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Exploring the effects of online instruction on reading comprehension achievement of students with learning disabilities

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EXPLORING THE EFFECTS OF ONLINE INSTRUCTION ON READING COMPREHENSION ACHIEVEMENT OF STUDENTS WITH LEARNING DISABILITIES

by

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ABSTRACT

Exploring the Effects of Online Instruction on Reading Comprehension Achievement of Students With Learning Disabilities

by

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Two major pieces of legislation, the *Individuals with Disabilities Education Act* (2004) and *No Child Left Behind* (NCLB) (2001) mandate that students with disabilities be placed in the Least Restrictive Environment and have access to the general education curriculum. To provide access to the general education curriculum, inclusion in general education classes for students with disabilities has become the accepted practice. Many students with specific learning disabilities experience difficulties with the general education curriculum because their reading ability falls significantly below the school curriculum and textbook instructional levels (Deshler & Schumaker, 1993). *The Word Identification Strategy* (Lenz, Schumaker, Deshler, & Beals, 2007) has been validated in traditional face-to-face settings to increase the oral reading and comprehension of students with reading deficits. Due to the possibilities of the Internet, online education has become a strong alternative option for traditional face-to-face instruction.

The purpose of this multiple-probe design study was to investigate the effect of teaching *The Word Identification Strategy* (Lenz, Schumaker, Deshler, & Beals, 2007) through online modules to students with specific learning disabilities. Specifically, *The*

Word Identification Strategy (Lenz et al., 2007) was taught to five participants (i.e., two fifth graders, one six grader, and two seventh graders) through online modules within an online distance education charter school. *The Word Identification Strategy* (Lenz et al.) served as the independent variable to determine the effect on the participants' oral reading and comprehension. *Oral Reading Probes* and *Comprehension Probes* were used to measure participant performance throughout three design conditions: (a) baseline, (b) instruction, and (b) maintenance. The instruction condition included three phases: controlled practice using instructional level reading passages, advanced practice using grade level reading passages, and generalization using reading assignments from their English, science, and social studies online classes. Maintenance Probes were used to determine whether participants maintained the skill two weeks after instruction ended. Visual analysis of graphed data from the *Oral Reading Probes* and *Comprehension Probes* obtained during the three conditions was analyzed to determine the strategy's effectiveness. Analysis revealed that all five participants learned *The Word Identification Strategy* (Lenz) through online instruction and improved their oral reading mean average scores from an instructional level (90%-95%) to an independent level (96%-100%) on controlled practice (instructional level) and advanced practice (grade level) materials. In addition, participants improved their comprehension on controlled and advanced materials when compared to pretest comprehension scores. Participants also generalized the strategy to online materials written at grade level. Finally, students with learning disabilities maintained their oral reading and comprehension skills over a two-week period at levels higher than their performance before learning the strategy.

TABLE OF CONTENTS

LIST OF TABLES

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CHAPTER 1

INTRODUCTION

The accessibility of computers and the invention of the Internet have made it possible for the American educational system to progress from one-room schoolhouses to virtual online schools. Due to the possibilities of the Internet, online education has become a strong model for teaching and learning (Allen, Mabry, Mattrey, Bourhis, Titsworth, Burrell, 2004; Rumble, 2001). The emergence of new technologies has changed instructional practices and the model of distance education. Virtual schools provide an alternate setting for many types of students including students with disabilities, students with health issues, and students who are home schooled. Furthermore, virtual schools provide an innovative setting for students who are at risk of dropping out of school due to raising families or working to support themselves (Ronsisvalle & Watkins, 2005).

Online learning has gained acceptance among educators, students, parents and the public (Ronsisvalle & Watkins, 2005; Rumble, 2001; Smith & Meyen, 2003). Since 1998, the demand for distance learning has increased in public school settings. In 1998, the average public school contained 90 instructional computers per school building and 50% of the classrooms in each building had access to the Internet. Significant growth in technology occurred during the following five years. By 2005, the average public school contained 154 instructional computers in each school building with nearly 100% of the classrooms having Internet access (Digest of Educational Statistics, 2008). Technology equipment and access has continued to grow each year allowing more students to have access to computer assisted and online instruction. In 2005, Pape reported as many as 40,000 to 50,000 students in 37 states were involved in online courses through charter

schools and district online programs. Many states have implemented online schools, also known as virtual schools, in hopes that online education will meet students' educational needs while simultaneously reducing the need to build new school facilities (Ronsisvalle & Watkins). Virtual schools are schools where coursework is offered over the Internet; some virtual schools use Web-based methods (Clark, 2001). Through online courses, school personnel are able to offer an array of classes to meet students' academic needs. Students may be offered remedial or accelerated coursework online. Online schools are sometimes used to reach student populations that have not been successful on traditional school campuses in hopes of increasing graduation rates.

Virtual schools use a variety of technology to enhance learning such as streaming video, chat rooms, instant messaging, and bulletin boards. Some virtual schools present coursework exclusively online and others use a hybrid approach that combines face-to-face instruction with online coursework. Technology's growth and rapid pace of new applications is providing online or virtual schools the ability to erase the difference between traditional approaches to teaching and teaching online (Rumble, 2001).

The Historical Evolution of Online Education

Online education is the most contemporary form of distance education. Ludlow (2005) defines distance education as education where the student and the teacher are separated by time and space when instruction occurs. The practice of distance education began to provide educational opportunities to diverse groups of individuals (Ludlow). Because educational access is increased to groups of people who historically have been excluded from educational institutions, Leinhardt (2006) maintains that distance

education is a form of “democratization” that augments not only educational experiences but results in social consequences as well. Education develops analytical and critical thinking with respect to knowledge and contributes to the development of free thinking which changes how people view their world (Leninhardt). Distance education provides possibilities of producing far reaching outcomes. Rumble (2001) chronicles four periods of distance education: (a) correspondence education, (b) broadcast education, (c) multimedia education, and (d) online education. The continued growth of distance education indicates social acceptance of the role and potential benefits that distance education has to offer.

The first period of distance education dates back to the introduction of correspondence education (Rumble, 2001). During the colonial era, distance education via correspondence provided education to clergy and professionals in rural areas (Ludlow, 2005). The earliest documentation of correspondence study was in 1728, when Caleb Phillipps posted an advertisement in the Boston Gazette advertising weekly shorthand lessons sent through the mail (Bower & Hardy, 2004). Another example of correspondence study was Anna Eliot Ticknor’s Society to Encourage Studies at Home created in 1873 (Leinhardt, 2006). Once women were accepted into her Society, they received correspondence study in six areas of content: French, German, English, history, and art. Learning was self motivated and individually paced. Over 7,000 women enrolled in coursework which offered opportunities otherwise unavailable to women (Leinhardt).

Printed educational materials sent via the postal system continued to evolve in an effort to reach students who could not afford to attend school or who, in many cases, lived too far away from an educational institution. In addition, correspondence education

allowed educational institutions to reach diverse groups of students. William Rainey Harper, the first president of the University of Chicago, is credited with founding correspondence programs at postsecondary institutions (Gaytan, 2007; Leinhardt, 2006). The Department of Home-Study allowed students to complete 30% of their coursework for a bachelor's degree through mail (Gaytan; Leinhardt). In addition, Harper, known as the father of the American junior college, designed correspondence courses in Hebrew while at the Baptist Union Theological Seminary bringing the practice of distance education to junior colleges (Bower & Hardy, 2004). Many universities, including the University of Wisconsin and the University of Kansas followed suit developing their own correspondence coursework. Distance education programs at the university level continued to grow and prosper offering unique learning opportunities and flexibility for all classes of students including students in international locations (Gaytan). Correspondence education became a social response to inequalities, serving the economic needs of the institution, and providing a method to promote democratization (Leinhardt). In addition to universities embracing distance education, correspondence schools developed in the late nineteenth century when Thomas J. Foster developed coursework to help coal miners learn engineering to advance their careers (Bower & Hardy). Despite the growth of correspondence education, face-to-face instruction had been considered superior to correspondence education resulting in little global influence on the development of improving the methodology of correspondence education (Ludow, 2005).

The second phase of distance education began with the invention of broadcasting technologies developed during the first part of the twentieth century. Broadcasting provided distance education with innovative alternate educational opportunities to distant

populations and remote classrooms (Rumble, 2001). Broadcasting by means of radio transmissions and television allowed educational institutions to expand throughout the world. The broadcast systems included telephones and two-way radios to enhance communication and provide feedback (Rumble, 2001). Two-way radiotelephones helped provide contact and feedback (Rumble). Over 200 American radio stations delivered radio transmissions and audio recordings in the 1920s (Bower & Hardy, 2004). This wave of distance education was short lived once television, the newest visual technology, entered the scene. With the introduction of television during the 1930s, educational institutions embraced the new technology as the future of education. Television as an instructional media advanced the growth of broadcast based educational programs. In the 1930s, the State University of Iowa began experimentally transmitting distance education courses via television (Jeffries, 2007). By the 1950s, television courses were offered regularly by Western Reserve University (Bower & Hardy).

The third phase of distance education occurred in the 1960s with the development of more advanced multi-media systems. Combinations of text, video technologies, and audio technologies were used with face-to-face teaching (Rumble, 2001). For 20 years, the most successful multi-media approach developed by the British Open University operated primarily using audiocassettes and videocassettes to deliver instruction to more than 25,000 students (Rumble). Bower and Hardy (2004) discussed satellite technology in the 1960s that permitted multimedia broadcasting to expand distance education worldwide. With the discovery of fiber optic technology in the 1980s, two-way live transmissions of distance coursework offered students an interactive educational experience (Bower & Hardy). The disadvantage to multimedia broadcasting was the

expense. Universities had to not only purchase the costly equipment but also create networks to provide students access to the new technology (Bower & Hardy). Oppenheim (1996) notes that instructional television began as one way recorded lectures sent to students' homes; after viewing, students communicated with a local instructor from a community college. In the 1970s to 1980s, instructors began televising their own instruction adding a two way audio component transmitted by microwave signals (Oppenheim). The two way audio communication provided an opportunity for students to actively participate and have direct contact with the instructor (Oppenheim) The signals, ITFS or Instructional Television Fixed Service, were transmitted by government television channels designated for instructional purposes (Oppenheim).

The fourth and current phase of distance education is online education. Since the 1980s, with the invention of personal computers and the Internet, distance education has been evolving and revolutionizing education while simultaneously expanding the reach of educational institutions. This technological combination allows for a less expensive model of distance education (Rumble, 2001). Ronsisvalle and Watkins (2005) maintain that the Internet is both an instructional and a social support tool that allows students to "learn, interact, and develop the necessary skills for employment and citizenship" (p. 119). Online learning has an advantage over former types of distance education due to the addition of online communication.

Distance education no longer has to be one-way communication. There are two types of communication via online instruction: synchronous and asynchronous. During synchronous communication, students and instructors are online at the same time using communication to enhance instruction (Bower & Hardy, 2004; Ludlow, 2005).

Synchronous technology such as chat rooms, instant messaging, video conferencing and online cameras allow for two way communication in real time which mirrors face-to-face instruction (Ludlow). During asynchronous communication, students and instructors are not online at the same time. Emailing and bulletin board postings provide asynchronous opportunities for two-way communication that also promote meaningful discussion between students and teachers related to course content. Although these forms of two-way communication provide improved communications, asynchronous technologies do not provide for immediate feedback. Rumble (2001) points out that distance education which began with correspondence studies through the postal system has returned to its beginnings with electronic mail. Initially, the academic community questioned correspondence education due to the lack of interaction between students and between students and instructors, but with the communication capabilities in online education, postsecondary institutions are embracing this new field of education (Gaytan, 2007).

Benefits of an Online Education

The Internet has brought unparalleled growth to the field of e-learning (Smith & Meyen, 2003). Many instructional management systems for the presentation of online instruction have been in use for only ten years (e.g., Blackboard, WebCT). As previously mentioned, new and improved technologies that offer communication systems such as chat rooms, instant messaging and bulletin boards are now being designed to benefit today's learners. These tools are used for collaborative learning endeavors and also help build a sense of community within online environments. The components of the Internet are extremely dynamic with Web sites and Web pages in a constant state of change

(Gardner & Wissick, 2005). Advantages of online learning are multi-faceted. Online learning offers beneficial individualized learning experiences for students (Smith & Meyen, 2003). Additionally, Smith & Meyen believe that learning on the computer will broaden the learning experiences and enhance the instruction for students with disabilities. Many accommodations for students with disabilities can be provided via the computer. The computer can be used to offer integrated lessons through online learning, web-based research, computer-assisted learning programs, and differentiated instruction.

One of the major advantages of online instruction is to be able to provide universal design to instructional coursework to meet the academic needs of all students. Universal Design for Learning (CAST, Inc., 2004; Smith & Meyen, 2003), is an educational framework, that provides choices to teachers and students through custom-designed content and curriculum. Design of the curriculum and assignments needs to be inclusive; by using universal design, curriculum adaptations are embedded within the instructional materials (Wehmeyer, Smith, & Davies, 2005). The goal of inclusive design of curriculum is to make the curriculum accessible to all students. Through online learning, instruction can be provided with equitable access.

In addition to universal design for learning, assistive technology via the computer helps to provide cost effective access for students with disabilities. Rose, Hasselbring, Stahl, and Zabala (2005) indicate that the future of inclusive education is through the pairing of assistive technology and universal design of learning. Assistive technology on the computer includes many tools which enhance instruction such as screen readers, word processors, spell checkers, and word recognition tools. Publishers are beginning to incorporate flexible digital versions of textbooks for student use. Textbooks and online

learning activities that are designed with universal design embedded within the text provide the information in a way that is interactive and motivating (Gardner & Wissick, 2005; Rose et al.).

Published information on the Internet doubles every 54 days (Pape, 2005). Pape states that the Internet allows students to build their literacy and inquiry skills. Many online schools use project-based learning which helps to facilitate research skills and the use of higher level thinking skills to synthesize information. Online learning expands the choice of curriculum materials to include computer-assisted learning programs, online libraries, web-based research and digital text. There is a wealth of information at the student's fingertips. Students with special needs can find information at their ability level, which also meets the requirements of federal and state law. Smith and Meyen (2003) point out that the abundant quantity of web sites on the Internet offers endless teaching and learning experiences. Web sites now contain multimedia applications such as graphics, hyperlinks, animations, digital pictures, and audio and video clips which are motivating and instructive for students with disabilities.

Another advantage offered by online instruction is the flexibility of controlling the learning environment. Online instruction is available to students throughout the day. Students can set up a schedule which benefits their personal preferences for time of instruction. Breaks from learning can be implemented on an as needed basis. Instruction online can be accessed from places other than school; students can access assignments from nontraditional geographic locations (Smith & Meyen, 2003). Most children today enter school proficient in some aspect of computer technology due to availability of computers in their homes or access to computers within early childhood environments.

Learning online will be viewed as another tool that expands learning opportunities and parallels learning from face-to-face instruction and printed materials (Smith & Meyen).

Challenges Facing Online Education

With the introduction of technology to the field of education, educational stakeholders have high expectations related to the benefits of technology for all students (Smith & Meyen, 2003). Many problems, however, plague the field of educational technology. Smith and Meyen discuss several reasons why educational institutions have lagged behind the development of technology. Until recently, many schools lacked funds to purchase adequate computers for student use. According to the Digest of Educational Statistics (2008), in 1997, approximately 70% of students in elementary and secondary schools used computers at school whereas by 2003 nearly 83% of elementary and secondary students used computers in school. In addition, students from lower income homes were less likely to use computers when compared to students from higher income homes (Digest of Educational Statistics). Before 2000, Internet access was limited in schools due to the cost of wiring schools for new technologies while today nearly 100% of public schools are wired for Internet access (Digest of Educational Statistics). Another area of concern according to Smith and Meyen is that even though public schools have significantly increased the numbers of computers, educational publishers have been slow in developing computer programs for school use that are easily implemented and cost effective. Moreover, in order to benefit from the growth in technology, professional development, for teachers in the area of technology as an instructional tool, needs to be fully implemented (Smith & Meyen).

Many forms of technology have been instrumental in the field of special education since the invention of Braille in the early 1800s. Blackhurst (2005) points out that since the 1980s with the invention of personal computers new technological applications have impacted the education of students with disabilities. Blackhurst maintains that computer-assisted programs with the advantages of multimedia instruction have been very effective for students with learning difficulties. He defines 'the technology of teaching' as instructional methodologies "that are systematically designed and applied in very precise ways" (p.8). Furthermore, Blackhurst maintains that the future of technology as an avenue for delivering effective instruction can not even be imagined at the present time. With the invention of the Internet, Ludlow (2005) maintains that web-based distance education will be embraced by educators as offering education to a wide audience throughout the world. The success of online K-12 instruction for students has yet to be validated through research (Ronsisvalle & Watkins, 2005). Most research of online instruction has been completed with university students; therefore, any generalizations to K-12 students are limited (Ronsisvalle & Watkins). Research needs to be completed with K-12 students before determination of successful learning can be confirmed. Ronsisvalle and Watkins maintain that students in an online environment need many psychological and learning characteristics to be successful. These characteristics include meta-cognition skills, strategy formation, self-monitoring and decision-making strategies. Students need to be able to have confidence in their abilities to learn and confidence in their abilities on the computer (Osborn, 2001). Another factor for success in online learning is motivation. Students need to have the desire to learn in an online environment as well as to self regulate their attending to the task of learning online. Specifically, they need to be able to

ignore preferred, but non-educational, activities that are available on the computer (Ronsisvalle & Watkins).

Rumble (2001) points out that most learners need guided instruction and two-way communication to learn new information through distance education. Publishers of online material need to realize the importance of developing engaging and interactive materials (Gardner & Wissick, 2005). Another goal of online instruction is to present direct instruction of specific skills that will be necessary in life (Gardner & Wissick). Online instruction has the potential to provide access to numerous materials and to provide two-way communication through chat rooms and instant messaging. Isolation in online environments can present difficulties for many learners. Ronsisvalle and Watkins (2005) advocate the development of online community through participation and interaction.

Some of the challenges facing online education can be lessened with a greater understanding of the advantages associated with using technology. The cost of implementing online education has not been completely determined (Rumble, 2001; Smith & Meyen, 2003). Once cost analyses are conducted, the potential benefits of providing equitable education to all students will likely outweigh the initial costs of technology setup and teacher training. Online instruction is in its infancy stage and its full potential is yet to be realized. In the future, the development of online technologies will exceed instructional strategies being used today, improve learning experiences for all students, and integrate learning between classroom and home environments (Smith & Meyen, 2003).

Critical Concerns Related to Student Academic Performance

Today, public schools are facing an increase in populations of students who are low achievers, students whose primary language is not English, and students with disabilities. In addition, the United States finds itself in the midst of a crisis related to high school completion. In the United States, high school graduation rates have not significantly improved in the past thirty years. In the 2005-2006 school year, the national average for students graduating high school with diplomas on time was 73.4 % (Digest of Educational Statistics, 2008). The lowest performing state with the nation's fifth largest school system, the Clark County School District in Las Vegas, Nevada, reported a graduation rate of only 50% in 2006-2007 school year (Hall, 2007). Hale (1998) states that graduation rates among certain student subgroups, minorities and students with disabilities, make up the largest percentage of students failing to graduate. The Digest of Educational Statistics (2008) reported the national dropout rates were higher among minorities in 2007. For example, the dropout rate for African American students was 8.4% and the Hispanic student dropout rate was 21.4%; whereas the dropout rate for Whites was only 5.3%. Public school personnel need to address overall graduation rates but also look at significant improvements in providing improved curriculum and resources to schools with high minority populations (Hall, 2007).

One of the primary reasons students fail to graduate is the low level of adolescent literacy. Traditionally, teaching the process of reading has been the responsibility of primary grade teachers. As students move through grade levels, the educational focus of instruction changes from learning to read to reading to learn new information. Students' reading abilities have not kept up with their advancement to higher-grade levels thereby

creating an ‘achievement gap’ between ability and expected instructional level (Deshler, Schumaker & Lenz, 1984; Hock & Deshler, 2003). According to the National Assessment of Education Progress (NAEP, 2006), 26% of students cannot read at a functional level (e.g., reading the newspaper and environmental texts). Students entering high school are expected to read textbooks. Unfortunately, these textbooks are written at many students’ frustrational reading levels. Additionally, over half of the students entering colleges today need to take remedial classes to be able to perform college academics successfully (Littlefield, 2006).

According to the United States Department of Education Office of Special Education and Rehabilitative Services (2002), 40% of students are placed in special education because they have not been taught to read and very few of those students ever close the achievement gap. Educating students with disabilities has been a concern of educators for the past four decades. The education of students with disabilities has encountered a variety of different service delivery models including institutional settings, special schools, self-contained classrooms, resource room settings and inclusion in the general education program. Two major pieces of legislation, the *Individuals with Disabilities Education Act* (2004) and *No Child Left Behind* (NCLB) (2001) mandate that students with disabilities be placed in the Least Restrictive Environment and have access to the general education curriculum. Teachers and parents of children with disabilities strive to find the best educational environment in which the child can achieve to their highest level academically and socially.

Components of Effective Reading Instruction

Reading is a complex process which includes the ability to read real words in isolation or in context with comprehension (Reid & Lienemann, 2006). In order to gain knowledge in primary, secondary, and postsecondary classes, reading is necessary. Students need to be able to comprehend text in many different content areas. Students need the ability to construct meaning from written language by manipulating, constructing, and translating text (King, 1994).

In 1997, the National Institute of Child Health and Human Development organized a panel of experts to assess research-based knowledge in the field of reading to determine effective methods for teaching children to read. After a thorough investigation of over 100,000 published studies, the National Reading Panel (NRP) (2000) identified five important areas related to reading instruction. Included among these were (a) alphabetics (i.e., phonemic awareness instruction and phonics instruction), (b) fluency, (c) comprehension (i.e., vocabulary instruction and text comprehension instruction), (d) teacher education and reading instruction, and (e) computer technology and reading instruction (International Reading Association, 2002; NRP, 2000).

Alphabetics

Alphabetics plays an important role in learning to read. Alphabetics involves the process of using letters in a written alphabet to represent spoken words (Kruidenier, 2002). Alphabetics is a term used to include both phonemic awareness and word analysis using phonics (NRP, 2000). Instruction in both of these areas is critical when learning to read.

Many students with reading problems have deficits in the areas of phonemic awareness (Bender, 2002; Cunningham & Allington, 2003; Reid & Lienemann, 2006; Swanson & Alexander, 1997) and word analysis (i.e., decoding words) using phonics. Decoding multi-syllabic words is particularly challenging. When students have difficulty decoding multi-syllabic words, their reading fluency and comprehension are affected (Pemberton, 2003). In order to have the skills needed to be an effective reader, literacy instruction needs to include an emphasis on the development of phonemic awareness and word analysis skills. Some experts refer to this as phonological processing (i.e., the ability to decode sound-symbol connections) (Bender, 2002; NRP, 2000).

Specifically, students with reading difficulties need explicit and systematic instruction in blending and segmenting the individual phonemes (i.e. smallest sound units heard in spoken words) (NRP, 2000). They also need explicit and systematic instruction in learning how to break apart multi-syllabic words (NRP). Breaking apart words into syllables helps students learn to read longer words because syllables are easier to read than long words and syllabication permits for phonetic decoding of each syllable (Bender, 2002). Traditionally, syllabication is taught through the memorization of rules for syllabication and using structural analysis. Structural analysis includes identifying word parts including prefixes, suffixes, and root words (Bender, 2002; Choate & Rakes, 2004a; Cunningham & Allington, 2003). If students do not learn an effective decoding strategy, they frequently use an inefficient method or randomly guess unknown words. This interferes with the development of grade-level vocabulary and comprehension (Pemberton, 2003).

Fluency

Fluency is the ability to read text orally with speed, correct expression, and accuracy (NRP, 2000). Often neglected in today's classrooms, research shows that fluency is a critical component to developing comprehension. When students struggle with word recall and read text slowly and with difficulty, they cannot remember what they have read (NRP). In addition, when students read with poor fluency, they cannot relate what they have read to their own experiences and knowledge which is another critical component of developing good comprehension (NRP).

The NRP (2000) reports two effective methods for improving fluency through reading practice. Guided oral reading is one method to improve fluency. A meta-analysis of research in both general education and special education classrooms revealed that guided oral repeated reading practice results in significant improvement in word recall, fluency, and comprehension (NRP). Oral repeated reading is the practice of reading a wide variety of text including poetry several times orally with the instructor. By chorally reading with the instructor, students improve their word recognition of unknown words, their speed in reading, and their expression of reading which leads to an overall improvement in comprehension (Cunningham & Allington, 2003; Bender, 2002; NRP).

Independent silent reading is the second method which improves fluency (NRP, 2000). The NRP reports that hundreds of correlational studies have shown that better readers read more. Implied in this body of literature is that (a) reading achievement improves when students participate in ongoing independent silent reading; and (b) increased silent reading leads to improved vocabulary, fluency, and comprehension. The NRP maintains, however, that there is not enough evidence to indicate that increased

silent reading improves fluency, vocabulary development, or comprehension. From their research, the NRP did conclude that independent silent reading should not be used as the only type of reading instruction.

Reading Comprehension

The NRP (2000) states that reading comprehension is a necessary skill for all academic and 'life-long' learning. Cunningham and Allington (2003) maintain that reading comprehension is the ability to think about what one is reading. The NRP defines reading comprehension as a complex cognitive process which includes fluency, vocabulary development and understanding what words and connected text mean. Reading comprehension is an active process which demands interaction between the reader and print. Per the NRP's comprehensive review of reading literature, the most effective teaching methods for teaching comprehension were a combination of skills including summarizing, self questioning, visual imagery, and structured learning strategies (Choate & Rakes, 2004a; NRP).

Readers need to actively participate with text in order to gain comprehension skills. Readers also need to relate ideas in text to their own knowledge and experiences to improve their comprehension (Keene & Zimmerman, 1997; NRP, 2000). Good readers expect text to make sense (Fountas & Pinnell, 1996). Explicit teaching of specific cognitive strategies helps readers develop better understanding of text (Keene & Zimmerman). The first step in developing comprehension is teaching children how to think while they are reading. The teacher needs to use 'think-alouds' so children can understand what good readers think and do while reading (Cunningham & Allington, 2003; Reid & Lienemann, 2006). A 'think aloud' involves the teacher modeling the

thinking and accompanying behaviors that are needed for effective and efficient reading. For example, when teaching a specific comprehension strategy, the instructor begins with a ‘think-aloud’ and then provides guided and controlled practice opportunities. Thus, the teacher scaffolds the reading skills to promote student success. The NRP recommends that students learn the following comprehension skills: comprehension monitoring, creating mental images, graphic and semantic organizers (including story maps), question answering and question generation, teaching story structure, and reading summarization.

Teacher Education and Reading Instruction

The NRP (2000) reports that in the area of teacher education preservice and inservice programs need to focus on improving the required coursework and methodology in reading instruction. Preservice teachers receive most of their knowledge in coursework learning about theory and methods. Knowledge is then practiced while experiencing supervised teaching. Teachers who are already out in the field (referred to as inservice teachers) receive their instruction through professional development. The NRP maintains that both student and teacher outcomes have to be assessed in order to draw any conclusions about effective professional development. Studies published about preservice teachers typically focused on positive teacher outcomes; whereas, the NRP found professional development resulted in higher student outcomes as well. Even though there have only been a few research studies completed in the area of professional development related to improving reading instruction, the results indicated positive effects on teaching (NRP).

Computer Technology and Reading Instruction

The NRP (2000) found only 21 studies relating computer technology to effective reading instruction. The studies did reflect positive results with regard to the use of technology and the Internet as a teaching device. In addition, seven studies indicated positive results in improving reading fluency and comprehension when using screen readers to provide speech to computer text (NRP). Further research needs to be completed to examine the use of the computer to deliver instruction in reading.

Studies have demonstrated computer assisted learning has a positive effect in the areas of fluency, vocabulary development and reading comprehension (George, Schaff, & Jeffs, 2005; Lewis, 2005; NRP, 2000; Rose, Hasselbring, Stahl , & Zabala, 2005; Strangman & Dalton, 2005). Strangman and Dalton conducted a literature review on using technology to improve reading difficulties. The authors found available computer technologies to remediate or prevent reading difficulties for most areas of reading. Technology provides teachers with supplementary teaching methods, accommodations to support students' profiles and an overabundance of materials to support classroom learning (Strangman & Dalton).

Digital text and universal design techniques enhance the power of corrective strategies and facilitate inclusion (Choate and Rakes, 2004b; Rose, Hasselbring, Stahl , & Zabala, 2005; Strangman & Dalton, 2005). Technology and computer programs can be used to teach a variety of skills with the provision of immediate corrective feedback which is beneficial to students. Research indicates that technology has the potential to improve student achievement, on task behavior, and motivation for learning (Lewis, 2005).

Improving Reading Achievement through Strategy Instruction

Strategy instruction involves teaching students *how* to learn and perform with the goal of helping them become effective, efficient, and ultimately independent learners. Specifically, students are taught individual strategies that include a variety of steps designed to: (a) help approach new and difficult tasks, (b) guide thoughts and actions as difficult skills are performed, (c) assist with completing tasks in a timely and successful manner, and (d) facilitate strategic thinking (Berry, Hall, & Gildroy, 2004).

Much of the early research on strategy instruction was completed at the University of Kansas Institute for Learning Disabilities under the leadership of Dr. Donald Deshler (Bender, 2002). Research conducted at this institute, now named the University of Kansas Center for Research on Learning, began in the late 1970s and has continued through the 2000s. Findings related to the effectiveness of individual strategies included in this curriculum (Bulgren, Hock, Schumaker, & Deshler, 1995; Hughes, Ruhl, Schumaker, & Deshler, 2002) as well as findings from reviews of literature indicate that strategy instruction is highly effective for improving the reading skills of school-aged students including students with learning disabilities (Deshler & Hock, 2007; Fisher, Schumaker, & Deshler, 1995; Fisher, Schumaker, & Deshler, 1996).

Because of the tremendous importance of learning to read, researchers at the University of Kansas have devoted much time and effort to the development of effective reading strategies for teachers to include in their strategy instruction programs. One strategy that has been validated for delivery via face-to-face instruction is *The Word Identification Strategy* (Lenz, Schumaker, Deshler & Beals, 2007). This reading strategy helps students improve their decoding skills and subsequently their comprehension skills.

The Word Identification Strategy (Lenz, et al.). is also used to teach students how to generalize the skills to settings outside of the class in which they are taught.

The Word Identification Strategy (Lenz et al., 2007) is designed to increase students' ability to break apart multi-syllabic words, improve reading fluency, improve reading comprehension and increase a student's ability to perform independently with success. Research related to the effectiveness of *The Word Identification Strategy* (Lenz et al.) indicated that students not only made fewer errors in their oral reading but their reading comprehension also improved after learning the strategy (Lenz et al.). Initial field tests of *The Word Identification Strategy* revealed that before learning the strategy students made 20 errors in oral reading of a 400-word passage and answered 40% of comprehension questions correctly. After learning *The Word Identification Strategy* (Lenz et al.), students made only 3 errors on a similar reading passage and correctly answered 70% of comprehension questions (Lenz et al.).

General consensus exists related to the benefits of strategy instruction for improving reading achievement as well as increasing independence in learning and performance among students with learning disabilities (Bender, 2002; Choate & Rakes, 2004b). Researchers recommend that explicit instruction be used to teach specific cognitive strategies designed to improve comprehension (NRP, 2000; Reid & Lienemann, 2006). Cognitive strategies or learning to think strategically helps remove barriers students encounter when they are reading (NRP, 2000). Bender asserts that every teacher in every grade has the instructional responsibility to teach learning strategies to ensure that students experience success in school. He defines a learning strategy as a series of

metacognitive planning and monitoring steps that involve the use of mnemonic devices to assist students in understanding and completing an academic task.

Statement of Problem

The *No Child Left Behind Act* of 2001 and The *Individuals with Disabilities Education Improvement Act* of 2004 established high standards for the public educational system. The expectations have been raised for students with and without disabilities in terms of proficiency levels and mandated testing. Most states require students to pass proficiency tests to earn a high school diploma. In order to achieve these goals, students with disabilities must have access to and show progress in the general education curriculum if they are to have a chance at succeeding on these high stake tests (Gable & Hendrickson, 2004; Haager & Klingner, 2005; Young, 2003). To provide access to the general education curriculum, inclusion in general education classes for students with disabilities has become the accepted practice. Some students with disabilities experience difficulties with the general education curriculum because their reading ability falls significantly below the school curriculum and textbook instructional levels (Deshler & Schumaker, 1993).

Successful education is based on the ability to read efficiently and effectively. Without this ability, students cannot succeed in school. Today, there is an increase in the population of students who are low achievers and students with disabilities. The need to improve the reading levels of students and close the achievement gap needs to be a primary focus of educators. In order for students to be effective and efficient readers at grade level, explicit instruction in word analysis, fluency and reading comprehension in narrative and expository texts needs to be a part of the schools' curriculum at every grade

level (NRP, 2000). NCLB (2001) mandates that research-based methods be used in the public education system to improve reading.

For the past thirty years, researchers at the University of Kansas' Center for Research on Learning have been developing and researching the Strategic Instruction Model (SIM). SIM has been successfully implemented in special education and general education classrooms (Deshler & Schumaker, 1993). Deshler and Schumaker researched the effectiveness of including strategy instruction in the general education setting. Their research indicated that students' reading achievement increased through strategy instruction taught by general education teachers.

The difficulty of teaching strategy instruction in the general education classroom lies in the environmental structure of traditional classrooms. Most middle and high schools operate on a 50 minute class schedule. A general education teacher is responsible for teaching the course curriculum but also needs to provide explicit and intensive instruction in learning strategies. Most general education teachers have a difficult time covering the course curriculum in a year. Therefore, strategy instruction is sometimes viewed as taking away valuable instructional time from content coursework. However, many students in middle and high school do not have the reading skills to achieve in the coursework without the benefit of learning strategies. Therefore, although strategy instruction is effective for increasing achievement levels, implementation in general education classes, with consistency, continues to be a challenge (Deshler & Schumaker, 1993).

The efficiency of technology provides a possible solution for delivering strategy instruction to students at risk. *The Word Identification Strategy* (Lenz et al., 2007) has been validated in traditional settings through face-to-face instruction but this strategy has

not been implemented in an online environment. Online education is expanding and has emerged as an alternative option for traditional face-to-face instruction. Little research has been completed to demonstrate the effectiveness of online instruction or the effectiveness of teaching specific reading skills through online instruction. By implementing research validated programs such as *The Word Identification Strategy* (Lenz et al.) online, students have an opportunity to learn the necessary skills to become effective and efficient readers. Once students' reading levels increase, they may be able to successfully read grade level materials and increase their chance of graduating from high school.

The purpose of this study was to investigate the effects of teaching *The Word Identification Strategy* (Lenz et al., 2007) through online modules to students with specific learning disabilities. The following research questions were identified to address this purpose:

1. Does online instruction related to the *Word Identification Strategy* (Lenz, et al., 2007) improve the decoding skills of students with learning disabilities?
2. Does online instruction related to the *Word Identification Strategy* (Lenz, et al.) improve the comprehension skills of students with learning disabilities?
3. Do students with learning disabilities maintain *Word Identification Strategy* (Lenz, et al.) skills 2 weeks after instruction has ended?
4. How satisfied are students with learning disabilities with online instruction of the *Word Identification Strategy* (Lenz, et al.)?

Significance of Study

This research contributes to the field of online instruction in several ways. Online learning is having a profound impact on education (Allen et al., 2004). Increased knowledge about instructional practices with the emergence of new technologies has the potential to improve the quality and effectiveness of distance education. Although educators note that online learning has an advantage over former types of distance education due to the addition of online communication, specific information related to the effectiveness of online instruction for school-aged students is quite limited (Rumble, 2001). Thus, this study contributes new knowledge related to teaching school-aged students who struggle with learning within an online environment.

Researchers suggest that many students, who have difficulty reading text at grade level, benefit from online instruction (George, Schaff, & Jeffs, 2005; Lewis, 2005; Rose, Hasselbring, Stahl , & Zabala, 2005; Strangman & Dalton, 2005). Blackhurst (2005) wisely maintains that technology does not take the place of effective instruction. Thus, research efforts need to focus on the integration of evidence-based reading practices within online environments. Because online schools are new phenomena, there has not been enough time to complete comprehensive evaluations on the success of online schools in the K-12 sector. Most of the research completed has been on student success in university online courses. Any generalizations to K-12 students and students with special needs will have to be validated through research (Allen et al., 2004; Pape, 2005; Ronsisvalle & Watkins 2005). This study contributes new knowledge related to the integration of an evidenced-based reading strategy within an online environment

composed of school-aged students and the results indicate increased reading performance of struggling learners.

This research demonstrated that students with learning disabilities were successful at learning a complex reading strategy online and that these students improved their reading instructional levels, thus another avenue for supplemental reading instruction emerged. Based on the large number of students who struggle with reading and ultimately choose to drop out of school, finding new ways to help students succeed in this content area is critically important. Finally, this study provides new information related to student satisfaction related to learning an evidenced-based reading strategy within an online environment. This information will help refine future deliveries of the instruction.

Limitations of the Study

This study had several limitations. First, the participants in the study were selected from students attending an online charter school in the Southwestern United States. Attendance at a charter school is based on family choice. Therefore, the selection of participants was not based on any randomized criteria and the results may not be generalized to other school populations. Second, the participants in this study were students with specific learning disabilities in grades five to eight. The findings cannot be generalized to dissimilar student populations in elementary or middle school grades. Finally, this study addressed the reading achievement of the students in the research project. The findings should not be generalized to other academic areas.

Definition of Terms

The following terms and definitions were used in this study.

Advanced practice stage of instruction. The stage of instruction in which the student demonstrates the steps of the strategy using grade level materials (Lenz et al., 2007).

Alphabetics. Alphabetics includes instruction in both phonemic awareness and phonics (NRP, 2000).

Assistive technology. The term assistive technology is defined as any product system or equipment that is used to increase, maintain, or improve the functional capabilities of an individual with a disability (Blackhurst, 2005).

Assignment sheet. The assignment sheet is used to help the student keep track of the stories assigned during Baseline, Controlled, and Advanced practice.

Charter school. An alternative school setting that is still under public control but liberated from the regulations that manage public schools (National Alliance for Public Charter Schools, 2005).

Cloze format. A structured fill-in-the-blank reading activity used to improve reading comprehension and vocabulary development through the use of context clues. (Bender, 2002).

Computer platform. The platform is the framework either in hardware or software which includes the computer's architecture, operating system, program languages and libraries (Wikipedia, 2007).

Controlled practice stage of instruction. The stage of instruction in which the student demonstrates the steps of the strategy using instructional level materials (Lenz et al., 2007).

Cue Cards. Cards that highlight the essential information required to perform the steps of *The Word Identification Strategy* (Lenz et al., 2007).

Describe stage of instruction. The stage of instruction in which the teacher describes each step of the strategy to the student explaining the process and the benefits of the strategy (Lenz et al., 2007).

Differentiated instruction. Differentiated instruction involves changing the way instruction is presented to a student by changing the content of what is to be learned, the process of how to teach the content, or by changing the product used to evaluate student performance (Tomlinson, 2001).

Distance education. Education occurs with a physical separation between the student and the teacher (Rumble, 2001).

Grade level probes. Probes that involve reading passages at the grade level in which the student is enrolled.

Instructional probes. Probes that involve reading passages at the student's ability level.

Internet. The 'backbone' or 'physical structure of communication and connectivity' that exists which allows a computer to connect to the World Wide Web (Gardner & Wissick, 2005, p.684).

Learning strategies. "Learning strategies are techniques, principles, or rules which enable a student to learn to solve problems and complete tasks independently" (Schumaker et al., 1984, p.1).

Model stage of instruction. The stage of instruction in which the teacher demonstrates the steps of the strategy mnemonic device by thinking aloud. Thus, the student can

observe both the cognitive process and overt behaviors used during strategy implementation (Lenz et al., 2007).

Multimedia. Computer applications that use "multiple formats to present information including text, graphics, and video and/or audio information, and thus link multimedia and computer-mediated instruction with efforts to incorporate Universal Design principles into instructional materials" (Wehmeyer, Smith, & Davies, 2005, p. 318).

Online education (aka "virtual schools"). Educational establishments that offer courses through the Internet, World Wide Web, or Web-based methods. Virtual K-12 schools join "proven distance learning delivery models" (Clark, 2001, p. i).

Online instruction. Instruction is received by the student through the Internet, World Wide Web, or by Web-based methods.

Online instruction using multimedia (video streaming). Instruction received by the student through the Internet in the form of an uploaded video demonstrating direct instruction.

Online instruction using Power Point media. Instruction received by the student through the Internet in the form of an uploaded Power Point presentation containing direct instruction.

Online student. An online student is a student who receives their educational instruction via the Internet.

Phonemic awareness. Phonemic awareness is instruction in the teaching of phonemes (sounds in the spoken word) and how to manipulate phonemes without any letters (NRP, 2000).

PowerPoint media. Microsoft Office PowerPoint is presentation software including text and graphics for producing quality presentations in a slide presentation format. PowerPoint can be hyperlinked to the Internet and pictures, movies, and sounds can be imported into the slides.

Reading comprehension. Reading comprehension is the ability to think about what is being read to derive meaning from the words (Cunningham & Allington, 2003).

Reading decoding. The ability to figure out the pronunciation of a word through the use of phonics (Cunningham & Allington, 2003).

Reading fluency. Fluency is the ability to orally read passages with proper expression, speed, and accuracy (NRP, 2000).

Rules of Twos and Threes. Rules to break apart the stem and to figure out vowel sound patterns when dissecting a multisyllabic word.

Streaming video. A recorded sequence of moving images which can include combinations of sound, text, and demonstrations during direct instruction. The video is then uploaded to a platform and viewed via the Internet through online instruction.

Student's affirmation. A positive statement written by the student reflecting his or her commitment to learning the strategy.

Student Progress Chart. The curriculum-based measurement graph for the student to keep track of progress during instruction condition.

Students with disabilities. Students who qualify with a specific disability as defined by the Individuals with Disabilities Education Improvement Act of 2004 receive specialized instruction, modifications and accommodations in an educational setting.

Students with specific learning disabilities. Students who qualify for special education services due to a specific learning disability which is defined by the Individuals with Disabilities Education Improvement Act of 2004 as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations" (IDEA, 2004).

Phonics instruction. Phonics instruction is the ability to use letter-sound correlations in order to read and spell words (NRP, 2000).

The Word Identification Strategy. A learning strategy that helps students break apart unknown multisyllabic words and use the word in their reading (Lenz et al., 2007).

Upload. Upload is the process of transferring and attaching a Power Point presentation or a file from a computer to a platform for student viewing on the Internet.

Verbal practice checklist. A checklist listing the steps of the mnemonic device DISSECT for the student and adult facilitator to keep a record of student attempts of naming the steps of the strategy.

Verbal practice stage of instruction. The stage of instruction in which the students verbally explain and memorize each step of the mnemonic device used in the strategy with 100% mastery.

World Wide Web ("Web" or "WWW"). The 'information and data' located on the infinite number of Web sites and Web pages (Gardner & Wissick, 2005). The Web sites and Web pages are connected via the Internet.

Summary

Students with disabilities are at a higher risk for dropping out from high school due to academic and emotional problems. According to the National Center for Learning Disabilities (2006), 36% of students with learning disabilities drop out of high school. Since the enactment of the *No Child Left Behind Act* (2001), the graduation rate for students in special education has declined another 9.3% and only 40% of students with an IEP graduate with a diploma or certificate of attendance (Alpert, 2004).

Hale (1998) reports the single strongest predictor of dropping out of school is poor academic performance, low-test scores and retention. Student frustration and low motivation increases chronic truancy. Hale suggested alternative school settings that are still under public control but free from the constraints under which public schools have to operate as a solution for students who have considered dropping out. Charter schools and online schools offer alternative school environments for students at risk.

Reading is one of the most important skills a student can learn in school. Once students have improved reading ability and experience school success, motivation to keep succeeding improves. In addition, increased school achievement produces a significant increase of students passing high stakes exams and ultimately graduating from high school. Not only does reading positively affect a students' success in school but also results in improved opportunities for employment, personal enrichment, and promotes active citizenship (Strangman & Dalton, 2005).

Students who do not master grade level skills (a) cannot pass high school proficiency exams, (b) become frustrated and drop out of school, (c) cannot continue in post secondary educational opportunities, and (d) will have a lower standard of economic

opportunities. Completing high school is a milestone that is associated with higher income, more stable employment, and less dependency on public assistance. In fact, those students who fail to graduate high school experience detrimental social outcomes such as: (a) unemployment or underemployment (working class poor), (b) incarceration, (c) annual income below $22,500, and (d) dependence on government assistance (Hale, 1998).

Through increased high school graduation rates, the economic future will progress for more students and less dependency on government assistance will result. Students with high school diplomas are more employable and have a higher earning rate (Hale, 1998). The need for remedial classes at colleges will be reduced and more students will be able to continue with their education at a post secondary level. Overall, improving students' reading ability has a long term and profound effect on society.

CHAPTER 2

REVIEW OF LITERATURE

This chapter has two purposes. The first purpose is to summarize and analyze existing peer reviewed literature related to online education. The chapter begins with a brief overview of online education. Next, the search procedures and selection criteria that were used for the review of literature related to online education are described. The online education review includes the following two areas: (a) studies related to student achievement in postsecondary online education and (b) studies related to student achievement in K-12 online education. The second purpose of this chapter is to summarize and analyze existing peer reviewed literature related to reading strategy instruction. This section of the chapter begins with the search procedures and selection criteria that were used to include literature on reading strategy instruction. The reading strategy instruction review includes the following two areas: (a) studies related to decoding strategies and (b) studies related to reading comprehension strategies. Finally, a summary and synthesis of the research related to online education and reading strategy instruction is provided. These literature bases provide the necessary knowledge to understand online strategy instruction related to the improvement of student achievement in the areas of decoding and reading comprehension for students with learning disabilities. The literature review includes both the strengths and limitations of current research related to this dissertation study.

Overview of Online Education Literature

Online learning, online programs, virtual learning, virtual schools, cyber schools, and e-learning are commonly used terms when referring to distance education via the Internet. Online education that began in postsecondary institutions is now offered nationwide at the K-12 level at both public and charter schools. Regardless of geographic locations or socio-economic barriers, the State Educational Technology Directors Association (SETDA) (2008) maintains that all students have the right to high quality education. Virtual learning can provide equal access opportunities to students. Currently, K-12 online programs are offered in 44 states (SETDA; Watson and Ryan, 2007); states are offering both full time and supplemental programs. In Alabama and Michigan online coursework for graduation from high school is mandated and in Florida it is mandated that all school districts offer fulltime online schools (SETDA).

Virtual schools integrate both online and distance education features into comprehensive programs that provide full time and supplementary instruction to students (Rhim & Kowal, 2007; Watson & Ryan, 2007). Virtual charter schools are the largest subset of virtual schools (Rhims & Kowal). Charter schools are a subsector of public schooling. Charter schools are autonomous from public schools and are formed under the state's charter school laws, overseen by a local or state agency, and receive funding based on state formulas. Although charter schools have the freedom to format their own regulations and rules, charter schools still have to meet the same state and federal accountability standards and outcomes as other public schools. Vanourek (2006) reported that in 2006 virtual charter schools made up about 4% of all public schools but made up

20% of all online schools; virtual charter schools enrolled 6% of the charter schools' students and comprised only about 4% of all charter schools.

Virtual schools, whether charter or public, are considered a school choice option under *No Child Left Behind* (2001) as long as the school law defines the virtual school as a public elementary or secondary school. Virtual schools are unfamiliar educational institutions to many educators and parents. Virtual schools have the potential to create and deliver education of the future by offering new forms of delivery (Rhims & Kowal, 2007; Watson & Ryan, 2007). Virtual schools appeal to a diversity of students, offer individualization of instruction, and depend on parent involvement.

Literature Review Procedures Related to Online Education

Research included in this literature review was located through a comprehensive search of studies from the following Web-based databases: Academic Search Premier, Professional Development Collection, Education Full Text, Education: A Sage Collection, and EdITLib Digital Library for Information Technology and Education and Digital Dissertations. The following descriptors were used: Web based instruction, online learning, online instruction, online learning and learner characteristics, distance education, virtual learning, virtual schools, and e-learning. In addition, an ancestral search through the reference lists of obtained articles was completed.

Selection Criteria Used for Studies Related to Online Education

Studies were included in this review of literature if: (a) the researchers examined distance education in the form of online education; (b) the participants were students or

teachers in online environments or (c) the purpose of the study was to investigate the effectiveness of online education related to online learners' characteristics, online instruction, and subsequent achievement. Meta-analyses related to online education also were included. Studies were excluded from this review if: (a) the participants were not related to the field of education or (b) data and/or results of the research did not provide information related to online education.

Review and Analysis of Studies Related Online Education

Postsecondary Studies

Schutte (1998) studied student achievement in an online social statistics course. Thirty-three post-secondary students were assigned to an experimental group or a control group. Traditional instruction was provided to half of the students; the other 17 students received online instruction. All students had weekly homework, weekly responses to discussion topics, weekly statistic reports, and weekly participation in peer chats. The students in the traditional class met on campus and assignments were due on a weekly basis.

Data were collected from two exams to assess student achievement and two surveys. Students completed the first survey at the beginning of the course; the survey was used to examine student understanding of computers, statistics, and math. At the end of the course, students completed another survey intended to assess time spent on class assignments, peer interaction, understanding of the class materials, perceived degree of class flexibility, and satisfaction towards the class, computers, statistics, and math. Data were analyzed by comparing the two survey responses and comparing the student's

scores on the exams in the online course to the traditional class. The mean for each condition was calculated.

Results from the two exams showed that scores for the online students were significantly higher when compared to the scores for the students in the traditional class. The online students scored an average of 20 points higher on both exams than the students in the traditional class. The data from the final survey demonstrated slight differences between the two groups. The online students spent more time on class assignments and communicated more with peers than the students in the traditional class.

Schutte (1998) concluded that the key to increase achievement in online coursework is to increase student collaboration and communication. In addition, Schutte states that further research needs to be completed to investigate online instructional techniques that affect student achievement in online courses.

The primary strength of this study was the new knowledge generated (i.e., that students in an online environment can achieve as well as or higher than students in a similar traditional course). Moreover, the study finding related to the need for collaboration and communication in online courses provided guidance for subsequent study in this area.

There were several limitations of the study. The sample population was not very large; the study involved only 34 students. Also, the study did not use any standardized assessments to measure pre and posttest achievement.

Lim and Kim (2003) conducted research in online environments related to learner characteristics at the postsecondary level. According to Lim and Kim, most online instructors focus on the content of the subject without consideration of the learner's

experience. These researchers hypothesized that various motivational factors as well as gender may play an important role in successful course completion for online learners.

Lim and Kim (2003) developed a questionnaire to investigate 77 undergraduate students' level of motivation and perceived learning in online coursework. The researchers found that motivational variables significantly influenced the student's learning in online coursework. Five types of motivational variables were included in the questionnaire: (a) course relevancy, (b) course interest, (c) affect/emotion, (d) reinforcement, and (e) self-efficacy. The most important factor identified was course relevancy. Analysis of the questionnaire showed that all the motivational areas except course interest had a significant effect on student learning.

The study also showed that gender affected online learning. Male and female students used different learning strategies throughout the online class. Female students contributed their learning success to external sources such as course design whereas male students contributed their success to internal motivation due to personal interest.

The practical implications obtained from the results of the study represent a primary strength of this research. Valuable information related to online course design that accommodates motivation variables and learner characteristics is provided. Lim and Kim (2003) recommend designing online instruction that provides many opportunities to practice new learning. They also suggest that online instructors design coursework customized to incorporate students' experiential backgrounds and that online learners should be engaged in authentic, problem solving situations. Lim and Kim note the importance of frequent and immediate feedback in terms of learner motivation. It is therefore suggested that online instructors frequently check student's progress and e-mail

their students with feedback and encouragement to keep students emotionally connected with the learning process and with the instructor.

There were several limitations of the study. The sample population was not large; the study involved only 77 students. Also, the study did not use any standardized assessments to measure pre and posttest achievement in the course with relation to the items on the survey.

Young (2006) investigated students' perceptions of the effectiveness of online instruction in postsecondary settings. Specifically, students' views of the effectiveness of their online teachers and the online instruction were assessed.

The study was conducted at a western United States university in 2004. Six colleges at the university enrolled 1,470 undergraduate and graduate students in online coursework. Thirty percent of the students (441 students) were randomly asked to participate in the study via email. The final analysis was based on 199 responses.

The online instrument, with 25 questions, was developed and implemented with students who had completed online coursework during the summer session. Seventeen items covered characteristics of effective teaching including items on instructor, student, and course characteristics. Eight items covered characteristics associated with teaching in online environments. The responses were measured using a Likert scale.

Data were analyzed using regression analysis. Intent of the analysis was to identify items that strongly correlate to effective online instruction. The analysis revealed that students indicated seven items contributed to the definition of effective online teaching. The seven items were: (a) presenting meaningful models, (b) adjusting to students' needs, (c) motivating students, (d) effective facilitation of the course, (e) communicating

effectively, (f) delivering a helpful course, and (g) demonstrating concern for student learning.

Young (2006) concluded that these items improved connections and communication between the instructors, the students, and the course content. The most important factor in online learning was effective communication. Young noted that online instructors need to model appropriate online communication skills for students to follow. Also noted, was that online learning should not be implemented in isolation and that instructors need to develop a community of learners for maximum learning to take place. In addition, study participants revealed a need for flexible instructors who provide meaningful examples so that connections with the course concepts can be made.

The strength of this study was the identification of factors that contribute to effective online instruction at a postsecondary level. The results revealed that communication between the instructor and students is the most important area of effective instruction. In view of the fact that distance education continues to grow both at the postsecondary and K-12 levels, instructors need to be consistently aware of how to engage students and maintain necessary components of effective instruction.

There were several limitations in the study. The study revealed only students' viewpoints and did not compare any items to student achievement. This study investigated postsecondary instruction only. Therefore, generalization to effective instruction at K-12 level is limited.

Pomales-Garcia and Liu (2006) investigated the impact of Web module length and instructional format on student recall, persistence, module appeal, and perceived difficulty and length. The researchers used an experimental design with a control group.

Segments of lectures were converted to instructional Web modules. The modules were designed in varying lengths of 7 to 20 minutes. Evaluation of student recall of the information was completed. Also, an assessment was completed to determine the perceived difficulty of the module content and length, the visual appearance of the lessons, and student persistence in learning the content.

The study took place in a computer laboratory on the University of Michigan campus at the Industrial and Operations Engineering Human Factors Laboratory using Dell computers with XP platforms. The experimenter station used Windows 2000 platform. The stations were equipped with a keyboard, a mouse, and adjustable speakers.

The participants were 18 undergraduate students attending the University of Michigan. The students were enrolled in engineering coursework. The study was voluntary; participants received $30 for every three hours of their time. Participants were administered The Index of Learning Styles Questionnaire (Felder & Soloman, 1991) to determine student learning style.

The experimental materials consisted of 12 Web-based modules of varying lengths. The lessons were selected lectures from the School of Public Health for the Environmental Impact Assessment course. The lessons were recorded in three formats: (a) video, (b) audio only, or (c) text only. The participants accessed the Web-based modules via the Internet. The modules used a multimedia format presenting pictures and words simultaneously. Background music was not included. Words were presented in audio or text. Narration of the text was not included.

Results of a participant questionnaire revealed that students were able to understand and retain information by collaboration (discussing or sharing the information with

others) and by quietly thinking about the information. The participants demonstrated sequential linear learning through visual methods such as graphic organizers and pictures.

During the experimental procedure, the participant followed a sequence of instructions. First, the participant was requested to evaluate the appearance of the screen without knowledge of the module content. Second, the participant examined the textbook page from which the module was designed. The participant rated the module in comparison to the textbook on visual attractiveness and excitement on a scale from one to ten. The appearance ratings were done pre and post study. Third, the participant viewed the module and answered recall questions by summarizing the information within 2 minutes. Also, the participant rated the content for difficulty level. Finally, the participants once again rated the module on appearance. For a total of nine trials, the participants repeated the procedures for nine of the twelve modules. Although the participants were not informed, the first three modules were regarded as practice modules. The participant assignments and presentation order was determined by a 6 X 6 Latin-Square Matrix.

Data analysis was performed using several methods. An analysis of variance was performed to determine the effect of length on content and visual appearance. To measure the differences between pre and post ratings of visual appearance, a paired comparison t-test was used.

Data analysis revealed a significant difference between pre and post study for excitement ratings and module lengths. The results demonstrated that the video modules and the 7- and 14-minute modules were seen as less difficult than the modules containing only text or audio lasting for 20 minutes. Modules that were perceived as more difficult

were also perceived as less exciting and less visually appealing. In addition, the data revealed that participants viewed the module as exciting or visually appealing based on the content. No significant difference was found for module length. Participants viewed module length based only on perceived length. The type of module (video, audio, or text) had no effect on participant perception of module length. In fact, participants perceived modules with video and audio lasting longer than text only modules. The analysis also revealed that there was no significant difference found in number of words recalled for different formats and length.

Pomales-Garcia and Liu (2006) concluded that neither visual appeal nor recall can be predicted by the type of the module. Also, participants did not perform significantly better in relation to the length of the module. Participants rated longer modules as less attractive and perceived the audio and video modules longer in length. Pomales-Garcia and Liu concluded that module length is an important issue to consider when designing Web modules. Participants had more control over the text only modules, rated them higher for attractiveness, and recalled the same amount of information. Finally, the study demonstrated that participants are more persistent in learning the material that they viewed as less difficult and more attractive.

One of the strengths of this study was its emphasis on the importance of the design of the Web-based modules. This was important because very few studies have been designed to investigate how various design features of online modules effect learning of the content. Learning style effects the way students learn in face-to-face instruction therefore learning style also needs to be taken into consideration when designing Web-based instruction.

A limitation of this study is that the researchers only investigated one type of content. Future studies need to be performed on many types of content to determine if type of module and module length effects student recall. Also, similar studies need to determine effective online instruction at a K-12 level.

Gaytan and McEwen (2007) conducted a study to investigate effective instructional and assessment strategies in online learning environments. The researchers used descriptive research methods using a survey instrument. The survey was posted online through the Web Ct and Blackboard platforms used by the universities. The participants included 85 faculty and 1,963 students enrolled in the fall 2004 semester at two southern state universities in online classes. The type of online coursework was not mentioned. Thirty-four percent of the faculty members and 17% of the students responded to surveys developed by the researchers.

The faculty survey requested demographic information, responses to statements that used a five-point Likert scale, and responses to five open-ended research questions. The questions were designed to investigate how instructional quality is developed and what assessment strategies faculty believe to be effective in the online courses.

The student survey requested information related to the students' perceptions of effective online instructional methods and assessment strategies. The student survey was developed using the same Likert scale as the faculty survey.

Data analysis involved descriptive statistics to summarize the surveys, measure overall observations of instructional practices and quality, and observations of online assessments. Descriptive statistics included frequencies and relative frequencies.

Data analysis of instructional strategies revealed six important areas being used by faculty. Ranked first was continual, immediate, and detailed feedback of student understanding. Second, online courses are developed to be as rigorous as face-to-face courses. Third, instructors need to use email to aid in the teaching process. Fourth, courses need to address students' learning styles by using a variety of instructional strategies. Fifth, faculty members need to collaborate and establish a rapport with students. And finally, courses need to include thought provoking threaded discussions.

Data analysis of instructional strategies revealed five important areas as identified by the students. First, email is needed to aid in the teaching process. Second, online courses should be developed as rigorous as face-to-face courses. Third, faculty members need to collaborate and establish a rapport with students. Fourth, courses need to include thought provoking threaded discussions. Finally, courses need active interactions included in the online learning environment.

Data analysis of assessment strategies revealed several areas of agreement by faculty and students. Online assignments need to be clearly explained, student work needs to be evaluated for learning outcomes, feedback needs to be immediate, continual, and detailed, and email needs to be checked to ensure student understanding. In addition, students agreed that instructors need to complete self assessments to check for learning outcomes, need to use rubrics for grading, and that assessments should include a variety of techniques.

Gaytan and McEwen (2007) concluded that online instructional quality, effective online assignments, and effective assessment techniques ensure successful online learning. Online instructors need to engage their students in asynchronous and

synchronous communication. Online instructors need to be proficient in working with groups and offer rigorous coursework. Increased achievement in online learning environments is a result of increased interaction. Assessments need to be frequent and systematically planned to demonstrate that students are learning. Meaningful feedback needs to be provided to the student. Carefully designed rubrics are effective assessment instruments to assess learning.

The strength of this study was the researchers' investigation of assessment strategies in addition to instructional strategies. The need for ongoing evaluations of online programs was noted. Clearly, effective instructional and assessment strategies can be used in online environments. Online learning environments need be held accountable and use research knowledge to improve online learning. The researchers pointed out that educational institutions need to balance learning styles and learning outcomes with technology and instructional delivery systems.

There were several limitations of the study. The study was completed through a survey format and did not include any normed assessment instruments. The study also did not compare the various instructional and assessment strategies to student achievement.

Oliver (2008) implemented a study to determine the effectiveness of a Web-supported inquiry-based learning tool on student engagement and motivation. The study took place with first year students obtaining a degree in communications at an Australian University. The course has been previously taught face to face through lectures and classroom activities. The study was implemented through a blended model including face to face and web-based learning. The students attended a two hour workshop session to learn how to use the Web-based learning program. In addition, the students attended a weekly

seminar session to receive an assignment and support from tutors if needed. Assignments were open-ended problems which required the students to develop and design a solution. The students were introduced to ten assignments but had to only submit five solutions for a grade. The assignments were completed and submitted online through the Web-based program. Feedback was also received online.

The course was completed in 12 weeks by 263 students. At the end of the course, the students voluntarily completed an online questionnaire. The questionnaire consisted of short answer and multiple choice questions. The questionnaire asked students to describe their levels of motivation and engagement in the problem-solving activities. The questionnaire was completed by 135 students. In addition, data were collected related to the Web-based program including the type and number of problems attempted, the problem solutions submitted, the feedback from the tutors, and the student's grades.

The data revealed that 41% of the students completed more than the minimum requirement of five problems whereas 6% of the students completed 8 or more problems. Thirty percent of students maintained that they worked harder in the online portion of the course. Students showed little improvement in their problem solving skills during the course. The data showed no correlation between the number of problems solved and the students' success. On the questionnaire, the students relayed a preference for research problems over open-ended problems. Students also completed more of the problems that were introduced in the beginning of the semester than towards the end. Students relayed that the direct and structured problems were easier to solve and therefore completed more often. Inquiry-based open-ended problems were more difficult to solve and completed

less often. Students indicated that the problems helped them learn through practical activities.

Oliver (2008) concluded that the Web-based inquiry program did increase student engagement and motivation but less than anticipated. The study demonstrated that the type of problem made the difference in the level of student engagement and motivation. Problems need to be written with clarity of intent but not overly simplified. Problems need to be relevant for the learner with enough information to support problem solving but not overly complex.

The study's strength was the finding that Web-based programs can support large first year classes at a university level. By using a blended model, a combination of face to face and Web-based programming, students' engagement and motivation can be increased.

There were several limitations of the study. The researchers could have used a pretest and posttest on problem solving to show whether or not the student's ability to problem solve increased. A one-way analysis of variance could have been used to determine pre- and posttest differences. The researchers could have compared data of a blended course model to data from the same course using a traditional model. The researchers also could have compared student achievement between the two models.

Puzziferro (2008) designed a study to investigate the achievement performance and satisfaction of undergraduate students in online courses. The researcher examined students' self-regulated learning strategies and self-efficacy for online technologies. The study was completed at a southeastern community college. From a random sample of 350 online course sections, 163 sections were selected for the study. Courses included liberal arts classes taught online in 12 to 16 week sessions.

Students enrolled in the classes were asked to participate by filling out two surveys. If the student was enrolled in multiple online courses, students selected only one course to participate in the study. The first survey, Questionnaire A, included three measures: (a) demographic factors, (b) Motivated Strategies for Learning Questionnaire (MSLQ) to measure the relations between learning strategies, learning styles, and the final grade, and (c) Online Technologies Self-Efficacy Scores (OTSES) to measure learner attributes. The second survey, Questionnaire B, measured student satisfaction, instructor variables, and course variables. Questionnaire A was filled out in the beginning of the course whereas Questionnaire B was filled out at the end of the course. Students who withdrew from the class completed a modified questionnaire.

Eight hundred fifteen students participated in the online classes. The first questionnaire was filled out by 43% of the students; the second questionnaire was filled out by 78% of the students. Twenty percent of the students were male; 80% were female. The average mean age of the students was 29.

Student success was determined by student satisfaction, final grade, and attrition. Sixty nine students withdrew from the classes. The mean final grade was 3.00 with a standard deviation of 1.3. The questions on satisfaction were reported on a four-point Likert scale. Fifty-four percent of the students reported that they were very satisfied with the course; 32% somewhat satisfied; 9% not very satisfied; and 4% not at all satisfied.

The MSLQ had two sections. The first section covered motivation with 31 items used to evaluate value beliefs, beliefs about learning, test anxiety, and student goals. The second section covered cognitive learning strategies with 50 questions used to evaluate student management of resources and the use of cognitive and metacognitive strategies.

Scores were determined from the mean of the items on the subscales. The results revealed that students were more likely to control their effort and attention when completing assignments whereas they were less motivated to participate in peer learning activities.

The OTSES was used to measure online learning self-efficacy. OTSES has twenty-nine items organized into four subscales. Students used a four point Likert scale to rate their confidence levels. A final score was determined by combining all subscales. Lower scores indicated that students felt very confident with the minimum score equaling 29 out of 116.The mean score was 37.63.

Puzziferro (2008) found no statistically significant differences in the OTSES scores for satisfaction or achievement. Most students reported high confidence levels in relation to taking online courses and using the Internet. Puzziferro found that effort regulation, time, and study environment were strongly related to grade achievement on the MSLQ. Students who demonstrated high grades scored high in these subtests and also had higher levels of satisfaction with online courses. The researcher did not find any relationship between peer learning and help-seeking behaviors to course achievement.

The study's strength is that it provides insight into the types of skills online students need to be successful. The study involved the use of a large sample size with students participating in many online courses. The study also investigated student characteristics using normed surveys.

There were several limitations of the study. Because students who participated in the study were in many online courses, the courses were not consistent in course design or grading standards. These variables would naturally influence students' perceptions of satisfaction with courses. Also, the instruments were self-report which may or may not

reflect perceptions over time since the surveys were given once either before or after the course. If the surveys were given twice, once before the course and once after completion of the course, then the researchers could have measured how the students' perceptions changed over the semester.

K-12 Studies Related to Online Education

Rice (2006) completed a meta-analysis of literature reviewing K-12 distance education programs. The meta-analysis included studies that were designed to compare distance education programs to traditional programs. Rice included 16 studies that investigated the variables related to instructional effectiveness and quality in relation to student learning outcomes, Web-based technologies, and Web-based delivery systems. Rice searched numerous electronic data bases, bibliographic sources, journals, and Web sites. A majority of the studies Rice found involved either Internet use in schools or general technology use in schools. Rice found nine K-12 comparative studies, seven research studies on secondary level online schools but very little research at the middle school level and no research for elementary level online schools.

Rice (2006) concluded that students can succeed or fail in a virtual environment just as in a traditional face-to-face setting. Rice identified three critical variables that promote success in the online learning environment: (1) student characteristics, (2) affective learner domains, and (2) student support systems.

Related to the first variable, student characteristics, Rice (2006) maintains that success in online programs depends on the student's level of independence and responsibility. In addition, Rice found that a combination of factors such as motivation, course convenience, assignment flexibility, and course delivery methods might lead to

student success. The meta-analysis also revealed that student's independence of working at their own rate and being in control of their learning affected their motivation whereas technology problems and time management were challenges with online learning.

The second variable related to online success is related to the affective learner domains and their effect on student satisfaction, performance and retention in distance education (Rice, 2006). Student isolation and lack of social interaction has been the major concern of critics to distance education (Rice). Recent additions to instructional online practice such as audio and video conferencing and increased communication through instant messaging, threaded discussion boards, and doc cameras have helped to increase student interactions. Rice noted that increased student-to-teacher positive interactions as well as increased student-to-student positive interactions created increased motivation and satisfaction with online learning. Increased motivation resulted in increased student persistence and student performance that in turn reduced dropout rates.

The third variable related to online success is the need for a student support system including technical support, design of the educational environment, and a sense of community (Rice, 2006). Rice located very few studies that addressed this variable at the K-12 level. Rice did locate two studies that indicated the importance of adult and student engagement: (a) the first study indicated that learner independence improved for K-12 online learning with adult facilitation; adult engagement improved amount of time and quality of student participation and learning in an online setting; and (b) the second study indicated that K-12 online student success increased with a high degree of student and teacher interaction which included increased feedback to the students. Several studies examined teacher quality and teacher role in online education compared to teachers in

face-to-face instruction. The researchers of these studies found that teacher quality in distance education plays a significant role in relation to student outcomes (Cavanaugh et al., 2004). The meta-analysis revealed that the instructional process is significantly more important than operational and delivery issues (Rice). Effective instruction, interaction, and feedback form the basis for successful learning whether online or in traditional settings.

Rice (2006) found a very small research base from which to draw conclusions. Rice concluded that research for K-12 distance education mirrors research completed in adult distance education. Rice surmised that the effectiveness of distance education is dependent on the quality of the teachers, the learner attributes, and how the learning is achieved rather than the medium by which the instruction is presented. Technology by itself has no special attributes to improve learning but online learning offers alternative opportunities to at-risk student populations such as flexible scheduling, self-paced instruction, and differentiated instruction implemented by a caring teaching staff (Rice).

Kaffar (2006) conducted a study to investigate the effectiveness of three online formats to teach writing skills to high school students. Three formats were developed to deliver writing lessons. Lessons were developed from the *Paragraph Writing Strategy* (Schumaker & Lyeria, 1993). The lessons were used to provide direct strategy instruction in writing a variety of sentence types and integrating the sentences into several types of paragraphs. Thirty-five lessons were presented through three types of online formats: (a) PowerPoint media, (b) streaming video, and (c) multimedia (PowerPoint and streaming video).

The study included 104 students in grades 9^{th} -12^{th} enrolled in an online charter school. The students were divided into three treatment groups. The study included 79 students without disabilities and 25 students with disabilities. Students accessed the lessons from the school's website. All activities and assignments were completed online.

Two pretest and posttest measures were used for analysis: (a) Curriculum-Based Paragraph Writing Assessment (CBPWA) from *The Paragraph Writing Strategy* (Schumaker & Lyeria) and (b) *The Oral and Written Language Scales* (OWLS) (Carrow-Woolfolk, 1996). Data analysis revealed a statistically significant difference between the pretest and the posttest on the CBPWA and on the *OWLS* pretest and posttest measures for all students. When PowerPoint media lessons were used, students with and without disabilities revealed significant differences in their writing achievement on the CBPWA. When streaming video lessons or multimedia lessons were used, students with disabilities revealed no significant differences in writing achievement on the CBPWA. However, students without disabilities did reveal significant differences in writing achievement on the CBPWA. In addition, data analysis revealed there was no statistical difference on writing achievement when comparing students with disabilities to students without disabilities.

Kaffar (2006) concluded that online instruction did not reduce the achievement gap between students with disabilities and students without disabilities because both groups of students improved. In addition, students with disabilities made significant improvement in their writing achievement only with the PowerPoint online lesson format. However, students without disabilities made significant improvement with all three types of lesson formats. Kaffar concluded that the three lesson formats were equally effective

in improving the writing achievement of all students but students with disabilities benefitted the most from the PowerPoint lessons.

A strength of this study was that the researcher investigated the effects of three distinctly different lesson design formats on student achievement for both students with and without disabilities; whereas most studies involving online environments look at learner characteristics within one design format. Another strength of the study is the finding that strategy instruction that has been validated in traditional school settings may be modified successfully for online settings. Thus, this study serves as a springboard for additional research related to strategy instruction in other content areas within online environments.

There were several limitations of the study. In order to strengthen external validity, this study needs replication in other online schools. The sample size was small and the students were not randomly assigned to treatment groups. Instead, intact classes received one of the three treatments.

Hughes, McLeod, Brown, Maeda, and Choi (2007) investigated instructional strategies presented in an Algebra course in both online and traditional environments. The researchers investigated both the students' perceptions and achievement within the learning environments.

The study took place in three virtual schools and three traditional schools in three different states. All the schools had Algebra I curriculum that was aligned with the National Council of Teachers of Mathematics (NCTM) and state standards. The study took place in the second semester of Algebra I in ninth grade. The traditional schools were matched to an online school in the same state in terms of student characteristics and

curriculum. Eighty-five students from the traditional classes and 25 students from the online classes participated in the study.

Students completed a demographic survey and two validated assessments. The first assessment, *What is Happening in this Class?* (WIHIC) (Fraser, McRobbie, & Fisher, 1996) is used to assess students' classroom perceptions. The WIHIC uses a one to five Likert-type scale. An average score is computed. The second survey, the *Assessment of Algebraic Understanding* (AAU) (Educational Testing Service, 2005) is used to assess algebraic concepts. An overall score is received on the fifty question exam.

Several types of descriptive analyses were used in this study. Two *t*-tests were computed to determine differences in Algebra performance and student characteristics between the traditional and virtual students. A multiple regression analysis was completed to determine if the type of school explained the difference in the AAU scores. To investigate the relationship between student characteristics and learning environment perceptions, correlational analyses were completed. In addition, two-sample *t*-tests were completed to look at the difference between traditional and virtual schools.

The results of the students' demographic survey demonstrated little difference in students' characteristics in terms of race/ethnicity, gender, age, and parents' educational levels. One third of the virtual students and 81% of the traditional students reported that they were college bound. The ages of the online students ranged more widely than the traditional students.

The results of AAU assessment showed that the online students scored higher than the traditional students on all subtests. The online students revealed statistically significant differences in two of the subtests, Patterns and Relations and Using Algebraic

Symbols, as well as on the final AAU score. Online students demonstrated higher Algebra achievement than traditional students.

The results of the WIHIC were correlated with the demographic, academic and school variables. Students in the traditional schools were more prone to have higher averages on the Student Cohesiveness, Involvement, and Cooperation subscales whereas, online students had higher scores on the Teacher Support subscale. Students' characteristics on the survey were not strongly related to their classroom perceptions.

Hughes, McLeod, Brown, Maeda, and Choi (2007) concluded that the online students demonstrated higher achievement in Algebra when compared to the traditional students even though the students reported that they were not college bound. In addition, students in the online programs were older. The online schools lacked complete student records; therefore, this Algebra class may not have been the students' first Algebra course.

The study's strength involved the comparison of online and traditional Algebra students' perceptions and achievement at a high school level using normed–reference measures. The study demonstrated that students can achieve and excel in high school online math classes.

There were several limitations of the study. There are many unknown variables. Even though the traditional and online courses used state and NCTM standards, the courses did not use the same curriculum. Also, the students' mathematical background is not stated. Some students may have had Pre-Algebra in eighth grade which would lead to higher achievement levels in Algebra I. To increase external validity, replication of the study needs to take place. Also, further studies should include a larger population of students and equal numbers of students from both the traditional and virtual settings.

Okolo, Englert, Bouck, and Heutsche (2007) conducted a pilot study to determine the effectiveness of learning history in a Web-based learning environment using the Virtual History Museum (VHM). VHM is a collection of artifacts, historical objects that include copies of primary source documents, pictures, photographs, videos, and music. Materials have been reviewed for historical accuracy. The instructional unit is an 'exhibit' created by a 'curator'. Each unit includes learning activities about the artifacts. Teachers can modify the exhibits by uploading their own artifacts. The learning activities help students discover and understand the unit through investigation and communication activities. The learning activities include quizzes and projects. Student work is posted in a private account that is only viewed by the teacher and the research staff. VHM also has a public side and classroom management tools.

The pilot study took place in an urban middle school within three general education classes of eighth grade students. Two of these classes included students with mild disabilities and were co-taught with a special education teacher. The third class contained honor students.

The students used the VHM during six class periods to learn about Andrew Jackson's presidency. Students were assessed through multiple choice pre- and posttests. Student interviews were also held that investigated the students' reasoning about the key ideas covered in the unit. Analysis of the students' written responses in the unit was completed to examine differences between the students with disabilities, without disabilities, and the honor students.

The analysis of the data demonstrated that the VHM provided access to history for the students with disabilities. Analysis of the pretests of the three groups of students was

significantly different in the areas of historical reasoning and knowledge. After completion of the unit, the students demonstrated no significant differences on the posttests. The results imply that the VHM enabled the students with disabilities to learn and understand as much information as the students without disabilities and the honor students. Results on the written paper indicated that the honor students outperformed the students with and without disabilities; the students without disabilities outperformed the students with disabilities. The students with disabilities wrote fewer words and their writing ability limited their ability to communicate what they learned.

Okolo, Englert, Bouck, and Heutsche (2007) concluded that VHM is a powerful Web-based technology tool. VHM can provide access to history to all students with a multimedia approach including assistive technology supports. In the future, Web-based programs such as VHM will continue to grow and improve history learning for students.

A strength of this study was the use of a well thought out intervention (i.e., VHM) designed to improve the understanding of history for students with and without disabilities. The study outcomes showed that VHM can help close the academic gap of learning history for all student groups.

There were several limitations of the study. The study was a pilot study and the findings were reported without statistical information, comparison tables, or detailed analysis of the project. The pilot used a small sample size; no randomization, nor control group. A comparison of students completing a unit in VHM could have been compared to students learning the same subject matter in a traditional format. Okolo, Englert, Bouck, and Heutsche (2007) have written a manuscript that describes the study in detail but has not yet been published.

Knezek and Christensen (2007) reported an analysis of data from research on the Key Instructional Design Strategies (KIDS) project. From 1999-2004, the United States Department of Education awarded 14 Technology Innovation Challenge Grants which included the KIDS project. The KIDS project was implemented over a five year period across fifty school districts in Texas. The project staff investigated technology usage to improve reading comprehension in first and second grades. The project included summer professional development for teachers involved in the project in technology areas including Web page design, online quizzes, digitizing curriculum, and integrating technology learning with classroom learning.

Twenty-five school districts were included in the study. The participants included 434 first-grade students and 453 second-grade students from 40 classrooms in the 25 districts. These participants were included in the study analysis due to the completion of both pre- and posttest data from the teachers. Control groups did not have access to the computer-based instruction nor did the teachers attend the summer workshop.

Knezek and Christensen (2007) used the pre- and posttest data to analyze whether the KIDS project significantly improved the reading of the first and second graders when compared to the control group. The Texas Primary Reading Inventory (TPTI) was used as the diagnostic assessment for comparison of the treatment and control group. The assessment includes measures of phonemic awareness, word reading, reading fluency and reading comprehension.

Data analysis related to the pre- and posttest effects of the KIDS project using the TPRI demonstrated significant gains in word reading in both first grade classrooms and in the second grade classrooms. In the first grade, reading comprehension gains were not

found to be significant whereas there were significant gains in second grade in reading comprehension. For both grade levels, the treatment students made significant gains when compared to the control group in reading accuracy. However, comprehension gains were only found for the second grade treatment group.

Knezek and Christensen (2007) concluded that overall students who received the technology instruction demonstrated significant improvement in reading accuracy and comprehension when compared overall to the control group. In addition, the technology enhanced instruction impacted the instruction by a sizeable margin.

The study's strength was the use of an experimental design as defined by leaders of educational research. The study included entire school districts with random assignment to treatment and control groups. The researchers noted that the study had strong internal validity. The intervention was implemented across districts rather than classrooms.

There were several limitations of the study. The findings can only be assumed to be valid for similar populations. Also, the Texas Primary Reading Inventory was the main diagnostic tool used for the analysis of the project. The tool may or may not be comparable to other reading measures. No normed tests were used in the study. Also, there was no reference to student demographics except in relation to free or reduced lunch, district populations of 1,000 or less, and grade level enrollment. Therefore, replication of this study may be difficult based on the included information.

Wang and Reeves (2007) investigated a Web-based learning environment in a tenth-grade science class to determine whether Web-based instruction improved the students' motivation to learn science. Web-LE, an interactive science unit was developed to cover the topic of fossilization. The program was adapted from an instructional video, high

school geology textbooks, and journal articles. The program included an online encyclopedia.

The study took place in a tenth-grade science classroom in a private day school in a small southeastern university town. The school contains classroom laptops, wireless networks and Internet access. The participants were 27 tenth grade students from two science classes and a male science teacher. Twenty-seven students participated in the instruction and completed survey forms. Twelve of the students, six from each classroom, were involved in classroom observations and student interviews.

The instruction took place over a three-day period. On the first day, the teacher introduced an assignment that included critical thinking abilities to the students. The students had three days to solve problems using the Web-based technology. The students had to select an organism, an ecological climate, and a physical burial. The objective was to witness whether or not a fossil would develop. The students could access the online encyclopedia for information.

Several instruments were developed to determine the level of student motivation and academic engagement. The first instrument was an observational protocol. Six students were observed in the two classrooms over three class periods producing 36 observational records.

The second instrument developed was a student interview questionnaire. The questionnaire focused on student's past experiences with Web-based programs, their learning experience with the fossilization unit, and the students' beliefs comparing face-to-face instruction to the Web-based program.

The third instrument developed was a teacher interview. The teacher interview focused on the Web-based program and student motivation and comparison of learning on a Web-based program to a face-to-face format.

The final instrument measured motivation through a questionnaire. Data from this questionnaire provided information for assessment of student engagement and motivation. All students completed this instrument. A Likert format was used on this 14-statement survey. Students rated the statements on a scale of 1-5.

Through data analysis of the questionnaires, the results revealed that students expressed positive attitudes towards Web-based learning. Students expressed satisfaction with the quality of information in the program. In addition, students expressed interest in completing comparable Web-based programs in the future. The students felt that the program increased their motivation to learn and their knowledge about fossilization was enhanced. Students expressed that the Web-based program was easy to navigate.

The observational findings revealed many positive attributes of learning through Web-based instruction. The students maintained focus on the science project and demonstrated responsibility in task completion. Students navigated the Web-based unit to problem solve and learn information. Students used the links and controls to gain access to hyperlinks and movies. The student's concentration levels were observed to be very focused on the science units and on the tasks. The students were observed as having enthusiasm for the project through frequent use of the encyclopedia, use of keywords, and selection of on screen objects.

The interview transcripts revealed that the students' interest levels increased when using the Web-based project. The animations, sound effects, and video were the

components that connected the students to the project. The Web-based learning increased their motivation about the subject matter and learning. The students expressed a desire to learn other subjects with similar programs. The teacher revealed that the Web-based tool strengthened the student's understanding of the subject matter and increased student attention and motivation for learning about fossilization.

Wang and Reeves (2007) concluded that Web-LE engaged unmotivated high school students to learn about fossilization through a Web-based program. Student interest increased to learn about fossilization compared to other science subjects taught during the school year.

A strength of this study was the discovery of an intervention that had positive outcomes for unmotivated students in a difficult content area (i.e., science). The qualitative measures indicated that the students' interest and motivation levels increased. Additionally, the students' attention was focused on the assignment and the assignment was completed within a specific period.

There were several limitations of the study. An asynchronous discussion board that was designed for communication purposes was supposed to be used by the teachers and the students but the discussion board was not used. Another limitation involves the cost and complexity of designing Web-based units such as the one used in this study. Perhaps this explains why Web-based interactive learning tools, such as those used in this study are limited in availability.

Chandra and Lloyd (2008) conducted a study at a secondary state high school in Queensland, Australia in 2004. The purpose of the study was to compare the achievement

of two cohorts of students in the same subject content, one in a traditional setting and the other in a blended online environment.

The study was conducted with two cohorts of students. The first cohort, Cohort 1, served as the control group; Cohort 1 studied chemistry in a traditional setting. The second cohort, Cohort 2, studied chemistry in a blended environment (Web-based learning materials blended with traditional classroom activities). Cohort 1 was comprised of 210 students and Cohort 2 was comprised of 232 students. Both groups were comprised of students with similar gender and ethnic backgrounds.

During Term 1, both cohorts studied the topics of consumer science and electro-chemistry. They were taught using similar traditional instructional methods and assessments. During Term 2, both cohorts' studied units related to physics, road science and space. Due to the difficulty of the subject matter, and based on previous years performance, students usually tested lower during Term 2 except for lower performing boys who tended to score higher on this unit. The teachers commented that boys tend to perform higher due to the concepts of speed, acceleration, and braking.

Assessments were administered at the end of each term. The performance data were compared using a paired sample *t*-test. The boys' and girls' results from the Term 1 unit assessments were ranked by order into quartiles. Using a paired sample *t*-test, the quartiles were then compared with the Term 2 unit results.

The results demonstrated that the boys in Cohort 1 (the traditional group) obtained a lower mean on assessments when comparing chemistry to physics. The results were reversed for the boys in Cohort 2 (the blended group). Cohort 2 demonstrated a

statistically significant difference between the means which suggests that the Web-based instruction positively impacted the assessment results.

The boys in the traditional group, Cohort 1, demonstrated negative differences in the quartiles except for Quartile 4 where the results were positive. The results suggest that the students except for the 'at risk' students found the chemistry unit easier than the physics unit.

The boys in the blended group, Cohort 2, demonstrated differences in the means that were positive in Quartiles 1 through 3. In Quartile 4, the difference was statistically significant and almost double when compared to Quartile 4 for the traditional group. The results suggest that the boys in Cohort 2 when compared to the boys in Cohort 1 performed better in all quartiles with most benefit occurring with the Web-based instruction in Quartile 4.

The girls in the traditional group, Cohort 1, demonstrated mean differences that were negative after the physics unit when compared to the chemistry unit. The girls in the blended group, Cohort 2, also demonstrated mean differences that were negative. The difference was statistically significant for Cohort 1 but not for Cohort 2. As with the boys, the girls in Cohort 2 scored better on the physics unit.

The girls in Cohort 1 demonstrated differences in the means across Quartiles 2 through 4 which were negative and statistically significant. Due to higher test scores on the physics assessment, the mean difference was positive in Quartile 1.

The girls in Cohort 2 demonstrated negative mean differences which were statistically significant in Quartiles 1 and 2 whereas in Quartile 3 and 4 the means were positive. Only in Quartile 4 were the means statistically significant. The results demonstrated that

the girls in Quartile 1 did not benefit from the Web-based instruction whereas in Quartiles 3 and 4 the girls performed better due to the Web-based instruction.

When comparing all the students, the majority of students in Cohort 2, the blended group, improved overall with the Web-based instruction but not at the same rate. Chandra and Lloyd (2008) concluded that overall the Web-based instruction improved student performance but improvement was not equal for all groups and the Web-based instruction impacted each group differently.

In addition to the quantitative analysis, a qualitative analysis of fourteen students from Cohort 2, the blended group, was performed through interviews. The students were represented by nine students who demonstrated improved scores, four students who demonstrated decreased scores and one student who showed no change in scores. The four students with increasing scores commented that Web-based instruction was engaging and motivating. Also, the Web-based instruction fostered independence. Chandra and Lloyd (2008) also noted that Web-based instruction supported students who found traditional settings confusing due to cultural and second language issues. The comments of the students who demonstrated decreased scores maintained the importance of the teacher and traditional lessons to learning and stated that e-learning should not take the place of traditional classrooms. Chandra and Lloyd concluded from the qualitative analysis that the Web-based instruction does improve student performance but that the impact was different for each student and may have been dependent of their level of comfort with Web-based instruction.

Chandra and Lloyd (2008) concluded that isolating the variables of the e-learning environment is difficult and complex. They noted that a positive variable related to Web-

based instruction is increased student engagement and test scores. They also noted that Web-based instruction is beneficial to student achievement and that students' comments indicated an enjoyment in the self-regulation and control of their learning.

A strength associated with this research is the identification of factors related to effective online instruction. The study verifies that online education mirrors traditional education; online education can improve student performance for most students but not all students.

There were several limitations of the study. The study had a small sample size and students were not randomly assigned. Results cannot be generalized to other subject matter. Further studies could be implemented in other coursework with a larger student population.

Roblyer, Davis, Mills, Marshall, and Pape (2008) investigated learner characteristics and learning environment variables to predict success in a virtual school. Roblyer et al. developed an instrument the *Educational Success Prediction Instrument-V2*. The instrument was comprised of sixty items. The students rated their degree of agreement or disagreement with statements based on a Likert scale of one to seven with one equaling strongly agree. The items covered achievement beliefs, risk-taking, responsibility, organizational skills, and technology skills.

The study took place in the Virtual High School Global Consortium (VHS). VHS operates in twenty-three countries and twenty-three states. There are over four hundred high schools in the consortium. VHS has over two hundred courses taught by certified teachers. Teachers are released by their school districts to teach for VHS and in exchange, twenty-five students from that school can register for coursework.

During the spring semester of the 2006 school year, 4,110 students were in the participant pool. The students were from the New England region, southern states, rural and suburban locations. In addition, students were given ten extra credit points for completing the survey that was posted in their courses. Of the original number of students, 70% of the students (2,880 students) completed most or all questions on the instrument. Of these students, two-thirds were taking online courses for the first time, one-half were in their senior year, and most students had above average grade point averages.

Data analysis of the findings indicated that success in an online program can be determined by a combination of learner characteristics and environmental conditions. The results were based on 2,162 students who completed the survey. Success was easier to predict than failure. Factor analysis and scale reliability results revealed four important factors: (a) technology use/self-efficacy, (b) achievement beliefs, (c) instructional risk-taking, and (d) organizational strategies. The most significant predictor of success was the student's self reported grade point average but the results revealed that technology access, self-efficacy, organizational strategies also make a significant contribution. Learning conditions such as having a computer in the home and completing online classes on a school campus impact a student's success. The learning conditions combined with the students' grade point average can be used to predict success in an online environment.

Roblyer et al. (2008) concluded that the learning environment needs to be considered as much as student characteristics when determining student success in an online environment. Roblyer et al. recommended that students need in-school access and outside

school access to computers and the Internet. Also, first time on-line students should have pre-course orientation to online coursework. Roblyer et al. also reported that previous studies demonstrate that students who are successful are active in their coursework within the first few weeks of school. It seems that if students are to be successful in virtual schools, personnel within these schools need to be aware of risk factors for students and special support should be offered.

A strength of this study was the large sample size and that the sample students represented a large demographic area. Additionally, the results of the study revealed important factors that lead to student success within online environments.

There were several limitations of the study. The study only looked at learner characteristics and learner environment. Future studies should also address course design and delivery systems. Comparisons of pre- and posttest data on student understandings in the subject matter and student achievement would strengthen this line of research.

Summary of Research Related to Online Education

Research studies related to postsecondary studies revealed that online education mirrors traditional face-to-face instruction. Students in online classes scored higher achievement when compared to students in similar traditional coursework (Oliver, 2008; Schutte, 1998). Researchers noted that online courses need to be designed with quality instruction, opportunities to practice skills, effective assignments, and effective assessment techniques (Gaytan & McEwen, 2007; Oliver; Pomales-Garcia and Lui, 2006; Young, 2006). Effective communication including immediate feedback and collaboration appears to be one of the most important factors associated with online learning (Gaytan &

McEwen; Lim & Kim, 2003; Schutte; Young). Studies have shown that learner characteristics, motivation, and satisfaction affect student performance in learning (Lim & Kim; Puzziferro, 2008). Additionally, researchers have determined that effort regulation and study environments are related to achievement within online settings (Puzziferro).

Research studies related to K-12 online education revealed that students face the same successes and failures in online environments as in the traditional setting (Rice, 2006). K-12 online education mirrors postsecondary online education (Rice). Research studies revealed that students demonstrate equal or higher achievement in academics as students in traditional settings (Chandra & Lloyd, 2008; Hughes et al., 2007; Knezek & Christensen, 2007; Okolo et al., 2007). As in traditional and post secondary online settings, effective instruction, course design, and feedback form the basis for successful online learning (Kaffar, 2006; Knezek & Christensen; Okolo et al.; Rice). Furthermore, student characteristics, affective learner domains and student support systems are three critical factors for student success in K-12 online environments (Hughes et al.; Rice; Roblyer et al., 2008). Finally, students' level of independence, responsibility, and motivation affect their performance in online coursework (Chandra & Lloyd; Reeves, 2007; Rice; Wang 2007). One important consideration for K-12 online education is the concern related to student isolation due to lack of social interaction and the effect on students' social growth and development (Rice, 2006).

Literature Review Procedures Related to Reading Strategy Instruction

Studies included in this literature review were located with a comprehensive search of studies from the following Web-based databases: Academic Search Premier, Professional Development Collection, Education Full Text, Education: A Sage Collection, and EdITLib Digital Library for Information Technology and Education and Digital Dissertations. The following descriptors were used: Web based reading instruction, online reading instruction, strategy instruction, *The Word Identification Strategy* (Lenz et al., 2007), word analysis instruction, structural analysis instruction, syllabication instruction, learning disabilities and reading instruction, and educational technology and reading instruction. In addition, an ancestral search through the reference lists of obtained articles was completed.

Selection Criteria Used for Studies Related to Reading Strategy Instruction

Studies were included in this review of literature if: (a) the purpose of the study was to investigate the effectiveness of an online education reading intervention to improve word analysis and reading comprehension; (b) the participants were elementary, middle, or beginning high school students; and (c) the published information about the study included a clear description of the participants, research setting, research design, and the data analysis procedures. Particular emphasis was placed on finding studies related to breaking apart multi-syllabic words and strategy instruction including the Strategic Instruction Model and *The Word Identification Strategy* (Lenz et al., 2007). In addition, studies were included if they examined improving the word analysis skills and reading comprehension skills of students with learning disabilities. Studies were excluded from

this review if: (a) the participants were in post-secondary settings, or (b) the implementation of a learning strategy did not focus on breaking apart multi-syllabic words.

Review and Analysis of Studies Related to Reading Strategy Instruction

Studies Related to Decoding Strategies

Lenz and Hughes (1990) investigated whether or not a strategy approach to learning how to break apart multisyllabic words would improve the reading ability of students with a reading disability. A multiple-baseline across subjects design with three replications was used. Each grouping included three students.

The subjects were 12 seventh, eighth, and ninth grade students who met the requirements for learning disability services in the state of Florida. *The Word Identification Strategy* (Lenz et al., 1984) developed at the Center for Research on Learning at the University of Kansas was implemented in language arts classes for students with learning disabilities in the middle school and ninth grade English classes in the high school. The researchers trained one teacher at each level in *The Word Identification Strategy* (Lenz et al.). The teachers taught the students the strategy following an eight step instructional procedure (i.e., pretest, describe, model, verbal practice, controlled practice, advance practice, posttest, generalization). The mastery level for controlled and advanced practice was consistent with *The Word Identification Strategy* instructor's manual (Lenz et al.): (a) 99% mastery on oral reading, and (b) 60% mastery on comprehension.

The research revealed that *The Word Identification Strategy* (Lenz et al.) was effective in the reduction of oral reading errors including substitutions, omissions, and mispronunciations. The design of the study showed that improvement in oral reading only happened after each student was given instruction in the strategy. In addition, the students' oral reading error rates decreased and reading comprehension increased in both instructional and grade level reading materials. The student's performance demonstrated significant change in six weeks and was maintained for five weeks after the training was finished.

Lenz and Hughes (1990) noted three important findings. First, students learned to decode multisyllabic words using a problem-solving approach rather than a decoding approach. Second, explicit and systematic instructional procedures led to the students' comprehension, recall, and mastery of the strategy. Finally, a necessary component of the successful intervention was the training of the teachers in the strategy instructional procedures.

A strength of the study is the important findings derived from a well designed investigation. The researchers demonstrated that middle and early high school students can improve their ability to break apart multisyllabic words and improve their oral reading rate thereby improving their comprehension. In other words, students can learn a strategic approach to improve oral reading rate. Moreover, generalization of skills to the general education setting can be demonstrated as well as maintenance of skills over a five week period.

There are several limitations of the study. The sample size was small due to the selection of a single subject design. Replication of the study with more students would

improve external validity. Furthermore, implementing a pre- and posttest using standardized reading assessments would validate and could strengthen findings related to student improvement in reading.

Abbott and Berninger (1999) conducted a study to investigate the effectiveness of an intervention to improve the structural analysis skills of students with reading disabilities. Scripted materials were developed from *WORDS: Integrated Decoding and Spelling Instruction based on Word Origin and Word Structure* (Henry, 1990). Lessons included elements of direct instruction, teacher modeling, student response and corrective feedback.

Twenty students enrolled in grades four through seven participated in the study. The students were identified through assessments given at the University of Washington Learning Disabilities Center. The students and their family were involved in a study investigating family genetics and history of reading problems. All students were diagnosed with a reading disability. The students were randomly assigned to two treatment conditions.

The first treatment group, the structural analysis group, received 15 minutes of explicit instruction in morpheme patterns and syllable types. Students learned to apply knowledge of structural analysis while oral reading. When errors were made, students were given corrective feedback.

The second treatment group, the study skills group, received study skills training for 15 minutes. Instructors did not discuss morpheme patterns or syllable types. Students were given training in beginning word recognition, phonological awareness and

decoding, and alphabetic principles. In addition, students practiced oral reading of specific words.

Results were determined using repeated measures ANOVA comparing pretests to posttests. On the pretest measures, results demonstrated no significant differences between groups. On the posttest measures, results demonstrated significant differences for reading and spelling from pretest to posttest for both groups. Students in the structural analysis group made greater gains than students in the study skills groups.

Abbott and Berninger (1999) concluded that students in grades four through seven with reading disabilities benefited from reading interventions. Whereas both treatment groups made gains, the structural analysis treatment group made more gains than the study skills groups. Severity of the reading disability and duration and intensity of treatment affected the outcomes of the study. Abbott and Berninger concluded further research needs to be completed to establish external validity.

The results of the study demonstrated that upper elementary and middle school aged children can improve their reading skills through intensive instruction. This was the primary strength of the study. Also, the study showed the effectiveness of structural analysis instruction to improve oral reading.

There were several limitations of the study. Further research needs to be conducted due to the small sample size and short intervention period. Researchers also need to determine whether the interventions can be implemented with small groups rather than individually. In addition, research needs to include randomly selected students with and without disabilities in general educational settings.

Woodruff, Schumaker, and Deshler (2002) implemented a research study to examine the effectiveness of *The Word Identification Strategy* (Lenz et al., 1984) in two high schools in a northeastern state with students who exhibited decoding deficits. The participants were chosen from two high schools that were approximately equivalent in size and had comparable student populations. Students in the schools were taught in traditional classrooms.

One hundred twenty-four 9th-grade students participated in the study. The students in School A served as the experimental group and students in School B served as the control group. All entering ninth graders were administered *The Word Identification Subtest of the Slosson Diagnostic Screening Test for Reading* using Form A. Students who scored below 9.0 grade level in each school were entered into the subject pool. Students from School A were matched with students from School B by gender, age, and race. In addition, students were matched within one year by their grade-equivalent reading score. Sixty-two students chosen from School A and 62 matched students from School B participated in the study. The selected students had a mean grade-equivalent reading score of 5.9 at School A and 6.1 at School B. The students represented the ethnic and cultural compositions of the schools. In school A, eleven students were formally diagnosed with learning disabilities.

The students in School A were taught *The Word Identification Strategy* (Lenz et al., 1984) following the instructor's manual. The students were taught in groups of four to six students for one hour daily by certified teachers who were trained in the strategy. Within four to eight weeks of instruction, the students mastered the strategy in grade level

materials. Once one group mastered the strategy, another group was given instruction until all the participating students had mastered the strategy.

The results of the study demonstrated that students who mastered *The Word Identification Strategy* (Lenz, et al., 1984) made significant gains in reading decoding levels. Female students in School A made average gains ranging between 2.8 and 3.4 grade levels in decoding; male students made average gains in reading decoding between 2.8 and 3.8 grade levels in decoding. African American students made the largest mean gains while Hispanic students made the lowest mean gains. The matched students in School B made very small gains. Caucasian students both females and males made the largest mean gain of .4 of a grade level. Male Hispanic students decoding scores decreased .7 of a grade level; females decreased .1 of a grade level. The students' with learning disabilities in School A demonstrated an average mean gain of 3.9 grade levels; their matched peers demonstrated an average mean gain of .3 of a grade level.

The students' pre- and posttests in School A and School B were compared using ANCOVAs. The ANCOVA for the group demonstrated significant statistical differences between the students in School A and B. The ANCOVA was also used to compare the students' with learning disabilities posttest scores to the posttest scores of the matched students in School B and statistically significant differences were found favoring students who received *The Word Identification Strategy* (Lenz et al., 1984) instruction.

Woodruff et al. (2002) concluded that students who received and mastered intensive instruction in *The Word Identification Strategy* (Lenz et al., 1984) produced mean gain averages from 2.8 to 3.8 grade levels in a four to six week period. The gains in this study were similar to the gains found in Lenz and Hughes (1990) that validated the

effectiveness of *The Word Identification Strategy* (Lenz et al.) in a middle school setting with twelve students with learning disabilities.

A strength of this study was the replication of findings to increase external validity of the intervention. The results extended the research by implementing the intensive instruction with students who presented decoding deficits but were not diagnosed with a learning disability. Also, this research demonstrated that students who read at a 2.7 grade level can benefit from intensive strategy instruction. In addition, the findings demonstrated that students of different ethnic backgrounds and large numbers of students taught in small groups can benefit from the instruction.

There were several limitations of the study. The students were not randomly assigned but were assigned to treatment according to their respective English classes. Further studies could involve more randomized assignments. Also, similar studies could be conducted in upper elementary and middle school settings.

Bhattacharya and Ehri (2004) conducted a study to investigate the effectiveness of instruction in graphosyllabic segmentation on the word-reading skills of poor readers. Instruction in syllabication was expected to improve the students' skills in dividing multi-syllabic words and decoding unfamiliar words.

The participants were 60 students in sixth to ninth grades who attended remedial reading classes. The participants attended five junior high and high schools in New York City. The students were not identified as students with disabilities or students with a second language. The students were randomly assigned to three groups: (a) syllable analysis group, (b) 'whole-word' reading group, and (c) control group. The control group received no treatment except the pre- and posttests. Each treatment group was then

divided into two sections: (a) a 3rd-grade equivalent reading level and (b) a 4th- to 5th-grade equivalent reading level. Both treatment groups used materials at the sixth-grade level. Students were given instruction over four 30-minute sessions during their reading class.

The first treatment group was given instruction in syllable analysis. The students were taught a strategy for analyzing multisyllabic words in graphosyllabic units in order to read them. Instruction included a description of the strategy, modeling, and corrective feedback. Students were given instruction explaining how to look for syllables to divide the words. The students followed a five-step sequence of instruction. First, students read the word; if incorrect, the instructor provided the word. Second, students gave the meaning for the word; if incorrect, the instructor told them the meaning. Third, students orally divided the word into syllables; if incorrect, the instructor modeled the correct answer. Fourth, students practiced dividing the written word with their thumb corresponding to the correct syllable; if incorrect, the instructor modeled the correct division of the word and the student copied the procedure. Fifth, students blended the syllable parts into the whole word. The strategy was practiced on the 100 multisyllabic words put onto flash cards. The words were divided into four 25 word card sets. Each day a different card set was practiced. The students read the set of cards for four trials.

The second treatment group was given instruction in 'whole-word' reading of multisyllabic words without any strategy. This group used the same 100 words with the flash card format. The students followed a three-step sequence of instruction: (a) student read the word aloud; if incorrect, the instructor said the word and the student repeated it; (b) student gave the meaning for the word; if incorrect, the instructor provided the

meaning for the word; and (c) students repeated steps until the word was read correctly. The students read the set of cards for six trials. The last two trials were timed and charted.

Data analysis involved the use of ANOVAs. Results on the pretests demonstrated no significant differences between the two treatment and control groups. The analysis determined that students with higher reading levels scored significantly higher than lower readers on the word and non-word reading tasks but not on letter knowledge or the misspelling test of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987). The ANOVA results on the posttests revealed a significant effect for the 3rd-grade equivalent reading group that received syllable training but not the 4th -to 5th- grade equivalent reading group. Also, the syllable trained 3rd-grade equivalent reading group significantly outperformed the whole-word reading group but the 4th- to 5th-grade equivalent whole-word reading group outperformed the syllable trained readers at 4th- to 5th-grade equivalent. Both treatment groups improved their ability to read multisyllabic words when compared to the control group.

Bhattacharya and Ehri (2004) concluded that syllable training improved students' ability to read multisyllabic words. The effect was more significant with the 3rd-grade equivalent reading group. The researchers maintained that the 4th- to 5th-grade equivalent reading group did not benefit as much from syllable training because they were already able to read more multisyllabic words. The 'whole-word' reading treatment group was not found effective in improving the reading of multisyllabic words for either grade level. Finally, Bhattacharya and Ehrin concluded that syllable training needs to be incorporated into reading remediation instruction.

A strength of this study was the random assignment of students to the instructional groups. Also, the findings reveal practical implications for reading instruction. Junior and high school students without disabilities can improve their ability to read through intensive instruction. Students can be taught to break apart multisyllabic words with only a few sessions of instruction and this can improve their oral reading.

There were several limitations of the study. The study needs to be replicated with more students for external validity. Also, the study needs replication including students with disabilities to demonstrate the effectiveness of the technique with this population. The intervention was completed using words in isolation. A second study can be designed to investigate the effectiveness of the intervention on oral reading in context using grade level materials.

Vadasy, Sanders, and Peyton (2006) conducted two studies investigating the effectiveness of supplemental instruction in structural analysis. The instruction was implemented by paraeducators. Paraeducators were hired from the school community and paid an hourly rate. Paraeducators received three hours of training in the intervention with ongoing training throughout the study.

The first study was implemented in a large northwestern school district in 12 similar schools. Six schools were control schools and 6 schools were treatment schools. Second grade students were referred to the study by their teachers as being at risk for reading problems. In the first study, 31 students were included in the intervention.

Students received individual instruction in the intervention 4 days a week for 20 weeks. Each 30-minute lesson included 15 minutes of scripted instruction in structural analysis and word-level skills and 15 minutes of oral reading. The scripted lessons

included spelling and reading of multisyllabic words. Thirty lessons covered common prefixes and suffixes. Paraeducators modeled how to chunk syllable parts and blend the parts into whole words. The chunking strategy was flexible with students instructed to: (a) notice the vowels, (b) find the syllables, (c) read the syllables, and (d) put the parts together. Oral reading used a variety of methods including partner reading, echo reading, and independent reading in grade level passages.

Data analysis involved the use of ANOVAs to determine whether significant differences existed. On the pretests there were no significant differences found between treatment and control groups. The posttest analysis demonstrated significant difference between the treatment and control group in reading efficiency, reading fluency, reading comprehension, and spelling.

The second study was implemented with 6 second and 15 third grade students from five schools in the same district. Eleven students received treatment and 10 students were a part of the control group. Six paraeducators implemented the study. The paraeducators were trained using the same procedures as in Study 1. The treatment was comparable to the treatment in Study 1 with the addition of: (a) 12 scripted lessons reading and spelling nonwords and words including two letter combinations, (b) practice of words with a schwa vowel, and (c) three to four minutes of spelling high frequency words.

Analysis demonstrated no significant differences on the pretests between the treatment and control groups. The results of Study 2 demonstrated significant differences on ANOVAs between the treatment and control group on reading fluency and accuracy.

Vadasy, Sanders, and Peyton (2006) concluded that supplemental instruction in structural analysis implemented by paraeducators is effective for improving the reading

skills of second and third grade students with reading problems. The results demonstrated significant effect in reading accuracy or efficiency and fluency skills for the treatment group. However, neither the treatment nor control group reached the benchmarks for oral fluency but both treatment groups improved in fluency over the control groups.

The results demonstrated the effectiveness of supplemental structural analysis for students in second and third grades on reading accuracy. The results also supported the use of paraeducators in implementing successful interventions. This was a strength of the study particularly when considering the current context of schools. Teachers have large class sizes and increased student diversity related to reading performance. The involvement of paraeducators to assist struggling students represents a viable method for meeting student needs.

There were several limitations of the study. The study needs to be replicated with larger groups of students including students with disabilities. In addition, further studies need to determine whether similar treatments implemented with small groups of students as an alternative to individual tutoring are effective. Small group instruction would be cost and time efficient.

Tressoldi, Vio, and Iozzino (2007) conducted a study to investigate the effectiveness of a reading intervention to identify syllables in context and improve reading fluency. The study was completed in three private clinics in three different locations in Italy.

Sixty-three children in second through eighth grades participated in the study. All students were diagnosed as being dyslexic by certified clinical psychologists. The students were divided into three treatment groups. The treatment groups were determined by the clinic staff where the student was to receive the treatment. Treatments were

randomly assigned to the clinics. The treatment groups did not present any statistically significant differences in reading fluency or age. The treatment consisted of three phases: (a) pretest, (b) training phase, and (c) posttest. The training phase consisted of an AB (treatment-no treatment).

The first treatment group, the linguistic group, participated in two weekly sessions for 45 minutes. The linguistic group completed exercises to improve phonemic blending by certified speech therapists. In addition, students read words in isolation and text with assistance. No exercises were used to teach recognition of syllables.

The second treatment group, the self-paced subsyllabic group, participated in weekly sessions once a week for the first month and once every two weeks for the duration of the study. The treatment was implemented by certified psychologists. The students and parents were taught exercises using a program, *WinABC* software, that facilitated the visual identification of syllable parts in words while reading text. The program presented texts at varying levels and lengths. Visual identification of syllable parts were presented from left to right in sequence via underlining. The self-paced treatment group controlled the advancement of the syllable parts by using the space bar. The students read the text as fast as they could read aiming for a defined goal. Reading errors were noted by an assistant; the student received corrective feedback.

The third treatment group, the automatic subsyllabic group, followed the same treatment procedures as the self-paced subsyllabic group except that the syllable advancement was automatic. The interval speed was set by the therapist. The student maintained fluency rate determined by the computer.

The results of the study showed that all students made gains in accuracy and fluency. All three groups made comparable gains in accuracy as demonstrated through posttest performance. The linguistic and self-paced subsyllabic groups made similar improvement in fluency whereas the automatic subsyllabic group made statically significant gains. After a period of no treatment, the interventions were repeated two or three times with students continuing to make more gains in fluency.

Tressoldi, Vio, and Iozzino (2007) concluded that the automatic treatment group made superior gains due to the computer controlling the fluency rate. Students were forced to read at a faster rate therefore developed greater fluency than their typical fluency rate.

The results of the study revealed that with intensive interventions, students in grades second through eighth can improve their reading accuracy and fluency. In addition, the study demonstrated that the use of technology with instructor assistance can provide effective interventions.

There were several limitations of the study. The study needs to be replicated in traditional school environments including children with and without disabilities. The study also needs to include larger sample sizes with random assignment. Also, the computer software with the addition of assistive technology such as a screen reader might promote student independence and could provide immediate corrective feedback.

Studies Related to Comprehension Strategies

Katims and Harris (1998) investigated the effectiveness of *The Paraphrasing Strategy* (Schumaker, Denton, & Deshler, 1984) in general education classrooms for students with and without disabilities. *The Paraphrasing Strategy* (Schumaker et al., 1984) is used to

teach students how to paraphrase while reading to improve comprehension skills. The participants attended a middle school in a district of 60,000 students. The school's demographics included 89% Hispanic students, 7% Caucasian, and 4% African American students in the lower socioeconomic range. Very few students passed state mandated proficiency tests and graduated high school. Ten classes of seventh grade students who attended mandated reading classes were included in the study. The reading classes were comprised of students with mixed abilities. Students who attended accelerated reading classes or students with severe disabilities were excluded from the study. The original sample pool had 295 students but due to students either passing the study's pretest or lack of completion of the posttest, 207 students were included in the final analysis. Twenty-five of the students were identified as having learning disabilities.

Based on intact classrooms, the students were randomly assigned to experimental and control groups. Ten classrooms with twenty or more students received the intervention for fifteen 20-minute sessions. Both the control classroom and the experimental group classroom participated in the pretest and the posttest for *The Paraphrasing Strategy* (Schumaker et al., 1984). The testing procedures were based on reading a 400 word expository passage from the *Timed Readings* (Spargo, 1989) and answering ten multiple choice comprehension questions. The comprehension scores were determined and a comparison was used to demonstrate reading comprehension growth for the purpose of analysis.

Students in the experimental classrooms were instructed in *The Paraphrasing Strategy* (Schumaker et al., 1984) following the instructor's manual. The instruction includes the following stages of strategy instruction (i.e., pretest, describe, model, verbal

practice, controlled practice, advanced practice, posttest) as specified in the instructor's manual. Students learn the mnemonic RAP (i.e., R-Read the paragraph, A-Ask yourself what is the main idea and details, and P-Put it into your own words). During controlled practice (student's instructional level) and advanced practice (student's grade level), students read from the *Timed Readings* (Spargo, 1989), paraphrased each paragraph, and then answered the comprehension quiz without looking back at the passage.

Students in the control classrooms were instructed with the district's mandated reading program, Reading Workshop. In this instructional format, students read self-selected expository books silently, partner read literature, or read while the teachers read the text. Then, the students respond to the literature in various formats. The teacher presented ten-minute mini-lessons based on state standards.

Data analysis involved a one-way analysis of Covariance (ANCOVA) comparing the student's pretest and posttest scores to examine the effects of the intervention on the student's comprehension scores. The data revealed that the intervention significantly improved the student's comprehension scores on the posttest. The students with learning disabilities in the experimental group demonstrated significant gains in reading comprehension compared to the students with learning disabilities in the control group.

Katims and Harris (1998) concluded that using the cognitive strategy, *The Paraphrasing Strategy* (Schumaker et al., 1984), students' made statistically significant gains in their reading comprehension from pretest to posttest. The study revealed that students at risk with and without a learning disability made gains receiving the same intensity of instruction in a general education setting.

The strength of this study is that it took place in general education classrooms including students of mixed ability. The study demonstrated that general education teachers can implement effective strategy instruction and students can make significant improvement within 15 sessions.

There were several limitations of the study. The study would have been stronger if, in addition to curriculum-based assessments, a standardized assessment in reading comprehension had been used. In addition, the students may have benefited from the inclusion of the curriculum-based graphing included *The Paraphrasing Strategy* (Schumaker et al., 1984) instructor's manual.

Manset-Williamson and Nelson (2005) conducted a research study comparing the effects of two reading interventions on middle school students. Their research was designed to determine whether a systematic and intensive reading intervention would increase the reading skills of upper-elementary and middle school students with a reading disability. In addition, the researchers compared explicit or implicit reading comprehension strategy instruction to determine whether one had a greater effect than the other.

The participants were 20 students selected from an initial pool of fourth through eighth graders recommended by their school principals. Students had to meet the following criteria: (a) entering fourth to eighth grades the next year; (b) grade equivalent scores at least two years below their expected grade level on the *Woodcock Johnson Tests of Achievement* (Woodcock, McGrew, & Mather, 2001); (c) standard scores at least one standard deviation below the mean on one of three composites of the *Comprehensive Test of Phonological Processing* (Wagner, Torgesen, & Rashotte, 1999); and (d) a standard

score above 75 on an intellectual functioning test. Students could not be formally identified as having an emotional disorder, autism, hearing impairment, or visual impairment. Students who were identified as English as a second language were also excluded. One student was identified as having Attention Deficit Hyperactivity Disorder. Students were randomly assigned to one of the two treatment groups.

The study was conducted in a reading clinic located in a private school for students with reading disabilities and a public school that qualified for Title 1 funding. The instruction took place during the summer lasting for six weeks. Students were not necessarily students attending either school. The instruction was delivered on a one-on-one basis one hour a day for four days a week. Total time of instruction was 20 hours.

Eleven tutors were hired to implement the study. Nine tutors were graduate students in education; one tutor was a recent bachelor's graduate; and the final tutor was finishing an undergraduate degree in special education. All tutors attended a graduate level course covering instructional approaches for reading disabilities. In addition, tutors received 14 hours of intensive instruction in the treatment intervention.

The intervention, a 'balanced' literacy approach, included intensive instruction in phonemic awareness/analysis, strategic decoding, fluency, and reading comprehension strategies. Both treatment groups had the same lessons in phonemic awareness/analysis, strategic decoding, and fluency. Only instruction in the reading comprehension strategies was altered for one test group. One group was given the reading strategy instruction through a guided reading format. The strategies included activating prior knowledge, prediction, summarizing, and question generation. Tutors modeled the comprehension

strategies simultaneously. All strategies were presented through guided practice by the tutor.

The explicit strategy instruction treatment group was based on the self-regulated strategy development (SRSD) model. This model includes explicit instruction (i.e., direct explanation, modeling, collaborative practice, and independent practice) in the strategies. In addition, self-regulatory procedures and collaborative communication between student and teacher were an integral part of the treatment. The mnemonic "SUPER-G" (i.e., Set goals, Use Prior knowledge, Predict what you think will be in the text, Explain the main idea in your own words, Retell the most important parts of the text, and Give yourself feedback) was developed to signify the strategies. The strategies were introduced sequentially, one at a time, until mastery was met.

A randomized comparison group design was used to determine effectiveness of the reading interventions. Tutors and students were randomly assigned to the treatment groups. Dependent measures included standard scores on four subtests of the *Woodcock Johnson Tests of Achievement* (Woodcock et al., 2001) and raw scores on informal reading comprehension passages designed for the intervention. Paired sample t-tests were used to compare pretest and posttest scores. One-way analysis of covariance (ANCOVA) was used to test for significant differences between treatments on dependent variables.

Results demonstrated that both groups made meaningful progress in decoding and fluency skills in a relatively short time period. On the oral reading passages included in the intervention, students read more accurately and more quickly. Students in both groups made significant gains in story retell and reading comprehension. There were significant differences in the general impact of reading comprehension between the two groups. The

results showed that the explicit strategy instruction treatment group made significantly greater gains in passage oral retell.

Manset-Williamson and Nelson (2005) concluded that intensive instruction for upper elementary and middle school students improves reading skills. Individualized intensive reading instruction is a necessary component to an inclusive education. By providing explicit strategy instruction, upper elementary and middle school students have more opportunity to significantly improve their reading skills and comprehension.

This study included a balanced approach including the critical skills of phonemic awareness/analysis, strategic decoding, fluency, and reading comprehension strategies. The intervention itself represented one of the strengths of the study. The results revealed that explicit strategy instruction in reading comprehension had a more significant effect than implicit strategy instruction. The study also showed that students can improve their reading skills with only 20 hours of intensive instruction by tutors with limited training.

There are several limitations in the study. Foremost, there was no control group. Both treatment groups made gains. It is hard to determine whether the gains were due to the interventions or due to natural progress. The intervention was implemented individually to only 20 students, which is not always possible in traditional school settings. To determine external validity, the study should be implemented with small or whole groups of students. The intervention included a combination of interventions. The result does not reveal which area of instruction benefitted the students or what degree of explicitness in the strategy instruction made a significant impact.

Houtveen & van der Grift (2007) completed a quasi-experimental study using cognitive strategy instruction with ten-year-old children in Dutch elementary schools.

Teachers in the experimental group were trained in reading comprehension strategies and compared to a control group of teachers who were not trained in the strategy instruction. The experimental groups included 11 schools and 344 students. The control group included nine schools with 225 students.

Several measures were used to determine the effectiveness of the intervention. An observation instrument was designed for the research that measured twenty items on teacher behavior in the area of metacognitive strategy instruction. Students' knowledge about reading strategies was measured using a reading comprehension questionnaire. The questionnaire included six types of questions related to the students' knowledge about strategies that he or she could use to monitor the reading behavior and strategies to use to improve reading comprehension. In addition, the researchers measured the students' reading attitudes, reading instructional time, and students' growth in reading comprehension.

Houtveen and van der Grift (2007) concluded that the teachers in the experimental group significantly demonstrated better knowledge about reading comprehension strategy instruction and spent more time teaching reading comprehension. The students in the experimental group also demonstrated better knowledge in reading strategies. Also, the students in the experimental group demonstrated greater growth in reading comprehension than the students in the control group.

The researchers concluded that better knowledge about reading comprehension strategies on the part of teachers leads to an improvement in reading comprehension among students. In addition, reading comprehension strategy instruction improved

student understanding of text rather than reading comprehension being a result of inherent abilities.

The primary weakness of this study related to the description of the procedures. The researchers did not relay enough information to be able to replicate the study. Specific reading strategies were not mentioned. Moreover, specific information about how the instruction occurred was absent.

Hagaman and Reid (2008) investigated the effectiveness of improving comprehension skills by implementing *The Paraphrasing Strategy* (Schumaker et al., 1984) in combination with a validated strategy instruction model. *The Paraphrasing Strategy* (Schumaker et al.) is used to teach students to follow the three-step mnemonic "RAP" in order to remember what they have read. The three steps to RAP: (a) R- Read the paragraph; (b) A-Ask yourself, "What is the main idea and two important details?"; and (c) P-Put it into your own words. Schumaker et al. (1984) reported that students improved their comprehension skills from 48% to 84% on a ten question multiple choice format after mastering the strategy. The self-regulated strategy development (SRSD) instruction model is a method of strategy instruction that integrates the significant components of strategy instruction (i.e., Develop Background Knowledge, Discuss It, Model It, Support It, and Independent Performance). In addition, the self-regulation strategies of goal-setting and progress monitoring were incorporated into the intervention.

The design of the study was multiple baseline across subjects with multiple probes included in the baseline phase. The study was implemented in a Midwestern state at a rural elementary school during spring semester. The strategy instruction took place during an afternoon reading enrichment program. All students who were identified as

struggling readers attended the reading enrichment program. The program was co-taught by a general education teacher and a special education teacher to provide additional instruction in reading.

The participant pool began with sixth grade students attending the reading enrichment program. The first criterion for participation was scoring 1 year behind grade level on the *Gates-MacGinitie Reading Test-4* (MacGinitie & MacGinitie, 2002). Of the 15 identified students, teachers selected 5 students who struggled with reading comprehension. Only 3 of the students received parental permission to participate in the study. The final participants were 3 female students: 2 Caucasian students and 1 Hispanic student. The first student was retained in first grade and referred for special education services. She qualified under Speech and Language Impairment for a few years and then was exited from special education. The second student was homeschooled until sixth grade. The third student was the Hispanic female. She came from a background where Spanish was predominately spoken in the home.

The instruction was administered individually to each student in the hallway outside the reading enrichment program. The RAP strategy lessons were implemented using the SRSD model. A detailed sequential lesson plan was explicitly developed and followed with each of the participants. A checklist was used to ensure that all lesson components were covered. An outside observer completed treatment of fidelity checks on fifteen percent of the lessons. Treatment fidelity was 99%.

During baseline, each participant read at least three passages from a fourth grade level social studies textbook. The social studies textbook was selected based on difficulty level and consistent number of words in the chapters. Passages approximately 490 words in

length were word-processed for readability levels. Only passages below a 4.8 grade level based on Flesch-Kincaid (1975) readability level were included in the study. Students read the word-processed passage aloud. Students were allowed to ask the instructor for help on unknown words. The students were not timed nor did they receive any other assistance, encouragement, or prompts. After reading, the students retold the information from the passage without looking at the passage or notes. Finally, the students orally answered six questions about the passage.

The first participant was given instruction (treatment phase) in the paraphrasing strategy after reaching a stable baseline. The instruction followed the SRSD strategy instruction model using "RAP" until the student met the criterion for independent performance. Criterion level was met when the student used RAP while independently reading a passage and identifying the main idea and details for each paragraph. Then, the student moved into the independent performance phase. Baseline probes were administered to the remaining students; then, the next student began instruction.

During independent performance, each participant completed four probes. The probes were the same as previous probes except that the student did not receive any assistance. Once the student met criterion for mastery, practice stopped and a maintenance probe was given two weeks later.

Dependent measures involved two conditions. The first condition was the amount of text recalled. A retelling checklist was developed for each passage that included the main idea and details from each paragraph. The students were given credit for the information they recalled correctly; this score was converted to a percentage score. In addition, all student retelling was tape recorded for the purpose of determining interscorer agreement

by an independent rater. The interscorer agreement was .91. The second dependent measure consisted of six researcher-constructed short-answer questions per passage; three text-explicit questions and three text-implicit questions. The students orally answered the questions. The instructor recorded the students' responses on scoring sheets.

Hagaman and Reid (2008) concluded that pairing *The Paraphrasing Strategy* (Schumaker et al., 1984) mnemonic, RAP, with SRSD strategy instruction model increased the reading comprehension scores of struggling readers. During baseline, retelling of main idea and details was low for all students. After treatment, all students demonstrated an increase in retelling both main idea and detail. Two students demonstrated a significant increase whereas one student made a smaller increase in text recall. On the short-answers, all students demonstrated a significant increase in the number of correct responses.

The study's strength was the validation of a combination of efficient strategies that was successfully implemented in an after school program. It is important for researchers and educators to refine and improve strategies in ways that are practically useful within a variety of environmental contexts. These researchers accomplished this and thus added important information to the established literature on reading strategies.

There were several limitations of the study. The sample size was small, and the instruction was implemented individually. The study needs replication with small and large groups to see if the same effect can be replicated. Also, the study was conducted with general education students. Replicating the study with students with learning disabilities would demonstrate the effectiveness with a different population of students. Finally, the researchers did not pre- and posttest using a standardized reading test. Pre-

and posttest scores on the standardized reading test would have provided a normed comparison of reading scores.

Scharlach (2008) implemented a study to determine the effectiveness of a metacognitive reading strategy. Scharlach designed the instructional framework that included modeling and scaffolding of eight comprehension strategies. The instruction was implemented 20 minutes daily for 40 sessions and included teacher read-alouds followed by independent reading. Texts were student selected.

The study took place in the southeastern United States in five third grade classrooms in one school. Eighty-one students were randomly assigned to three groups. One group was the control classroom (C) where the teacher and student completed daily read-alouds and independent reading without any changes. In the second group (ST), the teachers modeled the reading strategies during the daily read-alouds and scaffolded the use of the reading strategies prior to independent reading. In the third group (START), the teacher completed the same instruction as in the ST group, however, the students were also taught to complete a worksheet entitled ART (Actively Reading Text) during independent reading. The worksheet helped to keep students actively engaged, write out strategy responses, and use self-regulation during reading.

Teachers read aloud to the students from picture books or chapter books. During the read alouds, the teachers explicitly described, modeled, and scaffolded eight comprehension strategies. The strategies included predicting, making connections, visualizing, identifying the main idea, summarizing, checking predictions and making judgments. The strategies were introduced one at a time. A new comprehension strategy

was added every day after reviewing the previously learned strategy so that by the end of the eighth session, the students were practicing every strategy until the end of the study.

During independent reading session, students in the START classrooms completed the worksheet, the ART of Comprehension. The worksheet kept students actively engaged with the text. The worksheet was modeled by the teachers for each strategy. While the teachers were doing the read-alouds, the information that was modeled from the strategy instruction was placed on sticky notes in the book. These notes were then transferred to the worksheet in the appropriate place. By the 10th session, students were completing the worksheet independently.

The results of the study were determined by comparing pretesting and posttesting between the three groups. A one-way analysis of variance (ANOVA) with instruction as the independent variable and comprehension as the dependent variable was used to determine the results. Students in the START classrooms performed significantly better in reading comprehension on the reading comprehension test of the Gates-MacGinite standardized test than students in the ST or control classrooms. Another ANOVA analysis demonstrated that the ST classrooms made no significant gains compared to the control classroom in reading comprehension.

Scharlach (2008) concluded that the difference in achievement gains was due to the ART worksheet. The researcher also demonstrated that students made an average of six months gain in reading comprehension in 40 sessions compared to two months gain for the ST students. Scharlach found that all students made gains. Students on grade level in the START classrooms made the most gain. In addition, above grade level students made an average of one year and four months gain in the START classrooms compared to no

gain in the ST classroom and a one-year loss in the control group. All students in the START classrooms including advanced, average, and struggling readers made significant gains.

The study's strengths focus on the practicality of the selected intervention. The general education teachers provided the instruction as an integral part of their reading instruction. The teachers easily implemented the intervention with little training. The intervention did not increase planning or teaching time for reading or take away time from other subject matter instruction. The instruction was implemented whole group and students practiced at their instructional levels. Students filled out a questionnaire regarding their activity while they read both pre and post intervention. The questionnaire suggests that students became more actively involved while reading. Students developed a strategic awareness in their responses.

There were several limitations of the study. Eight different comprehension strategies were scaffolded beginning with day one. Every day a new strategy was introduced. Struggling readers may need more time to master each strategy before moving to the next strategy. A chart in the classroom was used to prompt students to the skills. The intervention did not use a mnemonic device that would provide students with a step by step prompt to promote independence. In addition, the researchers did not report each student's daily independent reading achievement on a comprehension quiz.

Summary of Research Related to Reading Strategy Instruction

Research on decoding strategies indicates that students can improve their decoding skills through intensive instruction in decoding multisyllabic words (Abbott & Berninger,

1999; Bhattacharya & Ehri, 2004; Lenz & Hughes, 1990; Vadasy et al., 2006; Woodruff et al., 2002). Specifically, research on *The Word Identification Strategy* (Lenz et al., 1984) reveals that students at middle and high school levels can improve their decoding skills of multisyllabic words, oral reading ability, and comprehension of grade level reading materials (Lenz & Hughes; Woodruff et al.). Additionally, the research shows that students with and without disabilities of different minority backgrounds make significant reading gains after mastering the strategy (Lenz & Hughes; Woodruff et al.). Intensive instruction via technology software results in improvement in reading of multisyllabic words and fluency rates (Tressoldi et al., 2007).

Research on strategy instruction indicated that students with and without disabilities at various levels improve their reading comprehension via strategy instruction (Hagaman & Reid, 2008; Houtveen & van der Grift, 2007; Katims & Harns, 1998; Manset-Williamson & Nelson, 2005; Scharlach, 2008) Explicit strategy instruction when compared to implicit strategy instruction seems to have a greater effect on reading comprehension (Manset-Williamson & Nelson). More knowledge about reading strategies has led to improvement in reading comprehension (Houtveen & van der Grift). Specifically, research on *The Paraphrasing Strategy* (Schumaker et al., 1984) reveals statistically significant improvement in reading comprehension for students with and without disabilities (Hagaman & Reid; Katims & Harris).

Literature Review Summary

There were two purposes for this chapter. The first purpose was to summarize and analyze existing peer reviewed literature related to online education. The second purpose

was to summarize and analyze existing peer reviewed literature related to reading strategy instruction. Knowledge of these two literature bases is needed to understand and design a rigorous study related to online strategy instruction for the purpose of improving student achievement in the areas of decoding and reading comprehension.

From this literature review it is evident that more research is needed to determine the effectiveness of online education. Research at the postsecondary level indicates that online education is comparable to traditional education. Additional research for K-12 online education needs to be conducted to determine the effectiveness of instruction for students who struggle in important content areas such as reading. Reading instruction in the area of decoding and comprehension has been determined to be necessary components of effective reading programs (NRP, 2000). To date, research related to the effectiveness of teaching strategies within online environments is limited, particularly related to reading strategies for struggling learners. Specifically, research needs to be conducted to determine the effects of explicit strategic online instruction in the areas of decoding and comprehension.

CHAPTER 3

METHODOLOGY

The purpose of this study was to investigate the effects of teaching *The Word Identification Strategy* (Lenz, Schumaker, Deshler, & Beals, 2007) through online modules to students with specific learning disabilities. Emphasis was placed on the acquisition of decoding and comprehension skills as well as student satisfaction with the provided instruction. All participants were taught *The Word Identification Strategy* (Lenz et al., 2007) from the University of Kansas Strategic Instruction Model (SIM) curriculum. This chapter is designed to provide a detailed description of the methodology used in the study and is organized into ten sections. The sections are as follows: (a) research questions, (b) participants, (c) setting, (d) instrumentation, (e) materials and equipment, (f) design, (g) procedures, (h) interscorer reliability, (i) fidelity of treatment, and (j) treatment of data.

Research Questions

The research questions were:

1. Does online instruction related to *The Word Identification Strategy* (Lenz, et al., 2007) improve the decoding skills of students with learning disabilities?
2. Does online instruction related to *The Word Identification Strategy* (Lenz, et al.) improve the comprehension skills of students with learning disabilities?
3. Do students with learning disabilities maintain *The Word Identification Strategy* (Lenz et. al.) skills two weeks after instruction has ended?

4. How satisfied were students with learning disabilities with online instruction of *The Word Identification Strategy* (Lenz, et al.)?

Participants

The participants in this study were two fifth graders and three middle school students with specific learning disabilities. The students were enrolled in an online charter school in the Southwest region of the United States. A special education instructional facilitator employed at the school implemented the instruction in this study.

Participant Pool

The five participants for this study were selected from a sample of convenience. Specifically, the participants were selected from the facilitator's caseload of 54 students. These 54 students were enrolled in grades one through eight. Of these 54 students, 18 were identified as having specific learning disabilities. Specific selection criteria were applied to identify eligible students from these 18 to participate in this multiple probe across participants study.

Participant Selection Criteria

There were eight criteria for participation in this study. The participants had to: (a) meet the State of Nevada Administrative Code eligibility criteria for specific learning disabilities, (b) be enrolled in 5^{th} through 8^{th} grade, (c) have an instructional reading level at least two years below their grade level, (d) have access to online instruction on a daily basis, and (e) meet the criteria for the strategy instruction based on *The Word Identification Strategy* Pretest. Additional criteria included: (a) parent recognition of their child's need for decoding and comprehension improvement, (b) parental informed

consent for their child to participate in the study, and (c) student assent to participate in the study.

Participant Demographic Data

Based on the previously described criteria, six students were eligible to participate in the study. Of these six students one chose not to continue in the study after the second baseline probe. Thus, the study continued with five participants.

Participant 1 was a male African American. He was in seventh grade and was 13.3 years old. His Verbal IQ and Performance IQ were 105 and 112 respectively. His Full Scale IQ was 108. He scored on the *Woodcock Johnson III Tests of Achievement* (*WJTA*) (Woodcock, McGrew, & Mather, 2001) *Reading Fluency Subtest* and *Reading Comprehension Subtest* grade equivalent scores of 4.4 and 4.5 respectively. He was eligible for special education services in reading, written expression, and mathematics. Participant 2 was a male and white. He was in seventh grade and was 13.2 years old. Information was not available for Verbal IQ. His Performance IQ was 87 and his Full Scale IQ was 90. He scored on the *WJTA* (Woodcock et al., 2001) *Reading Fluency Subtest* and *Reading Comprehension Subtest* grade equivalent scores of 3.4 and 2.6 respectively. He was eligible for special education services in reading and written expression. He also was eligible for speech and language therapy. Participant 3 was a female and African American. She was in sixth grade and was 11.2 years old. Her Verbal IQ and Performance IQ were 88 and 90 respectively. Her Full Scale IQ was 88. She scored on the *WJTA* (Woodcock et al.) *Reading Fluency Subtest* and *Reading Comprehension Subtest* grade equivalent scores of 2.2 and 4.0 respectively. She was eligible for special education services in reading, written expression, and mathematics.

Participant 4 was a male and white. He was in fifth grade and was 10.2 years old. His Verbal IQ and Performance IQ were 75 and 97 respectively. His Full Scale IQ was 85. He scored on the *WJTA* (Woodcock et al.) *Reading Fluency Subtest* and *Reading Comprehension Subtest* grade equivalent scores of 2.8 and 2.3 respectively. He was eligible for special education services in reading, written expression, and mathematics. He also was eligible for speech and language therapy. Participant 5 was a female and white. She was in fifth grade and was 10.2 years old. Her Verbal IQ and Performance IQ were 89 and 102 respectively. Her Full Scale IQ was 93. She scored on the *WJTA* (Woodcock et al.) *Reading Fluency Subtest* and *Reading Comprehension Subtest* grade equivalent scores of 2.3 and 2.3 respectively. She was eligible for special education services in reading, written expression, and mathematics. She also was eligible for speech and language therapy.

In summary, all five participants met the State of Nevada Administrative Code eligibility criteria for specific learning disabilities. Three participants were male; two participants were female. Three were white; two were African American. The participants ranged in age from 10.2 to 13.3. The mean age was 11.6. The participants were in grades five through seven. Table 1 displays the demographic data for each of the five participants.

Setting

The study took place in a distance education charter school located in a metropolitan city in the southwestern United States. The charter school was open to any

Table 1

Participant Demographics

Participant	1	2	3	4	5
Gender	Male	Male	Female	Male	Female
Ethnicity	Black	White	Black	White	White
Age	13.3	13.2	11.2	10.2	10.2
Grade	7	7	6	5	5
Verbal IQ	105	NA	88	75	89
Performance IQ	112	87	90	97	102
Full Scale IQ	108	90	88	85	93
WJTA Reading *Fluency* G.E.	4.4	3.4	2.2	2.8	2.3
WJTA Reading Comprehension G.E.	4.5	2.6	4.0	2.3	2.3

student living within the boundaries of the local school district. The school district was a county district including an area of approximately 100 square miles. The charter school operated under the state's distance education and charter school laws. The charter school's design met state approval and was overseen by the local school district. The charter school was certified through the Northwest Association of Accredited Schools.

The delivery model for K-7th grades in the charter school was through the presentation of instruction online. Students accessed and completed coursework through the charter school's Internet platform. All coursework was based on the instructional objectives and goals of the student's grade level. A general education teacher was assigned to each student. The student had a one hour weekly visit with the teacher either in the student's home or at a local library. The general education teacher met with the parent and the child to teach new skills and present the weekly assignments. Additionally, students with learning disabilities had a one-hour weekly visit with a special education teacher. The student received direct instruction based on their annual goals and benchmarks as indicated in the student's Individual Education Plan (IEP). The special education teacher and the general education teacher collaborated weekly to determine accommodations and modifications to the students' online assignments based on the student's instructional needs. Furthermore, the students and teachers communicated online as needed through emailing, instant messaging, and bulletin boards.

For the purpose of this study, all instructional and response assignments were sent via email. The instructional assignments were developed on *Photo Story 3 for Windows* and viewed through a *Windows Media Player 2008.*

Instrumentation

Pre- and Posttests

Prior to beginning *The Word Identification Strategy* (Lenz et al., 2007) instruction, the two reading subtests of the *Woodcock Johnson III Tests of Achievement* (*WJTA*) (Woodcock et al., 2001), *The Word Identification Curriculum-Based Measures* (i.e.,

Prefix/Suffix Test, Oral Reading Test, Comprehension Test), and the *DISSECT Curriculum-Based Test* were administered to all five students. With the exception of the *Prefix/Suffix Test*, all other measures were administered as posttests upon completion of the instruction.

The *WJTA* (Woodcock et al., 2001) is a standardized test designed to measure academic achievement. The *WJTA* (Woodcock et al.) includes eight subtests, two of which assess reading skills (i.e., *Passage Comprehension* and *Reading Fluency*). This test was designed to assess students for learning disabilities and to provide standard and grade equivalent scores. In addition, the *WJTA* (Woodcock et al) was designed to identify student strengths and weakness as well as assess for academic growth. The test's validity was established using normative data gathered from 8,818 subjects in over 100 geographically diverse communities in the United States including 1,143 preschool subjects, 4,784 kindergarten to twelfth-grade subjects, 1,165 college and university subjects, and 1,843 adult subjects. The reliability data for *Passage Comprehension* and *Reading Fluency* range from .80 (low) to .94 (high) (see Appendix A). The *WJTA* (Woodcock et al) was used as a pretest and posttest.

The Word Identification Strategy Curriculum-Based Measures (*WIS CBM*). *WIS CBM* are included in *The Word Identification Strategy Instructor's Manual* (Lenz, et al., 2007). There are three curriculum-based measures including: (a) a *Prefix/Suffix Test*; (b) an *Oral Reading Test*; and (c) a *Comprehension Test*. The *Prefix/Suffix Test* consists of twenty words. The test is divided into two parts. In the first part, the students separate the prefixes within ten words by drawing a line between the prefix and the stem of the word; one word does not have a prefix. In the second part, the students separate the suffixes

from ten words by drawing a line between the suffix and the stem of the word; one word does not have a suffix. The student has to separate 80% of the prefixes and suffixes correctly to obtain mastery. The student has to achieve mastery on the *Prefix/Suffix Test* prior to receiving the strategy instruction.

The *Oral Reading Test* and the *Comprehension Test* are implemented at the student's grade level. The *Oral Reading Test* is a grade level passage consisting of approximately 400 words and at least five paragraphs. The student reads the passage aloud. The percentage of words read correctly is then determined. The *Comprehension Test* consists of ten multiple-choice questions that correspond with the previously read passage. These three curriculum-based measures (i.e., *Prefix/Suffix Test, Oral Reading Test,* and *Comprehension Test)* were used to determine the students' appropriateness to receive instruction in *The Word Identification Strategy* (Lenz et al., 2007). Additionally, for the purpose of this study, the *Oral Reading Test* and the *Comprehension Test* were used as a pretest and posttest measure. The reading passages and questions for the posttest were different from the pretest, but both were at grade-level (i.e., a sixth grade student had a passage written at the sixth grade level).

DISSECT Curriculum-Based Test. The *DISSECT Curriculum-Based Test* is a researcher-constructed instrument designed to measure the students' ability to use the steps of *The Word Identification Strategy* (Lenz et al., 2007) mnemonic device (i.e., DISSECT) on multisyllabic words (see Appendix B). The test includes 10 words that contain two or more syllables each. There are: (a) 8 words with a prefix, stem, and suffix, (b) 1 word with a prefix and a stem; and (c) 1 word with a suffix and a stem. The student was required to divide the words using a backslash or hyphen between the

syllables. The *DISSECT Curriculum-Based Test* was used as a pretest and posttest measure.

On-going Monitoring Probes

Two *Word Identification Strategy Probes* were used for ongoing monitoring of student performance throughout the study. The first probe was the *Oral Reading Probe*. The student orally read a 400-word passage at his or her instructional or grade level (depending on the instructional stage/lesson) and recorded the reading using the sound recording software, *Audio MP3 Sound Recorder*. The student then sent the sound file to the researcher for analysis. The researcher counted the number of words misread and calculated the percentage of words read correctly out of the total number of words. The second probe was the *Comprehension Probe.* This probe consisted of ten multiple-choice questions about the passage. These two probes were used to measure baseline, intervention, generalization and maintenance performance (see Appendices C and D).

Word Identification Satisfaction Questionnaire

The *Word Identification Satisfaction Questionnaire* is a questionnaire designed by the researcher to evaluate the level of satisfaction of the participants. The questionnaire consists of 10 questions designed to measure the participant's level of satisfaction with the online instruction and the participant's perception of progress in reading decoding and comprehension. The questionnaire is based on a five-point Likert scale with 1 being least satisfied and 5 being most satisfied (see Appendix E). The participants filled out the questionnaire at the end of the study.

Materials and Equipment

The Word Identification Strategy Instructor's Manual (Lenz et al., 2007)

The Word Identification Strategy Instructor's Manual (Lenz et al., 2007) includes systematic and explicit instructions for teaching the strategy and scoring student work. The manual includes background information about the *Learning Strategies Curriculum* of which this strategy is a part, the benefit of teaching learning strategies, and the management of the instruction in a classroom setting. The manual also includes scripted lessons to be used during eight instructional stages (i.e., pretest, describe, model, verbal practice, controlled practice, advanced practice, posttest, and generalization). Also included in the manual, for each instructional stage, are goals and rationales, the required materials, required preparation, approximate time needed for each lesson, cue cards, and information on how to trouble shoot when students have difficulty with the strategy. The manual includes all student materials for the instructor except for grade level reading passages. However, commercially available passages are recommended in the manual.

Student Folders

The researcher organized two student folders for each participant, one for the researcher and one for the student. Each folder was labeled with the student's name and the strategy name. The researcher's folder included the student's pretest and curriculum-based measures and probes, the verbal practice checklist, and student's progress chart. In addition, the student's scored oral reading probes and comprehension tests and probes were included in the researcher's folder. The student's folder included the student's affirmation and the student's progress chart. Also, in the student's folder, a reading *Assignment Sheet* to keep track of the titles of the *Oral Reading Probes* was included for

use during strategy instruction. On the back of the folder, a manila envelope large enough to hold letter-sized paper was attached to the folder. The envelope held the cue cards the student needed during the strategy instruction.

Timed Readings

The *Timed Readings* (Spargo, 1989) series consists of ten books. Book One includes reading passages written at the fourth grade level. Book Two includes reading passages written at the fifth grade level. Similarly, the reading passages in each subsequent book advance one grade level. The final book in the series is written at college level. All passages in each grade level book include at least five paragraphs, approximately 400 words, and ten multiple choice comprehension questions. The books also include answer keys for the comprehension questions.

Photo Story 3 Media Lessons

Microsoft Office *PowerPoint 2007* was used to create quality presentations in a slide presentation format. The slides were designed with a consistent background and font. Graphics, hyperlinks, and video streaming were inserted into the slides as needed. The *PowerPoint 2007* slides were saved in a jpg format and uploaded into *Photo Story 3 for Windows*. The information on each slide was then recorded to provide text to speech. The final product was viewed on a *Windows Media Player 2008.*

Sound Recording Software

Audio MP3 Sound Recorder was used to record student oral reading. The student downloaded the sound recording software into their home computer. The software allowed students to record themselves using a plug in microphone. The student orally

read the assigned passage and created a sound file. The student emailed the sound recording to the researcher for analysis.

Design

A multiple-probe design across subjects (Horner & Baer, 1978) with one replication was used in this study. In a multiple probe design, after a series of continuous baseline probes are collected, the independent variable is introduced to the first participant. The remaining participants remain in baseline and receive intermittent baseline probe trials until Participant 1 reaches a predetermined performance criteria (Tawney & Gast, 1984). The probe trials in this study were conducted once a week. These baseline probe trials provide the researcher with information on whether or not the participants improve on the dependent variable prior to intervention. When the first participant reaches criteria, another baseline probe trial is administered to the remaining participants and the independent variable is introduced to the second participant. If there is a third participant, this systematic process of administering baseline probe trials and systematically introducing the independent variable to the third participant occurs. If the participants respond to the probes consistently and the dependent variable improves only after the intervention is introduced, a functional relationship has been demonstrated (Tawney & Gast).

There were three design conditions in this study: baseline, instruction and maintenance. The five participants formed one triad and one dyad for replication purposes. The triad consisted of Participant 1, Participant 2, and Participant 3.The dyad

consisted of Participant 4 and Participant 5. See Appendix F and G for an outline of the Implementation Schedule.

Baseline Condition

Once pretesting was completed, the multiple probe study began with Participant 1, Participant 2, and Participant 3 receiving baseline probe trials at their grade level (i.e., *Oral Reading Probe* and *Comprehension Probe*). These two baseline probes were administered to these three participants over four sessions. Subsequent to the initial four days of the Baseline condition, Participant 1 began Preliminary Strategy Instruction and the two participants who were not receiving Preliminary Strategy Instruction continued to receive baseline probe trials (at their grade level) once a week. When Participant 1 discontinued baseline and attained mastery of the Controlled Practice Stage of instruction, the second participant in the triad began Preliminary Strategy Instruction. Participant 3 continued to receive a baseline probe once a week until Participant 2 attained mastery of the Controlled Practice Stage of instruction.

A month later baseline data collection began with Participant 4 and Participant 5. The baseline procedures used with Participants 1-3 were replicated with Participants 4 and 5.

Instruction Condition

Preliminary Strategy Instruction. During Preliminary Strategy Instruction, participants completed four stages of instruction (i.e., Receive Feedback and Make Commitments, Describe, Model, and Verbal Practice) in *The Word Identification Strategy* (Lenz et al., 2007). The lessons were comprised of a video media lesson and a video media lesson worksheet that were designed based on the lessons found in *The Word Identification Strategy Instructor's Manual.*

Controlled practice. Following the Verbal Practice Stage within the Preliminary Strategy Instruction, participants began the fifth stage of instruction (i.e., Controlled practice). During the Controlled Practice Stage of instruction, participants received a video media lesson and video media lesson worksheet followed by *The Word Identification Strategy Probes* (at their instructional level) on a continuous basis. The Controlled Practice Stage continued until participants achieved 99% mastery on oral reading and 60% mastery on comprehension at instructional level as established in *The Word Identification Strategy Instructor's Manual* (Lenz et al., 2007).

Advanced practice. Participants then progressed to the sixth stage of instruction (i.e., Advanced practice). Beginning in the Advanced Practice Stage of instruction, participants received a video media lesson and video media lesson worksheet followed by *The Word Identification Strategy Probes* at their grade level. The Advanced Practice Stage continued until the participants achieved 99% mastery on oral reading and 60% mastery on comprehension at their grade level as established in *The Word Identification Instructor's Manual* (Lenz et al., 2007).

Generalization. Participants then progressed to the Generalization Stage of instruction. During the Generalization Stage, participants received a video media lesson and video media lesson worksheet followed by grade level content area assignments for a period of three days. *The Word Identification Strategy Probes* at grade level were designed to correlate with content area assignments (i.e., English, Social Studies, and Science).

Maintenance Condition

Two weeks after *The Word Identification Strategy* (Lenz et al., 2007) instruction, including Generalization, ended, Maintenance Probes were given (i.e., *Oral Reading Probe* and *Comprehension Probe*). These probes were administered to determine the degree to which students maintained their skills after two weeks without instruction or review related to *The Word Identification Strategy* (Lenz et al.).

Procedures

There were six phases in this study. These phases were as follows: (a) preparation for study, (b) training of research assistants, (c) pretest and baseline, (d) implementation of *The Word Identification Strategy* (Lenz et al., 2007), (e) post-assessments, and (f) maintenance condition.

Phase 1: Preparation for Study

Obtaining permission and informational meeting. Permission to implement the study was obtained from the University Office for the Protection of Research Subjects (OPRS) and from the charter school. Phone calls to parents were made to explain the study and obtain potential interest in participating in the study. Additionally, parents were queried to determine whether they believed their child needed assistance in reading decoding and reading comprehension.

After these initial phone calls, a group meeting was held with the recruited parents and participants to explain the study's rationales and procedures, complete consent and assent forms, as well as provide a timeline of events. The parental consent and student assent forms contained a description of the study and student expectations. The forms

included the phone contact information and email address of the researcher in case the parents wished to contact the researcher during the study (see Appendix J).

Also, during this group meeting, the parents and the students were given direct instruction on how to complete the assignments using *Photo Story3 for Windows* media and how to use *Audio MP3 Sound Recorder* software. The researcher discussed parental responsibilities during the study (i.e., parents were to ensure that the student completed the daily assessment probes and provide prompting during guided practice). The students were told to do the assignments to their best ability and that if they committed to learning the strategy, reading might become much easier. The parents and the students were also informed that each assignment counted as part of their weekly assignment time on task. Next, the students were informed that their teachers added the percentage grades earned on daily strategy assignments to their Language Arts grade and that the grades were included on the school's quarterly progress reports. Finally, any questions or concerns that the parents and students had were discussed.

Material development. Another aspect of this preparation phase was the development of online materials using *The Word Identification Strategy Instructor's Manual* (Lenz, et al., 2007) to determine lesson content. *PowerPoint 2007* slides were developed to correlate with the scripted lessons for seven instructional stages (i.e., receive feedback and make commitments, describe, model, verbal practice, controlled practice, advanced practice, and generalization) included in the instructor's manual. The *PowerPoint 2007* slides were saved in a jpg format and uploaded into *Photo Story3 for Windows*. A slideshow was developed with embedded voice recordings of the text.

Photo Story3 for Windows media lessons. Photo Story3 for Windows media lessons began with an Advance Organizer that "set the stage" for learning, reviewed the previous lesson, and explained the rationales and expectations of each lesson. The *Photo Story3 for Windows media lessons* were recorded so students could listen and read the lesson. The *Photo Story3 for Windows media lessons* included a lesson worksheet. All *Photo Story3 for Windows media lessons* ended with a Post Organizer that summarized the lesson and previewed the next lesson.

Photo Story3 for Windows media lesson worksheets. Along with the *Photo Story3 for Windows media lessons*, students were emailed a *Photo Story3 for Windows media lesson worksheet* that was developed using a cloze format (see Appendix I). Cloze format provided the student with a fill-in-the-blank structure to highlight vocabulary in context. The students filled out their *Photo Story3 for Windows media lesson worksheet* with the missing vocabulary words while they listened and read the *Photo Story3 for Windows media lesson*. The blanks on the worksheet were numbered. The student emailed the answers back to the researcher for grading. The worksheets were designed to help keep the student focused on the assignment.

Video streaming lesson. The *Model Stage* was developed using digital recorded video to provide the students with a visual and audio example of the modeling process. The completed video was edited with *Windows Movie Maker*. Then, the recording was exported into .wmv web streaming video clips for downloading. The Model Lesson included three parts: (a) the introduction to modeling, (b) the downloaded video clip with the demonstration lesson, and (c) the final part of the lesson that included student participation and a post organizer.

DISSECT practice worksheets. During the Controlled Practice Stage and Advanced Practice Stage, students completed *Oral Reading Probes* at their instructional and grade levels respectively. With each *Oral Reading Probe*, students completed a *DISSECT Practice Worksheet* before orally reading the passage (see Appendix H). The worksheet contained ten multisyllabic words from the reading selection. The student used the steps of DISSECT and the Rules of Twos and Threes to break apart the multisyllabic words (see Appendix K).

Phase 2. Training of Research Assistants

The researcher held one training session with each of two research assistants. The first research assistant was a doctoral student in special education at the university. During the session for this assistant, the researcher provided an overview of the five recruited participants and the characteristics of specific learning disabilities. The importance of confidentiality was discussed with the research assistant. Next, *The Word Identification Strategy Instructor's Manual* (Lenz et al., 2007) was previewed along with the rationales and timeline of the research study. The research assistant was given a copy of *The Word Identification Strategy Instructor's Manual* (Lenz et al.) to review and use during the implementation of the project. The researcher trained the research assistant in *The Word Identification Strategy Instructor's Manual* (Lenz et al.) by previewing each stage of the strategy. The responsibilities of the research assistant were discussed including how to score the students' performance on the *Oral Reading Probes* and *Comprehension Probes*.

The researcher discussed and modeled how to score the pre- and posttests. The researcher discussed the test record and the scoring of the subtests used in the *WJTA*

(Woodcock et al., 2001) (i.e., *Reading Fluency* and *Passage Comprehension*). The research assistant practiced scoring until 100% agreement was met on three sample tests using the formula agreements ÷ (agreements + disagreements) X 100 (Tawney & Gast, 1984). Next, the researcher discussed and modeled how to score the *WIS-CBM* (i.e., *Prefix/Suffix Test, Oral Reading Test,* and *Comprehension Test*), and the *DISSECT Curriculum-Based Test*. The researcher trained the research assistant to score the *Prefix/Suffix Test*. The research assistant was given the correct responses for the test and demonstrated 100% agreement on three *Prefix/Suffix Tests*. Scoring practice continued until these criteria were met. The researcher trained the research assistant to score the *Oral Reading Test*. The research assistant practiced scoring the *Oral Reading Test* read by the researcher until 90% agreement (i.e., agreements ÷ (agreements + disagreements) X 100) was met on three oral reading tests. The *Comprehension Tests* included multiple choice responses. The research assistant was given the correct responses to the tests and demonstrated 100% agreement on three *Comprehension Tests*. Scoring practice continued until these criteria were met. Then, the answer guide to the *DISSECT Curriculum-Based Test* was provided to the research assistant. The research assistant demonstrated 100% agreement on three *DISSECT Curriculum-Based Tests.* Scoring practice continued until these criteria were met.

Finally, the researcher discussed and modeled how to use the mnemonic device, DISSECT and the Rules of Twos and Threes (see Appendix K). The researcher trained the research assistant to score *Oral Reading Probes*. The research assistant practiced scoring *Oral Reading Probes* by listening to passages read orally via *Audio MP3 Sound Recorder* until 90% agreement (i.e., agreements ÷ (agreements + disagreements) X 100)

was met on three oral reading probes. *Comprehension Probes* were multiple-choice responses. The research assistant was given the correct responses to the probes and demonstrated 100% agreement on three comprehension probes.

The online instruction format was reviewed with the research assistant including how to conduct fidelity of treatment observations using the Fidelity of Treatment checklist. The criterion for fidelity of treatment observation practice was set at 80%. Once this criterion was met, the training session ended (see Appendix L). All video lessons, oral reading probes, *DISSECT practice worksheets*, and comprehension probes were emailed to the research assistant; pre- and posttests were hand delivered.

The second research assistant was an assistant professor and a professional developer in Learning Strategies for the University of Kansas' Center for Research on Learning. The second research assistant was familiar with the *Word Identification Strategy* (Lenz et al., 2007) and had previously provided professional development to teachers on this strategy. The researcher held a phone session with the second research assistant to review the responsibilities related to fidelity of treatment observations of the online lessons using the Fidelity of Treatment checklist. The criterion for fidelity of treatment observation was 80%. Once this criterion was met, the training session ended (see Appendix L). All lessons were emailed to the second research assistant.

Phase 3: Pretest and Baseline

Before beginning strategy instruction, the participants were administered the reading subtests from the *WJTA* (Woodcock et al., 2001). The reading subtests were: (a) the *Passage Comprehension* and (b) the *Reading Fluency* subtests. The reading subtests

provided grade level equivalent scores on a standardized assessment. The assessments were administered individually in one face-to-face session on the school campus.

Additionally, the *WIS-CBM* from *The Word Identification Strategy Instructor's Manual's* (Lenz et al., 2007) were administered to each student individually on the school campus. Participants identified nine prefixes in ten words and nine suffixes in ten words on the first pretest, the *Prefix/Suffix Test*. Participants had to attain 80% mastery to begin strategy instruction. All students met the requirement. Then the second pretest, the *Oral Reading Test*, was administered to the students. The students orally read a 400 word passage from the *Timed Readings* (Spargo, 1989) series at their grade level to the researcher. The *Oral Reading Test* was analyzed and the number of words read correctly was calculated as an oral reading pretest. The correlating *Comprehension Tes*t was then administered to the student. The student completed the *Comprehension Test* without reviewing the reading passage. The researcher calculated the percentage of answers correct. The researcher recorded the *Oral Reading Test* score and the *Comprehension Test* score on the Student's *Word Identification Progress Chart* in the researcher's folder. The student also recorded the scores in his or her student folder.

During ongoing baseline monitoring, two *Word Identification Probes* at grade level were administered to each participant. The *Oral Reading Probe* (i.e., the sound recording of reading on a grade level passage) and *Comprehension Probe* (i.e., 10 multiple choice comprehension questions) were sent to each student via email. The students completed the probes and returned the probes via email to the researcher for analysis.

Phase 4: Implementation of The Word Identification Strategy

Preliminary strategy instruction. After a minimum of four days of baseline probes, implementation of *The Word Identification Strategy* (Lenz et al., 2007) began according to the implementation schedules (see Appendices F and G). The researcher delivered online instruction using *Photo Story 3 for Windows* media to match the scripted lessons found in *Word Identification Strategy Instructor's Manual's* (Lenz et al.). Preliminary strategy instruction includes the following four stages: (a) Receive Pretest Feedback and Make Commitments; (b) Describe, (c) Model, and (d) Verbal Practice

The first stage of preliminary strategy instruction is the Receive Pretest Feedback and Make Commitments. Prior to the initiation of online instruction, the researcher provided feedback to the student related to the results of the pretests previously administered. The results were discussed privately with the student and the parent on the school campus. Online *Photo Story 3 for Windows media lessons* began with a brief description of the strategy including a formula for success and making a commitment to learn the strategy. The formula for success involved a discussion of how the strategy in combination with the student's effort leads to success. The researcher emailed her commitment to teach the strategy to the best of her ability to the student in hopes of creating a partnership with the student to learn the strategy. Students emailed the researcher a statement containing their goals and commitment to learn the strategy.

The second stage of preliminary strategy instruction is the Describe Stage. The Describe Stage consists of an overview of *The Word Identification Strategy* (Lenz et al., 2007) via a *Photo Story* 3 *for Windows* media lesson. The lesson included: (a) an overview of the rationales of the strategy, (b) where and when the strategy can be used,

(c) the results a student can expect after learning the strategy, and (d) a description of each step of the mnemonic device DISSECT (i.e., D-Discover the sounds and the context; I-Isolate the beginning; S-Separate the ending; S-Say the stem; E-examine the stem; C-Check with someone, and T-Try the dictionary). The student completed the *Photo Story* 3 *for Windows media lesson worksheet.* The student and the researcher recorded the student's completion date of the Describe Stage in their respective folders.

The third stage of preliminary strategy instruction is the Model Stage. The Model Stage consisted of a demonstration of the strategy. The researcher was video recorded during the model stage. The researcher demonstrated how to use the steps of the mnemonic DISSECT while reading a *Timed Readings* (Spargo, 1989) passage. While the researcher orally read the passage, the researcher modeled the strategy by "thinking aloud" to demonstrate the metacognitive process while implementing the steps of DISSECT. The video recording was uploaded on the school's server. The student was sent the lesson through email to view the demonstration. During the last part of the demonstration, the student was asked to participate and dissect several words found in the *Photo Story 3 for Windows media lesson worksheet* as the researcher demonstrated the process. The modeling demonstration ended with a post organizer that included a summary of the lesson and a preview of the next lesson. Students filled out the *Photo Story 3 for Windows media lesson worksheet* while viewing the *Photo Story 3 for Windows media lesson.* The student and the researcher recorded the student's completion date for the Model Stage in their respective folders.

The fourth stage of preliminary strategy instruction is the Verbal Practice Stage. During Verbal Practice, the student memorized the steps of the mnemonic device

DISSECT. Verbal practice began with an advance organizer. The advance organizer included a review of the previous lesson, statement of the purpose, and the rationale and expectations for memorizing the steps of DISSECT. Students filled out the *Photo Story 3 for Windows media lesson worksheet* while viewing the *Photo Story 3 for Windows media lesson.* Verbal elaboration of each step of the strategy was reviewed.

A second *Photo Story 3 for Windows media lesson* and *Photo Story 3 for Windows media lesson worksheet* were sent to the student via email that involved practice of The Rules of Twos and Threes for breaking apart and sounding out the stem of unknown words (see Appendix K). The second *Photo Story 3 for Windows media lesson* thoroughly demonstrated and explained the procedures and included student participation in breaking apart the stem of twenty words.

The students were directed to complete three types of verbal practice worksheets for three consecutive days. Students were told to memorize the mnemonic DISSECT and the Rules of Twos and Threes to a mastery level of 100%. Students completed the three worksheets daily for three days. The three worksheets were: (a) learning the mnemonic DISSECT, (b) memorizing the Rules of Twos and Threes, and (c) demonstrating breaking apart multisyllabic words using DISSECT and the Rules of Twos and Threes. The completed worksheets were emailed to the researcher for grading. The student and the researcher recorded the student's completion date of Verbal Practice Stage in their respective folders.

Strategy practice. After mastering the Verbal Practice Stage, participants applied the strategy while orally reading. Participants practiced the strategy in three stages: (a) controlled practice, (b) advanced practice, and (c) generalization.

The first stage of strategy practice is the Controlled Practice Stage of instruction. The Controlled Practice Stage of instruction provided an opportunity for the students to practice *The Word Identification Strategy* (Lenz et al., 2007) at their instructional level. The student's instructional level was determined using the Reading Subtests on the *WJTA* (Woodcock et al., 2001). The student received via email, *Timed Readings* (Spargo, 1989) passages at their instructional level, 10 words from the passage to dissect, and ten comprehension questions. The student recorded his or her oral reading with the sound recording software.

During Controlled Practice Stage of instruction, the participants' parent or sibling was instructed to prompt the participant to use DISSECT (i.e., D- Discover the sounds and context, I-Isolate the beginning, S-Separate the ending, S-Say the Stem, and E-Examine the stem with the Rules of Twos and Threes, C-Check with someone, and T-Try the dictionary). The parent or sibling was instructed not to give the word until the participant worked through each step of DISSECT. If the participant completed the first five steps of DISSECT and still could not figure out the word, then the participant could use step 6 (C-Check with someone) and ask for the word.

After completing the assignments, the student emailed the sound file, the 10 dissected words and the answers to the comprehension questions to the researcher. The student completed Controlled Practice Stage of instruction when they demonstrated the following criteria: (a) 99% on the oral reading and (b) 60% or higher mastery on the comprehension questions (per guidelines in *The Word Identification Instructor's Manual* (Lenz et al.). The student and the researcher recorded the student's completion date of Controlled Practice Stage of instruction and the scores on the probes in their respective folders.

The second stage of Strategy Practice is the Advanced Practice Stage of instruction. In the Advanced Practice Stage of instruction, students practiced and mastered *The Word Identification Strategy* (Lenz et al., 2007) in *Timed Readings* (Spargo, 1989) at their grade level. The student recorded their oral reading with the sound recording software. The student emailed the sound file, the 10 dissected words, and the answers to the comprehension questions to the researcher. When the student demonstrated a criterion of: (a) 99% mastery on oral reading and (b) 60% on the comprehension questions (per guidelines established in *The Word Identification Strategy Instructor's Manual* (Lenz et al.), the student successfully completed the Advanced Practice Stage of instruction. The student and the researcher recorded the student's completion date of the Advanced Practice Stage of instruction and the scores on the probes in their respective folders.

The third stage of Strategy Practice is the Generalization Stage. The Generalization Stage consisted of a *Photo Story 3 for Windows media lesson* and *Photo Story 3 for Windows media lesson worksheet* explaining the rationales for generalization. In the Generalization Stage, students applied *The Word Identification Strategy* (Lenz et al., 2007) in content area class assignments. The general education teacher and the researcher collaboratively determined an assignment schedule for the week. *The Word Identification Strategy Probes* were developed which correlated with content area assignments in science, social studies and English. For 3 days, the students received via email a reading assignment related to a content area class (i.e., science, social studies, and English), 10 words from the passage to dissect, and ten comprehension questions. The student recorded their oral reading with the sound recording software. The student emailed the sound file, the 10 dissected words and the answers to the comprehension questions to the

researcher. The student and the researcher recorded the student's completion date of the Generalization Stage and the scores on *The Word Identification Strategy Probes* in their respective folders.

After each *Oral Reading Probe* during the Controlled Practice, Advanced Practice, and Generalization Stages of instruction, the researcher emailed feedback to the participants. The researcher evaluated the students' oral readings. Then, the researcher emailed at least three positive comments about their oral reading and the words the participant figured out correctly. Included in the email were the words that the participant had incorrectly broken apart and mispronounced with the correct divisions and pronunciations. Finally, the researcher gave instruction in any phonetic skill that the participant did not use correctly while oral reading.

Phase 5: Post-Assessments

The post-assessments were administered individually in one face-to-face session on the school campus. First, the participants were administered the reading subtests from the *WJTA* (Woodcock et al., 2001). The reading subtests were: (a) the *Passage Comprehension* and (b) the *Reading Fluency* subtests. The reading subtests provided grade equivalent scores on a standardized assessment.

Additionally, *WIS-CBM* were administered to the students. The first curriculum-based measure, the *Oral Reading Test* was a 400-word passage from the *Timed Readings* (Spargo, 1989) series at their grade level. The students orally read the passage to the researcher. The number of words read correctly was divided by the total number of words in the passage to determine the student's oral reading percentage score. The correlating *Comprehension Te*st was given to the student. The student completed the *Comprehension*

Test without reviewing the reading passage. The researcher calculated the percentage of answers correct. The researcher recorded the *Oral Reading Test* score and the *Comprehension Test* score on the Student's *Word Identification Progress Chart* in the researcher's folder. The student also recorded the scores in his or her student folder.

Next, the *DISSECT Curriculum-Based Test* was administered to measure the students' ability to use the steps of *The Word Identification Strategy* (Lenz et al., 2007) mnemonic device (i.e., DISSECT) on multisyllabic words (see Appendix B). The test included 10 words that contained two or more syllables each. The words included (a) eight words with a prefix, stem, and suffix, (b) one word with a prefix and a stem; and (c) one word with a suffix and a stem. The student was required to divide the words using a backslash or hyphen between the syllables.

Finally, to assess social validity of the study, the participants filled out the *Word Identification Satisfaction Questionnaire*. Social validity authenticates the importance of the intervention effects to the participant (Wolf, 1978). The questionnaire consists of 10 questions designed to measure the participant's level of satisfaction with the online instruction and the participant's perception of progress in reading decoding and comprehension. The participants rated each statement on a scale from 1 to 5 with 5 being the most favorable (see Appendix E).

The test results were communicated to the student and the parent via email. The student was sent an online certificate congratulating him or her for success and effort. The researcher and the student recorded the *Post Assessment* scores on the *Word Identification Progress Chart* in their respective folders.

Phase 6: Maintenance

Two weeks after the *Post-Assessments,* another *Oral Reading Probe* and *Comprehension Probe* were administered per the parameters of multiple probe design data collection (i.e., ongoing performance measures graphed throughout the study are repeated after a break from instruction). First, the participant orally read and recorded a 400-word passage at their grade level. The researcher counted the number of words misread and calculated the percentage of words read correctly out of the total number of words. Second, the participant completed the *Comprehension Probe* that consisted of ten multiple-choice questions about the passage.

The researcher and the student recorded the final *Maintenance Probes* on the *Word Identification Progress Chart* in their respective folders. The researcher, the student, and the parent met to discuss the student's results obtained in the study; student folders were collected during the conference.

Interscorer Reliability

The researcher scored each student on the pre- and posttests: (a) *WJTA* (Woodcock et al., 2001), (b) the *WIS-CBM* (i.e., *Prefix/Suffix Test, Oral Reading Test*, and *Comprehension Test*), and (c) the *DISSECT Curriculum-Based Test.* To determine interscorer reliability, the first research assistant scored 20% of the *WJTA* (Woodcock et al.) subtests, the *WIS-CBM* (i.e., *Prefix/Suffix Test, Oral Reading Test,* and *Comprehension Test*), and the *DISSECT Curriculum-Based Tests*. The primary scorer was the researcher and the secondary scorer was the research assistant. An agreement was considered when both the researcher and the research assistant recorded the same score

for an answer. The formula agreements ÷ (agreements + disagreements) X 100 was used to determine reliability levels (Tawney & Gast, 1984). In addition, the researcher scored all *The Word Identification Strategy Probes* (*Oral Reading Probe* and *Comprehension Probe*) as the primary scorer. The first research assistant scored 20% of *The Word Identification Strategy Probes* as the secondary scorer. An agreement was considered when both the researcher and the research assistant recorded the same score for an answer. The formula agreements ÷ (agreements + disagreements) X 100 was be used to determine reliability levels (Tawney & Gast).

Fidelity of Treatment

To determine interobserver agreement related to fidelity of treatment, the two research assistants completed the fidelity of treatment checklist while viewing *The Word Identification Strategy* (Lenz et al., 2007) media lessons (see Appendix L). Items on the fidelity of treatment checklist were marked Yes to indicate compliance with *The Word Identification Strategy Instructor's Manual's* (Lenz et al.,) scripted lessons. The formula agreements ÷ (agreements + disagreements) X 100 was used to establish the fidelity of treatment level. The research assistants completed the fidelity of treatment checklists for the stages of instruction that have correlating *Photo Story 3 for Windows media lessons*.

Treatment of Data

Visual Analysis

Visual analysis of the participants' *Word Identification Strategy Instructional Probes* occurred to determine the effects of the online strategy instruction. Each participant's

performance was graphed according to the specifications of multiple probe designs (Horner & Baer, 1978). The level, trend, and variability of performance data were visually inspected to determine the effectiveness of the intervention. Level refers to the change in mean performance on the dependent variables from one design condition (e.g., baseline) to another (e.g. instruction). If online strategy instruction is successful, student performance on the dependent variables (e.g., *Oral Reading Probes* and *Comprehension Probes*) should increase when the intervention is introduced to the participants. Trend refers to the direction of the 'best-fit' straight line of the dependent variable data points. If the intervention is successful, there typically is an increase in the line's slope. Variability refers to the consistency of the data points around the mean. During the baseline phase, a steady trend with little variability is necessary before introducing the intervention. A successful intervention reveals little variability along the trend line during the treatment (i.e., online strategy instruction) condition. To demonstrate that the improvement in reading was due to the strategy instruction, the graphed data should reflect an increase in performance with little variability of the best-fit line during the intervention phase. By replicating the study results with an additional two subjects (external validity), confidence is increased that the changes in reading performance were due to the intervention. Staggered introduction of the intervention using a multiple probe design helps determine intervention effectiveness for multiple subjects (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005). Excel software was used to create single-subject design line graphs for this study.

Descriptive data are displayed in table format in Chapter 4. The table includes the pre- and posttest grade equivalent scores from *WJTA* (Woodcock et al, 2001)

(i.e., *Reading Fluency* and *Passage Comprehension*), the *Oral Reading Test*, the *Comprehension Test*, and the *DISSECT Curriculum Based Test* for each student. Descriptive data from *The Word Identification Satisfaction Questionnaire* are also displayed in table format. Frequency of participant responses and mean scores for each question are included.

Research Question Data Sets

Research Question 1: Does online instruction related to *The Word Identification Strategy* (Lenz et al., 2007)) improve the decoding skills of students with disabilities? Two data sets were used to answer this question. The first set of data was obtained from the *WIS-CBM*, the *Oral Reading Test* and the *DISSECT Curriculum Based Test*. The second set of data was obtained from *The Word Identification Strategy Probes* (i.e., the *Oral Reading Probe*) given throughout the instruction of *The Word Identification Strategy (*Lenz et al.).

Research Question 2: Does online instruction related to *The Word Identification Strategy* (Lenz et al., 2007) improve the comprehension skills of students with disabilities? Three data sets were used to answer this question. First, pre- and posttest data obtained from the *WJTA* (Woodcock et al., 2001) *Passage Comprehension Subtest* were compared to determine changes in comprehension abilities. The second set of data was obtained from the *WIS-CBM* (i.e., the *Comprehension Test*). The third set of data was obtained from *The Word Identification Strategy Probes* (i.e., the *Comprehension Probe*) given throughout the instruction of *The Word Identification Strategy (*Lenz et al.).

Research Question 3: Do students with disabilities maintain *The Word Identification Strategy* (Lenz, et al., 2007) skills 2 weeks after instruction has ended? Maintenance was

determined by administering the *Oral Reading Probe* and the *Comprehension Probe* at grade level. The *Oral Reading* and *Comprehension Probe* scores were graphed and through visual analysis, compared to the student's scores during the Advanced Practice and Generalization Stages of the instruction.

Research Question 4: How satisfied will students with disabilities be with online instruction of *The Word Identification Strategy* (Lenz et al., 2007)? *The Word Identification Satisfaction Questionnaire* was answered by the participants at the end of the study and was analyzed to determine satisfaction levels.

CHAPTER 4

DATA ANALYSIS

The purpose of this study was to investigate the effects of teaching *The Word Identification Strategy* (Lenz, Schumaker, Deshler, & Beals, 2007) through online modules to students with specific learning disabilities. Data were collected to answer four research questions related to the participants' ability to learn and use *The Word Identification Strategy* (Lenz et al., 2007). In addition, participants' satisfaction levels were assessed in relation to learning *The Word Identification Strategy* (Lenz et al.) through online modules. The first section of the chapter provides an overview of the collected data following the parameters of the multiple probe design. Second, the chapter provides the results related to the four research questions. Third, interscorer reliability and fidelity of treatment data are provided. Finally, the chapter concludes with a summary of the results obtained in this study.

Overview of Collected Data Using a Multiple Probe Design

According to the parameters of a multiple probe design, data collection was staggered (Horner & Baer, 1978). Five participants were arranged in one triad and one dyad. The research began with the triad and was replicated with the dyad beginning a month later. The dyad's performance was used to increase external validity (Barlow & Hersen, 1984). Student performance related to baseline, instruction (i.e., controlled practice, advanced practice, and generalization), and maintenance are displayed in Figures 1 and 2 and discussed in greater detail related to the research questions in this study.

Baseline Condition

The triad began the research study with baseline probes being administered to three participants on four consecutive days. The baseline probes consisted of *The Word Identification Strategy Probes* (i.e., *Oral Reading Probe* and *Comprehension Probe*) at the student's grade level. The researcher sent the reading selection and *Comprehension Probe* to the student via email. The student recorded himself or herself orally reading the probe with the Audio MP3 Player. Finally, the student sent the sound file and answers to the comprehension questions to the researcher for evaluation. All three students demonstrated relative stability on *Oral Reading Probes* during baseline. Stability on the *Oral Reading Probes* was used to determine initiation of the preliminary strategy instruction because these probes were more closely aligned with the primary purpose of *The Word Identification Strategy* (Lenz et al., 2007) (i.e., decoding) than the *Comprehension Probes*. Participant 1 began the preliminary strategy instruction. Participant 2 and Participant 3 continued to receive baseline probes once a week. When Participant 1 attained mastery level in controlled practice (i.e., 99% for Oral Reading and 60% for Comprehension), Participant 2 began the preliminary strategy instruction. When Participant 2 attained mastery level in controlled practice (i.e., 99% for Oral Reading and 60% for Comprehension), Participant 3 began the preliminary strategy instruction. Based on these criteria, prior to beginning the preliminary strategy instruction, Participant 1 received four baseline probes, Participant 2 received 10 baseline probes, and Participant 3 received 12 baseline probes. Baseline stability was achieved on the *Oral Reading Probes*

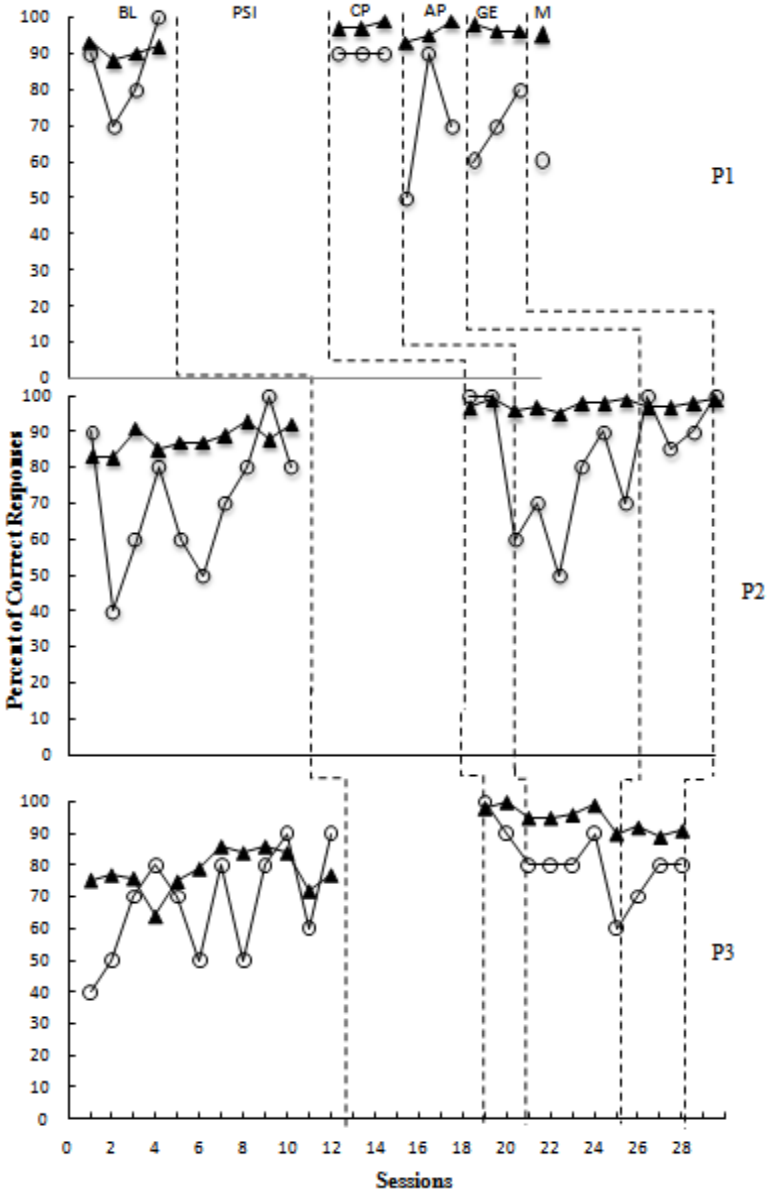

Figure 1. Percentage of strategic responses by Participants 1, 2, and 3.
Note. ▲ = Oral Reading; ○ = Comprehension
BL = Baseline; PSI = Preliminary Strategy Instruction; CP = Controlled Practice; AP = Advanced Practice; GEN = Generalization; M = Maintenance.

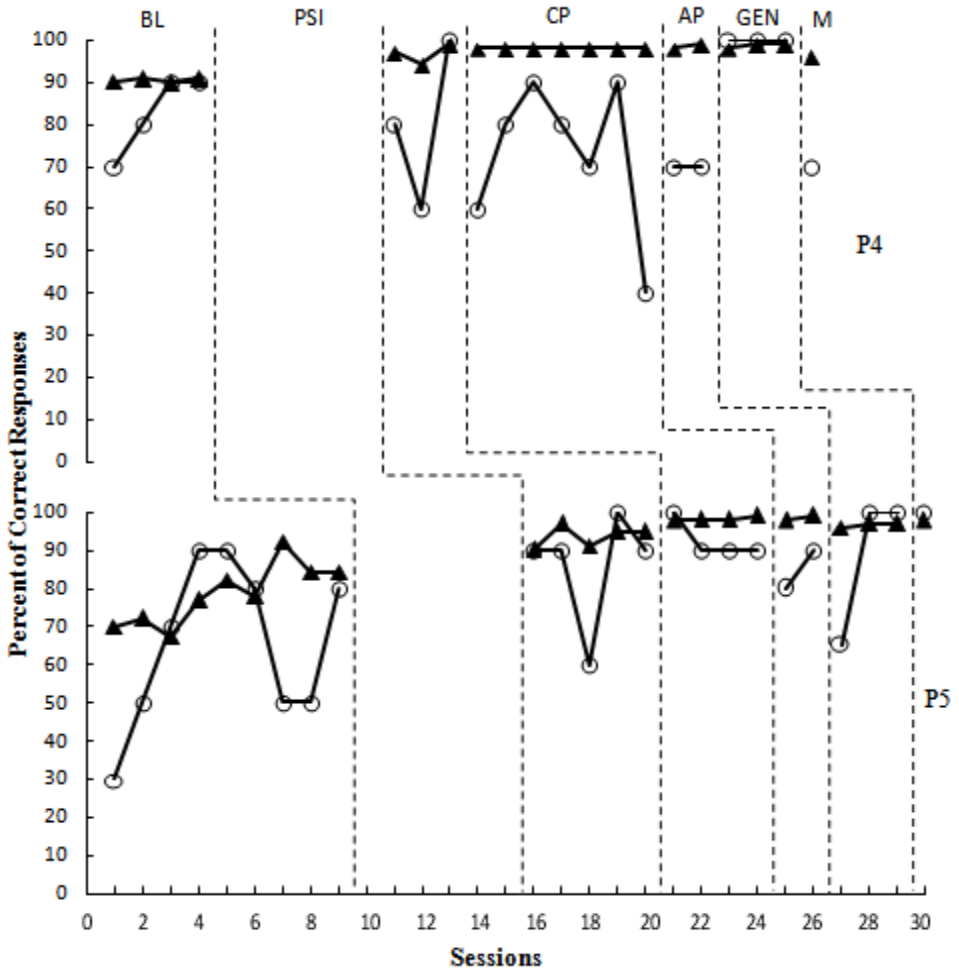

Figure 2: Percentage of strategic responses by Participants 4 and 5.
Note. ▲ = Oral Reading; ○ = Comprehension
BL = Baseline; PSI = Preliminary Strategy Instruction; CP = Controlled Practice;
AP = Advanced Practice; GEN = Generalization; M = Maintenance.

for all participants. The *Comprehension Probes* revealed more variability for all three participants.

The dyad began the research study one month later following the same criteria as the triad. Prior to beginning the preliminary strategy instruction, Participant 4 received four baseline probes; Participant 5 received nine baseline probes. Baseline stability was

achieved on the *Oral Reading Probes* for the participants. The *Comprehension Probes* revealed more variability for both participants.

Implementation of The Word Identification Strategy (Lenz et al., 2007)

Preliminary strategy instruction. During preliminary strategy instruction, participants completed four stages of instruction (i.e., Receive Feedback and Make Commitments, Describe, Model, and Verbal Practice) in *The Word Identification Strategy* (Lenz et al., 2007). The lessons were comprised of a video media lesson and a video media lesson worksheet that were designed based on the lessons found in *The Word Identification Strategy Instructor's Manual* (Lenz et al.). In total, preliminary strategy instruction included six video media lessons and video media lesson worksheets that were to be viewed on six consecutive days. In addition, participants were expected to memorize the mnemonic device DISSECT (i.e., D-Discover the sounds and the context; I-Isolate the beginning; S-Separate the ending; S-Say the stem; E-examine the stem; C-Check with someone, and T-Try the dictionary) in a three day period. Ideally, preliminary strategy instruction should have been completed in nine school days.

Due to the nature on online education (i.e., students initiate access to the lessons rather than a teacher delivering instruction at a prescribed time), the participants did not complete preliminary strategy instruction on consecutive days. Participant 1, 2, 3, 4, and 5 completed preliminary strategy instruction in 15 days, 10 days, 13 days, 18 days, and 14 days respectively. Clearly, the participants did not complete the lessons on nine consecutive days, in spite of being prompted to do so.

Controlled practice stage. During the Controlled Practice Stage of instruction, participants completed *The Word Identification Strategy Probes* (i.e., *Oral Reading*

Probe and *Comprehension Probe*) at instructional level. In addition, the participants completed the *DISSECT Practice Worksheet* before reading the selection. The worksheet contained ten multisyllabic words from the reading selection. Participants continued in the Controlled Practice Stage of instruction until *The Word Identification Strategy* (Lenz, et al., 2007) mastery criterion were met (i.e., at least 99% on the oral reading and at least 60% on the comprehension questions). Participants 1, 2, 3, 4, and 5 completed 3, 2, 2, 3, and 9 controlled practice probes respectively.

Advanced practice stage. During the Advanced Practice Stage of instruction, participants completed *The Word Identification Strategy Probes* (i.e., *Oral Reading Probe* and *Comprehension Probe*) at grade level. In addition, the participants completed the *DISSECT Practice Worksheet* before reading the selection. Participants continued in the Advanced Practice Stage of instruction until *The Word Identification Strategy* (Lenz, et al., 2007) mastery criterion were met (i.e., at least 99% on the oral reading and at least 60% on the comprehension questions). Participants 1, 2, 3, 4, and 5 completed 3, 6, 4, 9, and 2 advanced practice probes respectively.

Generalization stage. In the Generalization Stage of instruction, students completed three assignments at grade level. Assignments were completed in English, Science, and Social Studies. Assignments included a *DISSECT Practice Worksheet*, an *Oral Reading Probe* and a *Comprehension Probe*.

Maintenance phase. Two weeks after the Generalization Stage of instruction ended, students completed a maintenance probe at grade level. Both an *Oral Reading Probe* and a *Comprehension Probe* were administered.

Research Questions and Related Findings

Question1: Does online instruction related to the *Word Identification Strategy* (Lenz, et al., 2007) improve the decoding skills of students with learning disabilities?

Two data sets were used to answer this question. The first set of data was obtained from the *Word Identification Curriculum-Based Measures*: the *Oral Reading Test* and the *Dissect Curriculum Based Test*. The second set of data was obtained from the *Word Identification Strategy Probes* (i.e., the *Oral Reading Probe*) given throughout the instruction of *The Word Identification Strategy* (Lenz et al., 2007).

The pre- and posttest percentage scores for the *Oral Reading Test* were compared as evidence related to the strategy's effectiveness to improve oral reading. The *Oral Reading Test* involved reading a selection from *Timed Readings* (Spargo, 1989) at the participants' grade level; each reading passage contained 400 words. Pre- and posttest scores are reported as percentage scores based on the number of words the participant read correctly divided by 400.

The pretest and posttest scores for Participant 1 were 91% and 99% respectively representing an eight percentage point improvement. The pretest and posttest scores for Participant 2 were 92% and 98% respectively representing a six percentage point improvement. The pretest and posttest scores for Participant 3 were 70% and 95% representing a 25 percentage point improvement. The pretest and posttest scores for Participant 4 were 88% and 98% respectively representing a 10 percentage point improvement. The pretest and posttest scores for Participant 5 were 79% and 91% representing a 12 percentage point improvement. Thus, the percentage point

improvement on the *Oral Reading Test* ranged from 6 to 25 for the participants in this study (see Table 2).

Table 2

Participants' Pre- and Posttest Percentage Scores on the Word Identification Curriculum-Based Measure Oral Reading Test (ORT)

Participants	Pretest ORT	Posttest ORT	Percentage Point Improvement
Participant 1	91%	99%	8
Participant 2	92%	98%	6
Participant 3	70%	95%	25
Participant 4	88%	98%	10
Participant 5	79%	91%	12

The pre- and posttest percentage scores for the *DISSECT Curriculum Based Test* were compared as evidence related to the strategy's effectiveness to improve the participants' ability to break apart multisyllabic words according to *The Word Identification Strategy* (Lenz et al., 2007). The *DISSECT Curriculum Based Test* was a researcher-developed

assessment containing ten multisyllabic words. The same assessment was used for the pre- and posttest.

The pretest and posttest scores for Participant 1 were 30% and 90% respectively representing a 60 percentage point improvement. The pretest and posttest scores for Participant 2 were 20% and 90% respectively representing a 70 percentage point improvement. The pretest and posttest scores for Participant 3 were 20% and 70% respectively representing a 50 percentage point improvement. The pretest and posttest scores for Participant 4 were 30% and 80% respectively representing a 50 percentage point improvement. The pretest and posttest scores for Participant 5 were 30% and 80% respectively representing a 50 percentage point improvement. The percentage of improvement on the *DISSECT Curriculum Based Test* ranged from 50 to 70 percentage points for the participants in this study. All participants demonstrated substantial gains (see Table 3).

In addition to the curriculum-based data set (i.e., *Oral Reading Test* and *Dissect Curriculum Based Test),* a second data set was obtained from the *Word Identification Strategy Probes* (i.e., the *Oral Reading Probe*). All five participants were able to reach mastery performance on controlled practice *Oral Reading Probes* given at instructional level and advanced practice *Oral Reading Probes* given at grade level. It took participants between two and nine sessions to reach the prescribed mastery levels. Generalization *Oral Reading Probes* were given at grade level for three sessions in three subject areas (i.e., English, science, and social studies).

Baseline scores for Participant 1 on the *Oral Reading Probes* were 93%, 88%, 90%, 92%; scores for controlled practice *Oral Reading Probes* were 97%, 97%, and 99%;

scores for advanced practice *Oral Reading Probes* were 93%, 95%, and 99%; scores for generalization *Oral Reading Probes* were 98%, 96%, and 96%. Visual analysis of

Table 3

Participants' Pre- and Posttest Percentage Scores for on the Word Identification Curriculum-Based Measure for the DISSECT Curriculum-Based Test

Participants	Pretest DISSECT Curriculum Based Test	Posttest DISSECT Curriculum Based Test	Percentage Point Improvement
Participant 1	30%	90%	60
Participant 2	20%	90%	70
Participant 3	20%	70%	50
Participant 4	30%	80%	50
Participant 5	30%	80%	50

data indicated that the level of the oral reading probes increased from baseline condition to controlled practice in the instruction condition (see Figure 1). With regard to trend and variability, scores for Participant 1 revealed a steady increase in controlled practice performance after preliminary strategy instruction with little variability. The same trend and variability patterns were noted in advanced practice performance even though the

readability level of the probes increased to grade-level. The scores for Participant 1 revealed a slight decrease in level from controlled practice to advanced practice and from advanced practice to generalization with little variability within these instructional phases.

Baseline scores for Participant 2 on the *Oral Reading Probes* were 83%, 83%, 91%, 85%, 87%, 87%, 89%, 93%, 88%, and 92%, scores for controlled practice *Oral Reading Probes* were 97% and 99%; scores for advanced practice *Oral Reading Probes* were 96%, 97%, 95%, 98%, 98%, and 99%; scores for generalization *Oral Reading Probes* were 97%, 97%, and 98%. Visual analysis of data (see Figure 1) indicated that the level of the oral reading probes increased from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, the scores for Participant 2 revealed a steady increase in controlled practice performance after preliminary strategy instruction with little variability. An ascending overall trend with little variability was also evident in advanced practice performance. The scores for Participant 2 revealed a slight decrease in level from controlled practice to advanced practice and from advanced practice to generalization with little variability within these instructional phases.

Baseline scores for Participant 3 on the *Oral Reading Probes* were 75%, 77%, 76%, 64%, 75%, 79%, 86%, 84%, 86%, 84%, 72%, and 77%; scores for controlled practice *Oral Reading Probes* were 98% and 99%; scores for advanced practice *Oral Reading Probes* were 95%, 95%, 96, and 99%; scores for generalization *Oral Reading Probes* were 90%, 92%, and 89%. Visual analysis of data (see Figure 1) indicated that the level of the oral reading probes increased from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, the scores for Participant 3

revealed a steady increase in controlled practice performance after preliminary strategy instruction with little variability. The same trend and variability patterns were noted in advanced practice performance. The scores for Participant 3 revealed a decrease in level from controlled practice to advanced practice and from advanced practice to generalization with little variability. Performance on the first generalization *Oral Reading Probe* revealed a nine-percentage point decrease in performance from mastery level; the second and third probes maintained the decreased level with slight variability.

Baseline scores for Participant 4 on the *Oral Reading Probes* were 90%, 91%, 90%, 91%; scores for controlled practice *Oral Reading Probes* were 97%, 94%, and 99%; scores for advanced practice *Oral Reading Probes* were 98%, 98%, 98%, 98%, 98%, 98%, 98%, 98% and 99%; scores for generalization *Oral Reading Probes* were 98%, 98%, and 99%. Visual analysis of data (see Figure 2) indicated that the level of the oral reading probes increased from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, the scores for Participant 4 revealed an overall ascending trend in the controlled practice after preliminary strategy instruction with some variability. Performance on the second *Oral Reading Probe* revealed a three-percentage point decrease in performance. The trend and variability for advanced practice were stable with the exception of a one percentage point increase on the final *Oral Reading Probe*. The scores for Participant 4 revealed a slight decrease in level from controlled practice to advanced practice and from advanced practice to generalization with little variability within these instructional conditions.

Baseline scores for Participant 5 on the *Oral Reading Probes* were 70%, 72%, 67%, 77%, 82%, 78%, 92%, 84%, and 84%; scores for controlled practice *Oral Reading*

Probes were 90%, 97%, 91%, 95%, 95%, 98%, 98%, 98%, and 99%; scores for advanced practice *Oral Reading Probes* were 98% and 99%; scores for generalization *Oral Reading Probes* were 96%, 97%, and 97%. Visual analysis of data (see Figure 2) indicated that the level of the oral reading probes increased from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, scores for Participant 5 revealed an ascending overall trend in controlled practice performance with some variability after preliminary strategy instruction. Advanced practice performance revealed a steady ascending trend with little variability. Scores Participant 5 revealed a slight decrease in level from controlled practice to advanced practice, from advanced practice to generalization with little variability in the advanced practice and generalization stages of instruction. See Table 4 for a summary of oral reading scores obtained in the Controlled and Advanced Practice Stages of instruction. See Table 5 for a summary of oral reading scores obtained in the Generalization Stage of instruction.

Question 2: Does online instruction related to *The Word Identification Strategy* (Lenz, et al., 2007) improve the comprehension skills of students with learning disabilities?

Three data sets were used to answer this question. The first set of data was obtained from pre- and posttest data from the *Woodcock Johnson Tests of Achievement* (*WJTA*) (Woodcock, McGrew, & Mather, 2001) *Passage Comprehension Subtest*. The second set of data was obtained from the *Word Identification Strategy Curriculum-Based Measures* (*WIS-CBM*) (i.e., the *Comprehension Test*). The third set of data was obtained from *The Word Identification Strategy Probes* (i.e., the *Comprehension Probe*) given throughout the instruction of *The Word Identification Strategy (*Lenz et al., 2007).

Table 4

Participants' Percentage Scores for Baseline, Controlled- and Advanced Practice Oral Reading Probes (ORP)

Participants	Baseline *ORP*	Controlled Practice *ORP*	Advanced Practice *ORP*
Participant 1	93%, 88%, 90%, 92%	97%, 97%, 99%	93%, 95%, 99%
Participant 2	83%, 83%, 91%, 85%, 87%, 87%, 89%, 93%, 88%, 92%	97%, 99%	96%, 97%, 95%, 98%, 98%, 99%
Participant 3	75%, 77%, 76%, 64%, 75%, 79%, 86%, 84%, 86%, 84%, 72%, 77%	98%, 100%	95%, 95%, 96%, 99%
Participant 4	90%, 91%, 90%, 91%	97%, 94%, 99%	98%, 98%, 98%, 98%, 98%, 98%, 98%, 98%, 99%
Participant 5	70%, 72%, 67%, 77%, 82%, 78%, 92%, 84%, 84%	90%, 97%, 91%, 95%, 95%, 98%, 98%, 98%, 99%	98%, 99%

Table 5

Participants' Percentage Scores for Advanced Practice and Generalization Oral Reading Probes (ORP)

Participants	Advanced Practice *ORP*	Generalization *ORP*
Participant 1	93%, 95%, 99%	98%, 96%, 96%
Participant 2	96%, 97%, 95%, 98%, 98%, 99%	97%, 97%, 98%
Participant 3	95%, 95%, 96%, 99%	90%, 92%, 89%
Participant 4	98%, 98%, 98%, 98%, 98%, 98%, 98%, 98%, 99%	98%, 99%, 99%
Participant 5	98%, 99%	96%, 97%, 97%

The first set of data was obtained from the pre- and posttest data obtained from the *WJTA* (Woodcock et al., 2001) *Passage Comprehension Subtest* pre- and posttest scores were compared to determine changes in comprehension abilities. Participant 1 obtained a grade equivalent (G.E.) score on the pretest of 4.5; posttest was G.E. 6.7 with a G.E. change of 2.2. Participant 2 obtained a grade equivalent (G.E.) score on the pretest of 2.6; posttest was G.E. 5.8 with a G.E. change of 3.2. Participant 3 obtained a grade equivalent (G.E.) score on the pretest of 4.0; posttest was G.E. 4.5 with a G.E. change of .5.

Participant 4 obtained a grade equivalent (G.E.) score on the pretest of 2.3; posttest was G.E. 3.4 with a G.E. change of 1.1. Participant 5 obtained a grade equivalent (G.E.) score on the pretest of 2.3; posttest was G.E. 2.6 with a G.E. change of .3. All participants made gains in passage comprehension from pre- to posttest (see Table 6).

Table 6

Participants' Grade Equivalent Scores for the Pre- and Posttest Results on the WJTA Passage Comprehension Subtest

Participants	Pretest *Passage Comprehension*	Posttest *Passage Comprehension*	G.E. Improvement
Participant 1	4.5	6.7	2.2
Participant 2	2.6	5.8	3.2
Participant 3	4.0	4.5	.5
Participant 4	2.3	3.4	1.1
Participant 5	2.3	2.6	.3

Note. G. E. = Grade Equivalent

The second set of data was obtained from the pre- and posttest data *WIS-CBM* (i.e., the *Comprehension Test*) and was used to determine changes in comprehension abilities. The *Comprehension Test* contained 10 corresponding questions to the *Oral Reading Test*

selection at grade level. Participant 1 obtained 60% on the *Comprehension Test* pretest and 90% on the posttest. Participant 2 obtained 40% on the *Comprehension Test* pretest and 80% on the posttest. Participant 3 obtained 50% on the *Comprehension Test* pretest and 80% on the posttest. Participant 4 obtained 60% on the *Comprehension Test* pretest and 90% on the posttest. Participant 5 obtained 40% on the *Comprehension Test* pretest and 90% on the posttest (see Table 7).

Table 7

Participants' Percentage Scores for Pre- and Posttest Results on the Comprehension Test

Participants	Pretest *CT*	Posttest *CT*	Percentage Point Improvement
Participant 1	60%	90%	30%
Participant 2	40%	80%	40%
Participant 3	50%	80%	30%
Participant 4	60%	90%	30%
Participant 5	40%	90%	50%

Note. CT = Comprehension Test

The third set of data was obtained from *The Word Identification Strategy Probes* (i.e., the *Comprehension Probe*) given throughout the instruction of *The Word Identification*

*Strategy (*Lenz et al., 2007). All five participants were able to reach mastery performance on controlled practice *Comprehension Probes* given at instructional levels and advanced practice *Comprehension Probes* given at grade level. It took participants between two and nine sessions to reach mastery. Generalization *Comprehension Probes* were given at grade level for three sessions in three subject areas (i.e., English, science, and social studies).

The baseline scores for Participant 1 on the *Comprehension Probes* were 90%, 70%, 80%, and 100%; scores for controlled practice *Comprehension Probes* were 90%, 90%, and 90%; scores for advanced practice *Comprehension Probes* were 50%, 90%, and 70%; scores for generalization *Comprehension Probes* were 60%, 70%, and 80%. Visual analysis of data indicated a decrease in level of the comprehension probes from baseline condition to controlled practice in the instruction condition (see Figure 1). With regard to trend and variability, scores for Participant 1 revealed a steady trend with no variability in controlled practice performance after preliminary strategy instruction. Scores for Participant 1 revealed a decrease in level from controlled practice performance to advanced practice performance with substantial variability in the Advanced Practice Stage of instruction. An initial 40 percentage point decrease in level was revealed with the first advanced practice *Comprehension Probe* (i.e., at grade level) then returned to the former level with the second probe; the third probe revealed a 20 percentage point decrease in performance. Scores for Participant 1 revealed a 10 percentage point decrease in level from advanced practice to generalization; but during the Generalization Stage of instruction, there was little variability and a steady increase in trend.

The baseline scores for Participant 2 on the *Comprehension Probes* were 90%, 40%, 60%, 80%, 60%, 50%, 70%, 80%, 100%, and 80%; scores for controlled practice *Comprehension Probes* were 100% and 100%; scores for advanced practice *Comprehension Probes* were 60%, 70%, 50%, 80%, 90%, and 70%; scores for generalization *Comprehension Probes* were 100%, 90%, and 90%. Visual analysis of data (see Figure 1) indicated that the level of the *Comprehension Probes* increased from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, scores for Participant 2 revealed consistent performance of 100% in controlled practice (i.e., no increasing or decreasing trend after preliminary strategy instruction and no variability). With regard to level, trend, and variability patterns in advanced practice performance, scores for Participant 2 revealed a decrease in level from controlled practice to advanced practice with substantial variability. An initial 40 percentage point decrease in level occurred; scores for Participant 2 revealed five out of six sessions above mastery rate (at least 60%) with only the third session being below mastery. Scores for Participant 2 revealed an initial increase in level from advanced practice to generalization with some variability across three sessions.

Baseline scores for Participant 3 on the *Comprehension Probes* were 40%, 50%, 70%, 80%, 70%, 50%, 80%, 50%, 80%, 90%, 60%, and 90%; scores for controlled practice *Comprehension Probes* were 100% and 90%; scores for advanced practice *Comprehension Probes* were 80%, 80%, 80%, and 90%; scores for generalization *Comprehension Probes* were 60%, 70%, and 80%. Visual analysis of data (see Figure 1) indicated an initial increase in level of the *Comprehension Probes* from baseline condition to controlled practice in the instruction condition. With regard to trend and

variability, scores for Participant 3 revealed a steady decreasing trend in controlled practice performance after preliminary strategy instruction. Scores for Participant 3 revealed a decrease in level from controlled practice to advanced practice; for the first three sessions in advanced practice, the trend was steady with an increase in the 4th session. Scores for Participant 3 revealed a 30 percentage point decrease in level from advanced practice to generalization; performance on the *Comprehension Probes* revealed a steady increase in trend during generalization.

The baseline scores for Participant 4 on the *Comprehension Probes* were 70%, 80%, 90%, and 90%; scores for controlled practice *Comprehension Probes* were 80%, 60%, and 100%; scores for advanced practice *Comprehension Probes* were 60%, 80%, 90%, 80%, 70%, 90%, 40%, 70%, and 70%; scores for generalization *Comprehension Probes* were 100%, 100%, and 100%. Visual analysis of data (see Figure 2) indicated a decrease in level of the *Comprehension Probes* from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, scores for Participant 4 revealed an overall increase in trend with substantial variability in controlled practice performance after preliminary strategy instruction; all three probes in controlled practice revealed mastery performance (i.e., at least 60%). Scores for Participant 4 revealed a decrease in level from controlled practice performance to advanced practice. Eight of the nine advanced practice *Comprehension Probes* were at mastery (i.e., at least 60%) with the seventh session falling below mastery. There was no clear trend in advanced practice performance; there was a substantial amount of variability. Scores for Participant 4 revealed a 30 percentage point increase in level from advanced practice to generalization;

the *Comprehension Probes* in generalization revealed consistent performance at 100% (i.e., no increasing or decreasing trend and no variability).

Baseline scores for Participant 5 on the *Comprehension Probes* were 30%, 50%, 70%, 90%, 90%, 80%, 50%, 50%, and 80%; scores for controlled practice *Comprehension Probes* were 90%, 90%, 60%, 100%, 90%, 100%, 90%, 90%, and 90%; scores for advanced practice *Comprehension Probes* were 80% and 90%; scores for generalization *Comprehension Probes* were 70%, 100%, and 100%. Visual analysis of data (see Figure 2) indicated an increase in level of the *Comprehension Probes* from baseline condition to controlled practice in the instruction condition. With regard to trend and variability, scores for Participant 5 revealed a steady trend (neither increasing nor decreasing with substantial variability in controlled practice performance after preliminary strategy instruction); however, the third session decreased 30 percentage points and then increased 40 percentage points. Scores for Participant 5 revealed a 10 percentage point decrease in level from controlled practice performance to advanced practice performance; the second probe revealed a 10 percentage point increase. Scores for Participant 5 revealed a 20 percentage point decrease in level from advanced practice performance to generalization with some variability. Scores for Participant 5 revealed a 30 percentage point increase between the first and second generalization probe (see Tables 8 and 9).

Question 3: Do students with disabilities maintain *The Word Identification Strategy* (Lenz et al., 2007) skills two weeks after instruction has ended?

For the purpose of determining skill maintenance, an additional *Oral Reading Probe* and *Comprehension Probe* at grade level were administered two weeks after instruction

Table 8

Participants' Percentage Scores for Baseline, Controlled- and Advanced Practice Comprehension Probes (CP)

Participants	Baseline *CP*	Controlled Practice *CP*	Advanced Practice *CP*
Participant 1	90%, 70%, 80%, 100%	90%, 90%, 90%	50%, 90%, 70%
Participant 2	90%, 40%, 60%, 80%, 60%, 50%, 70%, 80%, 100%, 80%	100%, 100%	60%, 70%, 50%, 80%, 90%, 70%
Participant 3	40%, 50%, 70%, 80%, 70%, 50%, 80%, 50%, 80%, 90%, 60%, 90%	100%, 90%,	80%, 80%, 80%, 90%
Participant 4	70%, 80%, 90%, 90%	80%, 60%, 100%	60%, 80%, 90%, 70%, 90%, 40%, 70%, 70%
Participant 5	30%, 50%, 70%, 90%, 90%, 80%, 50%, 50%, 80%	90%, 90%, 60%, 100%, 90%, 100%, 90%, 90%, 90%	80%, 90%

Table 9

Participants' Percentage Scores for Advanced Practice and Generalization Comprehension Probes

Participants	Advanced Practice *CP*	Generalization *CP*
Participant 1	50%, 90%, 70%,	60%, 70%, 80%
Participant 2	60%, 70%, 50%, 80%, 90%, 70%	100%, 90%, 90%
Participant 3	80%, 80%, 80%, 90%	60%, 70%, 80%
Participant 4	60%, 80%, 90%, 80%, 70%, 90%, 40%, 70%, 70%	100%, 100%, 100%
Participant 5	80%, 90%	70%, 100%, 100%

ended. Per the parameters of multiple probe designs, these probes were administered in the same way they were administered throughout the study (i.e., online). Through visual analysis, the participants' scores on the maintenance *Oral Reading* and *Comprehension Probes* were compared to the student's scores during the Advanced Practice and Generalization Stages of instruction because grade-level passages were used at each of these stages.

Scores for advanced practice for Participant 1 on the *Oral Reading Probes* were 93%, 95%, and 99% (M=96%) and on the *Comprehension Probes* were 50%, 90%, and 70% (M=70%). Generalization scores for *Oral Reading Probes* (i.e., English, science and social studies respectively) were 98%, 96%, and 96% (M=97%) and *Comprehension Probes* were 60%, 70%, and 80% (M=70%). Maintenance *Oral Reading Probe* was 95% and *Comprehension Probe* was 60%. Thus, maintenance performance for Participant 1 on the *Oral Reading Probe* decreased one percentage point from the mean score on advanced practice *Oral Reading Probes* and two percentage points from the mean score on generalization *Oral Reading Probes.* Maintenance performance for Participant 1 on the *Comprehension Probe* decreased ten percentage points (i.e., the equivalent of one question) from both the advanced practice and generalization *Oral Reading Probe mean scores.*

Scores for advanced practice for Participant 2 on the *Oral Reading Probes* were 96%, 97%, 95%, 98%, 98%, and 99% (M=97%) and on the *Comprehension Probes* were 60%, 70%, 50%, 80%, 90%, and 70% (M=70%). Generalization scores for *Oral Reading Probes* (i.e., English, science and social studies respectively) were 97%, 97%, and 98% (M=97%) and *Comprehension Probes* were 100%, 90%, and 90% (M= 93%). Maintenance *Oral Reading Probe* was 99% and *Comprehension Probe* was 100%. Thus, maintenance performance on the *Oral Reading Probe* for Participant 2 increased two percentage points from the mean scores on advanced practice and generalization *Oral Reading Probes.* Maintenance performance on the *Comprehension Probe* for Participant 2 increased 30 percentage points (i.e., the equivalent of three questions) from the

advanced practice *Comprehension Probe mean score* and 13 percentage points from the generalization *Comprehension Probe mean score.*

Scores for advanced practice *Oral Reading Probes* for Participant 3 were 95%, 95%, 96%, and 99% (M=96%). *Comprehension Probes* were 80%, 80%, 80%, and 90% (M=83%). Generalization scores for *Oral Reading Probes* (i.e., English, science and social studies respectively) were 90%, 92%, and 89% (M=90%) and *Comprehension Probes* were 60%, 70%, and 80% (M=70%). Maintenance *Oral Reading Probe* was 91% and *Comprehension Probe* was 80%. Thus, maintenance performance on the *Oral Reading Probe* for Participant 3 decreased five percentage points from the mean score on advanced practice *Oral Reading Probes* and increased one percentage point from the mean score on generalization *Oral Reading Probes.* Maintenance performance on the *Comprehension Probe* for Participant 3 decreased three percentage points from the advanced practice *Comprehension Probe mean score* and increased 10 percentage points (i.e., the equivalence of one question) from the generalization *Comprehension Probe mean score*.

Scores for advanced practice *Oral Reading Probes* for Participant 4 were 98%, 98%, 98%, 98%, 98%, 98%, 98%, 98%, and 99% (M=98%). *Comprehension Probes* were 60%, 80%, 90%, 80%, 70%, 90%, 40%, 70%, and 70% (M=72%). Generalization scores for *Oral Reading Probes* (i.e., English, science and social studies respectively) were 89%, 99%, and 99% (M=96%). *Comprehension Probes* were 100%, 100%, and 100% (M=100%). Maintenance *Oral Reading Probe* was 96% and *Comprehension Probe* was 70%. Thus, maintenance performance on the *Oral Reading Probe* for Participant 4 decreased two percentage points from the mean score on advanced practice *Oral Reading*

Probes and matched the mean score on generalization *Oral Reading Probes.* Maintenance performance on the *Comprehension Probe for* Participant 4 decreased two percentage points from the advanced practice *Comprehension Probe mean score* and decreased 30 percentage points (i.e., the equivalence of three questions) from the generalization *Comprehension Probe mean score.*

Scores for advanced practice *Oral Reading Probes* for Participant 5 were 98% and 99% (M=99%). *Comprehension Probes* were 80% and 90% (M=90%). Generalization scores for *Oral Reading Probes* (i.e., English, science and social studies respectively) were 96%, 97%, and 97% (M=97%). *Comprehension Probes* were 70%, 100%, and 100% (M=90%). Maintenance *Oral Reading Probe* was 98% and *Comprehension Probe* was 100%. Thus, maintenance performance on the *Oral Reading Probe* for Participant 5 decreased one percentage point from the mean score on advanced practice *Oral Reading Probes* and increased one percentage point from the mean score on generalization *Oral Reading Probes.* Maintenance performance on the *Comprehension Probe* for Participant 5 increased 10 percentage points from the advanced practice *Comprehension Probe mean score* and increased 10 percentage points (i.e., the equivalence of 1 question) from the generalization *Comprehension Probe mean score.* See Tables 10 and 11.

Question 4: How satisfied were students with learning disabilities with online instruction of *The Word Identification Strategy* (Lenz, et al., 2007)?

The researcher-developed *Word Identification Satisfaction Questionnaire* was used to determine participant satisfaction with learning *The Word Identification Strategy* (Lenz et al., 2007) via online instruction and to determine whether or not the participant felt that *The Word Identification Strategy* (Lenz et al.) helped improve his or her oral

reading and comprehension. *The Word Identification Satisfaction Questionnaire* was answered by the participants during the posttest session and was analyzed to determine satisfaction levels. *The Word Identification Satisfaction Questionnaire* contained ten statements. Participants rated

Table 10

Participants' Percentage Scores for Advanced Practice, Generalization, and Maintenance Oral Reading Probes (ORP)

Participants	Advanced Practice *ORP*	Generalization *ORP*	Maintenance *ORP*
Participant 1	93%, 95%, 99%, (M=96%)	98%, 96%, 96%, (M= 97%)	95%
Participant 2	96%, 97%, 95%, 98%, 98%, 99% (M= 97%)	97%, 97%, 98% (M=97%)	99%
Participant 3	95%, 95%, 96%, 99% (M=96%)	90%, 92%, 89% (M =90%)	91%
Participant 4	98%, 98%, 98%, 98%, 98%, 98%, 98%, 98%, 99% (M=98%)	98%, 99%, 99% (M=96%)	96%
Participant 5	98%, 99% (M= 99%)	96%, 97%, 97% (M= 97%)	98%

Table 11

Participants' Percentage Scores for Advanced Practice, Generalization, and Maintenance Comprehension Probes (CP)

Participants	Advanced Practice *CP*	Generalization *CP*	Maintenance *CP*
Participant 1	50%, 90%, 70% (M=70%)	60%, 70%, 80% (M=70%)	60%
Participant 2	60%, 70%, 50%, 80%, 90%, 70% (M=70%)	100%, 90%, 90% (M=93%)	100%
Participant 3	80%, 80%, 80%, 90% (M=83%)	60%, 70%, 80% (M=70%)	80%
Participant 4	60%, 80%, 90%, 80%, 70%, 90%, 40%, 70%, 70% (M=72%)	100%, 100%, 100% (M=100%)	70%
Participant 5	80%, 90% (M=90%)	70%, 100%, 100% (M= 90%)	100%

the statements from 1 to 5 with 1 being Strongly Disagree, 2 being Disagree, 3 being Neither Agree Nor Disagree, 4 being Agree, and 5 being Strongly Agree (see Appendix E).

On Statement 1, participants rated their satisfaction level related to the statement: "I liked the Power Point media lessons." Participant ratings were as follows: (a) 60% (3/5) of the participants' responses on this question indicated that they Strongly Agree and (b) 40% (2/5) Neither Agreed nor Disagreed with the statement.

On Statement 2, participants rated their satisfaction level related to the statement: "I liked that the Power Point media lesson worksheets helped me stay on task and learn the

strategy." Participant ratings were as follows: (a) 20% (1/5) of the participants' responses on this question indicated that they Strongly Agree, (b) 40% (2/5) Agreed, and (c) 40% (2/5) Neither Agreed nor Disagreed with the statement.

On Statement 3, participants rated satisfaction level related to the statement: "I liked memorizing the mnemonic DISSECT through the online presentation." Participant ratings were as follows: (a) 60% (3/5) of the participants' responses on this question indicated that they Strongly Agree and (b) 40% (2/5) Agreed with the statement.

On Statement 4, participants rated satisfaction level related to the statement: "I liked memorizing the Rules of Twos and Threes through the online presentation." Participant ratings were as follows: (a) 80% (4/5) of the participants' responses on this question indicated that they Agreed, and (b) 20% (1/5) Neither Agreed nor Disagreed with the statement.

On Statement 5, participants rated satisfaction level related to the statement: "I liked using the *MP3 Player* to record my oral reading." Participant ratings were as follows: (a) 40% (2/5) of the participants' responses on this question indicated that they Strongly

Agreed, (b) 40% (2/5) Agreed, and (c) 20% (1/5) Neither Agreed nor Disagreed with the statement.

On Statement 6, participants rated satisfaction level related to the statement: "I liked using the DISSECT *Practice Worksheets* to help me learn how to divide words." Participant ratings were as follows: (a) 40% (2/5) of the participants' responses on this question indicated that they Strongly Agree, (b) 20% (1/5) Agreed, and (c) 40% (2/5) Neither Agreed nor Disagreed with the statement.

On Statement 7, participants rated satisfaction level related to the statement: "I liked that the *Comprehension Probes* were easy to complete." Participant ratings were as follows: (a) 20% (1/5) of the participants' responses on this question indicated that they Strongly Agree, (b) 60% (3/5) Agreed, and (c) 20% (1/5) Neither Agreed nor Disagreed with the statement.

On Statement 8, participants rated satisfaction level related to the statement: "I like to use *The Word Identification Strategy* while reading." Participant ratings were as follows: (a) 20% (1/5) of the participants' responses on this question indicated that they Strongly Agree, (b) 40% (2/5) Agreed, and (c) 40% (2/5) Neither Agreed nor Disagreed with the statement.

On Statement 9, participants rated satisfaction level related to the statement: "I like that *The Word Identification Strategy* has helped me to read large words." Participant ratings were as follows: (a) 60% (3/5) of the participants' responses on this question indicated that they Strongly Agree and (b) 40% (2/5) Agreed with the statement.

On Statement 10, participants rated satisfaction level related to the statement: "I like that *The Word Identification Strategy* has helped me to improve my understanding of

what I read." Participant ratings were as follows: (a) 60% (3/5) of the participants' responses on this question indicated that they Strongly Agree and (b) 40% (2/5) Agreed with the statement. See Table 12.

Interscorer Reliability

The researcher scored each student on the pre- and posttests: (a) *Woodcock Johnson III Tests of Achievement* (*WJTA*) (Woodcock, McGrew, & Mather, 2001) (i.e., the *Passage Comprehension Subtest*), (b) the *Word Identification Curriculum-Based Measures* (i.e., *Prefix/Suffix Test, Oral Reading Test,* and *Comprehension Test*), and (c) the *DISSECT Curriculum-Based Test.* To determine interscorer reliability, the first research assistant scored a random sample of 20% of the *WJTA* subtests, the *WIS-CBM* (i.e., *Oral Reading Test, Comprehension Test*), and the *DISSECT Curriculum-Based Tests*. The primary scorer was the researcher and the secondary scorer was the research assistant. On the *WJTA* (Woodcock et al., 2001) (i.e., the *Passage Comprehension* subtest), the researcher and the research assistant scored the test items according to the directions in the *WJTA* scoring manual. The researcher compared the two sets of scores test item by test item. Agreement was reached if both the researcher and the research assistant marked the response the same. If there was a disagreement in the response, the item was marked as a disagreement. The formula agreements ÷ (agreements + disagreements) X 100 was used to determine reliability levels (Tawney & Gast, 1984). On the pretests, the researcher and the research assistant agreed on 509 items out of 510 opportunities for an overall total percentage agreement of 99.8%. On the individual

Table 12

Participants' Ratings on The Word Identification Satisfaction Questionnaire

Questionnaire Statements	P1	P2	P3	P4	P5	M
1. I liked the Power Point media lessons.	5	5	5	3	3	4.2
2. I liked that the Power Point media lesson worksheets helped me stay on task and learn the strategy.	3	5	4	3	4	3.8
3. I liked memorizing the mnemonic DISSECT through the Online presentation.	4	4	5	5	5	4.6
4. I liked memorizing the Rules of Twos and Threes through the online presentation.	3	4	4	4	4	3.8
5. I liked using a *MP3 Player* to record my oral reading.	4	4	5	5	3	4.2
6. I liked using the DISSECT *Practice Worksheets* to help me learn how to divide words	4	3	5	3	5	4.0
7. I liked that the *Comprehension Probes* were easy to complete.	3	5	4	4	4	4.0
8. I like to use *The Word Identification Strategy* while reading.	4	4	5	3	3	3.8
9. I like that *The Word Identification Strategy* has helped me to read large words.	5	4	5	4	5	4.6
10. I like that *The Word Identification Strategy* has helped me to improve my understanding of what I read.	4	5	4	5	5	4.6

Note. P1 = Participant 1; P2 = Participant 2; P3 = Participant 3; P4 = Participant 4; P5 = Participant 5; M = mean score for questionnaire statement.

pretests (i.e., *WJTA Passage Comprehension Subtest*, *Prefix/Suffix Test*, *Oral ReadingTest, Comprehension Test,* and the *DISSECT Curriculum-Based Test*), the percentage of agreement ranged from 90% to 100%. On the posttests, the researcher and the research assistant agreed on 474 items out of 474 opportunities for an overall total percentage agreement of 100%. On the individual posttests (i.e., *WJTA Passage Comprehension Subtest, Oral Reading Test, Comprehension Test,* and the *DISSECT Curriculum-Based Test*) the percentage of agreement was 100% (see Tables 13 and 14).

Table 13

Interscorer Reliability on Pretests

	Total Agreements	Total Agreements + Disagreements	Percent of Agreement
WJTA Passage Comprehension	38	38	100%
Prefix/Suffix Test	9	10	90%
Oral Reading Test	402	402	100%
Comprehension Test	10	10	100%
DISSECT Curriculum-Based Test	10	10	100%
Overall	509	510	99.8%

Table 14

Interscorer Reliability on Posttests

	Total Agreements	Total Agreements + Disagreement	Percent of Agreement
WJTA Passage Comprehension	32	32	100%
Oral Reading Test	397	397	100%
Comprehension Test	10	10	100%
DISSECT Curriculum-Based Test	10	10	100%
Overall	474	474	100%

The researcher scored all *The Word Identification Strategy Probes* (i.e., the *Oral Reading Probes* and the *Comprehension Probes*) as the primary scorer. The first research assistant scored a random sample of 20% of *The Word Identification Strategy Probes (*i.e., the *Oral Reading Probes*). Both the researcher and the research assistant listened to the sound recordings of the *Oral Reading Probes* and scored the oral reading. Any word that the participant orally read wrong or omitted was considered an error. If the participant added a word to the passage the word was not counted as an error. If the participant self-corrected the word, the word was considered correct. The researcher compared the scored passages. An agreement was reached if both the researcher and the

research assistant marked the response the same. If there was a disagreement in the response, the item was marked as a disagreement. The formula agreements ÷ (agreements + disagreements) X 100 was used to determine reliability levels (Tawney & Gast, 1984). On the *Oral Reading Probes*, the researcher and the research assistant agreed on 7,949 items out of 8,255 opportunities for an overall total percentage agreement of 96%. For the overall individual oral readings, the percentage of agreement ranged of from 95% to 98% (see Table 15).

Table 15

Interscorer Reliability on Oral Readings

	Total Agreements	Total Agreements + Disagreements	Percent of Agreement
Participant 1	1,180	1,205	98%
Participant 2	2,017	2,078	97%
Participant 3	1,531	1,617	95%
Participant 4	1,541	1,604	96%
Participant 5	1,680	1,751	96%
Overall	7,949	8,255	96%

In addition to the researcher, the first research assistant scored a random sample of 20% of *The Word Identification Strategy Probes (*i.e., the *Comprehension Probes*). Both the researcher and the research assistant compared the *Comprehension Probes* responses to the *Timed Readings'* (Spargo, 1989) answer guides. The researcher compared the scored *Comprehension Probes*. An agreement was reached if both the researcher and the research assistant marked the response the same. If there was a disagreement in the response, the item was marked as a disagreement. The formula agreements ÷ (agreements + disagreements) X 100 was used to determine reliability levels (Tawney & Gast, 1984). On the *Comprehension Probes*, the researcher and the research assistant agreed on 206 items out of 210 opportunities for an overall total percentage agreement of 98%. On the individual pretests, the percentage of agreement ranged from 93% to 100% (see Table 16).

Fidelity of Treatment

To determine interobserver agreement related to fidelity of treatment, the two research assistants completed the Fidelity of Treatment Checklist while viewing *The Word Identification Strategy* (Lenz et al., 2007) *media lessons* (see Appendix L). Items on the Fidelity of Treatment Checklist were marked "Yes" to indicate compliance with *The Word Identification Strategy Instructor's Manual's* (Lenz et al.) scripted lessons or No to indicate noncompliance. The formula agreements ÷ (agreements + disagreements) X 100 was used to establish the fidelity of treatment level. The researcher compared the Treatment of Fidelity Checklists of the two research assistants. An agreement was

Table 16

Interscorer Reliability on Comprehension Probes

	Total Agreements	Total Agreements + Disagreements	Percent of Agreement
Participant 1	30	30	100%
Participant 2	49	50	98%
Participant 3	37	40	93%
Participant 4	40	40	100%
Participant 5	50	50	100%
Overall	206	210	98%

reached if both research assistants marked the response the same. If there was a disagreement in the response, the item was marked as a disagreement.

The formula agreements ÷ (agreements + disagreements) X 100 was used to determine reliability levels (Tawney & Gast, 1984). On the Fidelity of Treatment Checklists, the researcher assistants agreed on 34 items out of 35 opportunities for an overall total percentage agreement of 97%.

Summary of Results

The purpose of this study was to investigate the effects of teaching *The Word Identification Strategy* (Lenz et al., 2007) through online modules to students with specific learning disabilities. Data were collected from several assessments, standardized and curriculum-based. First, pre- and posttest results were compared from *WJTA* (Woodcock et al., 2001) *Passage Comprehension Subtests*. Second, pre- and posttest results were compared from the *Word Identification Curriculum-Based Measures* (i.e., the *Oral Reading Test*, the *Dissect Curriculum Based Test, and the Comprehension Test*). Third, *The Word Identification Strategy Probes* (i.e., the *Oral Reading Probe* and the *Comprehension Probe)* given throughout the strategy instruction were analyzed.

A multiple-probe design across subjects (Horner & Baer, 1978) with one replication was used in this study. By replicating the study's results with an additional two subjects (external validity), confidence is increased that the changes in reading performance were due to the intervention. Staggered introduction of the intervention using a multiple probe design helps determine intervention effectiveness for multiple subjects (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005).

Prior to the intervention, all participants were reading from two years and two months to three years and six months behind their grade level based on scores obtained from the *WJTA* (Woodcock et al., 2001) *Passage Comprehension Subtest*. Comparison of the *WJTA* (Woodcock et al.) *Passage Comprehension* pre- and posttests revealed that participants' performance increased on the subtest. Overall, participants' performance increased on the *Passage Comprehension Subtest* from three months to three years and two months.

Comparison of pre- and posttest scores on the *Word Identification Curriculum-Based Measures* (i.e., *Oral Reading Test, DISSECT Curriculum-Based Test,* and *Comprehension Test*) revealed growth on all three assessments. On the *Oral Reading Test*, participants orally read a 400-word passage at grade level and demonstrated a 6 to 25 percentage point improvement in the number of words read correctly. On the *Comprehension Test*, participants' improvement ranged from 30 to 50 percentage points 10 multiple-choice questions. On the *DISSECT Curriculum-Based Test*, participants' performance improved with regard to being able to break apart multisyllabic words using the mnemonic DISSECT and the Rules of Twos and Threes; percentage point improvement ranged from 50-70 points across the five participants.

Visual analysis of the participants' *Word Identification Strategy Instructional Probes* (i.e., *Oral Reading Probe* and *Comprehension Probe*) occurred to determine the effects of the online strategy instruction. Each participant's performance was graphed according to the specifications of multiple probe designs (Horner & Baer, 1978). The level, trend, and variability of performance data were visually inspected to determine the effectiveness of the intervention. Level refers to differences in performance from one condition (e.g. baseline) to another (e.g. instruction). Trend refers to the direction of the 'best-fit' straight line of the dependent variable data points. Variability refers to the consistency of the data points around the mean.

Visual analysis of the participants' *Word Identification Strategy Instructional Probe*, the *Oral Reading Probe*, was conducted per the parameters of a multiple probe design. All five participants in this study achieved a stable oral reading baseline prior to the preliminary strategy instruction. Analysis of the data indicated a level increase from the

baseline *Oral Reading Probes* to the initial stage of instruction (i.e., controlled practice). There was a decrease in level from controlled practice to advanced practice and from advanced practice to generalization for all five participants.

Analysis of the data indicated trend increases during controlled practice and during advanced practice with little or no variability. During generalization stage of instruction, three participants demonstrated an increasing trend. The trend for the remaining two participants was either stable or decreased with some variability. Participants did not consistently maintain mastery level (99%) two weeks after instruction ended. Analysis of the data for *Oral Reading Probes* indicated a level increase of one percentage point from generalization stage of instruction to maintenance for three participants. There was a decrease in level of one to three percentage points from generalization stage to maintenance for two participants.

Visual analysis of the participants' *Word Identification Strategy Instructional Probe,* (i.e., the *Comprehension Probe*) revealed that participants' performance on the *Comprehension Probes* was above mastery (i.e., 60%) on 95% (60 out of 63) trials during controlled practice, advanced practice, generalization, and maintenance with substantial amounts of variability in performance.

In addition to mastering *The Word Identification Strategy* (Lenz et al., 2007), participant satisfaction related to the online strategy instruction was high. The three highest ranked statements (M=4.6) related to: (a) satisfaction with memorizing the mnemonic DISSECT through the online presentation, (b) the strategy improving their skills in decoding multisyllabic words, and (c) the strategy improving their skills in reading comprehension. Other highly ranked statements related to: (a) liking the media

lessons (M=4.2), (b) using the MP3 Player to record their reading (M=4.2), and (c) liking the *DISSECT Practice Worksheets* (M=4.0) and the *Comprehension Probes* (M=4.0). The participants gave the lowest ratings (M=3.8) to statements related to: (a) the media lessons worksheets, (b) memorizing the Rules of Twos and Threes, and (c) using the strategy while reading. Therefore, even though the participants saw the benefit and improvement in their reading, they were not as satisfied with the process of learning the strategy.

In conclusion, all participants' demonstrated an improvement in their ability to break apart multisyllabic words, orally read a passage at grade level, and comprehend material at grade level. All participants made performance growth on the standardized assessment, the *Passage Comprehension Subtest* of the *WJTA* (Woodcock et al., 2001). Visual analysis of the multiple-probe graph revealed an increase in level between baseline and the initial stage of instruction for oral reading. Trends were positive with little or no variability for oral reading; the graphed data revealed an improvement on the dependent variable (i.e., oral reading) with the introduction of the independent variable (i.e., the intervention). In addition, visual analysis of the multiple-probe graph revealed an increase in level between baseline and initial instruction for comprehension. The graphed data demonstrated an improvement on the dependent variable (i.e., comprehension) with the introduction of the independent variable (i.e., the intervention). Positive trends for comprehension performance were clearly evident for three of the five participants in the Generalization Stage of instruction. Trend performance in the Controlled Practice and Advanced Practice Stages of instruction were less clear, primarily due to substantial variability in performance.

CHAPTER 5

DISCUSSION

Over the past decade, online education has been expanding rapidly in the K-12 sector of public education. Many virtual schools both public and charter schools offer an education with a combination of online and offline activities. Public virtual schools enroll students with and without disabilities, align curriculum to state standards, require students to take national and state exams, and hire certified teachers (Revenaugh, 2005-2006).

With the expansion of online education, ongoing research has been conducted to determine the effectiveness of online education. Research at the postsecondary level indicates that online education parallels traditional face-to-face instruction. Effective online programs need to be designed with: (a) quality instruction, (b) effective communication, (c) opportunities to practice skills, (d) effective assignments, and (e) effective assessment techniques (Gaytan & McEwen, 2007; Lim & Kim, 2003; Schutte, 1998; Oliver, 2008; Pomales-Garcia and Lui, 2006; Young, 2006). In addition, studies reveal that learner characteristics, motivation, student effort regulation, study environments, and satisfaction affect student performance in online learning (Lim & Kim; Puzziferro, 2008).

Research at the K-12 level reveals that students face the same successes and failures in online environments as in the traditional setting (Rice, 2006). Research at the K-12 level also reveals that students demonstrate equal or higher achievement in academics than students in traditional settings (Chandra & Lloyd, 2008; Hughes, McLeod, Brown, Maeda, & Choi, 2007; Knezek & Christensen, 2007; Okolo, Englert, Bouck, & Heutsche,

2007). Effective online environments at the K-12 level need to be designed with: (a) effective instruction and course design, (b) consistent communication and feedback, (c) differentiated instruction to support student characteristics, student learning styles, and affective learner domains (Hughes et al.; Knezek &Christensen; Okolo et al.; Rice; Roblyer, Davis, Mills, Marshall, & Pape, 2008). Research at the K-8th grade level in online environments is very limited. Little research has been conducted to investigate the effectiveness of learning the fundamental skills of reading through an online format.

The most recent reauthorizations of the *No Child Left Behind Act* of 2001 (*NCLB*) (P.L. 107-110) and the *Individuals with Disabilities Education Improvement Act* (*IDEA*) of 2004 (PL 108-446) mandate higher academic standards, proficiency standards, and access to the general education curriculum for students with disabilities. Public and charter school personnel that provide instruction within online environments are expected to meet the same mandates as educators that teach within traditional face-to-face settings. In addition, *NCLB* requires that schools use instructional methods that have been validated through research. Quality research has yet to be implemented in K-8 online environments to teach complex reading strategies. Successful research in this area has the potential, to provide another avenue for instruction to help school-aged students, especially students with disabilities, meet these increased demands.

The purpose of this study was to explore the effects of teaching *The Word Identification Strategy* (Lenz, Schumaker, Deshler, & Beals, 2007) through online modules to students with specific learning disabilities. Four research questions were answered to address the purpose of this study. Three types of assessment

(i.e., standardized, curriculum-based, and ongoing performance monitoring probes) were used to answer the four research questions. The first assessment used as pre- and posttest measures was the *Reading Comprehension Subtest* from *Woodcock Johnson III Tests of Achievement* (*WJTA*) (Woodcock, McGrew, & Mather, 2001). The second assessment used as pre- and posttest measures was *The Word Identification Strategy Curriculum-Based Measures* (*WIS-CBM*) (i.e., the *Oral Reading Test* and the *Comprehension Test*) included in *The Word Identification Strategy Instructor's Manual* (Lenz et al., 2007). The third assessment was ongoing *Word Identification Strategy Probes* (i.e., the *Oral Reading Probe* and the *Comprehension Probe*) used to monitor student performance throughout the study.

This chapter includes the following six sections: (a) discussion of findings related to the research questions, (b) informal observations related to implementing strategy instruction within an online environment, (c) conclusions and related discussions, (d) practical implications, and (f) recommendations for future research.

Discussion of Findings Related to Research Questions

The four research questions used to guide the design and implementation of this study are presented in this section of the chapter. The findings for each question are reviewed followed by discussion.

Question One

Does online instruction related to the *Word Identification Strategy* (Lenz, et al., 2007) improve the decoding skills of students with learning disabilities?

Two data sets were used to answer this question. The first set of data was obtained from the *WIS-CBM* (i.e., the *Oral Reading Test* and the *Dissect Curriculum Based Test*). The second set of data was obtained from the *Word Identification Strategy Probes* (i.e., the *Oral Reading Probe*) given throughout the instruction of *The Word Identification Strategy* (Lenz et al., 2007).

The *Oral Reading Test* consisted of reading grade level passages (i.e., *Timed Readings*) that contained approximately 400 words. Results from this first set of data reveal that all participants made gains on the *WIS-CBM Oral Reading Test* from pre- to posttest. Pretest scores for all five participants indicated they were reading grade-level passages at the frustration level. According to reading experts, word recognition (i.e., decoding) from 96%- 100% indicates independent reading level (i.e., reads and comprehends without support or assistance from others), word recognition from 90% to 95% indicates instructional reading level (i.e., material is challenging, but appropriate for instruction and some assistance is needed), and word recognition below 90% indicates frustration level reading that results in laborious reading, many errors and difficulties with both decoding and comprehension (Mercer & Mercer, 2005; Vaughn, Bos, & Schumm, 2007). Posttest scores indicated improvement for all five participants in this study. The posttest scores for Participant 1, Participant 2 and Participant 4 indicated they were reading at the independent level on grade-level passages; the posttest scores for Participant 3 and 5 indicated they were reading at the instructional level. Participant 3 was one percentage point away from the independent reading level; whereas, Participant 5 was five percentage points away from the independent reading level.

Although all five participants improved from pre- to posttest, the amount of improvement differed among participants. The results revealed that Participants 3 and 5 had the lowest oral reading scores on the pretest and made the highest percentage point gains as indicated on their posttest performance. It is important to note that the highest possible score was 100% accuracy. Therefore, a natural limit (i.e., ceiling effect) was present related to the amount of improvement participants could make on oral reading. The percentage point gains of Participants 1, 2, and 4 (whose posttest scores indicated independent reading level) ranged from 6 to 10 points. However, the percentage point gains of Participants 3 and 5 (whose posttest scores indicated instructional reading level) were 25 and 12 points respectively. Participant 5 performed in the lower range of the instructional reading level. If she had scored 2 percentage points lower on her posttest, she would have been at the frustration level.

Participant 5 may have been the lowest performer due to several possible reasons. During pretesting on the standardized assessment, Participant 5 had overall lower scores when compared to the other participants. She scored 2.3 Grade Equivalent (G.E.) on both the *WJTA* (Woodcock et al., 2001) *Oral Reading Fluency* and *Passage Comprehension* pretests whereas the other participants scored higher on at least one of the subtests (e.g. Participant 3 scored 2.2 G.E. on *Reading Fluency* but a 4.0 G. E on the *Passage Comprehension*). During the 2009-2010 school year, a three-year revaluation was completed on Participant 5; the multidisciplinary team determined that Participant 5 also had a secondary disability in the area of Speech and Language Impairment. The speech and language therapist stated that Participants 5's speech utterances were intelligible, although at times disjointed and syntactically incorrect. In addition, she displayed

difficulty with verbal sequencing of multisyllabic words. In addition, the school psychologist reported that Participant 5 had difficulties in phonological awareness (i.e., alphabetic principle and decoding) specifically in the areas of larger spoken units such syllables, decoding words, irregular sound patterns and multiple syllables. The above deficits in language processing for Participants 5 may relate to her difficulty with academic skills and most likely contributed to her level of performance in this study. Another possible explanation for lower performance may be related to personality factors. Participant 5 lacked self-confidence and during the pretesting on campus she expressed to the researcher she was a very poor reader. Her family described her as extremely shy. During baseline, Participant 5 had very poor oral reading fluency. She read very slowly getting 'stuck' on words she did not know, she had no strategies for figuring out unknown words, and she would skip the words. Finally, during the strategy instruction, Participant 5 was resistant to using the procedures of self-talking through the mnemonic device and rereading the sentence after determining the correct word. If she had used those steps, she may have made more improvement in oral reading.

The pre- and posttest percentage scores for the *DISSECT Curriculum Based Test* were compared to determine the strategy's effectiveness with regard to improving the participants' ability to break apart multisyllabic words according to the parameters of *The Word Identification Strategy* (Lenz et al., 2007). Participants did not have to read the words orally. Analysis of the data reveals all participants made substantial gains in their ability to break apart multisyllabic words. Participants had to break apart ten multisyllabic words based on *The Word Identification Strategy* (Lenz et al.) mnemonic DISSECT and the Rules of Twos and Threes. After learning the strategy through the

online lessons, participants were sent via email 10 words from every reading selection to practice breaking apart words before reading the selection. In addition, during the oral reading practice in controlled practice and advanced practice, participants used the strategy on unknown words. Participants' improvement from pre- to posttest percentage scores ranged from 50 percentage points to 70 percentage points demonstrating that after learning the strategy, participants were able to implement the strategy and break apart more multisyllabic words in isolation. Consequently, because participants were able to break apart more words in isolation an assumption can be made that this helped participants read more words in context.

The second set of data was obtained from the *Oral Reading Probes* given throughout the instruction of *The Word Identification Strategy* (Lenz et al., 2007). *Timed Readings* (Spargo, 1989) were used for the *Oral Reading Probes*. A multiple probe design was used to assess the effects of online instruction related to improving the decoding skills of students with learning disabilities. All five participants were able to reach mastery performance on controlled practice *Oral Reading Probes* given at instructional levels and on advanced practice *Oral Reading Probes* given at grade level. The number of trials needed to reach mastery differed across participants. During controlled practice, Participants 2 and 3 met mastery (99% on Oral Reading of passages at the students' instructional levels) in two trials, Participants 1 and 4 met mastery in three trials, and Participant 5 met mastery in nine trials. In the beginning of the study, the participants expressed to the researcher that oral reading was difficult and that they felt uncomfortable while oral reading on the *MP3* player. The researcher could hear many of the problems

associated with poor fluency (i.e., speed, expression, and accuracy) while listening to the oral recordings.

Participant 2 and Participant 3 took the fewest trials to reach mastery in controlled practice. During baseline, Participant 2 and 3 had very poor oral reading fluency. Participant 2 had poor breath control and had little expression while reading; his approach to an unknown word was to guess the word. During controlled practice, Participant 2 followed all the instructions in the strategy lessons and quickly learned to figure out unknown words using the mnemonic device steps. During baseline, Participant 3 had very poor oral reading fluency. She read with good speed but skipped unknown words while reading; she also frequently lost her place while reading and skipped whole lines of text. During controlled practice, Participant 3 followed all the instructions in the strategy lessons and quickly learned to figure out unknown words using the mnemonic device steps. In addition, her mother relayed that she practiced the strategy throughout the day in her other lessons.

Participants 1 and 4 took three trials to reach mastery. During baseline, Participant 1 read smoothly and without hesitation; his approach to an unknown word was to guess the word. During controlled practice, Participant 1 learned the strategy without much adult facilitation. This may be why it took him a session longer to reach mastery than Participants 2 and 3. During baseline, Participant 4 had very poor oral reading fluency. He had good speed and expression but when he encountered an unknown word, he would ask for the word from his mother. She would tell him to use the steps of DISSECT. He would argue with her; then his mother would prompt him through the steps.

During baseline, Participant 5 had very poor oral reading fluency. She read very slowly getting 'stuck' on words she did not know and then she would skip the unknown words. As stated previously, deficits in the area of language processing for Participant 5 may have affected not only her spoken language but also her ability to accurately sequence syllables. Participant 5 needed more practice in order to learn how to not only divide the words but also how to verbally sequence them correctly.

In advanced practice, Participant 5 who had the most trials (nine trials) in controlled practice mastered advanced practice in the least trials (two trials). Participant 1, 3, 2, and 4 mastered advanced practice in 3, 4, 6, and 9 trials respectively. Advanced practice is completed at the student's grade level. Participant 2 and 4 needed the most trials 6 and 9 respectively in advanced practice. Advanced practice is completed at the student's grade level. The increase in the difficulty level of oral reading from controlled practice to advanced practice is partly due to an increase in the number of multisyllabic words. Participant 2 may have needed more trials due to the increased level of difficulty in advanced practice. The level of prompt dependency and resistance to becoming an independent reader for Participant 4 may have affected his ability to use the skill at a higher reading level. Also during this part of the study, the home environment for Participant 4 became less structured and more chaotic. This may have affected his level of motivation and his ability to concentrate on academics.

In conclusion, data analyses for Question 1 indicated that online instruction related to *The Word Identification Strategy* (Lenz, et al., 2007) improved the decoding skills of students with learning disabilities. After preliminary strategy instruction, all participants revealed an immediate effect on the dependent variable (i.e., oral reading skills). The

only notable difference between the participants was the number of trials needed to attain mastery in controlled and advanced practice. A range of two to nine sessions was needed for the participants in this study. Generalization involved the use of grade level passages from subject matter material in online assignments from a contracted publishing company used by the school. The length of the assignments in Generalization may have affected the participant's ability to maintain mastery levels. Advanced practice passages were in controlled readers of approximately 400 words whereas Generalization passages contained from 800 to 1600 words. Participants may have experienced reading fatigue due to the length of the assignments thereby causing a lack of concentration during oral reading. It is also possible that the participants were less interested in the content associated with their traditional curricula. In spite of the fact that participants experienced a decrease in level during generalization, all participants demonstrated substantial gains compared to baseline performance.

The findings in this study concur with the findings of other researchers who found that students can improve their ability to decode multisyllabic words through intensive strategic instruction (Abbott & Berninger, 1999; Bhattacharya & Ehri, 2004; Lenz & Hughes, 1990; Vadasy, Sanders, & Peyton, 2006; Woodruff, Schumaker, & Deshler, 2002). The findings of this study also align with the findings of Lenz and Hughes and Woodruff, Schumaker, and Deshler indicating that students at middle and high school levels can improve their decoding skills of multisyllabic word and oral reading ability using grade level reading materials through mastery of *The Word Identification Strategy* (Lenz et al., 2007). Specifically, both the current study and Lenz and Hughes and Woodruff et. al studies revealed: (a) *The Word Identification Strategy* (Lenz et al.,) was

effective in the reduction of oral reading errors including substitutions, omissions, and mispronunciations; and (b) improvement in oral reading only happened after each student was given instruction in the strategy. The current study extends the current literature in that effects of the strategy were examined within an online environment.

Question Two

Does online instruction related to *The Word Identification Strategy* (Lenz, et al., 2007) improve the comprehension skills of students with learning disabilities?

Three data sets were used to answer this question. The first set of data was obtained from pre- and posttest data from the *WJTA* (Woodcock et al., 2001) *Passage Comprehension* that was compared to determine changes in comprehension abilities. The second set of data was obtained from the *WIS-CBM* (i.e., the *Comprehension Test*). The third set of data was obtained from *The Word Identification Strategy Probes* (i.e., the *Comprehension Probe*) given throughout the instruction of *The Word Identification Strategy (*Lenz et al., 2007).

Analysis of the first set of data revealed that all participants made gains on the *WJTA* (Woodcock et al., 2001) *Passage Comprehension Subtest* from pre- to posttest. Participants demonstrated improvement toward closing the gap between their instructional and grade levels in reading comprehension even though they still performed below their current grade level at the time of the posttest. Students with learning disabilities in the area of reading typically do not make a year's growth in a year's period of time. In this study, three participants (i.e., Participants 1, 2, and 4) made growth that exceeded a year. The other two participants (i.e., Participants 3 and 5) made 5 and 3 months growth respectively. This growth in comprehension may have been due to the

improvement in oral reading. It makes sense that if the participants were able to decode better and read more words, they also would understand more of what they read.

Another possible explanation for why these participants demonstrated such substantial growth in comprehension may be related to the *WJTA Passage Comprehension Subtest* (Woodcock et al. 2001). Each test item was composed of only one to three sentences with one word left out. Participants had to state what the missing word was by reading the rest of the passage and using the context of the sentences to fill in the missing word. Thus, the participants did not have to read lengthy passages and answer specific comprehension questions as they did during the instructional condition of this study.

The second set of data was obtained from comparing the pre- and posttest on the *WIS-CBM Comprehension Test.* The *Comprehension Test* was correlated to the passage in the *Oral Reading Test* given at the participants' grade levels. *Timed Readings* (Spargo, 1989) were used for the *Comprehension Tests*. The *Comprehension Test* was comprised of 10 multiple-choice questions about the passage. The pre- and posttest *Comprehension Test* were different passages from the book at the participants' grade level. All participants made substantial gains on this comprehension measure.

The Word Identification Strategy (Lenz et al., 2007) is primarily designed to improve decoding skills of multisyllabic words, however, as noted previously, improved decoding and oral reading is likely to result in improvement of comprehension. When a reader can read more of the words in a passage, their comprehension frequently improves as a result. The results on the *Comprehension Test* show marked improvement to an even greater degree than the results obtained from the *WJTA* (Woodcock et al., 2001). It should be

noted that the *Comprehension Test* was more closely aligned to the type of practice that students engaged in throughout the instruction condition of this study.

The third set of data was obtained from *The Word Identification Strategy Probes* (i.e., the *Comprehension Probe*) given throughout the instruction of *The Word Identification Strategy* (Lenz et al., 2007). *Timed Readings* (Spargo, 1989) were used for the *Comprehension Probes.* The *Comprehension Probes* consisted of ten multiple-choice questions based on a passage of approximately 400 words. A multiple probe design was used to assess the effects of online instruction related to improving the comprehension skills of students with learning disabilities. All five participants were able to reach mastery performance on controlled practice *Comprehension Probes* related to the instructional level passages and on advanced practice *Comprehension Probes* related to grade level passages. The number of trials required to reach mastery performance ranged from two to nine. Participants mastered controlled practice on all trials. Participants mastered advanced practice on all but three trials (e.g., Participant 1 did not meet mastery in the 1st trial of advanced practice, Participant 2 did not meet mastery in the 3rd trial of advanced practice, and Participant 4 did not meet mastery on 7th trial). Even though participants met mastery on the *Comprehension Probes*, the probes continued until mastery was met on both *Oral Reading Probes* and *Comprehension Probes* on the same trial. Thus, all participants attained comprehension scores at or above mastery for 95% of the attempted *Comprehension Probes* (41 out of 43 probes).

In conclusion, visual analysis of ongoing comprehension probes reveals that all participants had variability in one or more of the phases. All participants experienced a decrease in level when beginning advanced practice possibly due to increased level of

word difficulty. Overall, mean scores for *Comprehension Probes* during all phases ranged from 73% to 81% with an overall mean score for all participants of 79%. Participants' variable performance on comprehension may be because comprehension is dependent on many other factors that extend beyond decoding ability. The National Reading Panel (NRP) (2001) found that proficient reading is based on mastery of the following skills: (a) alphabetics (i.e., phonemic awareness instruction and phonics instruction), (b) fluency, and (c) comprehension (i.e., vocabulary instruction and text comprehension instruction). One of the primary factors effecting comprehension is background knowledge (Keene & Zimmerman, 1997). When a student has had prior experience with a topic, the student's comprehension benefits (Keene & Zimmerman,). For example, Participant 2 had a preference for reading material about history therefore, his comprehension was better in passages in that content area. The passages that participants read during this study may have been about topics with which the students had prior experience. There was no attempt to control for background knowledge when selecting passages for this study.

In conclusion, findings related to research question two concur with the findings of other research that reveals that when students improve their ability to decode multisyllabic words through intensive strategic instruction, comprehension may improve (Lenz & Hughes, 1990). Specifically, this study aligns with the findings of Lenz and Hughes indicating that when students at a middle school level improve their decoding skills of multisyllabic words through mastery of *The Word Identification Strategy* (Lenz et al., 2007), comprehension in grade level material improves. As revealed in this current study, Lenz and Hughes also noted that improved word identification skills increased

comprehension and that inconsistent gains in comprehension were made by some participants. Additionally, researchers maintain that students who are not efficient in dividing multisyllabic words tend to have short-term memory difficulties for words that ultimately results in poor comprehension (Perfetti & Lesgold as cited in Lenz and Hughes, 1990). During oral reading probes, Participants 2, 3, 4, and 5 would frequently figure out a word using the strategy and then by the time they were rereading the sentence with the word, they would forget what they had said. Therefore, students do not automatically improve their comprehension skills as a result of mastering *The Word Identification Strategy* (Lenz et al.); some students may need to become more automatic in using the strategy and then be taught other comprehension strategies (Lenz & Hughes). Findings related to research Question 2 extends the literature in that the effects of the strategy on comprehension were examined within an online environment.

Although the measures used to answer research Questions 1 and 2 in this study did not include state assessments, it is interesting to note that four out of five participants in this study showed improvement on state assessments used to evaluate student reading and comprehension. It is possible that this strategy instruction contributed, at least in part, to this improvement. Four of the five participants substantially improved their Language Arts Nevada State Criterion Reference Test (Nevada Department of Education, 2009). The Language Arts Criterion Reference Test assesses the student's ability to read and comprehend. Students with a disability do not receive testing accommodations on this assessment. A score of 100-200 is considered as Emergent/Developing whereas, as score from 200-300 is considered Approaching Standard and above 300 is considered Meeting Standards. In 2007-2008, Participants 1, 3, 4, and 5 scores were 100, 100, 161, and 100

respectively. After the study in 2008-2009, Participants 1, 3, 4, and 5 scores were 325, 156, 217, and 210 respectively. Participant 2's scores decreased from 392 in 2007-2008 to 268 in 2008-2009 possibly due to the increased difficulty level from 6th grade to 7th grade. As part of his special education services, Participant 2 has related service from a speech and language therapist. He has difficulty identifying the meaning of unknown words and describing vocabulary that may affect his reading comprehension as the vocabulary becomes more difficult.

Question Three

Do students with learning disabilities maintain *The Word Identification Strategy* (Lenz et al., 2007) skills 2 weeks after instruction has ended?

Two assessments were used to determine maintenance performance. Two weeks after posttests were administered, an *Oral Reading Probe* and *Comprehension Probe* at grade level were given online (to be consistent with other multiple probe design data collection procedures used throughout the study).

On the *Oral Reading Probe* during maintenance performance, Participants 1, 2, 4, and 5 read at or above instructional level; Participant 3 read at an instructional level but substantially higher than her initial *WIS-CBM Oral Reading Test*. Only Participant 2 maintained mastery as prescribed in *The Word Identification Strategy* (Lenz et al., 2007).

On the *Comprehension Probe* during maintenance performance, Participant 1 scored at mastery level for comprehension set by *The Word Identification Strategy* (Lenz et. al). Participants 2, 3, 4, and 5 scored higher on comprehension during maintenance than during baseline. In addition, when Participants 2, 3, and 5 increased their percentage

scores on oral reading, the outcome was an increase in the number of questions answered correctly on the *Comprehension Probe*.

The study findings related to research question three concur with the findings of other researchers related to oral reading and comprehension skill maintenance. Lenz and Hughes (1990) found that after a period of no direct instruction in *The Word Identification Strategy* (Lenz et. al) maintenance performance on oral reading and comprehension was better than baseline performance. Lenz and Hughes' research also revealed that maintenance probes at 1 week, 3 weeks, and 5 weeks on grade level materials in oral reading and comprehension were consistent with the scores during the instructional condition. Specifically, at weeks 1, 3, and 5 after no instruction, oral reading and comprehension results on the maintenance probes were consistent with advanced practice probes but lower than the scores on controlled practice probes. Four out of six participants scored lower on maintenance scores for oral reading in a grade level textbook but similar to their performance in grade level *Timed Readings* (Spargo, 1989) passages. All oral reading scores were better during training than scores during baseline; except for one student, all comprehension scores were better during maintenance than before instruction.

Similar to the Lenz and Hughes (1990) findings, Participants 2, 3, 4, and 5 in the current study maintained skill levels over two weeks in oral reading when compared to performance in advanced practice. Only Participant 1 displayed a decrease in oral reading from an average of 96% in oral reading in advance practice compared to 91% on maintenance *Oral Reading Probe*. However, this current study also reveals that all

students performed better during maintenance than before instruction on both oral reading and comprehension.

In conclusion, as evidenced in a similar research study (Lenz & Hughes, 1990), most students maintain their oral reading and comprehension skills. Lenz and Hughes implemented maintenance probes that included a strategy review at 1, 3, and 5 weeks; whereas, the current study implemented a maintenance probe at 2 weeks without a strategy review. Therefore, the maintenance criteria were a bit more rigorous in the current study. The results indicate that some students may need more frequent practice in the strategy and/or strategy reviews to maintain skill level. Rather than waiting two weeks, oral reading practice and/or strategy reviews may need to be implemented until the skill of breaking apart multisyllabic words becomes more automatic. In addition, if students had to demonstrate mastery in advanced practice more than one time, they may maintain skills at higher levels for a longer period of time. For example, if students had to demonstrate mastery on three different grade level passages, it is possible the increased practice and more a gradual transition to maintenance would be beneficial.

Question Four

How satisfied were students with learning disabilities with online instruction of the *Word Identification Strategy* (Lenz, et al., 2007)?

The researcher developed *The Word Identification Satisfaction Questionnaire* to determine participant satisfaction with learning *The Word Identification Strategy* (Lenz et al., 2007) via online instruction. In addition, several items were included to determine whether the participant felt that *The Word Identification Strategy* (Lenz et al.) helped improve his or her oral reading and comprehension. *The Word Identification Satisfaction*

Questionnaire was answered by the participants on campus during the posttest session and was analyzed to determine satisfaction levels. *The Word Identification Satisfaction Questionnaire* contained ten statements. Participants rated the statements from 1 to 5 with 1 being 'Strongly Disagree' to 5 being 'Strongly Agree'. Participants answered all questions with either "Strongly Agree", "Agree", or "Neither Agree nor Disagree".

Participants' answers revealed that statements 3, 9, and 10 received the highest average score. Three out of five participants stated that they "Strongly Agreed" and two out of five "Agreed" with the following statements: (a) Statement 3 "I liked memorizing the mnemonic DISSECT through the online presentation."; (b) Statement 9 "I like that *The Word Identification Strategy* has helped me to read large words."; and (c) Statement 10 "I like that *The Word Identification Strategy* has helped me to improve my understanding of what I read." Overall, the participants were very satisfied with learning the mnemonic DISSECT.

Participants may have rated statements 3, 9, and 10 with highly positive marks because of a positive change in perceptions about their reading abilities. All of the participants relayed to the researcher during the pretest session that reading was a very difficult task for them. Specifically, the participants made statements such as: "I do not like to read because reading is hard for me" and "Reading is my worst subject." During Stage 1 (i.e., Receive Pretest Feedback and Make Commitments), students made a commitment to learn the strategy and the researcher made a commitment to help them become better readers. The researcher consistently made positive comments about the students' progress and expressed her excitement because their reading was going to improve. This may have influenced their thoughts about the strategy in a positive

direction. The participants may have liked memorizing the steps in the mnemonic DISSECT because of the novelty of learning something new and their anticipation that the strategy would work. Participant 3 even made up a song to the tune of "BINGO" to help her remember the mnemonic device steps and sang the song throughout the week. After the participants memorized the mnemonic device steps and began to see their progress, they expressed their excitement to the researcher about their improved reading and comprehension.

In addition, participants were graphing their progress on a curriculum-based measurement graph after each assignment and could graphically see their improvement. The combination of (a) using DISSECT, (b) seeing their progress on the graph, and (c) having positive feedback about their reading from the researcher, their parents and teachers, may have resulted in the participants realizing that the strategy was helping them improve their oral reading and comprehension. It is possible that because participants were satisfied with the strategy (i.e., DISSECT) and saw the benefit of the strategy, they were motivated to continue to use the strategy throughout the instructional lessons. The strategy instruction seemed to foster a positive learning cycle for the participants; positive feedback and noted progress motivated the participants to be enthusiastic about the strategy effects.

Even though participants expressed satisfaction with learning the mnemonic DISSECT through online instruction, only three participants "Strongly Agreed" with Statement 1 "I liked the Power Point media lessons." Two participants neither agreed nor disagreed. Four out of five participants were even less satisfied with the PowerPoint media lesson worksheets (statement 2's average score 3.8). The PowerPoint media

lessons were comprised of the direct instruction scripted lessons from *The Word Identification Strategy* (Lenz et al., 2007). The researcher typed the lessons into PowerPoint, saved the lessons in jpg format, and uploaded the lessons into *Adobe Photo Story* 3 *for Windows*. The researcher then recorded the script.

The participants' typical daily academic lessons at the charter school are presented online with a very interactive multimedia format. In contrast, the lessons developed for the research were very basic. The participants may have viewed the online media lessons as boring compared to their daily interactive multimedia online lessons. In addition, the PowerPoint media lesson worksheets involved structured learning and required student participation and concentration. The worksheets presented the PowerPoint media lessons in a cloze format. Participants had to search for the correct answer and type the answer online or print the worksheet out and write the answer in the blank. Participants may have viewed the worksheets as "busy work" and therefore not pleasant.

As stated previously, the participants relayed that they were satisfied with Statement 3, "I liked memorizing the mnemonic DISSECT through the online presentation." On the other hand, participants gave a lower satisfaction rating (M=3.8) to Statement 4 "I liked memorizing the Rules of Twos and Threes through the online presentation." Four out of five of the participants' responses on this question indicated that they "Agreed" while one participant "Neither Agreed nor Disagreed" with the statement. Memorizing and understanding the Rules of Twos and Threes may have been challenging for the students due to their learning disabilities. Many students with learning disabilities struggle with memory tasks and new concepts. The Rules of Twos and Threes represented totally new information for these participants and there was no memory device (i.e., mnemonic) to

help them with the memorization of these rules. It is, therefore, not particularly surprising that students rated this item lower than Statement 3 about memorizing the DISSECT steps.

On Statement 6, the participants' average rating was a 4 for satisfaction related to the statement: "I liked the DISSECT *Practice Worksheets* to help me learn how to divide words." The participants were provided practice using the Rules of Twos and Threes during controlled and advanced practice on the *DISSECT Practice Worksheets*. Each *DISSECT Practice Worksheet* contained 10 multisyllabic words found in the reading passage. Before reading the passage, the participants were instructed to use four steps of DISSECT (i.e., I-Isolate the beginning, S-Separate the ending, S-Say the Stem, and E-Examine the stem using the Rules of Twos and Threes) to break apart the words. The participants liked the *DISSECT Practice Worksheets* possibly because the worksheets gave them an opportunity to practice the skills of dividing out the stem with the Rules of Twos and Threes in isolation. By spending time before reading, practicing implementation of the Rules of Twos and Threes to divide challenging words, participants may have been better able to focus on the task because the words were being attacked in isolation rather than within the context of an entire passage. In addition, the participants were introduced to some of the difficult words in the passage in advance. This type of previewing in supported widely in the reading literature (Bender, 2002)

Throughout the study, (i.e., baseline, controlled practice, advanced practice, generalization, and maintenance), participants were required to record oral readings. *MP3* players were downloaded into their home computers. The participants recorded their reading on the *MP3 Player* and sent the sound file to the researcher for scoring. On

Statement 5, participants rated a satisfaction level of 4.2 related to the statement: “I liked using a *MP3 Player* to record my oral reading.” Four out of five participants “Strongly Agreed” and “Agreed” that they liked using the MP3 player. While scoring the recordings, the researcher could ‘hear’ the improvement in fluency through the oral reading practice. The participants gained confidence and after learning the strategy, had a strategic approach to figuring out unknown words rather than simply skipping the words or guessing at what they might be. During initial instruction, several of the participants had difficulty figuring out how to save recorded passages, locate the saved sound file, and how to attach the sound file to an email. After the first few recorded sessions in which the participants expressed some hesitation about recording, the participants’ voices sounded more relaxed and their reading fluency improved. Graphing their progress and seeing their progress on the graph, also may have resulted in participants becoming more comfortable with the process of recording their readings.

On Statement 7, participants rated a satisfaction level of 4 related to the statement: “I liked that the *Comprehension Probes* were easy to complete.” Four out of five participants marked either “Strongly Agree” or “Agreed” with the statement. *Comprehension Probes* were comprised of ten multiple-choice questions. Participants viewed the *Comprehension Probes* as easy to complete. Participants’ online assignments are typically in a multiple-choice format; therefore, participants may have liked the *Comprehension Probes* because the format was familiar. Also, the students may have viewed the multiple choice comprehension probes as easy because other more challenging formats (i.e., short answer or fill in the blank) were not used.

On Statement 8, participants rated a satisfaction level of 3.8 related to the statement: "I like to use *The Word Identification Strategy* while reading." Three out of five participants "Strongly Agree" or " Agreed" with the statement; and two out of five "Neither Agreed nor Disagreed" with the statement. Statement 8 received the lowest satisfaction rating along with Statement 2 (i.e., "I liked that the Power Point media lesson worksheets helped me stay on task and learn the strategy."). It is interesting to note that even though participants rated "using" *The Word Identification Strategy* (Lenz et al, 2007) while reading lower, the participants were very satisfied with being able "read large words" and "understand what I read" (i.e., Statements 9 and 10). It is possible that the students interpreted this question to mean all of the work they were required to do during the strategy instruction. Because the students did not feel highly favorable about the Power Point media lesson worksheets, there overall view of the strategy may have been influenced. Also, because the participants' academic lessons in the online school are typically interactive using multimedia, students may have viewed these strategy lessons as less exciting than what they are used to receiving from their teachers. When learning a new skill, students often view the process as difficult at first. It is possible that participants' views of the strategy may change as they continue to use the strategy and it becomes easier. Additionally, more time to experience the benefits of the strategy may change perceptions in a positive direction.

In conclusion, participants' responses on the satisfaction survey revealed an overall average of 4.1 out of a 5 rating on *The Word Identification Satisfaction Questionnaire*. The participants particularly enjoyed memorizing the mnemonic device (i.e., DISSECT) through the online presentation and believed the strategy improved their skills in

decoding multisyllabic words and improved reading comprehension. The participants did not seem to enjoy the media lesson worksheets, memorizing the Rules of Twos and Threes or using the strategy while reading as much. So even though the participants saw the benefit and improvement in their reading, they were not as satisfied with some of the processes of learning the strategy.

Informal Observations Related to Implementing Strategy Instruction Within an Online Environment

The primary difference between this study and previous investigations (Lenz & Hughes, 1990; Woodruff et. al, 2002) related to the effectiveness of *The Word Identification Strategy* (Lenz et al., 2007) was the method of instructional delivery (i.e., online vs. face-to-face). Because the strategy was delivered online in this study and because this appears to be the first and only investigation that involves teaching the strategy in this manner, it is important to link informal observations related to the online delivery method to previous reports in the literature. Specifically, student characteristics and online environments are addressed.

Student Characteristics

In a meta-analysis related to online environments, Rice (2006) found that students can succeed or fail in a virtual environment just as in a traditional face-to-face setting. Based on this meta-analysis, Rice identified student characteristics as a critical component of success in the online learning environment. In subsequent studies, researchers noted that students' levels of independence, responsibility, and motivation affect their performance in online coursework (Chandra & Lloyd; Reeves, 2007; Rice; & Wang 2007). Although

not directly measured nor systematically analyzed, informal observations of the five participants in this study revealed some interesting findings related to student characteristics identified as being important within online learning environments.

For example, Participants 1, 2 and 3 demonstrated qualities identified in the literature as being important related to online performance (i.e., independence, responsibility, and motivation) as they progressed through the lessons. Specifically, Participants 1, 2 and 3 were highly motivated and self-directed related to assignment completion. They were responsible and completed the assignments in a timely manner except when special circumstances occurred in the home environment (e.g., illnesses, doctor appointments, and technology problems with the home computer). They learned the strategy and improved their oral reading and comprehension. Participant 1 completed the assignments without much adult facilitation. Participant 2 expressed to the researcher his excitement related to improved oral reading. Initially, Participant 3 seemed as though she lacked the characteristics noted in the literature as being important for online success. She sounded very frustrated with the oral readings during baseline. However after learning the DISSECT strategy, her oral reading significantly improved and she displayed independence, responsibility, and motivation related to assignment completion in a timely manner. She learned the strategy and improved her oral reading and comprehension.

Participants 4 and 5 seemed to lack the characteristics identified in the literature (e.g., independence, responsibility, motivation) as being important for online success and still performed well in the strategy. Participant 4 was highly prompt dependent. He expected his mother, who was the online teacher, to sit with him at every moment. He was not self-motivated to self-talk or put the correct word in the sentence after he figured out the

word. If he came across an unknown word while reading, he would say, “Mom, I need this word!” or “Mom, I need help!” He consistently requested the word and had to be prompted to use the strategy. His mother followed the researcher’s instructions on how to correctly provide assistance and how much assistance to provide. His mother guided him through the step-by-step procedures in the mnemonic DISSECT and expected him to follow the procedures correctly. Even though he lacked the critical student characteristics for success as identified in the literature, he learned the strategy and improved his oral reading and comprehension. Participant 5, also, needed assistance throughout the instructional phase. During controlled and advanced practice, she was prompt dependent. Her sister who was her online teacher did not follow the researcher’s instructions on how to correctly provide assistance and how much assistance to provide. Instead of guiding her through the step-by-step procedures in the mnemonic DISSECT; her sister would tell her the word. The participant did not use self-talk or consistently reread the sentence with the correct word. Even though she lacked the critical student characteristics for success, she learned the strategy and improved her oral reading and comprehension.

Most research related to needed student characteristics in online environments has been conducted at the high school level; very little has been conducted at the elementary and middle school levels. The participants in this study were in the 5th through 7th grade level. Overall, Participants 1, 2, and 3 who were in the 7th, 6th, and 7th grades respectively, demonstrated independence, responsibility, and motivation related to assignment completion. However, Participants 4 and 5, who were both in the 5th grade, appeared to be deficit in these student characteristics perhaps due to immaturity. The participants in this study demonstrated that the level of independence and responsibility within online

environments may differ based on age and/or grade level. Regardless of the lack of some of the identified critical student characteristics for success in an online environment, all five participants learned the strategy and made substantial growth in oral reading and comprehension.

Online Learning Environments

Roblyer, Davis, Mills, Marshall, and Pape (2008) maintains that the learning environment needs to be considered as much as student characteristics when determining student success in an online environment. In addition, Rice (2006) indicated the importance of adult facilitation. Adult facilitation helps students at a K-12 level improve the amount and quality of time students participate and learn in an online setting. Additionally, researchers have determined that learning environments including technology proficiency, technology problems, and time management are related to achievement within online settings (Puzziferro, 2008).

The participants' success in this research study seemed to be somewhat dependent on his or her online learning environment and on adult facilitation. In the charter school where this study was implemented, the parent becomes the teacher with the guidance of the general and special education teachers. The online learning environment was in the home. It became quite apparent that the home environment also affected the participants' motivation, independence, effort regulation, and study environment.

In addition, the researcher found that family dynamics and family circumstances seemed to take precedence over school-related lessons. Even though children who attend traditional schools sometimes bring home problems to school, the school environment helps children concentrate on learning and helps them leave the family circumstances at

home. However, when children learn at home, family dynamics, circumstances, and problems are always present. Each participant in this study had specific family circumstances that seemed to influence their timeliness in completing assignments and/or their concentration levels.

Although for the most part, Participant 1 demonstrated responsibility in assignment completion, there were a few instances where family circumstances interfered. When family members came down with the flu, he was 'absent' from school. Another family situation that effected Participant 1's participation in the study was his Dad's foot surgery and complications with recovery. During this family crisis, which lasted several weeks, schoolwork became secondary. Participant 1 was finishing preliminary strategy instruction during this crisis. The last two PowerPoint media lessons were delayed for one week. During controlled practice, *Oral Reading Probes* and *Comprehension Probes* were designed to be completed daily until mastery was met. Participant 1 completed the second probe a week after the first probe and then met mastery on the third probe. Although his scores were not significantly impacted, if he had completed the probes on a consistent basis, he probably would have mastered controlled practice in two trials instead of three.

Initially, the online learning environment for Participant 2 was very chaotic. He had younger siblings. When listening to his responses on the MP3 player, the researcher could hear the chaos at home and the effect the chaos was having on the participants' level of concentration. The researcher asked the parent if the lessons could be completed when the younger siblings were napping. The environment became a quieter learning environment and the participant's level of concentration improved.

Although Participant 3 ultimately demonstrated responsibility related to assignment completion, an initial adjustment to her schedule had to be made. Participant 3 attended two classes at her zoned middle school in addition to the online charter school. Her mother, who worked evenings, slept from 11 A.M. to 2 P. M. while the participant was in school and then went to work at 4 P.M. During preliminary strategy instruction, the first assignment was not completed in a timely manner. Once the parent communicated to the researcher why the assignment was not being completed, the researcher made adjustments and sent the work the evening before it was due. Thus, all assignments had to be emailed before 8 A.M. to accommodate the participant's learning schedule.

Participant 4 needed a very structured learning environment and would not work on assignments unless the parent was sitting next to him. He was very prompt dependent. It is likely that this pattern of behavior had developed and been inadvertently reinforced over time as evidenced by the parent's desire to control his school assignments and related responses. The researcher counseled the parent on encouraging independent behavior from the student by using a positive behavior support system for accurate and quality completion of assignments. After preliminary strategy instruction, the family went to another state for an educational consultation on the student's learning problems that resulted in a ten-day absence from school. Finally, during the generalization stage of instruction, the participant's older sister with her two children moved in with the family due to marital problems. The nephew and niece were under the age of four and required supervision from the grandmother: hence, the home learning environment became very chaotic and consistent supervision of lesson completion did not occur.

The work completion for Participant 5 was also affected by home circumstances. She had adult facilitation from her older sister. Her older sister was working and going to school. Therefore, her older sister could only help at certain times of the day. The researcher worked out a learning schedule with the older sibling so that work could be completed daily. In addition, even though the older sister had the same instruction as the other participants' parents, she did not understand how to implement the strategy correctly or how to guide the participant in using the strategy. The researcher completed a training session with the sister in which the researcher modeled how to provide guided instruction. The session did not help. Participant 5 also was affected by family circumstances with another older sibling having difficulty at school with behavioral issues. Finally, during advanced practice, a two day break from the study was requested due to a family pet that was dying followed by spring break.

In summary, online learning environments and adult facilitation are important factors for student success in online environments (Rice, 2006; Roblyer et al., 2008). Learner independence improves for K-12 online learning with adult facilitation and adult engagement improves amount of time and quality of student participation while learning in an online setting (Rice, 2006) As noted in the literature (Rice, 2006; Roblyer et al., 2008) family circumstances and issues clearly affect K-12 online learning environments. One parent is usually the teacher and provides the structure and adult facilitation. As previously described, family circumstances and issues surrounding adult facilitation affected each of the participants in this study. When school is in the home, family seems to be the primary focus; schooling often becomes secondary and not the priority.

Conclusions and Related Discussions

Several conclusions emerged based on this research study. First, students with learning disabilities can learn *The Word Identification Strategy* (Lenz et.al., 2007) through online instruction. Specifically, they can learn the steps of the strategy and apply those steps to break apart multisyllabic words. They can improve both oral reading and comprehension abilities. They can generalize the strategy to online subject area materials written at grade level.

A second conclusion derived from the results of the study is that by learning *The Word Identification Strategy* (Lenz et al., 2007), students with learning disabilities can improve their comprehension grade equivalent scores on standardized assessments (i.e., *WJTA*, Woodcock et al., 2001). Participants in this study demonstrated growth and in some cases substantial growth on the *WJTA Passage Comprehension Subtest* (Woodcock et al., 2001) (e.g., Participant 2 made three years and two months growth on the *Passage Comprehension Subtest* over four months).

A third conclusion derived from the results of this study is that students with learning disabilities who learn *The Word Identification Strategy* (Lenz et al., 2007) can maintain their oral reading skills over a two-week period at levels higher than their performance before learning the strategy and comprehension abilities are maintained at mastery level performance. Additional instructional support is needed to maintain mastery level performance on oral reading using grade level materials.

A fourth conclusion derived from the results of the study is that students with learning disabilities have favorable opinions about *The Word Identification Strategy* (Lenz et al.,

2007) particularly related to the benefits of the strategy in terms of improving their oral reading and comprehension.

Practical Implications

Based on formal and informal assessments and observations that took place during this study, several practical implications emerged related to providing strategy instruction within an online environment. These implications involve instructional design, adult facilitation, and family dynamics.

Instructional Design

When providing instruction to online learners with reading difficulties via PowerPoint presentations, it is helpful to provide audio of the slide text so that students can view and hear the slide text independently. When incorporating audio files within online instruction, the recording of the text should be read very clearly and slowly. It may be necessary to supplement and modify online instruction of *The Word Identification Strategy* (Lenz et al., 2007) with activities to ensure the student is actively engaged in the presented lessons (e.g., PowerPoint media lesson worksheets that involve use of a cloze format and/or supplemental worksheets used to practice breaking apart multisyllabic words before reading the story). The use of video streaming enhances the teacher's ability to model the strategy steps. All materials used should be clear and easily visible. Several of the participants in this study had difficulty reading the scanned stories from the *Timed Readers* (Spargo, 1989); the stories had to be rescanned to improve clarity. When implementing online instruction, there will likely be challenges associated with the technology. The computer systems in the students' homes may be old and not have

current programs installed. Thus, it is helpful to be sure all necessary software programs are installed before beginning instruction. The parents may not be as well versed as the students in how to navigate on the computer. Thus, the parents may need some individualized instruction to help with the computer software.

Downloading and learning to use the *MP3* player posed the most difficulty for the participants. The researcher demonstrated how to download, record, and save the files on the *MP3* player during the first group meeting and again during the pretesting session on campus. Four out of the five participants had to have phone help to download the program, learn how to record, where to save the files, how to label the files, and how to find the files. After a few practice sessions, the students and the parents became proficient in the use of the MP3 player. Thus, it is important to be sure that students can record and send sound files before beginning the instruction. In addition, the participants were very slow readers and the recorder can only record for a limited number of minutes; therefore, it is important to divide recordings into several sound files.

Curriculum-based measurement and providing feedback were important components of the instruction. After completion of an assignment, immediate positive and corrective feedback was provided by the researcher. The feedback helped to shape the students future performance. In addition, students seemed to benefit from graphing their performance on a chart. This process helped students track their own performance and provided a visual picture of their performance that seemed to be motivating.

After mastering *The Word Identification Strategy* (Lenz et al, 2007), some students likely will need additional practice to maintain their newly acquired oral reading skills. Weekly practice sessions may be needed. If the student maintains the skill with weekly

practice after a few weeks, maintenance intervals may be lengthened (i.e., biweekly to monthly) until the student's skill has become automatic. It may also be helpful to establish more rigorous mastery criteria in the controlled, advanced and/or generalization stages of the instruction.

Adult Facilitation

Adult facilitation is helpful when providing strategy instruction in an online environment to elementary and middle school students. The adult facilitator should be trained in the strategy, understand how much help is enough, and how to provide performance feedback. Too little or too much facilitation and feedback can interfere with student independence and mastery of the strategy.

Family Dynamics

It is important to realize that family dynamics may affect student success in an online learning environment. In an online environment, family priorities may come first with school priorities becoming second. The family is part of the school environment. Siblings may have an effect on the learner's ability to concentrate and adult facilitation may not always be available. Thus, scheduling variables are very important within online environments. Family crisis such as illness and accidents may affect the student's ability to complete assignments on time. Family schedules also affect when assignments will be completed. Although one of the advantages frequently cited for online instruction is the flexibility of the school day, it is still important to consider family variables and the need for structure that many students with learning disabilities display. The students in Lenz and Hughes' (1990) and Woodruff, Schumaker, and Deshler's (2002) studies mastered *The Word Identification Strategy* (Lenz et al., 2007) in four to six weeks of intensive

instruction in a traditional setting. The participants in this current study mastered the strategy in comparable number of sessions but over eighteen to twenty weeks possibly due to family dynamics within the online environment. It may be necessary to allow for more time for students to master learning strategies taught in an online environment.

Recommendations for Future Research

This study represents an initial contribution to literature involving teaching *The Word Identification Strategy* (Lenz et al., 2007) through online instruction to students with learning disabilities. Reflection on the methods used in this study, as well as the results obtained, led to the following recommendations for future study.

1. Future research related to teaching *The Word Identification Strategy* (Lenz et al.) through online instruction should be conducted to determine the effectiveness of this type of instruction for students with reading deficits, but without learning disabilities (e.g., students with English as a second language, students with behavioral and emotional issues, students identified to receive tier two interventions within a response to intervention system, students with language disorders, and students with intellectual disabilities).
2. Future research related to teaching *The Word Identification Strategy* (Lenz et al.) through online instruction to students with learning disabilities should include students in other grade levels (e.g., high school).
3. Future research related to teaching *The Word Identification Strategy* (Lenz et al.) through online instruction should be conducted with a larger sample size of students

with learning disabilities and/or a larger sample size of students without disabilities (perhaps third grade students learning to decode multisyllabic words).

4. Future research should be conducted to explore the effects of teaching *The Word Identification Strategy* (Lenz et al.) in other types of online environments such as online instruction in general education settings, online environments in remedial settings, and in before and after school settings.

5. Future research should be conducted to explore teaching other validated reading strategies through online instruction such as *The Paraphrasing Strategy* (Schumaker, Denton, & Deshler, 1984).

6. Future research should be conducted to explore the characteristics that elementary and middle school students need to have to be successful in online strategy instruction. Once these characteristics are identified, investigations related to effective accommodations for students who lack the needed characteristics would be beneficial.

APPENDIX A

Reliability Coefficient Data

(McGrew, K. S. & Woodcock, R. W., 2001)

Subtests	*Ages*					
	9	10	11	12	13	14
Reading Fluency	.89	.90	.87	.90	.90	.94
Passage Comprehension	.91	.89	.83	.80	.83	.86

APPENDIX B

DISSECT Curriculum-Based Test

Break the word into syllable parts. Use a back slash /.

1. disappointment
2. repeat
3. automatic
4. combination
5. epicenter
6. objective
7. hopeless
8. respectful
9. immobilize
10. implosion

APPENDIX C

Oral Reading Probe Sample

Ludwig van Beethoven was one of the greatest composers who ever lived. He taught people that they could be freer when they wrote music. Before his time, music was composed for a special purpose. Often it was church music. Or, music was written to entertain at parties and dances. Beethoven did not think that music needed to have a practical use. He thought people should listen to music just for itself.

Beethoven was born in Germany in 1770. He was a very musical child. The boy learned to play the violin and the piano. But he was not happy at home. His mother died when he was in this teens. After that, his father was often drunk and bad-tempered. Beethoven became a tutor in a rich family. He was glad to get a job. His student's mother was very kind to the young teacher. She helped him meet many famous musicians. One of these was Mozart. Mozart heard the boy play the piano. He said, "That boy will give the world something worth listening to." In a few years, Beethoven was ready to leave his teaching job. He went to the city of Vienna. There he wrote a lot of music. Some people who hear his music did not like it. They thought it was too loud and forceful. But soon most people came to admire his work.

When Beethoven was in his twenties, he began to go deaf. The deafness changed his behavior. He became withdrawn and moody. His friends found him hard to be around. But he kept composing even when he lost all of his hearing. The music he heard was in his head.

Beethoven died when he was 57 years old. Most of his friends and family had deserted him. This had caused Beethoven a great deal of grief. But at least he had had his music. He had composed over a hundred pieces. His music spanned two stages of music history. His early music was more formal. It followed certain steps and patterns. But his later music changed. That style is now called romantic music. This type of music is written to stir the listener's feelings. Sometimes a piece tells a story. Beethoven learned to use music, not words, for the story. This romantic style changed the way people thought about music. Many later composers gained new ideas from Beethoven's musical discoveries.

Spargo, E. (1989). *Timed readings; Book one (pp. 15-16)* (3rd ed.). New York: Glencoe McGraw-Hill

APPENDIX D

Comprehension Probe Sample

Name: Date:

Without looking at your reading selection, answer the following questions. Underline or highlight the correct answer and save onto your desktop. Email the completed worksheet back to your teacher.

1. Beethoven was born in
    a. France.
    b. Germany.
    c. England.

2. The boy got a job as a
    a. violinist
    b. singer.
    c. tutor.

3. When Beethoven was in his twenties, he began to go
    a. deaf.
    b. blind.
    c. crazy.

4. During his life, Beethoven composed
    a. only a few pieces.
    b. five hundred pieces.
    c. over a hundred pieces.

5. Beethoven's later style is now called
    a. baroque music.
    b. romantic music.
    c. country music.

6. The young Beethoven
    a. was very talented.
    b. did not get along with his mother.
    c. played the trumpet.

7. Beethoven's father
    a. begged him not to leave home.
    b. died when Beethoven was in his teens.
    c. was not kind to his son.

8. Mozart apparently thought that Beethoven
    a. had a bad temper.
    b. should stop playing the piano.
    c. would become famous.

9. Beethoven's deafness made him
    a. stop writing music.
    b. difficult to socialize with.
    c. talk very loudly.

10. Beethoven's music
    a. changed the way later composers thought.
    b. is unimportant in today's music world.
    c. ended the romantic ear of music.

Spargo, E. (1989). *Timed readings; Book one (pp.16)* (3rd ed.). New York: Glencoe McGraw-Hill.

APPENDIX E

Word Identification Satisfaction Questionnaire

Name: Date:

Please highlight the number next to each question that best describes how you feel.

1= Strongly disagree

2= Disagree

3 = Neither agree nor disagree

4 = Agree

5 = Strongly Agree

1. I liked the Power Point media lessons.

1 2 3 4 5

2. I liked that the Power Point media lesson worksheets helped me to stay on task and learn the strategy.

1 2 3 4 5

3. I liked memorizing the mnemonic DISSECT through the online presentation.

1 2 3 4 5

4. I liked memorizing the Rules of Twos and Threes through the online presentation.

1 2 3 4 5

5. I liked using a *MP3 Player* to record my oral reading.

1 2 3 4 5

6. I liked the DISSECT *Practice Worksheets* to help me learn how to divide words.

1 2 3 4 5

7. I liked that the *Comprehension Probes* were easy to complete.

1 2 3 4 5

8. I like to use *The Word Identification Strategy* while reading.

1 2 3 4 5

9. I like that *The Word Identification Strategy* has helped me to read large words.

1 2 3 4 5

10. I like that *The Word Identification Strategy* has helped me to improve my understanding of what I read.

1 2 3 4 5

APPENDIX F

Triad's Implementation Schedule

Day	Activity
September 22-26	Pretest Participants 1-3
October 21	Participant 1 Completed Baseline 1 Participant 2 Completed Baseline 1 Participant 3 Completed Baseline 1
October 22	Participant 2 Completed Baseline 2 Participant3 Completed Baseline 2
October 23	Participant 1 Completed Baseline 2 Participant 2 Completed Baseline 3 Participant 3 Completed Baseline 3
October 24	Participant 1 Completed Baseline 3 Participant 2 Completed Baseline 4 Participant 3 Completed Baseline 4
October 27	Participant 1 Completed Baseline 4
October 29	Participant 1 Completed Media Lesson 1
October 30	Participant 1 Completed Lesson Media 2-1
November 4	Participant 1 Completed Lesson Media 2-2
November 5	Participant 2 Completed Baseline Probe Participant 3 Completed Baseline Probe
November 12	Participant 1 Completed Media Lesson 3 Participant 2 Completed Baseline Probe Participant 3 Completed Baseline Probe
November 13	Participant 1 Media Lesson 4 Practice
November 14	Participant 1 Media Lesson 4 Practice
November 17	Participant 1 Completed Media Lesson 4
November 18	Participant 1 Completed Media Lesson 4-2

November 19	Participant 2 Completed Baseline Probe Participant 3 Completed Baseline Probe
November 25	Participant 2 Completed Baseline Probe Participant 3 Completed Baseline Probe
December 1	Participant 1 Phone Lesson Participant 1 Completed Media Lesson 5; Participant 1 Controlled practice 1
December 2	Participant 2 Completed Baseline Probe Participant 3 Completed Baseline Probe
December 8	Participant 1 Controlled practice 2
December 9	Participant 2 Completed Baseline Probe Participant 3 Completed Baseline Probe
December 10	Participant 1 Controlled practice 3 (Mastery)
December 11	Participant 1 Completed Media Lesson 6 Participant 2 Completed Baseline Probe
December 12	Participant 2 Completed Media Lesson 1
December 15	Participant 1 Advanced practice 1 Participant 2 Completed Media Lesson 2-1
December 16	Participant 1 Advanced practice 2 (Mastery) Participant 2 Completed Media Lesson 2-2 Participant 3 Completed Baseline Probe
December 17	Participant 2 Completed Media Lesson 3
December 18	Participant 2 Media Lesson 4
December 19	Participant 2 Completed Media Lesson 4
January 5	Participant 1 Media Completed Media Lesson 7 Participant 2 Completed Review Media Lesson Participant 3 Completed Baseline Probe
January 6	Participant 1 Generalization Reading

January 8	Participant 1 Generalization Science Participant 2 Completed Phone Lesson
January 9	Participant 2 Completed Media Lesson 5 Participant 2 Completed Controlled practice 1
January 12	Participant 1 Generalization Social Studies Participant 2 Completed Controlled practice 2 (Mastery)
January 13	Participant 2 Completed Advanced practice 1 Participant 3 Completed Baseline Probe
January 14	Participant 2 Completed Advanced practice 2 Participant 3 Completed Media Lesson 1
January 15	Participant 2 Completed Advanced practice 3 Participant 3 Completed Media Lesson 2-1
January 16	Participant 1 Posttest
January 20	Participant 2 Completed Advanced practice 4 Participant 3 Completed Media Lesson 2-2
January 22	Participant 2 Completed Advanced practice 5
January 27	Participant 2 Completed Advanced practice 6 (Mastery)
January 28	Participant 2 Completed Generalization Reading
January 29	Participant 2 Completed Generalization Science
January 30	Participant 2 Completed Generalization Social Studies
February 2	Participant 1 Maintenance Probe Participant 2 Posttest
February 17	Participant 2 Maintenance Probe
February 26	Participant 3 Posttest
March 12	Participant 3 Maintenance Probe

APPENDIX G

Dyad's Implementation Schedule

Day	Activity
October 27	Participant 4 Pretest
December 8	Participant 5 Pretest
January 12	Participant 4 Completed Baseline 1 Participant 5 Completed Baseline 1
January 13	Participant 4 Completed Baseline 2 Participant 5 Completed Baseline 2
January 15	Participant 4 Completed Baseline 3
January 16	Participant 5 Completed Baseline 3
January 22	Participant 4 Completed Baseline 4 Participant 5 Completed Baseline 4
January 26	Participant 4 Completed Media Lesson 1
January 28	Participant 4 Completed Media Lesson 2-1
January 29	Participant 5 Completed Baseline Probe
January 30	Participant 4 Completed Media Lesson 2-2
February 2	Participant 4 Completed Media Lesson 3
February 3	Participant 4 Media Lesson 4
February 4	Participant 4 Media Lesson 4
February 5	Participant 4 Completed Media Lesson 4 Participant 5 Completed Baseline Probe
February 6	Participant 4 Completed Media Lesson 4-2
February 12	Participant 5 Completed Baseline Probe
February 17	Participant 4 Completed Media Review Lesson
February 18	Participant 4 Completed Phone Lesson

February 19	Participant 4 Completed Media Lesson 6 Participant 5 Completed Baseline Probe
February 20	Participant 4 Completed Controlled Practice 1
February 23	Participant 4 Completed Controlled Practice 2
February 26	Participant 4 Completed Controlled Practice 3 (Mastery)
February 27	Participant 4 Completed Media Lesson 7 Participant 4 Completed Advanced Practice 1 Participant 5 Completed Baseline Probe
March 2	Participant 4 Completed Advanced Practice 2 Participant 5 Completed Media Lesson 1
March 3	Participant 4 Completed Advanced Practice 3 Participant 5 Completed Media Lesson 2-1
March 5	Participant 4 Completed Advanced Practice 4
March 6	Participant 5 Completed Media Lesson 2-2
March 9	Participant 5 Completed Media Lesson 3
March 10	Participant 4 Completed Advanced Practice 5 Participant 5 Media Lesson 4-1
March 11	Participant 4 Completed Advanced Practice 6 Participant 5 Media Lesson 4-1
March 12	Participant 5 Completed Media Lesson 4-1
March 13	Participant 4 Completed Advanced Practice 7 Participant 5 Completed Media Lesson 4-2
March 17	Participant 4 Completed Advanced Practice 8
March 18	Participant 4 Completed Advanced Practice 9 (Mastery)
March 19	Participant 4 Completed Media Lesson 7 Participant 5 Completed Phone Lesson Participant 5 Completed Media Lesson 5 Participant 5 Completed Controlled Practice 1
March 20	Participant 4 Completed Generalization Social Studies
March 23	Participant 5 Completed Controlled Practice 2

March 25	Participant 5 Completed Controlled Practice 3
March 26	Participant 4 Completed Generalization Reading Participant 5 Completed Controlled Practice 4
March 27	Participant 4 Completed Generalization Science Participant 5 Completed Controlled Practice 5
March 28	Participant 4 Completed Posttest
March 31	Participant 5 Completed Controlled Practice 6
April 1	Participant 5 Completed Controlled Practice 7
April 2	Participant 5 Completed Controlled Practice 8
April 6-10	Spring Break
April 13	Participant 4 Completed Maintenance Probe Participant 5 Completed Review Media Lesson
April 14	Participant 5 Completed Controlled Practice 9
April 15	Participant 5 Completed Controlled Practice 10 (Mastery)
April 16	Participant 5 Completed Media Lesson 6 Participant 5 Completed Advanced Practice 1
April 17	Participant 5 Completed Advanced Practice 2 (Mastery)
April 22	Participant 5 Completed Generalization Reading
April 23	Participant 5 Completed Generalization Science
April 24	Participant 5 Completed Generalization Social Studies
April 27	Participant 5 Posttest
May 12	Participant Completed Maintenance Probe

APPENDIX H

DISSECT Practice Worksheet Sample

Name: Date:

Complete before reading the *Oral Reading Probe.* Separate the following multisyllabic words from the story into smaller parts. Use a backslash '/' to separate the parts.

1. I- isolate the beginning.
2. S-separate the ending
3. E-Examine the stem using the Rules of Twos and Threes

Example: discovering: dis / cov / er / ing

1. composers
2. entertain
3. practical
4. musical
5. forceful
6. admire
7. deafness
8. deserted
9. romantic
10. discoveries

APPENDIX I

Photo Story3 for Windows Media Lesson Worksheet Sample

Name _____Date_____

Stage 4: Verbal Practice Power Point Media Lesson Worksheet

Advance Organizer

- Yesterday, I modeled for you how to use the *Word Identification Strategy* because I wanted you to see how you will need to _____ to _____ as you use the strategy.
- Today, we will discuss what you have learned and ensure that you know what to do as you use each step of the strategy.
- If you _____ and can _____ the steps, you will be able to tell yourself what to do when you are trying to use the strategy while reading.
- I expect you to pay close attention and to _____ the steps of DISSECT.
- I also expect you to be able to _____what you do in each step.

- **Verbal Elaboration Review**

- First, let's make sure you understand _____ you are to do for each step of the strategy and _____ you are to do it.
- I will ask you a question and I want you to _____ the question on the *PowerPoint Media Lesson Worksheet.*
- Then you can check your answer on the next page.
    - Your answer should be similar but it does not have to say the exact _____ thing.

- Question 1
- What is the major purpose of the Word Identification Strategy?
- Write out the answer to the question before going to the next slide.
    - To help you _____ long words.

- Question 2
- What kinds of reading materials might you apply this strategy?
- Write out the answer to the question before going to the next slide.
  - Anything you _____: textbooks, newspapers, magazines, novels.

- Question 3
- In a nutshell, what are you doing as you use the *Word Identification Strategy*?
- Write out the answer to the question before going to the next slide.
  - You are breaking the words into_____ parts.

- Question 4
- Why is breaking a word into its parts helpful?
- Write out the answer to the question before going to the next slide.
  - Each part is _____ and easy to pronounce. Once you can pronounce the parts, you can put them all _____ to say the _____ word.

- Question 5
- Why do you suppose that you have to use the *Word Identification Strategy* when you come upon a word you don't know instead of waiting until the end of the reading passage?
- Write out the answer to the question before going to the next slide.
  - Because you need to _____ each sentence before you _____ the next one.

- Question 6
- What does "Discover the sounds and context mean?"
- Write out the answer to the question before going to the next slide.

- It means that you try to say some of the _____ in the word. Then you _____ the rest of the sentence to learn about the m_____ within which the word needs to fit.

- Question 7
- What does “Isolate the beginning” mean?
- Write out the answer to the question before going to the next slide.
  - It means that you look at the _____ of the word for a group of l_____ you can pronounce. If you find one, you can draw a / to s_____ it from the rest of the word.
- Question 8
- What does “Separate the ending” mean?
- Write out the answer to the question before going to the next slide.
  - It means that you look at the _____ of the word for a group of letters you can pronounce. If you find one, you can draw a / to separate it from the _____-- of the word.

- Question 9
- What does “Examine the stem” mean?
- Write out the answer to the question before going to the next slide.
  - It means you _____ what’s left of the word into _____ after you isolate the beginning and separate the ending.

- Question 10
- Why do we have the Rules of Twos and Threes?
- Write out the answer to the question before going to the next slide.
  - They help us to decide how to _____ up the stem into its parts.

- Question 11
- Who should you ask for help?
- Write out the answer to the question before going to the next slide.
  - Someone who is a good _____.

- Question 12
- When should you ask someone for help?
- Write out the answer to the question before going to the next slide.
  - After you've tried the first five steps of the strategy and still you can't _____ the word.

- Question 13
- What are two ways the dictionary can help you?
- Write out the answer to the question before going to the next slide.
- You can use it to see how the word is to be _____, and you can use it to find what the word _____.
- Question 14
- Tell me in your own words, what you are going to do as you use the *Word Identification Strategy.*
- Write out the answer to the question before going to the next slide.
  - 1. I start r_____.
  - 2. When I come to a word I don't kn_____, I try to s_____ some of the sound and r_____the whole sentence to see if I can guess the word.
  - 3. If that doesn't help me, I look at the b_____ of the word to see if there's a prefix or a beginning part that I can say.
  - 4. Then I look at the e_____ of the word to see if there's a suffix or an ending I can say.
  - 5. Then I try to say the _____ of the word.

- 6. If I can't I break the stem of the word down into small parts using the Rules of _____.
- 7. I try to say all the parts together the b_____, the s_____, and the _____.
- 8. If that doesn't work, I can ask s_____ for help or look in the d_____.
- 9. I always read the wh_____ sentence and make sure I un_____ what it means before reading more.

- **Verbal Rehearsal**
- I want you to make _____ cards for the mnemonic DISSECT.
- On the front of the card write one _____.
- On the b_____ of the card write what the letter stands for.
- Make a card for each letter in DISSECT.
  - **D-Discover the sounds and the context**
  - **I-Isolate the beginning**
  - **S-Separate the ending**
  - **S-Say the stem**
  - **E-Examine the stem**
  - **C-Check with someone**
  - **T- Try the Dictionary**
- Practice with your Mom or Dad.

- Post Organizer
- Today, we reviewed the concepts and processes involved in using the Word Identification Strategy.
- Today and tomorrow you are going to practice m_____ the mnemonic DISSECT, elaborate on what each letter means, and _____ to use DISSECT when reading.

- I expect that _____ will be able to master naming the steps of this strategy in a very short time.
- I think you will be able to _____ how to use it quickly, too.
- Put the PowerPoint Media Lesson Worksheet in folder for your teacher.

APPENDIX J

Consent and Assent Forms

UNLV
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PARENT PERMISSION

Department of Special Education

TITLE OF STUDY: Exploring the Effects of Online Instruction on Reading Comprehension Achievement of Students with Learning Disabilities

INVESTIGATOR(S): Dr. Susan Miller and Nancy Fitzgerald

CONTACT PHONE NUMBER: Dr. Susan Miller Office (702) 895-1108

Purpose of the Study

Your child is invited to participate in a research study. The purpose of this study is to determine the effectiveness of online instruction on the reading achievement of 4th - 8th grade students with learning disabilities

Participants

Your child is being asked to participate in the study because he/she is enrolled at Odyssey Charter K-8th School and will be receiving online instruction in reading as part of his/her academic program this school year.

Procedures

If your child volunteers to participate in this study, your child will be asked to do the following: allow us to analyze your child's pre-, mid-, and posttest scores from the Woodcock Johnson Tests of Achievement Reading Subtests used in Odyssey School's curriculum.

Benefits of Participation

There may not be direct benefits to your child as a participant in this study. However, we hope to learn more about effectively providing online instruction and improving reading ability through online instruction to 3rd-8th grade students with learning disabilities.

Risks of Participation

There are risks involved in all research studies. This study includes only minimal risks. Time spent completing online tasks may cause a minimal degree of anxiety or frustration.

UNLV
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PARENT PERMISSION
Department of Special Education

TITLE OF STUDY: Exploring the Effects of Online Instruction on Reading Comprehension Achievement of Students with Learning Disabilities
INVESTIGATOR(S): Dr. Susan Miller and Nancy Fitzgerald
CONTACT PHONE NUMBER: Dr. Susan Miller Office (702) 895-1108

Cost /Compensation
There *will not* be financial cost to you or your child to participate in this study. The study will take place over the course of Semester 2 in your child's 2007-2008 school year.. He/she will not be compensated for his/her time.

Contact Information
If you have any questions or concerns about the study, you may contact **Dr. Susan Miller at (702) 896-8867 or Nancy Fitzgerald at (702) 257-0578 Ext. 5520.** For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office for the Protection of Research Subjects at 702-895-2794.**

Voluntary Participation
Your child's participation in this study is voluntary. Your child may refuse to participate in this study or in any part of this study. Your child may withdraw at any time without prejudice to your relations with the university or the charter school. Your child is encouraged to ask questions about this study at the beginning or any time during the research study.

Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link your child to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be destroyed.

Parent Consent:
I have read the above information and agree to my child participating in this study. I am at least 18 years of age. A copy of this form has been given to me.

Child's Name_____

Parent Name (Please Print) _____
Parent Signature _____

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired Date

UNIVERSITY OF NEVADA LAS VEGAS

Student Form
ASSENT TO PARTICIPATE IN RESEARCH

Exploring the Effects of Online Instruction on Reading Comprehension Achievement of Students with Learning Disabilities

1. My name is Mrs. Nancy Fitzgerald. I am a student at the University of Nevada Las Vegas. I am studying ways to help students read better.

2. I am inviting you to help.

3. I am going to teach you ways to figure out words you don't know. I'm also going to teach you how to understand what you read. If you agree to help me, I'll look at scores you get on reading tests to see if your reading gets better. I need your permission to do this.

4. Sometimes it is hard to learn new things. This might make you feel bad.

5. I think your reading will get better and I think I'll become a better teacher.

6. Please talk to your parents about letting me study your reading scores. I will ask your parents if they want you to do this. But even if your parents say "yes", you can still say "no" and I won't study your scores.

7. You can say "yes." It is up to you. No one will be upset if you don't want me to study your reading scores. You can say "yes" now but change your mind later. That's OK.

8. I will answer your questions now. If you think of questions later, you can call me at (702) 257-0578 Ext. 5520. You can also ask questions the next time you see me.

9. If you agree to do this, you need to sign your name below. You and your parents will get a copy of this form after you sign it.

_____ _____
Print your name Date

_____
Sign your name

APPENDIX K

DISSECT Mnemonic and Rules of Twos and Threes

DISSECT

D-Discover the sounds and the context
I-Isolate the beginning
S-Separate the ending
S-Say the stem
E-Examine the stem
C-Check with someone
T-Try the dictionary

Rules of Twos and Threes

Rule 1:

If a stem or part of the stem begins with:
A vowel, divide off the first two letters.
A consonant, divide off the first three letters

Rule 2:

If you can't make sense of the stem after using Rule 1, take off the first letter of the stem and use Rule 1 again.

Rule 3:

When two different vowels are together, try making both of the vowel sounds (diet).
If this does not work, try pronouncing them together using only one of the vowel sounds (believe).

APPENDIX L

Fidelity of Treatment Checklist

Student: _____Observer: _____

Date: _____Online Media Lesson: _____

Interobserver agreement:

1. Instructor included an advance organizer. Y / N
2. Instructor reviewed the previous lesson. Y / N
3. Instructor clearly stated rationale and the purpose of lesson. Y / N
4. Instructor followed lesson scripts in the development of the online media lesson. Y / N
5. Instructor included a post organizer. Y / N

REFERENCES

Abbott, S. P., & Berninger, V. W. (1999). It's never too late to remediate: Teaching word recognition to students with reading disabilities in grades 4-7. *Annals of Dyslexia 49,* 223-250.

Allen, M., Mabry, E., Mattrey, M., Bourhis, J., Titsworth, S., & Burrell, N. (2004). Evaluating the effectiveness of distance learning: A comparison using meta-analysis. *Journal of Communication, 54*, 402-240.

Alpert, D. (2004, October). Feds publish incorrect info on graduation rates for disabled students. *Wrightslaw*. Retrieved November 13, 2005 from www.wrightslaw.com/news/04/grad.rates.alpert.htm

Barlow, D. H., & Hersen, M. (1984). *Single Case Experimental Designs(2nd ed.).*Boston: Allyn and Bacon.

Bender, W. N. (2002). *Differentiating instruction for students with learning disabilities: Best practices for general and special educators.* Thousand Oaks, CA: Corwin.

Berry, G., Hall, D., & Gildroy, P.G. (2004). Teaching learning strategies. In B. K. Lenz, D.D. Deshler, & B.R. Kissam (Eds.), *Teaching content to all: Evidence-based inclusive practices in middle and secondary schools* (pp. 258-278). Boston: Pearson Education, Inc.

Bhattacharya, A., & Ehri, L. C. (2004) Graphosyllabic analysis helps adolescent struggling readers read and spell words. *Journal of Learning Disabilities*, *37* (4), 331-348.

Blackhurst, E. A. (2005). Historical Perspectives about Technology Applications for People with Disabilities. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.3- 29).* Whitefish Bay, WI: Knowledge by Design, Inc.

Bower, B. L., & Hardy, K. P. (2004). From correspondence to cyberspace: Changes and challenges in distance education. *New Directions for Community Colleges*, 128, 5-12.

Bulgren, J. A., Hock, M. A., Schumaker, J. B., & Deshler, D. D. (1995). The effects of instruction in a paired-associates strategy on the information mastery performance of students with learning disabilities. *Learning Disabilities Research and Practice*, *10*(1), 22-37.

Carrow-Woolfolk, E. (1996). *Oral and Written Language Scales: Written Expression Scale Manual*. Circle Pines, MN: American Guidance Service.

CAST Inc. (2004). *Universal Design for Learning*. Retrieved May 15, 2005 from http://www.cast.org

Cavanaugh, C.S., Gillan, K. J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K-12 student outcomes: A meta-analysis.* Naperville, IL: Learning Point Associates.

Chandra, V., & Lloyd, M. (2008). The methodological nettle: ICT and student achievement *British Journal of Educational Technology*, (39) 6, 1087-1098.

Choate, J.S., & Rakes, T. A. (2004a). Recognizing words as tools for reading comprehension. In J. S. Choate (Ed.). *Successful inclusive teaching: Proven ways to detect and correct special needs* (pp 56-85). Boston: Pearson.

Choate, J.S., & Rakes, T. A. (2004b). Reading to construct meaning and to comprehend. In J. S. Choate (Ed.). *Successful inclusive teaching: Proven ways to detect and correct special needs* (pp 86-129). Boston: Pearson.

Clark, T. (2001). *Virtual schools: Trends and issues: A study of virtual schools in the United States*. Retrieved October 28, 2005 from www. wested.org/online-pubs/virtual schools.

Cunningham, P. M., & Allington, R. L. (2003). *Classrooms That Work (3rd ed.).* Boston: Pearson Education.

Deshler, D. D., & Hock, M. F. (2007). *Adolescent literacy: Where we are-where we need to go.* University of Kansas: Center for Research on Learning.

Deshler, D.D., & Schumaker, J. B. (1993) Strategy mastery by at-risk students: Not a simple matter. *The Elementary School Journal, 94*, 153-167.

Deshler, D. D., Schumaker, J. B., & Lenz, B. K. (1984). Academic and cognitive interventions for LD adolescents (Part I). *Journal of Learning Disabilities, 17*, 108-117.

Digest of Educational Statistics. (2008). National Center for Educational Statistics. Retrieved August 9, 2009 from http://nces.ed.gov/programs/digest/d08/index.asp

Felder, R. M., & Soloman, B. A. (1991). Index of learning styles. Available online from http://www.ncsu.edu/felder-public/ILSpage. html

Fisher, J. B., Schumaker, J. B., & Deshler, D. D. (1995). Searching for validated inclusive practices: A review of the literature. *Focus on Exceptional Children, 28*(4), 1-20.

Fisher, J. B., Schumaker, J. B., & Deshler, D. D. (1996). Searching for validated inclusive practices: A review of the literature. In E.L. Meyen, G.A. Vergason, and R.J. Whelan (Eds.), *Strategies for teaching* (pp.123-154). Denver, CO: Love Publishing Company.

Fountas, I. C., & Pinnell, G.S. (1996). *Guided reading: Good teaching for all children.* Portsmouth, New Hampshire: Heinemann.

Fraser, B., Fisher, D., & McRobbie, C. (1996). Development, validation and use of personal and class forms of a new classroom environment instrument. Paper presented at the annual meeting of the American Educational Research Association, April, New York.

Gable, R. A., & Hendrickson, J. M. (2004). Teaching all the students: A mandate for educators. In J. S. Choate (Ed.). *Successful inclusive teaching: Proven ways to detect and correct special needs* (pp 2-17). Boston: Pearson.

Gardner, J. E., & Wissick, C. A. (2005). Web-based resources and instructional considerations for students with mild cognitive disabilities. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.683-718).* Whitefish Bay, WI: Knowledge by Design, Inc.

Gayton, J. (2007). *Visions shaping the future of online education: Understanding its historical evolution, implications, and assumptions.* Online Journal of Distance Learning Administration. *10*(1). Retrieved September 8, 2007 from http://www.westga.edu/~distance/ojdla/summer102/gaton102.htm

Gaytan, J., & McEwen B. C. (2007). Effective online instructional and assessment strategies. *The American Journal of Distance Education, 21*, 117-132.

George, C. L., Schaff, J. I., & Jeffs, T. L., (2005). Physical access in today's schools: Empowerment through assistive technology. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.355-377).* Whitefish Bay, WI: Knowledge by Design, Inc.

Haager, D., & Klingner, J. K. (2005). *Differentiating instruction in inclusive classrooms: The special educator's guide*. Boston: Pearson.

Hagaman, J.L., & Reid, R. (2008). The effects of the paraphrasing strategy on the reading comprehension of middle school students at risk for failure in reading. *Remedial and Special Education, 29,* 222-234.

Hale, L. F. (1998). *School dropout prevention: Information and strategies for parents.* National Association of School Psychologists. Retrieved September 30, 2005 from www.moreland.k12.ca.us/Discovery/NASP/dropout_rk.html

Hall, D. (2007). *Graduation matters: Improving accountability for high school graduation*. The Education Trust. Retrieved September 22, 2007 from http://www2.edtrust.org/NR/rdonlyres/5AEDABBC-79B7-47E5-9C66-7403BF76C3E2/0/GradMatters.pdf

Hock, M., & Deshler, D. D. (2003). *Adolescent literacy: Ensuring that no child is left behind.* The University of Kansas, Center for Research on Learning.

Horner, R. D., & Baer, D. M. (1978). Multiple-probe technique: A variation of the multiple baseline. *Journal of Applied Behavior Analysis, 11,* 189-196.

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-base practice in special education. *Exceptional Children, 71*, 165-179.

Houtveen, A. A. M., & van de Grift, W. J. C. M. (2007). Effect of metacognitive strategy instruction and instruction time on reading comprehension. *School Effectiveness and School Improvement, 18*, 173-190.

Hughes, C. A., Ruhl, K. L., Schumaker, J. B., & Deshler, D. D. (2002). Effects of an assignment completion strategy on the homework performance of students with learning disabilities in general education classes. *Learning Disabilities Research and Practice, 17* (1), 1-18.

Hughes, J. E., McLeod, S., Brown, R., Maeda, Y., & Choi, J. (2007). Academic achievement and perceptions of the learning environment in virtual and traditional secondary mathematics classrooms. *The American Journal of Distance Education, 21*, 199-214.

Individuals with Disabilities Education Improvement Act of 2004, (IDEA), PL 108-446, 20 U.S.C. 1400 et. seq.

International Reading Association (2002). *Summary of the (U. S.) National Reading Panel Report: Teaching Children to Read.* Retreived September 10, 2007 from http://www.reading.org/downloads/resources/nrp_summary.pdf

Jeffries, M. (2007). *Research in distance education: The history of distance education.* Retrieved on August 8, 2007 from www.digitalschool.net/edu/DL_history_mjeffries.html

Kaffar, B. J. (2006). Exploring the effects of online instructional models on the writing achievement of high school students with and without disabilities. (Doctoral Dissertation, University of Nevada, Las Vegas).

Katims, D. S., & Harris, S. (1997). Improving the reading comprehension of middle school students in inclusive classrooms. *Journal of Adolescent & Adult Literacy, 41*, 116-123.

Keene, E. O., & Zimmerman, S. (1997). *Mosaic of Thought: Teaching Comprehension in a Reader's Workshop.* Portsmouth, N.J.: Heinemann.

King, A. (1994). Guiding knowledge construction in the classroom: Effects of teaching children how to question and how to explain. *American Educational Research Journal, 31*(2), 338-368.

Knezek, G., & Christensen, R. (2007). Effect of technology-based programs on first-and second-grade reading achievement. *Computers in the Schools,* 24(3/4), 23-41.

Kruidenier, John (2002). *Research-Based Principles for Adult Basic Education Reading Instruction.* Washington, D. C.: National Institute for Literacy, Partnership for Reading.

Leinhardt, J. (2006). Going the distance with online education. *Review of Educational Research, 76*, 567-605.

Lenz, K. L., & Hughes, C.A. (1990). A word identification strategy for adolescents with learning disabilities. *Journal of Learning Disabilities, 23*, 149-163.

Lenz, K. L., Schumaker, J. B., Deshler, D. D., & Beals, V. L. (1984). *The Word Identification Strategy: Instructor's Manual.* Lawrence, KS: The University of Kansas Center for Research on Learning.

Lenz, K. L., Schumaker, J. B., Deshler, D. D., & Beals, V. L. (2007). *The Word Identification Strategy: Instructor's Manual.* Lawrence, KS: The University of Kansas Center for Research on Learning.

Lewis, R. B, (2005). Classroom technology for students with learning disabilities. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.325-334).* Whitefish Bay, WI: Knowledge by Design, Inc.

Lim, D. H., & Kim, H. (2003). Motivation and learner characteristics affecting online learning and learning application. *Journal of Educational Technology Systems, 31*, 423-439.

Littlefield, C. (2006, January). Nearly half of Nevada students need remedial courses. *Las Vegas Sun.* Retrieved November 12, 2006, from http://www.lasvegassun.com

Ludlow, B. (2005). Technology-mediated distance education: Current practice and future trends. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.793-817).* Whitefish Bay, WI: Knowledge by Design, Inc.

MacGinite, W. H., & MacGinitie, R. K. (2002). *Gates-MacGinitie Reading Tests* (4th ed.). Rolling Meadows, IL: Riverside.

Manset-Williamson, G., & Nelson, J. M. (2005). Balanced, strategic reading instruction for upper-elementary and middle school students with reading disabilities: A comparative study of two approaches. *Learning Disability Quarterly*, *28*, 59-74.

Mercer, C. D., & Mercer, A. R. (2005). *Teaching students with learning problems*. (7th ed.). Upper Saddle River, NJ: Pearson Education.

National Alliance for Public Charter Schools. (2005). *Renewing the compact: A statement by the task force on charter school quality and accountability.* Washington, D.C.

National Assessment of Education Progress. (2002). *NAEP: The Nation's Report Card.* Retrieved March 13, 2006, from http://nces.ed.gov/naep3

National Center for Learning Disabilities. (2006). *Why students with learning disabilities need no child left behind.* Retrieved June 14, 2008 http://www.ncld.org/index.php?option=content&task=view&id=287

National Reading Panel (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Washington, D. C.: National Institute of Child Health and Human Development.

Nevada Department of Education (2009) *Language Arts Criterion-Referenced Test*.

No Child Left Behind Act of 2001. (2001). Retrieved from http:// www.ed.gov/ legislation/ESEA02/index.html

Okolo, C. M., Englert, C. S., Bouck, E. C., & Heutsche, A. M. (2007). Web-based history learning environments: Helping all students learn and like history. *Intervention in School and Clinic, 43*, 3-11.

Oliver, R. (2008). Engaging first year students using a Web-supported inquiry-based learning setting. *Higher Education, 55*, 285-301.

Oppenheim S, A. (1996). History and instructional television. *The History Teacher, 35*, 55-64.

Osborn, V. (2001). Identifying at-risk students in videoconferencing and web-based education. *The American Journal of Distance Education, 15*, 41-54.

Pape, L. (2005). High school on the web. *American School Board Journa,l 192*, 12-16.

Pemberton, J.B. (2003). Integrated processing: A strategy for working out unknown words. *Intervention in School and Clinic, 38*, 247-250.

Pomales-Garcia, C. & Liu, Y. (2006). Web-based distance learning technology: The impacts of web module length and format. *The American Journal of Distance Education, 12*, 163-179.

Perfetti, C. A., & Lesgold, A. M. (1976). Discourse comprehension and sources of individual differences. In A. Just & P. Carpenter (Eds.), *Cognitive Processes in Comprehension* (pp. 141-183). Hillsdale, NJ: Erlbaum.

Puzziferro, M. (2008). Online technologies self-efficacy and self-regulated learning as predictors of final grade and satisfaction in college-level online courses. *American Journal of Distance Education, 22,* 72-89.

Reid, R., & Lienemann, T. O. (2006). *Strategy instruction for students with learning disabilities*. Guilford Press: New York.

Revenaugh, M. (2005-2006). K-8 virtual schools: A glimpse into the future. *Association for Supervision and Curriculum Development: Educational Leadership*. 60-64.

Rhim, L. M., & Kowal. J. (2007). Demystifying special education in virtual charter schools. Primers on Special Report Special Education Charter Schools www.uscharteschools.org/specialedprimers

Rice, L. L. (2006). A comprehensive look at distance education in the k-12 context. *Journal of Research on Technology in Education, 38*, 425-445.

Roblyer, M. D., Davis, L., Mills, S. C., Marshall, J., & Pape, L. (2008). Toward practical procedures for predicting and promoting success in virtual school students. *The American Journal of Distance Education 22,* 90-109.

Ronsisvalle, T., & Watkins, R. (2005) Student success in online K-12 education. *The Quarterly Review of Distance Education, 6,* 117-124.

Rose, D. H., Hasselbring, T. S., Stahl, S., & Zabala, J. (2005). Assistive technology and universal design for learning: Two sides of the same coin. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.507-518).* Whitefish Bay, WI: Knowledge by Design, Inc.

Rumble G. (2001). Re-inventing distance education, 1971-2001. *International Journal of Lifelong Education, 20,* 31-43.

Scharlach, T. D., (2008). START comprehending: Students and teachers actively reading text. *The Reading Teacher, 62,* 20-31.

Schumaker, J. B., Denton, P. H., & Deshler, D. D. (1984). *The paraphrasing strategy*. Lawrence: University of Kansas.

Schumaker, J.B., & Lyerla, K. D. (1993). *The paragraph writing strategy*. Lawrence, KS: University of Kansas Center for Research on Learning.

Schutte, J. (1998.) Virtual teaching in higher education. Retrieved January 4, 2008 from http://www.csun.edu/sociology/virexp.htm

Smith, S. J., & Meyen, E. L. (2003). Applications of online instruction: An overview for teachers, students with mild disabilities and their parents. *Focus on Exceptional Children, 35,* 1-15.

Spargo, E. (1989). *Timed readings; Book one (pp. 15-16)* (3rd ed.). New York: Glencoe McGraw-Hill.

Strangman, N., & Dalton, B. (2005). Using technology to support struggling readers: A review of the research. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.545-570).* Whitefish Bay, WI: Knowledge by Design, Inc.

Swanson, H. L., & Alexander, J. (1997). Cognitive processes and predictors of word recognition and reading comprehension leaning-disabilities and skilled readers: Revisiting the specificity hypothesis. *Journal of Education Psychology*, *89*, 128-158.

Tawney, J. W., & Gast, D. L. (1984). *Single Subject Research in Special Education*. Columbus, OH: Merrill.

The State Educational Technology Directors Association (SETDA). (2008) *Learning virtually: Expanding opportunities*. Available online from http:// www.setda.org/2020/professional-development

Tomlinson, C.A. (2001). *How to Differentiate Instruction in Mixed-Ability Classrooms* (2nd ed.). Alexandria, Virginia: Association for Supervision and Curriculum Development.

Tressoldi, P. E., Vio, C., & Iozzino, R. (2007). Efficacy of an intervention to improve fluency in children with developmental dyslexia in a regular orthography. *Journal of Learning Disabilities, 40*, 203-209.

U. S. Department of Education Office of Special Education and Rehabilitative Services. (2002). *A new era: Revitalizing special education for children and their families.* Washington D. C. Retrieved October 20, 2004 from http://www.ed.gov

Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2006). Paraeducator-supplemented instruction in structural analysis with text reading practice for second and third graders at risk for reading problems. *Remedial and Special Education, 27,* 365-378.

Vanourek, G. (2006). A primer on virtual charter schools: Mapping the electronic frontier. *National Association of Charter School Authorizers Issue Brief 10*.

Vaughn, S., Bos, C. S., & Schumm, J. S. (2007). *Teaching students who are exceptional, diverse, and at risk in the general education classroom*. Boston: Pearson Education.

Wagner, R. K., Torgesen, J. K., & Rashotte, K. (1999). *Comprehensive test of phonological processing*. Austin: TX: Pro-Ed.

Wang, S.-K., & Reeves, T.C. (2007). The effects of a web-based learning environment on student motivation in a high school earth science course. *Education Tech Research Development, 55,* 169-192.

Watson, J., & Ryan, J. (2007). *Keeping Pace with K-12 Online Learning: A Review of State-Level Policy and Practice.* North American Council of Online Learning, http://www.nacol.org/.

Wehmeyer, M. L., Smith, S. J., Davies, D. K. (2005). Technology use and students with intellectual disability: Universal design for all students. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice (pp.545-570).* Whitefish Bay, WI: Knowledge by Design, Inc.

Wikipedia: The Free Encyclopedia. Retrieved on July 13, 2007 from http://en.wikipedia.org/wiki/Main_Page

Wolf, M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis, 11*, 203-214.

Woodcock, R. (1987). *Woodcock reading mastery tests-Revised*. Circle Pines, MN: American Guidance Service.

Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson III Tests of Achievement*. Itasca, IL: Riverside Publishing.

Woodruff, S., Schumaker, J.B., & Deshler, D. D. (2002). The effects of an intensive reading intervention on the decoding skills of high school students with reading deficits. Institute for Academic Access Research Report # 15. U.S. Department of Education, Office of Special Education Programs.

Young, S. (2003). The challenges of NCLB: Some requirements of the No Child Left Behind Act are causing more chaos than cures and driving teachers, parents and administrators mad. *State Legislatures, 29*, 24+. Retrieved May 3, 2006, from http://www.questia.com/PM.qst?a=o&d=5002440609

Young, S. (2006). Student views of effective online teaching in higher education. *The American Journal of Distance Education*, 20, 65-77.

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Kaffar, B. J., Miller, S. P., & Fitzgerald, N. S. (2006). Exploring the effects of online instructional models on the writing achievement of high school students with and without disabilities. In C. M. Crawford, R. Carlsen, K. MeFerrin, J. Price, R. Weber, & D. A. Willis (Eds.), *Society for Information Technology & Teacher Education International Conference Annual* (pp. 945-949). Chesapeake: VA, Association for the Advancement of Computing in Education.

Miller, S. P., Fitzgerald, N. S., & Kaffar, B. J. (2006). Integrating technology into special education methods courses: A journey worth taking. In C. M. Crawford, R. Carlsen, K. MeFerrin, J. Price, R. Weber, & D. A. Willis (Eds.), *Society for Information Technology & Teacher Education International Conference Annual* (pp. 4205-4208). Chesapeake: VA, Association for the Advancement of Computing in Education.

Fitzgerald, N. S., Kaffar, B. J., & Miller, S. P. (2008). Improving reading through online strategy instruction. In K. McFerrin, R. Weber, R. Carlsen & D. A. Willis (Eds.), *Society for Information Technology & Teacher Education International Conference Annual* (pp. 5054-5059). Chesapeake: VA, Association for the Advancement of Computing in Education.

Miller, S. P., Van Norman, R., & Fitzgerald, N. (2008). Using digital video to enhance teacher preparation within the field of special education. In K. McFerrin, R. Weber, R. Carlsen & D. A. Willis (Eds.), *Society for Information Technology & Teacher Education International Conference Annual* (pp. 5131-5135). Chesapeake: VA, Association for the Advancement of Computing in Education.

Van Norman, R., Fitzgerald, N., & Kaffar, B. J. (2008). High and low technology for increasing students' active responding in college classrooms. In K. McFerrin, R. Weber, R. Carlsen & D. A. Willis (Eds.), *Society for Information Technology & Teacher Education International Conference Annual* (pp. 1550-1555). Chesapeake: VA, Association for the Advancement of Computing in Education.

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