canadian Journal of Hospital Pharmacy, 68*(3), 226-231.

Swanson, H. L. (1987). Information processing theory and learning disabilities: A commentary and future perspective. *Journal of Learning Disabilities, 20*(3), 155-166.

Szabo, S. M., & Moctari, K. (2004). Developing a reading teacher efficacy instrument for teacher candidates: A validation study. *Action Teacher in Education, 26*(3), 59-68.

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences.* Thousand Oaks, CA: Sage.

Titz, C., & Karbach, J. (2014). Working memory and executive functions: Effects of training on academic achievement. *Psychological Research, 78*(6), 852-868.

Tournaki, N., & Podell, D. M. (2005). The impact of student characteristics and teacher efficacy on teachers' predictions of student success. *Teacher and Teacher Education, 21,* 299-314. doi: 10.1016/j.tate.20Q5.01.003.

Tschannen-Moran, M., & Hoy, A. W. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education*, *23*(6), 944–956.

Tschannen-Moran, M., & Johnson, D. (2011). Exploring literacy teachers' self-efficacy

beliefs: Potential sources at play. *Teaching and Teacher Education, 27*(4), 751-761.

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202-248. doi: 10.3102/00346 543068002202

Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice, 6*(5), 100-110.

Wachs, T. D., Georgieff, M., Cusick, S., & McEwen, B. S. (2014). Issues in the timing of integrated early interventions: Contributions from nutrition, neuroscience, and psychological research. *Annals of New York Academy of Sciences, 1308*(1), 89-106.

Weisstein, E. W. (2018). Quartile. *Wolfram Math-World*. Retrieved from http://mathworld.wolfram.com/Quartile.html

Wooley, G. (2001). Developing reading comprehension: Combining visual and verbal cognitive processes. *Australian Journal of Language and Literacy, 33*(2), 108-125.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

Yin, R. K. (2005). Case study methods. In J. L. Green, G. Camilli, & P. B. Elmore (Eds.), *Handbook of complementary methods in education research* (pp. 279–298). Washington, DC: American Educational Research Association.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Los Angeles, CA: Sage.

Zadina, J. N. (2015). The emerging role of educational neuroscience in education reform. *Psicología Educativa, 21*(2), 71-77.

APPENDICES

APPENDIX A

IRB APPROVAL PROTOCOL 19-009

Institutional Review Board
Columbus State University

Date: 9/26/18
Protocol Number: 19-009
Protocol Title: Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits
Principal Investigator: Amy Miller
Co-Principal Investigator: Jennifer Brown

Dear Amy Miller:

The Columbus State University Institutional Review Board or representative(s) has reviewed your research proposal identified above. It has been determined that the project is classified as exempt under 45 CFR 46.101(b) of the federal regulations and has been approved. You may begin your research project immediately.

Please note any changes to the protocol must be submitted in writing to the IRB before implementing the change(s). Any adverse events, unexpected problems, and/or incidents that involve risks to participants and/or others must be reported to the Institutional Review Board at irb@columbusstate.edu or (706) 507-8634.

If you have further questions, please feel free to contact the IRB.

Sincerely,

Amber Dees, IRB Coordinator

Institutional Review Board
Columbus State University

APPENDIX B

LETTER TO PARTICIPATING SCHOOL DISTRICT

Informed Consent: Participating School District

September 7, 2018

Dr. Larry Derico
Superintendent
Thomaston-Upson Schools
205 Civic Center Drive
Thomaston, GA 30286

Dear Dr. Derico:

I am a doctoral student from Columbus State University writing my dissertation titled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits*. This dissertation is under the direction of my dissertation chair, Dr. Jennifer Brown, who can be reached at brown_jennifer2@columbusstate.edu.

This explanatory sequential, mixed methods research study will examine special education teachers' perceptions of their background and experiences, self-efficacy, and implementation of evidence-based strategies to improve the reading comprehension of students with working memory deficits. The study will also explore special education teachers' preparation to teach students with working memory deficits and their perceptions of effective professional learning opportunities that address teaching students with working memory deficits. Teachers will participate in a brief online survey related to professional demographics, their understanding of working memory, and their understanding of research-based reading comprehension strategies. Some teachers will also be selected to participate in two qualitative measures, a brief questionnaire and an interview. The qualitative measures will collect data on teacher perceptions and experiences directly related to the 2 research questions.

I would like your permission to conduct research with kindergarten through twelfth grade special education teachers within your district. All communication with study participants will be held after duty hours for all teachers and the researcher. The interviews will occur on one of the district campuses after hours of duty and instruction.

If these are acceptable terms and conditions, please provide a letter from the school district indicating the district's cooperation in the proposed study. Please include the three items listed on the next page into your district letter and check all that are applicable. Thank you for your time and consent.

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

Check any applicable:

☐ I hereby authorize Amy Miller to access the campuses of Thomaston-Upson Schools to access participants and conduct surveys, questionnaire, and interviews related to a study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

☐ I hereby authorize Amy Miller to recruit Thomaston-Upson Schools' personnel as subjects for participation in a study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

☐ I hereby authorize Amy Miller to use data that does not contain employee or student identifying information, of the facility, organization, university, institution, or association identified above when publishing results from the study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

APPENDIX C

INFORMED CONSENT FOR PARTICIPATING DISTRICT

COLUMBUS STATE UNIVERSITY

INSTITUTIONAL REVIEW BOARD

Informed Consent Form

You are being asked to participate in a research project conducted by Amy Miller, a doctoral student in the Educational Leadership program at Columbus State University. This dissertation project is under the supervision and direction of Dr. Jennifer Brown, who can be reached at brown_jennifer2@columbusstate.edu.

I. Purpose:

The purpose of this project is to examine special education teachers' perceptions of their background and experiences, self-efficacy, and implementation of evidence-based strategies to improve the reading comprehension of students with working memory deficits..

II. Procedures:

Teachers will participate in an online survey related to professional demographics, their understanding of working memory, and their understanding of research-based reading comprehension strategies. The survey should take approximately 30 mintues to complete. Participants will be given three days to complete the survey. Some teachers will also be selected to participate in two qualitative measures, a brief questionnaire and an interview. The qualitative measures will collect data on teacher perceptions and experiences directly related to the 2 research questions. The questionnaire can be completed in approximately 30 minutes to one hour. The interview should conclude in approximately one hour. The data collection period for this study is approximately 4 to 5 weeks. The data obtained in this study will not be used for further research.

III. Possible Risks or Discomforts:

It must be declared that the researcher serves as an administrator within the selected school district. The researcher has an established working relationship with the population pool and research study participants; however, unlike the participants purposely sampled based on their background and experiences in special education, the researcher has a general education background and does not possess certification in special education.

IV. Potential Benefits:

This study will examine the experiences, confidence, and perceptions of teachers who work with students with working memory deficits regarding their understanding of working memory and effective reading instructional strategies. This information will be used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory. Increasing special education teachers' knowledge and classroom practices regarding working memory can potentially narrow the reading achievement gap for students with disabilities.

V. Costs and Compensation:

There is no cost to the district or participants. Survey participants will receive a $5.00 gift card after completing the survey and providing their email address. Questionnaire and interview participants will be provided with $10.00 gift cards for participation in the qualitative measures.. All costs and compensation will be covered by the researcher.

VI. Confidentiality:

Teacher responses on the confidence and preparedness survey will be disaggregated and represented using a table. Teacher names will not be disclosed on the table or entered into the narrative describing the results of the survey. Names of participants who agree to participate in the qualitative measures and are selected based on appropriate quartiles will not be published. Any direct quotation from a participant will be identified using unique numbers not related to the participants' name or email address. The iPhone 8 recording of the interview will be transcribed by the researcher. Transcriptions will be reviewed by the dissertation committee. Names of participants, schools, or the school district will not be disclosed in the study. After acceptance and publication of the dissertation or within one calendar year, the data collection and audio recording of the interviews will be destroyed.

VII. Withdrawal:

Your participation in this research study is voluntary. You may withdraw from the study at any time, and your withdrawal will not involve penalty or loss of benefits.

For additional information about this research project, you may contact the Principal Investigator, Amy Miller at 706-975-4986 or miller_amy2@columbusstate.edu. If you have questions about your rights as a research participant, you may contact Columbus State University Institutional Review Board at irb@columbusstate.edu.

I have read this informed consent form. If I had any questions, they have been answered. By signing this form, I agree to participate in this research project. A letter of cooperation from Thomaston-Upson School System will be provided.

Signature of Participant

9-7-18

Date

Revised 10/01/2017

APPENDIX D

LETTER OF COOPERATION FROM AN OUTSIDE PERFORMANCE SITE

Thomaston-Upson County Schools
205 Civic Center Drive
Thomaston, Georgia 30286
Telephone 706-647-9621 Fax 706-647-7154

Larry Derico, Ed.D.
Superintendent
Mike Gatlin, Ed.D.
Deputy Superintendent
Julie English, Ed.S.
Assistant Superintendent

Keith Rohling, *Board Chair*
Jacqueline Hollis, *Vice-Chair*
Jaye Eubanks
Leon Fowler
Sheila Hall
Angeline McGill
Steve Sadler

Letter of Cooperation from an Outside Performance Site

September 7, 2018

Amy G. Miller
223 Adams Road
Thomaston, GA 30286

Dear Ms. Miller:

Based on my review of your proposed research project, I grant permission for you to conduct the study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits* within the Thomaston-Upson School System.

Check any applicable:

☑ I hereby authorize Amy Miller to access the campuses of Thomaston-Upson Schools to access participants and conduct surveys, questionnaires, and interviews related to a study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

☑ I hereby authorize Amy Miller to recruit Thomaston-Upson Schools' personnel as subjects for participation in a study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

☑ I hereby authorize Amy Miller to use data that does not contain employee or student identifying information, of the facility, organization, university, institution, or association identified above when publishing results from the study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

Signature

9-7-18
Date

Sincerely,
Dr. Larry Derico
Superintendent
Thomaston-Upson School System

Excellence in Education … Every Individual, Every Day

APPENDIX E

EMAIL TO BUILDING PRINCIPALS

Principals,

My name is Amy Miller. I am a doctoral student from Columbus State University writing my dissertation titled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.* This dissertation is under the direction of my dissertation chair, Dr. Jennifer Brown, who can be reached at brown_jennifer2@columbusstate.edu. Dr. Larry Derico, Thomaston-Upson School System Superintendent, has provided informed consent for this district and school personnel to participate in this research study.

The purpose of this study is to explore special education teacher perceptions of students with working memory deficits, as well as the impact of those deficits on the process of learning to read. The study will also explore special education teachers' preparation to teach students with working memory deficits and their perceptions of effective professional learning opportunities that address teaching students with working memory deficits.

In the next few days, I will be emailing the teachers in your building who meet the following qualifications based on the staff rosters provided by Dr. Derico. The email will include the purpose, procedures, possible risks and discomforts, potential benefits, costs and compensation, confidentiality, and withdrawal from the study. Teachers will be asked to complete an online survey related to working memory and reading comprehension. Some teachers will be selected to participate in a follow-up questionnaire and interview. The upcoming email, which include the link to the online survey, will be sent to the following staff members:

CERTIFIED special education teachers:

- serving grades kindergarten through twelfth grade
- serving students in collaborative teaching and resource classrooms
- providing instruction on reading comprehension

Self-contained teachers serving Severe and/or Profound Intellectually Disabled students will not be selected for this study due to adapted curriculum and student assessment requirements.

Thank you for your assistance and access to your special education staff!

Amy Miller

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX F

EMAIL TO SURVEY PARTICIPANTS

Special Education Teachers serving grades kindergarten through twelfth grade:

My name is Amy Miller. I am a doctoral student from Columbus State University writing my dissertation titled *Special Education Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.* This dissertation is under the direction of my dissertation chair, Dr. Jennifer Brown, who can be reached at brown_jennifer2@columbusstate.edu. Dr. Larry Derico, Thomaston-Upson School System Superintendent, has provided informed consent for this district and school personnel to participate in this research study.

The purpose of this explanatory sequential, mixed methods research study is to examine special education teachers' perceptions of their background and experiences, self-efficacy, and implementation of evidence-based strategies to improve the reading comprehension of students with working memory deficits.

I am seeking participants who meet the following criteria:

CERTIFIED special education teachers:

- serving grades kindergarten through twelfth grade
- serving students in collaborative teaching and resource classrooms
- providing instruction on reading comprehension

Self-contained teachers serving Severe and/or Profound Intellectually Disabled students will not be selected for this study due to adapted curriculum and student assessment requirements.

The link below provides access to a brief, online survey related to professional demographics, your understanding of working memory, and your understanding of research-based reading comprehension strategies. Your participation is greatly appreciated. A $5.00 gift certificate to a local restaurant will be provided to participants who complete the survey. All responses and participant identities will be kept confidential.

SURVEY MONKEY LINK

Thank you for your assistance in conducting this research study!

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX G

INFORMED CONSENT FOR SURVEY PARTICIPANTS

COLUMBUS STATE UNIVERSITY

INSTITUTIONAL REVIEW BOARD

Informed Consent Form

You are being asked to participate in a research project conducted by Amy Miller, a doctoral student in the Educational Leadership program at Columbus State University. This dissertation project is under the supervision and direction of Dr. Jennifer Brown, who can be reached at brown_jennifer2@columbusstate.edu.

I. Purpose:

The purpose of this project is to examine special education teachers' perceptions of their background and experiences, self-efficacy, and implementation of evidence-based strategies to improve the reading comprehension of students with working memory deficits..

II. Procedures:

Teachers will participate in an online survey related to professional demographics, their understanding of working memory, and their understanding of research-based reading comprehension strategies. The survey should take approximately 30 mintues to complete. Participants will be given two weeks to complete the survey. Some teachers will also be asked to participate in two qualitative measures, a brief questionnaire and an interview. The data collection period for this study is approximately 4 to 5 weeks. Data obtained in this study will not be used for further research.

III. Possible Risks or Discomforts:

It must be declared that the researcher serves as an administrator within the selected school district. The researcher has an established working relationship with the population pool and research study participants; however, unlike the participants purposely sampled based on their background and experiences in special education, the researcher has a general education background and does not possess certification in special education. Each data collection period will be prefaced by reminding participants of anonymity and research confidentiality. Participants will also be reminded that their participation is voluntary and exclusion from the group can occur at any time.

IV. Potential Benefits:

This study will examine the experiences, confidence, and perceptions of teachers who work with students with working memory deficits regarding their understanding of working memory and effective reading instructional strategies. This information will be used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory. Increasing special education teachers' knowledge and classroom practices regarding working memory can potentially narrow the reading achievement gap for students with disabilities.

V. Costs and Compensation:

There is no cost to the district or participants. Survey participants will receive a $5.00 gift card after completing the survey and providing their email address. All costs and compensation will be covered by the researcher.

VI. Confidentiality:

Teacher responses on the confidence and preparedness survey will be disaggregated and represented using a table. Teacher names will not be disclosed on the table or entered into the narrative describing the results of the survey. All documentation collected including answers to the survey, participant email addresses, and data charts and summaries will be stored in a password protected, online, password protected storage system. The researcher is the only individual that can access the online storage system or the data disaggregation software. After acceptance and publication of the dissertation or within one calendar year, participant information, completed surveys, and disaggregated survey data will be destroyed through the deletion of all research files. The software used for data disaggregation will also be deleted after publication. Any hard copies of data related to the study will be shredded by the researcher.

VII. Withdrawal:

Your participation in this research study is voluntary. You may withdraw from the study at any time, and your withdrawal will not involve penalty or loss of benefits.

For additional information about this research project, you may contact the Principal Investigator, Amy Miller at 706-975-4986 or miller_amy2@columbusstate.edu. If you have questions about your rights as a research participant, you may contact Columbus State University Institutional Review Board at irb@columbusstate.edu.

I have read this informed consent form. If I had any questions, they have been answered. By selecting the *I agree* radial and *Submit*, I agree to participate in this research project.

○ I agree. ○ I do not agree.

Submit

APPENDIX H

CONFIDENCE AND PREPAREDNESS SURVEY
(ADAPTED FROM CANIGLIA, 2016)

Section 1: Demographics

1. How many years of service do you have in the field of education?

0-5 6-10 11-15 16-20 21-25 25+

2. What is the highest degree you have earned:

Bachelor's Degree Master's Degree

Specialist Ed.D./Ph.D.

3. What instructional environment best describes your teaching assignment?

Resource/Separate Class Collaborative Teacher (Co-Teacher)

4. What grade level do you primarily serve (circle only one response):

Early Childhood (ages 3-5) Primary (K-2)

Elementary School (K-5) Middle School (6-8)

High School (9-12) Transition (18-21)

5. What is your current certification?

Special Education-General Consultative

Special Education-Adapted Curriculum

Dual Certification (Special Education & General Education)

Other: _____

6. Do you have a degree or specialization to teach Reading/English-Language Arts? Please Explain. _____

Section II: Preparedness and Confidence Regarding Working Memory								
Please indicate your level of PREPAREDNESS ("I have the knowledge or skills") and your level of CONFIDENCE ("I am confident in my ability to perform the skill in my current assignment") for each of the following items. Please indicate your response using the rating scale in each column.								
	LEVEL OF PREPAREDNESS				**LEVEL OF CONFIDENCE**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	NOT PREPARED	**SOMEWHAT PREPARED**	**PREPARED**	**VERY PREPARED**	**NOT CONFIDENT**	**SOMEWHAT CONFIDENT**	**CONFIDENT**	**VERY CONFIDENT**
I *understand* **the role of working memory in the learning process.**	1	2	3	4	1	2	3	4
I *understand* **the role of working memory in verbal reasoning.**	1	2	3	4	1	2	3	4
I *understand* **the role of working memory in developing early literacy skills.**	1	2	3	4	1	2	3	4
I *understand* **the role of working memory in reading comprehension.**	1	2	3	4	1	2	3	4

I *understand and implement* **research-based strategies to increase working**	1	2	3	4	1	2	3	4
I *use* **my understanding of working memory and information on students' working memory levels**	1	2	3	4	1	2	3	4

If you identified (1) ***prepared*** or (2) ***very prepared*** for any of the above items, please identify where you feel ***most*** of your preparation came from.

I was ***mostly*** prepared for the knowledge and skills related to ***Working Memory*** through...

- o My teacher preparation program.
- o My teacher preparation program AND professional development.
- o Professional development through my school district.
- o Graduate school specialization.
- o Collaboration with colleagues (Professional Learning Communities, book studies, etc.).
- o Self-study.
- o Other: (Please indicate) _

_____

If you identified (1) *not prepared/not confident*, or (2) *somewhat prepared/somewhat confident* for any of the above items, please identify training or support you need related to **Working Memory**.

_____
_____
_____

Section III: Preparedness and Confidence Reading Comprehension								
Please indicate your level of PREPAREDNESS ("I have the knowledge or skills") and your level of CONFIDENCE ("I am confident in my ability to perform the skill in my current assignment") for each of the following items. Please indicate your response using the rating scale in each column.								
	LEVEL OF PREPAREDNESS				**LEVEL OF CONFIDENCE**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	NOT PREPARED	**SOMEWHAT PREPARED**	**PREPARED**	**VERY PREPARED**	**NOT CONFIDENT**	**SOMEWHAT CONFIDENT**	**CONFIDENT**	**VERY CONFIDENT**
I understand **collaborative comprehension strategies well enough to use them as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4
I understand **story structure and story grammar well enough to use them as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4

I understand **metacognitive/comprehension monitoring strategies well enough to teach them as an effective strategy to teach reading comprehension** to students with working memory	1	2	3	4	1	2	3	4
I understand **reciprocal teaching strategies or multiple strategy instruction (prediction, clarification, question generation, and summarization) well enough to use them as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4
I understand the **question generating strategy well enough to use it as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4

I understand **the question answering strategy well enough to use it as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4
I understand **graphic/semantic organizers well enough to use it as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4
I understand **the summarization strategy well enough to use it as an effective strategy to teach reading comprehension** to students with working memory deficits.	1	2	3	4	1	2	3	4

If you identified (1) ***prepared*** or (2) ***very prepared*** for any of the above items, please identify where you feel ***most*** of your preparation came from.

I was ***mostly*** prepared for the knowledge and skills related to ***Reading Comprehension*** through...

- o My teacher preparation program.
- o My teacher preparation program AND professional development.
- o Professional development through my school district.
- o Graduate school specialization.
- o Collaboration with colleagues (Professional Learning Communities, book studies, etc.).
- o Self-study.
- o Other: (Please indicate) _

_____

If you identified (1) *not prepared/not confident*, or (2) *somewhat prepared/somewhat confident* for any of the above items, please identify training or support you need related to **Reading Comprehension for Students with Working Memory Deficits**.

_____
_____
_____

Thank you for your time. Your responses are appreciated!

Would you be willing to participate in a follow up questionnaire and interview?

_____Yes _____No

If "Yes," please provide your email address below.

e-mail address: _____

Thank you for being willing to participate in the questionnaire and interview! You will be contacted soon regarding the questionnaire and a date, time, and location for the interview.

APPENDIX I

LETTER OF CONSENT TO ADAPT SURVEY

COLUMBUS STATE UNIVERSITY

Letter Seeking Permission to Use Survey/Questionnaire Tool

February 4, 2018

Dr. Cyndi Caniglia
Gonzaga University
School of Education
502 East Boone Avenue
Spokane, WA 99258-0102

Dear Dr. Caniglia,

I am a doctoral student from Columbus State University in Columbus, Georgia. I am conducting a research study entitled *The Effects of Special Education Teachers' Self-Efficacy and Outcome Expectancy for Improving the Reading Comprehension of Students with Working Memory Deficits.* My dissertation committee is chaired by Dr. Pamela Lemoine, who can be reached at (706) 507-8509 or lemoine_pamela@columbusstate.edu. The Columbus State University IRB Committee can be contacted at irb@columbusstate.edu.

I would like your permission to use an adapted version of the 2012 Council for Exceptional Children Initial Special Education Teacher Preparation Standards (2015) survey/questionnaire instrument in my research study. I would like to use and print your survey under the following conditions:

- I will use the surveys only for my research study and will not sell or use it with any compensated or curriculum development activities.
- I will include the copyright statement on all copies of the instrument.
- I will send a copy of my completed research study to your attention upon completion of the study.

If these are acceptable terms and conditions, please indicate so by signing the consent below and returning this letter with signature as an attachment to the following email address:

miller_amy2@columbusstate.edu or amiller@upson.k12.ga.us

I, Dr. Cyndi Caniglia, consent to the use of my dissertation survey/questionnaire in a research study conducted by Amy Miller, doctoral candidate at Columbus State University.

Cyndi Caniglia
Signature

2-7-18
Date

Sincerely,

Amy Miller

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX J

SURVEY REMINDER EMAIL

Teachers,

Thank you for your participation in conducting this research study**!**

Last week, you received an email and link regarding my research study titled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.*

Your participation in this study is desperately needed! Please click the link below to access a brief, online survey regarding your perceptions and experiences of working memory and reading comprehension. All responses and participant identities will be kept confidential. A $5.00 gift certificate to a local restaurant will be provided to participants who complete the questionnaire.

SURVEY MONKEY LINK

The link will remain active for one more week. Thank you for your assistance in conducting this research study!

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX K

SURVEY ITEM ANALYSIS

Item	Research	Research Question
1. Years of Experience	Tschannen-Moran et al., 1998	Question 1
2. Level of Degree	Tschannen-Moran et al., 1998	Question 1
3. Classroom Setting	Tschannen-Moran et al., 1998	Question 1
4. Grade Level	Tschannen-Moran et al., 1998	Question 1
5. Current Certification	Tschannen-Moran et al., 1998	Question 1
6. Reading ELA Specialization	Bishop et al., 2010; Brownell et al., 2010; Caniglia, 2016	Question 1
7. Role of Working Memory in Learning	Alloway et al., 2009; Dunning et al., 2013; Gathercole & Alloway, 2008; Loosli et al., 2012; Randall & Tyldesley, 2016	Question 1, 2
8. Role of Working Memory in Verbal Reasoning	Alloway et al., 2009; Dahlin, 2011; Kendeou et al., 2014	Question 1, 2
9. Role of Working Memory in Early Literacy	Ansari et al., 2015; Crain et al., 1990; Kendeou et al., 2014; Lee, 2014; Siegel, 1993; Titz & Karbach, 2014	Question 1, 2
10. Role of Working Memory in Reading Comprehension	Arina et al., 2015; Baddeley, 2012; Dahlin, 2011; Dunning et al., 2013; Garcia-Madruga et al., 2013; Holmes et al., 2009; Kendeou et al., 2014; Oakhill et al., 2011	Question 1, 2
11. Research-based Strategies to Improve Working Memory	Dahlin, 2011; Dunning et al., 2013; Flavell et al., 1966; Garcia-Madruga et al., 2013; Holmes et al., 2009; Holmes & Gathercole, 2014; Karbach et al., 2013 Lee, 2014; Loosli et al., 2012; Melby-Lervage & Hulme, 2013; Morrison & Chein, 2011; St. Clair et al.,	Question 1, 2

	2010	
12. Use of WM Knowledge and Student Data in Instruction	Alloway et al., 2012; Muscella, 2014; Reed, 2016; Ruppar et al., 2016	Question 1, 2
13. Preparation Regarding Working Memory	Alloway et al., 2012; Muscella, 2014; Reed, 2016; Ruppar et al., 2016	Question 2
14. Professional Needs re: Working Memory	Alloway et al., 2012; Muscella, 2014; Reed, 2016; Ruppar et al., 2016	Question 2
15. Collaborative Comprehension Strategies	Klingner et al., (2004)	Question 1, 2
16. Story Structure and Story Grammar Strategies	Alves et al., (2015)	Question 1, 2
17. Metacognitive Strategies	Boulware-Gooden et al., (2007)	Question 1, 2
18. Reciprocal Teaching Strategies	Lysynchuk et al., (1990)	Question 1, 2
19. Question Generating Strategies	Davey & McBride (1986)	Question 1, 2
20. Question Answering Strategies	Raphael & Pearson (1985)	Question 1, 2
21. Graphic/Semantic Organizers	Griffin et al., (1995)	Question 1, 2
22. Summarization Strategies	Jitendra et al., (2000)	Question 1, 2
23. Preparation Regarding Reading Instruction	Bishop et al., 2010; Brownell et al., 2010; Caniglia, 2016	Question 2
24. Professional Needs re: Reading Instruction	Bishop et al., 2010; Brownell et al., 2010; Caniglia, 2016	Question 2

APPENDIX L

SELF-EFFICACY QUESTIONNAIRE

Adapted from the Reading Teacher Efficacy Instrument (Szabo & Mokhtari, 2004)

Thank you for agreeing to participate in this study. The purpose of the research is to explore special education teachers' perceptions of their background and experiences, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. This information will be used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory. Your perspective is helpful towards informing future training and support of special education. Your participation in this study is voluntary and can be stopped at any time. Your responses will remain confidential and your name will not be used in any written reports. Any quotes that may appear in the write up of the study will be anonymous.

Do you consent to participate in the questionnaire? _____ Yes _____ No

_____ _____

Participant Signature Date

Please answer the questions below.

1. What strategies do you feel are most effective for improving comprehension?
2. Where did you learn about teaching reading and effective comprehension strategies?
3. Are you confident in your understanding of the reading process well enough to teach reading effectively? Why or why not?
4. Is there a relationship between students' reading achievement and teacher effectiveness? Why or why not?
5. Do you feel that you have the ability to effectively teach students with reading problems? Why or why not?

APPENDIX M

LETTER OF CONSENT TO USE AND ADAPT RTEI

From: Susan Szabo <Susan.Szabo@tamuc.edu>
Sent: Tue, Aug 14, 2018, 10:36 AM
To: Amy, kmokhtari@uttyler.edu, me

Hi Amy,

Yes, you have permission Good luck with your study.

Dr. Susan Szabo

From: Amy Miller [amiller@upson.k12.ga.us]
Sent: Saturday, August 11, 2018 10:46 PM
To: Susan Szabo; kmokhtari@uttyler.edu
Cc: Amy Miller
Subject: Permission to Use and Adapt RTEI

Dr. Susan Szabo & Dr. Mokhtari,

My name is Amy Miller. I am a doctoral candidate at Columbus State University in Columbus, Georgia. I am conducting a research study entitled *Special Education Teachers' Self-Efficacy Regarding Improving the Reading Comprehension of Students with Working Memory Deficits.* The purpose of the research is to assess special education teachers' perceptions of their self-efficacy to improve the reading comprehension of students with working memory deficits.

As a Special Education Director and a School Improvement Specialist in a rural, central Georgia school district, I find that we are continuously discussing professional learning and supplemental resources to address widespread gaps in student literacy. However, the professional learning often targets improving the teacher self-efficacy and knowledge of general education teachers. In my tenure as a Special Education Director, I have found that our special education teachers need specialized professional learning that provides them with the knowledge and confidence to blend research-based literacy instructional strategies with strategies designed for learners with specific cognitive strengths and deficiencies. Many of our younger teachers are dual certified, with basic knowledge in general and special education. Through informal conversations with my special education staff, I have found that our teachers need additional professional learning on effective literacy instruction and addressing specific cognitive deficits.

During my research for my literature review, I discovered your article *Developing a Reading Teaching Efficacy Instrument (RTEI) for Teacher Candidates: A Validation Study* (2004). I am writing to request permission to adapt the RTEI into an open-ended questionnaire to gather qualitative data on special education teachers' perceptions of their self-efficacy to improve the reading comprehension of students with working memory deficits. The adapted instrument will only be used for this dissertation and will not be distributed for compensation or professional learning activities. A copyright statement will be included on all copies of the survey.

Attached is a letter formally seeking permission to use and adapt the RTEI. If you agree to graciously allow me to use and adapt this instrument, please print and sign the attached permission letter and return it to my email address via an attachment.

amiller@upson.k12.ga.us

Thank you in advance for your consideration and assistance.

Sincerely,

Amy Miller

APPENDIX N

QUESTIONNAIRE ITEM ANALYSIS

Item	Research	Research Question
1. Strategies for Reading Comprehension	Alves et al., (2015); Bishop et al., 2010; Brownell et al., 2010; Boulware-Gooden et al., (2007); Caniglia, 2016; Davey & McBride (1986); Griffin et al., (1995); Jitendra et al., (2000); Lysynchuk et al., (1990); NICHD, 2000; Raphael & Pearson (1985)	Question 1
2. Training regarding reading comprehension	Bishop et al., 2010; Brownell et al., 2010; Caniglia, 2016; Dingle et al., 2011; Sharp et al., 2016; Tschannen-Moran & Johnson (2011)	Question 1
3. Confidence regarding teaching reading comprehension	Bishop et al. (2010); Dingle et al. (2011); King-Sears & Bowman-Kruhm (2011); Ruppar et al. (2016); Sharp et al. (2016); Tschannen-Moran & Johnson (2011)	Question 1
4. Teacher Effectiveness and Reading Achievement	Bishop et al., 2010; Brownell et al., 2010; Katsiyannis et al., 2003; King-Sears & Bowman-Kruhm (2011); Ruppar et al., 2016	Question 2
5. Self-Efficacy regarding reading instruction	Bishop et al. (2010); Dingle et al. (2011); King-Sears & Bowman-Kruhm (2011); Ruppar et al. (2016); Sharp et al. (2016); Tschannen-Moran & Johnson (2011)	Question 2

APPENDIX O

QUESTIONNAIRE EMAIL

Questionnaire Participants,

Thank you for your willingness to participate in a brief questionnaire regarding special education teachers' perceptions and experiences of reading comprehension for students with working memory deficits.

The questionnaire is attached in a Word document. Please complete the questionnaire at your leisure. Please save all responses and return the questionnaire as an email attachment with three days.

Thank you for your assistance in conducting this research study. Your participation is truly appreciated!

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX P

INFORMED CONSENT FOR QUALITATIVE MEASURES

INSTITUTIONAL REVIEW BOARD

Informed Consent Form

You are being asked to participate in a research project conducted by Amy Miller, a doctoral student in the Educational Leadership program at Columbus State University. This dissertation project is under the supervision and direction of Dr. Jennifer Brown, who can be reached at brown_jennifer2@columbusstate.edu. The following consent form provides information regarding participation in phase 3 of the proposed research study which includes a brief questionnaire and interview.

I. Purpose:

The purpose of this project is to examine special education teachers' perceptions of their background and experiences, self-efficacy, and implementation of evidence-based strategies to improve the reading comprehension of students with working memory deficits.

II. Procedures:

Qualitative measures participants consist of special education teachers within the targeted population pool who completed the online survey and volunteered to participate in an open-ended questionnaire and interview. The qualitative measures will collect data on teacher perceptions and experiences directly related to the 2 research questions. The questionnaire will be emailed to each participant to complete at their preferred time and location. The questionnaire will be presented using a Word document attachment. Participants will be given 3 days to complete the brief online questionnaire. The interviews will occur in September/October at one of the following locations: XX Primary School, XX Elementary School, XX Middle School, XX High School, or XX Board of Education. The interview will last approximately thirty minutes to one hour. The data collected in this study will not be used for further research projects.

III. Possible Risks or Discomforts:

There are no risks for participants. However, because the researcher serves as an administrator within the district, some participants may find it uncomfortable to discuss professional learning concerns. Each data collection period will be prefaced by reminding participants of anonymity and research confidentiality. Participants will also be reminded that their participation is voluntary and exclusion from the group can occur at any time.

IV. Potential Benefits:

There are no individual benefits for participants within this study. However, this study will examine the experiences, confidence, and perceptions of teachers who work with students with working memory deficits regarding their understanding of working memory and effective reading instructional strategies. This information will be used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory. Increasing special education teachers' knowledge and classroom practices

regarding working memory can potentially narrow the reading achievement gap for students with disabilities.

V. Costs and Compensation:

Qualitative measures participants will be provided with $10.00 gift cards for participation in the study. Gift cards will be provided at the conclusion of the interview. All costs and compensation will be covered by the researcher.

VI. Confidentiality:

Names of participants who agree to participate in the qualitative phase and are selected based on appropriate quartiles will not be published. Any direct quotation from a participant will be identified using numbers. Information related to participants in the qualitative phase of the study will be stored in an online, password protected storage system. This storage system is only accessible to the primary researcher. The interview will be recorded using the researcher's personal, password protected iPhone 8. The recording of the interview will be transcribed by the researcher. The iPhone recording and transcriptions that may include identifiable information is only accessible by the primary researcher. Transcriptions will be reviewed by the dissertation committee; however, names of participants, schools, or the school district will not be disclosed in the study. All documentation collected regarding the questionnaire and interviews, including the recording, transcript, and participant email addresses, will be stored in a password protected, online storage system. The researcher is the only individual that can access the online storage system. After acceptance and publication of the dissertation, the data collection and audio recording of the interview will be destroyed through the deletion of all research files. The software used for data disaggregation will also be deleted after publication. Any hard copies of data related to the study will be shredded by the researcher.

VII. Withdrawal:

Your participation in this research study is voluntary. You may withdraw from the study at any time, and your withdrawal will not involve penalty or loss of benefits.

For additional information about this research project, you may contact the Principal Investigator, Amy Miller at 706-975-4986 or miller_amy2@columbusstate.edu. If you have questions about your rights as a research participant, you may contact Columbus State University Institutional Review Board at irb@columbusstate.edu.

I have read this informed consent form. If I had any questions, they have been answered. By signing this form, I agree to participate in this research project. I agree to participate in a questionnaire, writing prompt, and brief interview.

_____ _____

Signature of Participant Date

APPENDIX Q

QUESTIONNAIRE REMINDER EMAIL

Questionnaire Participants,

This is a reminder that the questionnaire is need by the following date. If you have already completed the questionnaire and submitted it via email, thank you for your time and participation. If you have not completed the questionnaire, your participation is needed and appreciated.

Remember, a $10.00 gift card will be provided for your participation in the questionnaire and interview!

Thank you for your assistance in conducting this research study!

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX R

REVISED INTERVIEW PROTOCOL

"Thank you for agreeing to participate in this study. The purpose of the research is to explore special education teachers' perceptions of their background and experiences, self-efficacy, and understanding of evidence-based strategies to improve the reading comprehension of students with working memory deficits. This information will be used to suggest professional learning and collaborative opportunities that help teachers construct a greater understanding of specialized instructional strategies that address deficits in working memory. Your perspective is helpful towards informing future training and support of special education. Your participation in this interview is voluntary and can be stopped at any time. Your responses will remain confidential and your name will not be used in any written reports. With your permission, I would like to record the interview. The interview discussion will be transcribed and used for analysis of the data. Any quotes that may appear in the write up of the study will be anonymous. May I have your permission to record the interview?"

1. Describe the primary factors behind your successful AND unsuccessful efforts to improve the reading comprehension of students with working memory deficits.

2. When providing reading comprehension instruction to students with working memory deficits, tell me about the likelihood of those students achieving the desired outcome.

3. How do you gauge your success and effectiveness?

APPENDIX S

INTERVIEW ITEM ANALYSIS

Item	Research	Research Question
1. Factors Behind Success and Lack of Success	Bishop et al. (2010); Dingle et al. (2011); King-Sears & Bowman-Kruhm (2011); Ruppar et al. (2016); Sharp et al. (2016); Tschannen-Moran & Johnson (2011)	Question 1
2. Outcome Expectancy	Allinder, 1995; Collier, 2005; Green, 2012; Rotter, 1954	Question 2
3. Measuring Teacher Success and Effectiveness	Bandura, 1977; Darling-Hammond et al., 2002; Hoy & Spero, 2005; Protheroe, 2008; Ruppar et al., 2016	Question 2

APPENDIX T

IRB MODIFICATION APPROVAL

From: CSU IRB <irb@columbusstate.edu>
Sent: Mon, Nov 5, 2018, 5:53 PM
To: me, Jennifer

The submitted modification requests for Protocol 19-009 have been approved by the IRB.

Please note any further changes to the protocol must be submitted in writing to the IRB before implementing the change(s). Any adverse events, unexpected problems, and/or incidents that involve risks to participants and/or others must be reported to the Institutional Review Board at irb@columbusstate.edu or (706) 507-8634.

If you have any questions or concerns, please feel free to contact the IRB.

Sincerely,

Amber Dees, IRB Coordinator

Institutional Review Board
Columbus State University

APPENDIX U

INTERVIEW EMAIL

Interview Participants,

Thank you for your willingness to participate in an interview regarding special education teachers' perceptions and experiences of reading comprehension for students with working memory deficits. A $10.00 gift card will be provided for your participation in the questionnaire and interview.

The interview will occur during the week of September X-XX. Your classroom or any room in your school or at the XXXXXXXXXX Board of Education will serve as our location for the interview. The interview will last approximately 30 minutes to one hour.

Below are possible dates and times for the interview.

Monday: 4:00, 4:30, or 5:00 pm
Tuesday: 4:00, 4:30, or 5:00 pm
Wednesday: 4:00, 4:30, or 5:00 pm
Thursday: 4:00, 4:30, or 5:00 pm

Which date and time is most convenient for you?

The date and time will be determined based on time preferences. An email will follow notifying you of the date and time. A reminder email will also be sent on the day before the interview.

Thank you for your assistance in conducting this research study!

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX V

INTERVIEW REMINDER EMAIL

Interview Participant,

This is a reminder that our interview will be held in the conference room of XX X School on September XX, 2018 at 4:00 pm.

Light refreshments will be provided. Remember, your participation in this study is voluntary. All responses and participant identities will be kept confidential. A $10.00 gift card will be provided at the completion of the interview.

Thank you for your assistance in conducting this research study! See you tomorrow!

Sincerely,

Amy Miller, Ed. S.
Doctoral Candidate
Educational Leadership
College of Education & Health Professionals
Columbus State University

APPENDIX W

THEMES AND SUBTHEMES OF QUALITATIVE DATA ANALYSIS

Appendix W

Themes and Subthemes Identified Through Cumulative Qualitative Data Analysis

Theme	Category	Descriptor
Effective reading comprehension strategies (n = 7)	Evidence-based comprehension Strategies (6)	Summarizing (4) Reciprocal teaching/making predictions (4) Question answering/guided questioning (4) Metacognition (3) Graphic organizers (3) Story structure (story boards, timelines) (2)
	General comprehension strategies (7)	Activating prior knowledge (4) Making connections (4) Student illustrations (4) Motivating/purpose for reading (3) Making inferences (3) Visualization (3) Explicit, direct instruction (2) Highlighting details (2) Sequencing (2) Scaffolding reader (2) Multiple reads (1) Vocabulary instruction (1)
Teacher preparation (n = 7)	Sources of teacher preparation (7)	In-service professional development-literacy (7) Teaching experience (4) Graduate programs (4) Reading/ELA certification (2) Undergraduate programs (2) Peer collaboration (2) Content planning (1)

Teacher knowledge and ability (*n* = 7)	Strengths (5)	In-depth knowledge of reading process (5) Ability to diagnose and address deficits (5) Prior success (5) Knowledge/use of reading skills/strategies (3) In-depth knowledge of specialized instructional strategies (3) Relationships with students (2) Ability to address different learning styles (1) Consistency in instructional practice (1)
	Weaknesses (4)	Lack of success with significantly low readers (4) Limited knowledge of specialized reading strategies (4) Limited understanding of reading process (3) Inability to correctly diagnose and address reading deficits (1)
Teacher confidence (*n = 7)*	High self-confidence (2)	Confident in knowledge and ability to teach student with reading problems (2)
	Confidence with parameters (5)	Confidence limited to specific reading domains (1) Confidence limited to current reading programs (1) Need more knowledge on specialized reading instruction (2)
Job related factors (*n* = 7)	Instructional or professional needs (5)	Additional resources/tools (5) PL on reading process (5) PL on specialized instructional strategies (cognitive/processing/etc.) (5)
	Student factors (5)	Working memory deficits (4) Significant cognitive deficits (3) Limited background/prior knowledge (3) Decoding deficits (2) Lack of reading fluency (2) Socioeconomic (1) Student behavior (1)

Teacher effectiveness (*n* = 7)	Characteristics of teacher effectiveness (7)	Understanding instructional strategies (6) Evidence of student growth (4) Diagnosing and addressing deficits (4) Bridging gaps in reading ability and content (4) Building student relationships (2) Mastery of subject matter (2)
	Measuring Teacher Effectiveness (7)	Student growth model (4) Student screeners (3) IEP growth data (1) Daily interaction/observation (2) Self-reflection (1)
Outcome expectancy (*n* = 7)	High outcome expectancy (2)	Expected outcomes are likely or met (2)
	Low outcome expectancy (5)	Low expectancy rate (5) Below grade level (4) Higher for short-term goals (4) Long-term, not immediate growth (2)

APPENDIX X

NATIONAL INSTITUTE OF HEALTH (NIH) CERTIFICATE: RESEARCHER

Certificate of Completion

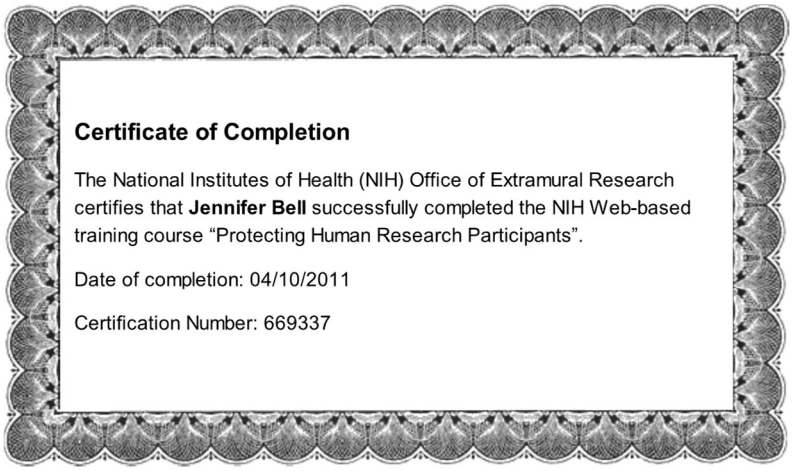
The National Institutes of Health (NIH) Office of Extramural Research certifies that **Amy Miller** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 01/30/2017.

Certification Number: 2301920.

APPENDIX Y

NATIONAL INSTITUTE OF HEALTH (NIH) CERTIFICATE: CHAIR



Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Jennifer Bell** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 04/10/2011

Certification Number: 669337