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Online Reading Comprehension Among Seventh Grade Students with High Incidence Disabilities in Inclusive Settings: A Mixed Methods Study

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ONLINE READING COMPREHENSION AMONG SEVENTH GRADE STUDENTS WITH HIGH INCIDENCE DISABILITIES IN INCLUSIVE SETTINGS: A MIXED METHODS STUDY

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ABSTRACT

Because research exploring how students with disabilities read and comprehend on the Internet is scarce, a mixed methods study was implemented to determine if Internet Reciprocal Teaching (IRT) is an effective intervention for improving online reading comprehension among seventh grade students with high-incidence disabilities in inclusive settings. Differences between students with disabilities and their non-disabled peers were also explored.

The intervention included a twenty week (40 lessons) instructional program delivered in three phases in seventh grade English/Language Arts classes from three middle schools in eastern region of the United States. Pre and post intervention data was collected on the Online Reading Comprehension Assessment (ORCA-Iditarod) and the Survey of Online Reading. Further, and a sample of students was randomly selected for further post-intervention qualitative analysis. Qualitative and quantitative data were then triangulated to examine convergent and divergent findings of online reading comprehension.

Results indicate that online reading comprehension, as measured by the ORCA-Iditarod increased for students in the treatment group, but no apparent differences appeared between general education students and students with disabilities. Students in the treatment group demonstrated increased self-efficacy of reading online and locating answers. Qualitative findings further supported improvements in online reading comprehension noting more frequent use of effective search strategies among students in the treatment group, more effective strategy use for determining the reliability of Web sites, and improved communicating strategies using email.

While the ORCA did not reveal significant differences between students with disabilities and their nondisabled peers, Survey data indicated that students with disabilities are using and receiving more instruction on the Internet at school, and some qualitative results revealed more attention to written mechanics and spell check tools than general education students. Implications for practice and recommendations for future research are provided.

DEDICATION

This dissertation is dedicated in loving memory of my cousin, Anthony E. Rivers Jr. whose life was tragically taken in a senseless act of violence on August 4, 2008. Also, to my family, my father, Paul, mother, Lois, and brothers, Douglas, and Donald, for their constant source of strength, support, encouragement, and belief in me. Finally, to my amazing husband, Jonathan Hunt, whose patience, understanding, humor, and love were never-ending throughout the day-to-day challenge and stress of the dissertation process; I am forever grateful for God blessing me with you in my life.

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CHAPTER ONE: INTRODUCTION

Online reading comprehension among seventh grade students with high-incidence disabilities in inclusive settings: A Mixed Methods Study.

Purpose of the Study

The purpose of this mixed methods study is to evaluate the effectiveness of an intervention, Internet Reciprocal Teaching (IRT), and to explore online reading comprehension skills and strategies among students with high incidence disabilities in inclusive settings within the context of a larger study. The study employs a mixed methods research design, which uses different but complementary data collected on the same phenomenon (Creswell & Plano Clark, 2007). In this study, a quasi-experimental research design was used to test the effectiveness of IRT by examining pre and post assessment measures of online reading comprehension, as well as survey data for seventh grade students with high-incidence disabilities in inclusive, English/Language Arts classrooms. Concurrent with the quantitative data collection, qualitative verbal protocol data and video recordings of actions were collected during an online activity to explore the reading comprehension strategies used by the targeted population of students. The reason for collecting both quantitative and qualitative data is to bring together the strengths of both forms of research to compare the results from two different perspectives that individually may not address the complexity of online reading comprehension (Creswell & Plano Clark, 2007).

Research Questions

1. Is Internet Reciprocal Teaching (IRT) an effective intervention to improve online reading comprehension for middle school students in inclusive, general education settings?

   a. Is there a difference in effectiveness of IRT for general education students versus students with disabilities?

2. What online reading comprehension strategies do middle school students in inclusive general education settings use?

   a. Is there a difference in the online reading comprehension strategies used by students with and without disabilities and between treatment and control conditions?

3. Is Internet Reciprocal Teaching associated with changes in students' self-reported data for facility with, frequency of use, and self-efficacy on the Internet?

4. Do the online reading comprehension strategies used by students with and without disabilities in the qualitative data support and converge with the pretest and posttest online reading comprehension scores from the quantitative data?

Rationale of the Study

Since its emergence in 1989, the Internet has evolved rapidly (Bull & Kimball, 1997) encroaching on all aspects of our everyday lives. Seventy-five percent of all households in the United States report having Internet access (Nielsen/NET Ratings, 2004), and Americans increasingly use the Web for work, education, communication, hobbies, banking, and shopping (Harryson, Svensk, & Johansson, 2004; Kerr &

Dworet,1996; Madden, 2008). Consequently, Internet innovation creates both new advantages and challenges in education, commanding the attention of educators and creating a need for increased integration of the Internet into K-12 classrooms along with instruction of online literacy skills and strategies (International Reading Association, 2009; Web-Based Education Commission, 2000). While U.S. public schools have responded by acquiring new technology and making Internet access available almost universally (National Center on Education Statistics, 2001), there is still a lacking for systematic and widespread efforts to integrate Internet use and instruct students in online literacy skills that will prepare them to compete globally in an increasingly technological world (Dede, 1999; Hutinger, Clark, & Johanson, 2001; Izzo, Murray, & O'Hanlon, 2004).

Barriers to Internet Literacy

Despite the prevalence of the Internet in contemporary society and the apparent need to equip students with online literacy skills, challenges continue to impede progress towards the goal of ensuring all students achieve literacy, and in the twentieth century, the definition of literacy should include online literacy. Students with disabilities are further disenfranchised regarding online literacy proficiency due to major barriers to implementation including: (a) a lack of research, (b) the digital divide, (c) insufficient teacher training and support, and (d) the unique and complex nature of reading online. The obstacles hindering more pervasive integration and instruction of Internet literacy for students with disabilities, however, pale when examining the numerous potential positive educational outcomes, and, therefore, should not deter increased efforts in research and instructional practice.

Lack of Research

Despite the necessity of preparing today's student to demonstrate Internet literacy, research studies are scant in the current literature and even fewer exist specifically targeting students with disabilities. According to several researchers, little empirical evidence is available pertaining to Internet use and the efficacy of online literacy instruction for students with disabilities directly resulting in a call for additional research efforts (Abbott & Cribb, 2001; Attwenger, 1997; Castellani, 1999; Castellani & Jeffs, 2001; Hutinger, Clark, & Johanson, 2001; Roschelle, Pea, Hoadley, Gordan, & Means, 2000; Williams, 2006). Mimicking such findings, a systematic literature search performed in the current study of students with disabilities and their use of the Internet resulted in a mere 18 studies, of which, only 11 were intervention studies; five quantitative, five qualitative, and one mixed methods. The remaining seven studies reported survey data, with three studies that included students with disabilities; yet the other four studies were indirectly related involving the teachers of students with disabilities. With such little existing research, many advocates have made a plea for further research examining the impact technology has on teaching and learning for students in special education (Cronis & Ellis, 2000; De Craene, 2007; Duhaney & Duhaney, 2000; Zhang, 2000).

The Digital Divide

Lack of research is one characteristic preventing more widespread integration and online instruction in public schools, yet another aspect further impeding progress in this area is the digital divide. The digital divide is defined as the gap between those who benefit from technology and those who could greatly benefit from it if they had access (DigitalDivide.org, n.d.). Although much of the literature focuses on minority groups, including blacks and Hispanics, and lower SES groups who are negatively impacted from the digital divide, Enders and Bridges (2006) cite that more than 70% of individuals with disabilities are victims of the digital divide. While some researchers indicate that special education schools are not receiving technological resources equivalent to their general education counterparts (Abbot & Cribb, 2001), others point out inequalities within public schools reporting that general education classrooms generally receive more computers, software, and Internet access than do special education classrooms within the same schools (Castellani, 2000). Further contributing to the digital divide for students with disabilities is the lack of training special education teachers receive for implementing both adaptive and instructional technology into their classrooms (Cronis & Ellis, 2000). While many contributing factors exist, one final factor significantly impacts the digital divide for students with disabilities: cognitive barriers (Hutinger, Clark, & Johanson, 2001). Although more universal design measures are beginning to be implemented in the design of technology and software, increased efforts need to address universal design for individuals with cognitive impairments in mind to minimize cognitive barriers to accessing technology and the Internet (Hutinger, Clark, & Johanson, 2001).

Lack of Teacher Training

Further inhibiting more extensive integration of the Internet into classrooms is the well-documented scarcity of effective training and support for teachers. Some studies have evaluated and concluded that in-service training programs in many districts were simply inadequate (Attwenger, 1997; Gallagher, 2000; Pierce, 1998; Rossi, Mullick, & Bauder, 2000). Other research examined teacher attitudes and found that, while many believed integrating technology and the Internet into their lessons could improve student learning, a majority of teachers felt inadequately trained and incapable of doing so effectively (Attwenger, 1997; Werner, 1994; Pierce, 1998). Further examination of teacher opinion reveals that many teachers have a fear of technology and often feel overwhelmed by the increased time demands for properly planning to include Internet technology in their classrooms have prevented them from increased integration (Pierce, 1998). As a result of insufficient training, and teacher attitudes, many teachers reported rarely integrating the Internet into instruction and modeling or providing instruction of online strategies even less (Rossi et al., 2000).

Complex Features of Online Reading Comprehension

The Internet provides an abundance of potential benefits for students with disabilities; however, certain characteristics of online reading comprehension present students with greater challenges and further complexity than reading printed text. The advantages gained from access to unlimited amounts of information online also create greater complexity for students to locate relevant information (Abbot & Cribb, 2001; Leu et al., 2004, March, McKenzie, 1995; Pierce, 1998). Finding pertinent information requires students to learn and apply effective navigation techniques and search strategies, and then sift through immense amounts of information to determine useful information without reaching cognitive overload and frustration (Azevedo & Cromley, 2004; Bulger, 2006; Dede, 2000). Reading online is further complicated by the need to critically evaluate online sources to determine the reliability of the information (Abbot & Cribb, 2001; Bulger, 2006; Brand-Gruwel, Wopereis & Vermetten, 2005; Gabbard, Federation for Children with Special Needs, & National Early Childhood Technical Assistance System, 2001; Leu et al., 2004, February). Prior to publication, printed materials usually undergo peer-review, editing, or some other form of evaluation; however, online materials must be evaluated for reliability, which students generally neglect, and/or with which they struggle; therefore evaluation strategies must be taught (Pierce, 1998). In addition to the complexities of searching and locating information that is both relevant and reliable, multimedia components imbedded in online reading adds to the complex nature of Internet reading because it requires unique skills for processing multiple modes of information, including embedded links, graphics, and video that sometimes distract students, causing a decrease in comprehension rather than the intended enhancement of comprehension and retention (Coiro, 2005; Kerr & Dworet, Mayer & Moreno, 2003; Leu et al., 2004, March). Although barriers are present preventing progress towards improved online literacy for students with disabilities, when efforts for integration are made, students obtain considerable benefit from learning online reading comprehension skills and strategies.

Benefits of Integrating the Internet into Instruction

Although research is scarce, a body of literature identifies the advantageous nature of the Internet for improving the academic outcomes for students with disabilities including: (a) unlimited access to various resources, (b) adaptability, (c) increased opportunities for communication, and (d) the motivational aspect. One such benefit of the Internet is the unprecedented access to unlimited information, resources, and unique learning environments that can enhance learning for students. Another noteworthy aspect of the Internet is the ease of adapting online materials for students with disabilities, and the availability to assistive software that facilitates differentiating and individualizing instruction, particularly for those students with exceptionalities being educated in inclusive settings. Furthermore, online communication tools provide increased opportunities for peer and adult interaction, thus promoting positive social and interpersonal skills that students with disabilities often lack (Burgstahler, 1997; Huntinger, Clark, & Johansen, 2001). A final and ubiquitous theme is found within relevant literature describing the motivational nature of Internet that results in enhanced student engagement in learning. Students' tendency to perceive Internet literacy as an attractive and culturally relevant skill to possess also seemingly contributes to their increased motivation to use and learn skills and strategies in online literacy. Among others, unbounded access, adaptability, various communication tools, and motivation are all themes repeatedly identified in the literature as characteristics of the Internet that have been found, or have the potential to elicit improved academic achievement for students with disabilities. Due to the tremendous potential for improving academic and social outcomes for students with disabilities and the barriers preventing more widespread and meaningful implementation of the Internet into instruction, a dire need to increase research and practice efforts of online reading comprehension exists. While small, the body of research in the area indicates that teaching online reading comprehension is generally a promising practice to enhance learning for students with disabilities. However, barriers to implementing this promising practice, along with the unique nature of online reading, hinders both instruction and student achievement. Therefore, this study was intended to not only add to the scant body of research but to also provide an effective intervention to improve online reading comprehension for students with disabilities, ultimately aiming to answer societal demands that all children be Internet literate and better prepared for college and/or the workplace.

Overview of the Dissertation

The subsequent chapters will provide further evidence of the need for improving online literacy for students with high-incidence disabilities, a theoretical framework for the intervention, a review of the current literature, the methods involved in the current study, the results of the findings, and a discussion of the results. Chapter two provides a background and emergence of the Internet in society; discusses the barriers and advantages of online literacy and students with disabilities; describes elements of the intervention, Internet Reciprocal Teaching (IRT); and explores studies reported in the literature. The research design, setting, participants, measures, and procedures are covered in Chapter three. Chapter four presents the results for each of the four research questions, and the final chapter provides a discussion of the findings, limitations of the study, implications, and recommendations for future research.

CHAPTER TWO: LITERATURE REVIEW

Introduction

This chapter provides an overview of the Internet and its impact on society and education. Next, a synthesis of the positive outcomes resulting from Internet use with students with disabilities follows, as well as the barriers students with disabilities face when reading online, both building the case for the increased need to provide instruction of online literacy for this population of students. The chapter then describes how the current intervention was derived in attempt to meet the aforementioned need based on a theoretical framework of the new literacies and joined with an adapted version of the well-renowned intervention, reciprocal teaching, for improving reading comprehension strategies. The remainder of Chapter Two outlines a synthesis of studies found in the literature including survey studies and intervention studies related to the current study.

The Internet (aka, the World Wide Web, the Web, the Net, and the Information Superhighway) is now commonplace in the lives of many throughout the world in various contexts, and innovations to provide access to the masses through increasingly mobile and convenient means are emerging almost daily. In fact, in 2005, one-sixth of the world's population was reading on the Internet, and at that the current growth rate, one-half of the world's population will be reading on the Internet by 2010 (Internet World Stats: Usage and Population Statistics, 2006). Furthermore, extensive efforts to increase Internet usage are occurring in various contexts. One example expressing such global efforts is the action plan ratified in June, 2000, by The Council of the European Union stating that all the member states of the Union prioritize expanding Internet access to all citizens (Council of the European Union Commission of the European Communities, 2000). In the United States alone, 75% of all households reported having Internet access in the 2004 Nielsen/NETRatings (Eagleton & Dobler, 2007), and a more recent study indicated 73% of the population in America use online resources for education, work-related research, and general information about health, hobbies and shopping (Madden, 2008). Since its inception, use of the Internet has grown exponentially becoming an important new area of literacy in contemporary society, therefore an important literacy to be taught in our schools.

The Internet

The World Wide Web began in 1989 at CERN laboratories in Switzerland as a distribution information system complete with hypertext and multimedia (Bull & Kimball, 1997). Considered a novelty at the time, hypertext allowed movement from link-to-link, and multimedia combined a variety of data types into one document (Bull & Kimball, 1997). Since 1989, the Internet has continued to evolve so rapidly that tools and resources considered innovative seemingly one moment are often soon found to be obsolete (Bull & Kimball, 1997). Today, the Internet is known to us as a convenient and constantly changing resource that has the capacity to allow access to the most current information (Fresch, 1999), and to provide “direct, effective, and novel” methods of communication 24 hours per day, 365 days per year (Kerr & Dworet, 1996; Salend, Duhaney, Anderson, & Gottschalk, 2004). Common contemporary uses of the Internet include banking online, exchanging goods and services (Harrysoon, Svensk, & Johansson, 2004), utilizing search engines, contributing to blogs and wikis, creating Web pages, and participating in social networks and forums (Leu & Kinzer, 2000). Consequently, widespread use of the Internet influences the way we think and act and has revolutionized the way we communicate and create connections with one another (Gabbard, Federation for Children with Special Needs, & National Early Childhood Technical Assistance System, 2001; Lebo, 2003). Due to extensive and varied use, the Internet has infiltrated every facet of life and added a new dimension to education (Web-Based Education Commission, 2000). Because of this, the International Reading Association defines seven rights that students have in regard to what they define as New Literacies and 21st-Century Technologies. Literacy educators have a responsibility to integrate information and communication technologies (ICTs) into the curriculum, to prepare students for the futures they deserve. (International Reading Association, 2009) As expected, the Internet has also had a marked effect in the workplace (U.S. Department of Commerce, 2002).

Internet in the Workplace

The workplace is one component of life that experienced substantial increases of Internet use reporting a rate increase of nearly 60% from 2000 to 2001, with a swell in usage from 26% to 42% of employed adults over the age of 25 (Leu, Kinzer, Coiro, & Cammack, 2004). Dede (1999) describes how the global marketplace is pushing the evolution of high performance computing and communication to enhance our ability to communicate and work across geographic and technological boundaries. In response, many have stressed the importance of teaching students Internet and technology skills to levels of proficiency that will ensure they are competitive in a global economy

(Cunningham, 1997; Izzo, Murray, & O'Hanlon, 2004). A fear exists however that K-12 education is not doing enough to prepare our students, particularly students with disabilities, to meet the demands of a technical world. As noted by The National Council on Disabilities and Social Security Administration (2000), students with disabilities who desire post-secondary education, face the challenge of being unprepared to meet the technological expectations in college due, in part, to limited access. Some sources indicate that not only are students with disabilities not adequately trained to use information technology that would enable them to work in technical fields, but, in fact, expectations have actually been lowered for this population of students throughout the K-12 educational system (Cunningham, 1997). As a result, demands found in post-high school placements in colleges, universities, or working environments often prove overwhelming for students with disabilities, further iterating the need for early access and instruction in the area of instructional as well as adaptive technology (Cunningham, 1997). Henke (2007) further asserts the importance of preparing graduates to compete in a digital, global workforce by calling for strong national policy and dialog between business, government and education. Without national policy, Henke (2007) believes that the goal of creating capable and competitive graduates, prepared to compete in a global market, will never be realized. With the increased demands placed on schools to boost achievement, many are taking measures to ensure more universal Internet access to students, and educators are searching for meaningful methods of integrating technology and the Internet into curricula in attempt to meet increased demands.

Internet in Education

The prevalence of Internet use in contemporary society has spurred schools to action in equipping their buildings with technology and making efforts to provide students increased access to technology and the Internet, yet, although schools have been successful in providing access and improving the quality of technology and Internet access, these improvements do not necessarily ensure greater student use or widespread levels of integration from which students would benefit. Although few research studies exist, a growing body of literature is emerging documenting the benefits, challenges, and positive learning outcomes that can result from integrating the Internet into instruction. Existing literature indicates numerous benefits the Internet can extend to students with disabilities including increased access to a wide variety of resources, the ability to make adaptations to online materials, extensive communication opportunities that improve social skills, and improvements in motivation and engagement for learning. Unfortunately, the common practice of integrating the Internet in educational settings is hindered by barriers such as a documented digital divide for students with disabilities, a lack of sufficient teacher training, a lack of Internet literacy skills among students; thus, providing evidence of a documented need for more widespread and consistent instruction of online literacy. The current literature alludes to the Internet as a tool in literacy instruction that seems to show preliminary evidence as a promising practice for improving academic achievement; therefore, a need for further research is necessary to identify the potential benefits for students with disabilities.

School Access. While only 35% of public schools in the United States had access to the Internet in 1994, within a decade, the percentage nearly tripled reaching almost 100% by 2003 (National Center for Education Statistics, 2003). During that same time period, public schools made considerable progress in extending Internet access into instructional areas as well. Whereas a mere three percent of schools offered access in instructional areas during the 1994 school year, 93% in 2003 were able to provide access in instructional areas also greatly improving the ratio of students to computers with Internet access (National Center for Education Statistics, 2005). With a 12.1 to one ratio in 1998, equipping more classrooms and labs with Internet access resulted in a 4.4 to one ratio of students to computers with Internet access in 2003 (National Center for Education Statistics, 2005). Unfortunately however, ratios of students to instructional computers spiked to 5.1 to one (compared with 4.2 to one) in schools with the highest concentration of students qualifying for free or reduced lunch (National Center for Education Statistics, 2005).

Along with the tremendous increase in Internet access in schools, the quality of access also improved substantially over the course of the past decade including much faster connections that also allow access to larger, multimedia files containing audio and video (Eagleton & Dobler, 2007). Broadband connections by 2003 could be found in 93% of all U.S. schools, yet slight variations in the percentages were evident depending on the school size (large and small) and the location (rural or urban), yet still ranging from 90% to 98%. In addition, a smaller percentage of schools (32%) made wireless connections available to students in classrooms in 2003; however, only 25% of schools with a higher population of students from impoverished backgrounds could offer similar wireless connections.

Beyond the regular school day, only 48% of schools in the US, provided students availability to computers with Internet access either before or after school hours, and even less, a mere 8%, loaned laptops to students or plan on doing in the future (National Center for Education Statistics, 2005). In addition to providing Internet access, 88% of all US schools in 2003 had created and maintained their own Web sites to disseminate information to others (National Center for Education Statistics, 2005). Furthermore, a majority of schools have take measures to ensure the safety of students and the school, as almost all public schools (97%) reported having either technological or procedural safeguards to control student access to inappropriate online material (National Center for Education Statistics, 2005). A majority of schools identified safeguards including: blocking or filtering software (96%), teacher monitoring (93%), parent contracts (83%), student contracts (76%), monitoring software (57%), honor codes (45%), or the Intranet (39%). Furthermore, 99 percent of these schools used more than one technology or procedures to control the access of all Internet-connected computers used by students (National Center for Education Statistics, 2005).

Improvements in the number and quality of Internet access in schools has been crucial, particularly for students who are most affected by the digital divide. School access is often the only access that certain groups of students are able to enjoy. A majority of students living in poverty (52%) and students whose parents did not achieve a high school diploma (59%) reported their only availability to the Internet is in the school setting. Conversely, students from higher SES backgrounds (26%) and those from families with more highly educated parents (39%) indicated that the Internet could only be accessed at school (National Center for Education Statistics, 2005). The groups of students most affected by the digital divide pose a greater need for accessing the Internet at school, and, therefore, would greatly benefit from additional opportunities to access the Internet; however, Hutinger, Clark, and Johanson (2001) are quick to point out that schools must go beyond simply providing students with access to the Internet; they must also update and maintain equipment, wiring, and software, and provide teachers with adequate training to ensure they are equipped to teach students, therefore maximizing the benefits to students.

School Use. Interestingly, despite widespread access to the Internet in almost 100% of public schools, according to the NCES report of 2001, a majority of children and adolescents report using the Internet most often at home (78%) rather than at school; however, the opposite is true regarding the use of computers, with 81% of students indicated they use computers more often at school. When examining this trend further by disaggregated groups, it becomes apparent that the groups of students who are most likely to have access at home, White and Asian children from families with parents achieving higher education levels, and two-parent families, are those who reported accessing the Internet more often at home, obviously not from a lack of home access that might affect those groups plagued by the digital divide (National Center for Education Statistics, 2001).

The inequities of the digital divide are revealed along racial and ethnic lines and in SES where Internet access at home is much more infrequent. Results from these groups of students show that school Internet use exceeds home Internet use by more than 30 percent for Blacks and Hispanics, and for demographic groups including those whose parents did not complete high school, those who reside with a single mother, those who live in households where Spanish is the only spoken language, and those who live in homes where the family income is less than $20,000 per year (National Center for Education Statistics, 2001). In contrast, use of the Internet is slightly more prevalent at home rather than school for two groups: children and adolescents whose parents have some graduate school education and children and adolescents who live in families with incomes of $75,000 or more per year. Although it is encouraging to see trends that reveal ever increasing availability of the Internet in public schools, many studies indicate that increased access does not necessarily translate into increased student use in school, instruction, and/or demonstrated student competency for using the Internet effectively further strengthening the case for increased research and instruction on the topic.

Student Use. A study by Jackson, von Eye, Biocca, Barbatsis, Zhao, and Fitzgerald (2006) asserts that numerous attempts have been made to measure the frequency and nature of children's Internet use; however, results vary in findings of frequency from approximately three hours per week to one hour per day, and findings from some studies indicate the most frequent activity among children and adolescents is communication, while others cite school work as the primary activity. Jackson et al. (2006) explained that deviation of results depends largely on how each variable is measured, the ages of the sample, and the year of the study. Furthermore, the predominate method for study of student Internet use via means of self-reported surveys or interviews rather than actual recordings of online activity can account for additional discrepancies in the results (Jackson et al., 2006). Mindful of the differences in research methods and results between studies, a few extensive studies have been completed with the purpose of defining the frequency and the nature of Internet use among children and adolescents.

The National Center on Education Statistics (2001) reports that most five to 17-year olds use both computers and the Internet, and that Internet use begins early in life and increases with age, particularly use in peer communication About 75% of five year olds use the computer and the percent increases to approximately 90 by the time a U.S. teenager is 17 years old (National Center for Education Statistics, 2001). Additionally, students without disabilities are more likely to use the computer than their peers with disabilities. Results of the NCES 2001 report provided evidence of an existing digital divide based on demographics, socioeconomic status, and parent education as well. For example, students coming from families earning less than $35,000 are more likely to not use computers at home and rely on their local school for computer use. Findings contained in the NCES report (2001) indicate White and Asian students use the Internet more than both Black and Hispanic students. Jackson et al. (2006) further asserts this disparity reporting European Americans tend to use the Internet more frequently than African Americans. Examining group differences based on demographics, students coming from two parent families and who reside outside of the inner city are also more likely to use the Internet than children and adolescents being raised by single mothers or who live in the inner-city. Students that live in metropolitan city centers or non-metropolitan areas are less than half as likely to use a computer or the Internet (National Center for Education Statistics, 2001). Students with disabilities are another group who find themselves on the wrong side of the digital divide reporting a 10% difference in their likelihood of using the Internet compared with their same age peers. While disparities in Internet use between genders have virtually disappeared, dissimilarities in the nature of use have been reported in current literature (see Table 1).

Table 1: Percentage of Internet Use Based on Demographics Adapted from the National Center for Education Statistics (2001).

	Internet Use (hours)	Percentage
Ages	5-7	31
	8-10	54
	11-14	68
	15-17	77
Sex	Female	59
	Male	58
Race/Ethnicity	White	67
	Black	45
	Hispanic	32
	Asian	65
	American Indian	54
Disability Status	Disability	49
	No disability	59
	Poverty status	37
	Non poverty status	65

Nature of Student Use. Statistics regarding home computer use revealed that playing games (59%) is the number one use, followed by accessing the Internet (46%), and completing homework assignments (44%) among children and adolescents, ages 5 to 17 (NCES, 2001). These results shift somewhat when only middle and high school students, ages 11 – 17, are targeted. For this group, the order of priorities when using home computers are reversed: 57-64% of students report completing school assignments most often, 54-63% indicate connecting to the Internet most frequently, and the remaining 60-63% report playing games most often on their home computers (NCES, 2001). When isolating use of the Internet for children and adolescents, reports indicate use for various purposes including communication, information, enjoyment, and homework completion (National Center for Education Statistics, 2001).

According to the NCES report (2001), results indicate school assignments as the most common Internet activity; 42% of all youth (72% of Internet users), followed closely by e-mail and instant message at 38% of all students (65% of Internet users), and online games 36% of children (or 62% of Internet users). Interestingly, as email was found to be the most broadly used Internet resource by adults (U.S. Department of Commerce, 2002), it is ranked second in popularity among school-aged children (National Center for Education Statistics, 2001). However, disparities in findings do contrast with the NCES report. Additional studies revealed that teens, in particular, use the Internet most often for communication purposes; however, Jackson et al. (2006) warns that the results of those studies should be interpreted with caution, as participants in the studies include mostly upper-middle class adolescents, and very few studies included a significant number of students from poor socioeconomic backgrounds in their samples. Additional findings in the nature of Internet use among children and adolescents reveals that anywhere from 6% to 22% use the Internet for locating information (news, weather, sports and products), participating in chat rooms or listservs, watching or listening to television, movies or radio, and making purchases are among other identified Internet uses of youth ages 5 – 17 (National Center for Education Statistics, 2001).

Prior to 2001, studies showed a tendency for males to use the Internet more frequently than females; however, according to new studies, this gap has been virtually eliminated, and many believe due in part to the increase in communication tools available on the Net that have attracted more females. Current studies reveal no apparent differences in the overall Internet use based on gender; however, a contrast exists in the nature of online activities engaged in between male and female users. For instance, the NCES (2001) report indicates when online, girls are more likely to use communication tools such as e-mail, while boys are more likely to play games, shop, and search for information about sports, news and weather. These findings on gender differences coincide with research on adults, which reveal no differences in overall rates of Internet use, but indicate gender differences persist in preferences of online activities, with men favoring entertainment and women favoring communication and educational assistance (Weiser, 2000).

In a recent study targeting college students, Peng, Tsai, and Wu (2006) report gender disparities between male and female attitudes and perceptions of the Internet. Whereas, males tended to indicate more positive attitudes, more perceived control, more communicative self-efficacy, and were more likely to perceive the Internet as a toy, females were more apt to view the Internet as a tool and were more likely to use email than males. Still an additional study found equity in use between gender with one exception; boys visited Web sites more often than girls, but girls were more likely to use email than were boys (Jackson, et al., 2006). Despite tremendous attempts to increase the access and use of the Internet for children and adolescents, in order for students to be competent and keep pace with the ever-changing nature of the Internet, schools have to improve their efforts to provide increased access, use and instruction for all students, particularly those groups of students most beset by the digital divide.

Lack of Research

Despite the prevalence of Internet access and use pervading every area of life, studies pertaining to the Internet as instructional technology are surprisingly scarce. According to Leu et al. (2004), little research has been conducted examining student use of the Internet and/or how to conceptualize and teach the skills and strategies necessary to improve online literacy. Furthermore, the scarcity is even greater in the literature pertaining to students with high incidence disabilities or even learning difficulties. A review of literature revealed a majority of the existing research focuses on access issues for students with specific low incidence disabilities (visual impairments and hearing impairments), teachers' Internet and computer use, and the evaluation of special education distance courses for pre-service and in-service teacher education.

Clearly evident, however, in the current review of literature, is the necessity for more research on Internet use of students with disabilities, as well as the development and evaluation of interventions that measure the academic outcomes of integrating the Internet into instruction for students with disabilities (Castellani, 1999; Rogers & Mahler, 1992; Abbott & Cribb, 2001; Williams, 2006). Among other researchers, Williams (2006) describes the surprising lack of research that explores how people with learning difficulties use information and communication technologies, and reiterating such sentiment, Attwenger (1997), completed a literature review, which revealed many studies pertaining to the computer and Internet use of teachers and their levels of training, but neglected to examine the use and level of training for students. Furthermore, Castellani and Jeffs (2001) documented the lack of research that exists supporting the utility of the Internet for instruction of students with disabilities. Roschelle, Pea, Hoadley, Gordon, and Means (2000) further indicate a lack of rigorous, structured, longitudinal research may explain why conclusive findings regarding information technology use and a positive effect on academic achievement have yet to be found. Because of the lack of research, many educators and researchers have called for increased efforts to explore how the Internet is used by and for people with disabilities (Abbott & Cribb, 2001), and the cognitive processes of online reading that can be used to develop a taxonomy to teach online literacy skills and strategies (Attwenger, 1997; Bulger, 2006).

Hutinger, Clark, and Johanson (2001) urge increased efforts for research by asserting that as use of the Internet and access to information on the Web expands, researchers and educators must increase the dissemination of effective educational practices for promoting access and teaching effective online strategies for students in special education. Although few studies have been conducted to support the effectiveness of using the Internet to improve achievement, many experts believe the Internet has the potential for benefiting students in special education more than any other group (Hasselbring, 1994; Okola et al., 1993; Rose & Meyer, 2001). Moreover, numerous publications support the many promising benefits, while outlining possible challenges, the Internet poses for students with disabilities; therefore, before reviewing current research studies, a synthesis of findings outlining the benefits and challenges of integrating the Internet into classrooms for students with disabilities is explored.

Support for Integrating Technology & the Internet

The importance of integrating technology into the classroom is not a new concept, and initiatives can be found at the national, state, and local levels to create a technologically literate society over the past twenty years (Attwenger, 1997; Dede, 1999; Education Goals 2000; International Society for Technology in Education, 2008; National Council for Accreditation of Teacher Education, 2008; Wood, Roache, & Reinke, 1997). In 1992, the International Society for Technology in Education (ISTE) deemed integrating technology a necessity when they identified 13 content standards on the subject (Attwenger, 1997). Shortly thereafter, other organizations followed their lead, like the National Council for Accreditation of Teacher Education (NCATE), who used those standards as a foundation to develop computer and technology standards for teacher education programs (Attwenger, 1997). These standards included teachers being skilled in using a wide range of technology, and applying that technology to student learning activities in the classroom (Attwenger, 1997). Education Goals 2000 also set an agenda for all adults in the U.S. to be literate, knowledgeable and skilled to compete in a global economy, thereby defining literacy to include proficiency standards in reading, writing, and technology (Wood, Roache, & Reinke, 1997).

State Initiatives

Aligning with national initiatives and standards, individual states began to implement technology standards along with their standing academic goals and objectives. Ohio is one example of many states attempting to rise to the challenge of creating a technical labor force; therefore, the Ohio Department of Education requires that educators teach students sufficiently to meet academic technology standards that include skills in computer and multimedia literacy. These standards set expectations for students to be competent in using information technology to locate, interpret, and disseminate information through electronic sources, and in using the Internet as a resource to build knowledge, perform research, and acquire vocabulary (Izzo, Murray, & O'Hanlon, 2005). Likewise, Michigan is another example of a statewide initiative to improve academic outcomes using computers and the Internet. In this case, the state targeted underperforming middle schools, including 23,000 students and 1,500 teachers, and provided them with personal laptops, wireless Internet access, and inquiry and project-based instructional models. The program titled, "Freedom to Learn," was launched in 2004 and also provides teachers with comprehensive training and curriculum support for integrating laptops into instruction (McHale, n.d.). Yet another example of a state embarking on an initiative to integrate technology into education was Pennsylvania's Link-to-Learn program incorporated with the purpose of using information technology to enhance education, promote community partnerships, and support economic growth

(Cotugno & Kahn, 2000). To achieve this goal, state funds and resources were allocated to institutions of higher learning to encourage the development and implementation of innovative staff development programs aimed at teaching pre-service and in-service teachers to use and integrate technology into their classrooms, but that required an added practicum component mandating that participating teachers be able to model such competency (Cotugno & Kahn, 2000). A final example (among many) chosen to include is a statewide initiative found in West Virginia, where a new core curriculum model was created combining traditional learning, digital technology, and crucial skills for the 21st century (Henke, 2007). Information and Communication Technology (ICT) skill standards from the International Society for Technology in Education were adopted and combined with state core content standards; however, implementation of this model required that new assessments be created to evaluate student progress on the newly included standards (Henke, 2007). Finally, numerous efforts have been made at the local district levels across the country to increase the use and skill levels in technology and the Internet.

Special Education Law

Ray and Atwill (2004) argue that students with disabilities have been more profoundly affected by the integration of technology than any other group of students because, in part, the ability of assistive technology to level the playing field allowing students with disabilities greater access the general education curriculum. However, Ray and Atwill (2004) also point out that the same access that exists to the general education curriculum does not necessarily extend to the Internet, as evident in statistics reflecting a digital divide. While disparities in home Internet access may occur for students with disabilities, within the school context, the digital divide should not exist.

For students with disabilities, access to adaptive and instructional technology is not only recommended as an ideal practice, but U.S. law essentially mandates it. From the 1973 Rehabilitation Act, schools were required to provide students with disabilities access to educational materials; this was followed by the 1990 Americans with Disabilities Act that mandated schools make information technology accessible to individuals with disabilities. Furthermore, requirements from the most recent 2004 reauthorization of IDEA (IDEIA, 2004) are written to ensure that students with disabilities have access to the general education curriculum, which also extends access to include information technology. Furthermore, assistive technology is increasingly required in Individualized Education Plans (IEP), and as a result, federal, state, and local education agencies, along with national organizations including the Council for Exceptional Children (CEC), are developing standards to encourage effective technology instruction (Castellani, 2000). Hence, schools must provide students with disabilities the same access to technology and the Internet as is afforded them to the general education curriculum. This not only indicates that students with disabilities have physical access, but that they are also capable of accessing technology and the Internet, which often requires instruction. Failure to provide students with disabilities access to technology and the Internet is failing to provide them access to the general education curriculum, a basic right extended to students with disabilities through IDEIA, ADA, and Section 504.

Positive Outcomes for Integrating the Internet into Instruction

Educators and researchers alike identify the Internet as a powerful tool that can enhance student learning. In fact, a state-wide survey administered by the American Association of School Administrators (Wood, Roach, & Reinke, 1997) reveals an overwhelming belief (94%) of educators that computer technology, including the Internet, improves learning in their schools; moreover, the open ended portion of the survey resulted in teachers and administrators identifying positive aspects of including the Internet into instruction. Among others, educators reported: (a) access to unlimited resources, (b) world-wide communication opportunities, and (c) improved motivation for student learning (Wood, Roach, & Reinke, 1997). Although few research articles exist on the subject, a growing body of literature provides copious examples of the beneficial nature of the Internet in special education supporting its integration into instruction.

According to Atwell (2000), home Internet access has been associated with higher reading scores, and Elder-Hinshaw et al. (2006) indicate that using multimedia inquiry projects gives students with disabilities the opportunity to practice reading comprehension strategies that engage them in reading more deeply for meaning and applying specific reading strategies of identifying and summarizing main ideas from the text. Another observation of a middle school classroom found that students were more willing to read and answer questions using the Internet, and indicated an added benefit noted by teachers that using the Internet with adolescents with reading disabilities gave them the opportunity to find Web sites about subjects that interest adolescents while also matching their various reading levels to the material.

Another description of effective use of the Internet for enhancing learning is the integration into an eighth grade, American History class (Langhorst, 2007). This teacher used the Internet to extend learning by teaching students to blog and participate in a virtual book club using Blogger (a free blogging tool) about the books they were reading inside and outside of class to extend their classroom understanding of American History. Interestingly, eventually, the author of the book students were reading, a professor, expert on the subject matter, from another state, an English/Language Arts (ELA) class in another state, relatives of students, and even the president of the school board began contributing to the classroom blog (Langhorst, 2007). In addition, the class created collaborative podcasts using Audacity (a free audio-editing program) to record discussions to be used for test review. Special education teachers reported the benefit of these 'studycasts' in aiding in test preparation for students with reading disabilities who would otherwise have difficulty studying independently.

Further supporting the need for greater use of the Internet among students in schools were the preliminary findings of the Freedom to Learn program in Michigan (including 23,000 student participants). These findings indicate that notebook PCs, provided in the study, enabled individualized instruction allowing students to learn at their own pace (Jones, n.d.), and although academic achievement data has not yet been analyzed and disseminated, early findings from the project point to improvements in technology skills related to the intervention. Perhaps among the most striking findings were the results from Hutinger, Clark and Johanson's 2001 study that discovered that using an intervention that taught students to create and maintain their own Web site resulted in students as young as ages three through eight being able to demonstrate the ability to competently use the Internet and easily retain elements of effective use over a period of time (Hutinger, Clark, & Johanson, 2001).

In addition to the numerous examples of effective Internet integration in classrooms, one particular study provides a comprehensive description of the beneficial nature of the Internet for students with disabilities. Castellani and Jeffs (2001) outline numerous reasons it is imperative to implement electronic text available on the Internet in the instruction of students in special education including:

(1) electronic formats allow accommodations for struggling readers including screen or text readers and the ability to change text size, appearance and layout;

(2) numerous reading resources and writing activities are available online;

(3) Web sites include graphics, audio, video, and animation that enhance motivation;

(4) the Internet allows opportunities for authentic learning, which involves real world events or problems that in turn promote higher levels of student engagement and learning;

(5) increased opportunities for student choice in selecting text on the Internet increases perception of authentic learning and increasing motivation.

(6) Text readers assist students with tracking and text-to speech feedback therefore, increasing students' ability to work on higher, reading level text and unfamiliar vocabulary.

(7) numerous post-reading resources can be accessed to aid students in synthesis including concept maps, outlines and prewriting activities.

(8) online post-reading resources can serve as a structure assisting students in composition of sentences, paragraphs and passages pertaining to the text.

(9) the Internet offers a wide range of tools and software allowing students to create sophisticated and polished finished products that include graphics and multimedia.

To date, experimental studies are scant, yet an abundance of qualitative descriptions, teacher practitioner articles, conference presentations, and other forms of literature outline the benefits of integrating the Internet into the curriculum for students with disabilities. A synthesis of reviewed literature reveals online benefits in four broad categories: (a) access to an almost infinite amount of information and resources; (b) adaptations made available through the Internet for students with disabilities; (c) communication tools unconstrained by time and location; and (d) increased motivation and engagement in learning.

Access

Without a doubt, the Internet has revolutionized the way we acquire information and provides access to a wide variety of information and resources. Tremendous access opportunities have repeatedly surfaced as a major theme in the literature attributing to the beneficial nature of the Internet. Regarding access to resources, educators boast that through the Internet experience, students have instant access to an unlimited amount of information (Attwenger, 1997; Bulger, 2006; Fresch, 1999) offering access to information and activities that would ordinarily be prohibited by time, distance or scheduling conflicts (Dede, 1999). Attwenger (1997) further describes online access to include the most current and up-to-date information, in any content area, that once "took us weeks to gather" (Attwenger, 1997). As one educator describes, the Internet has the ability of 'opening doors to the world through virtual field trips, video conferencing, and computer based pen pal projects, which not only offer global connections for students, but also assist in the development of communication skills.

Access to Online Resources. While reading online, students can access a plethora of resources designed to enhance the learning experience. According to Fresch (1999), alternate resources available on the Web have the ability to enhance the student-text interaction: resources such as dictionaries, thesauruses, and encyclopedias (Bull & Kimball, 1997), many of which have speech capabilities to enhance learning of new vocabulary through sight and sound recognition (Franklin & Ferguson, 2005). English language learners can also be supported through language options available online, like those available on the Alta Vista search engine (Bayha, 1998). Bull and Kimball (1997) further assert that a wide variety of free software is available on the Internet including sound card software that can be downloaded from the Internet to support students who are learning to read, struggling readers, students with attention difficulties, and English language learners (Bayha, 1998).

In addition to the multitude of reading resources, numerous writing activities are also available online including concept maps, outlines, note-taking templates, and prewriting activities (Castellani & Jeffs, 2001; Igo, Riccomini, Bruning & Pope, 2006) that assist students in “chunking” information, or breaking tasks into smaller chunks, which has proven to be an effective strategy for students with disabilities. In addition, online access to software and tools permit students an alternate means for creating products reflecting their level of learning that can include graphics and multimedia (Castellani & Jeffs, 2001). According to Castellani and Jeffs (2001), creating student products using multimedia provides students the opportunity to exhibit what they learned along with their creativity that gives students a sense of pride in their work and an avenue for publishing their work in online, public forums (Castellani & Jeffs, 2001).

“Knowledge Webs” reflect unique online resources that allow access by students to experts, archives, and authentic environments (Fresch, 1999). Additionally, students with disabilities can also access curriculum-support Web sites specifically designed to provide them with information on their disabilities and offer support geared specifically to their individual needs (Ray & Atwill, 2004). According to Bull and Kimball (1997), not only can students with disabilities enjoy unlimited access to resources on the Internet but may also enjoy indirect benefits through the availability of parents and teachers access to resources on the Web. Ray and Atwill (2004) note that the resources available on the Internet provide parents information and support about specific disabilities as well as community networks where they can receive support themselves and seek information from other parents. Teachers can also access resources, which include lesson plans, strategies and adaptations that directly benefit students with different disabilities (Atwell, 2000).

Access to Multimedia. The Internet provides the unique component of multimedia, a resource usually not available in traditional learning environments that can provide exposure to art, tools, experiments, and virtual worlds (Bull, Shuler, Overton, Kimball, Boykin, & Griffin, 1999). According to researchers, multimedia includes elements of graphics, audio, video, and animation (Castellani & Jeffs, 2001), and these components are believed to enhance classroom instruction, facilitate learning, and improve motivation and engagement for students with disabilities (Abbot & Cribb, 2001; Langone, Clees, Rieber, & Matzko, 2003; Castellani & Jeffs, 2001; Ray & Atwill, 2004; Hasselbring, Goin, & Wissick, 1989; Higgins & Boone, 1990; Higgins, Boone, & Lovitt, 1996). Many electronic books (e-books) accessed through the Internet include built-in multimedia in the form of hyperlinks that can assist students with unfamiliar words and additional information to key ideas and concepts directly benefitting students with disabilities as well as struggling readers (Franklin & Ferguson, 2005). In addition, e-books often include audio options, which students can use to listen and follow along, further enhancing student engagement with the text (Franklin & Ferguson, 2005).

Virtual worlds and exhibits are also a form of multimedia; through which students can gain access to places that would be impossible to visit, like a virtual museum tour, or a virtual world such as Second Life. Virtual worlds provide students with disabilities a safe environment where they can practice and master life-skills through simulations of real life experiences that can expand the walls of the classroom worldwide, without students ever leaving campus (Lagone, et al., 2003; Ray & Atwill, 2004; and Dede, 1999). The Horizon report (2007) further describes how virtual environments can enhance learning by explaining that because virtual worlds are generalized, learning spaces can be created for any subject area. In addition, very realistic and detailed locations and artifacts can be created in three-dimensions (3D), and students can then learn through simulated problem solving activities and role-playing (The Horizon Report, 2007). For instance, students can become nurses in a hospital room and learn skills in the simulated setting allowing students to temporarily complete the tasks and responsibilities of nurse without having to sustain the real-life consequences of their actions. The Horizon Report (2007) asserts that role-playing through problem solving activities in simulated environments can provide powerful learning experiences to students (The New Media Consortium, 2007). Access to a multitude of information and resources online is only one benefit that can be found on the Internet to enhance the learning of individuals with disabilities. The ease with which educators and students can adapt content online also provides a compelling case for increased integration of the Internet for students with high incidence disabilities.

Adaptations

Throughout the literature, integrating the Internet in the instruction of students with disabilities provides tools to easily adapt and individualize instruction. According to Castellani and Jeffs (2001), the Internet allows educators the ability to individualize instructional materials providing students with disabilities greater access to textual information on their reading level. Adaptations can be made to online text to adjust font size, highlight key information, alter the color and contrast, and adjust backlighting, all to support students with vision problems, learning disabilities, and/or dyslexia (Bayha, 1998; Castellani & Jeffs, 2001; Franklin & Ferguson, 2005). Practically speaking, these adjustments can also make text more easily visible for group work and/or peer tutoring (Bayha, 1998). Students who are learning to read, are struggling readers, have attention difficulties, or are English language learners can further benefit from the increased independence and ability to work at their own pace that can be provided through soundcard software downloaded from the Internet (Bull & Kimball, 1997; Bull et al., 1999). Especially valuable for inclusive settings, screen/text readers provide students text-to speech feedback allowing them the ability to acquire and understand new vocabulary and read and comprehend text above their current reading levels allowing greater latitude for students with disabilities to access the general education curriculum (Castellani & Jeffs, 2001). Bayha (1998) specifically identifies adaptations for students with more significant disabilities, or those with fine or gross motor skills problems, asserting that those students are able to benefit through assistive communication tools on the Internet such as touch screens, alternative keyboards, on-screen keyboards, word prediction software, and voice input and output technologies. In addition, word processing software such as on-screen word lists, spell check, and overlay keyboards have been found to be useful for students with mild learning difficulties providing them with more confidence in their abilities and an increased sense of independence (Williams, 2006). Since the Internet provides increased access and adaptations for students with disabilities, it holds increased opportunities for communication and a tremendous potential benefit for students with disabilities.

Communication

The World Wide Web has revolutionized the way we communicate with each other through various means such as email, instant message, and social networking sites like MySpace, Facebook, and Twitter. According to Burgstahler (1997), computer-mediated communication (CMC) can connect people who are separated by distance and may not otherwise have a chance to meet, and it also provides a safe environment for students with disabilities, to feel more confident communicating with others without the social stigma of their disability interfering (Burgstahler, 1997). Jeffs and colleagues (2003) further describe the Internet as a resource that is currently being used to improve communication and provide students the opportunity to create alternative learning products. Dede (1999) describes the Internet as providing opportunities for increased interaction with other students as well as instant access to networks of people who serve as a 'brain trust' to answer inquiries. In addition, an idealized description by Hutinger, Clark, and Johanson (2001) identifies the Internet as a 'potentially viable tool for creating the global classroom' by allowing communication that can create increased tolerance and bonds with those in other cultures and arouse curiosity in diversity. Regardless of the various descriptions, the literature identifies the Internet as a tool for communication that allows students with disabilities opportunities to build and maintain relationships with others, acquire social skills, participate in online networks, and contribute publically to online forums that host student learning products.

Friendships/Social Skills. Although major findings from the MacArthur Report (2008) do not disaggregate results for students with disabilities, it does provide evidence that most young people extend their friendships through online networks, giving them the ability to stay in close, intimate, and constant contact with friends using IM, email, mobile phones, or through social networking sites like Facebook. Increases in CMC have been found to reduce the social isolation experienced by many students with disabilities by providing them opportunities to create and maintain more intimate and rich relationships with peers over great distances (Burgstahler, 1997; Salend et al. 2004), particularly students with emotional and behavioral disorders (EBD), or more severe disabilities, who are educated in special school settings thus further isolating them from their same age peers (Abbott & Cribb, 2001). In addition, Burgstahler (1997) identifies the added benefit of CMC providing students with disabilities a sense of belonging and access to role models who can offer advice, information, and a sense of empowerment.

Hutinger, Clark, and Johanson, (2001) assert the additional capability the Internet has on development in young children, as early as ages three to eight, when online communication strategies are taught and opportunities are provided for practice and reinforcement. Online communication has been known to result in many positive outcomes for students with disabilities including; improved academic and career goals of students with disabilities through contact with mentors (Burgstahler, 1997), improved social skills, enhanced self reflection regarding social behavior, and increased tolerance of others (Hutinger, Clark, & Johanson, 2001). In addition, Bayha (1998) affirms that conflict resolution projects can be launched using email to improve online communication skills as well as social skills and conflict resolution strategies. In addition, The Internet can provide access to different worlds and cultures through collaborative, ongoing projects that can foster tolerance and understanding from local to international members (Hutinger, Clark, & Johanson, 2001), and with various ethnic and disability groups via direct communication with individuals with first-hand experience from various minority groups (Salend et al., 2004). Furthermore, the MacArthur Report (2008) cites student gains in new literacy skills in both technology and media literacy as a result of increased online communication. Burgstahler (1997) adds the benefit of increased engagement in active learning through the sharing of information, questioning information, expressing opinions, and evaluating arguments.

Peer mentoring/Peer tutoring. Another advantage online communication can provide students is the ability to establish opportunities for peer tutoring, peer mentoring, and computer pals for students with disabilities in other schools, districts, states, regions or countries (Dede, 1999; Salend et al., 2004). Peer tutoring, an evidenced based practice, can be orchestrated via online means in online communities, to extend learning experiences outside of school or at times when resources are unavailable in person (Dede, 1999). These peer tutoring or mentoring sessions can be facilitated using video tools such as iChat, Skype or similar software further enhancing the experience by allowing "face-to-face" communication (Salend et al., 2004). In one example, students with behavior disorders act as mentors to non-disabled middle school students in another town through email. Results indicate that not only do students improve their electronic communication skills, but they also learn critical thinking skills by evaluating situations that lead to conflict and offering advice on the best ways to respond (Bayha, 1998)

Social Networks. Social Networks are common among young people; however, use in educational settings can expose students to additional learning experiences. For example, students with disabilities can find support and information on Web sites and discussion groups specifically geared towards individual disabilities (i.e. learning disabilities, autism spectrum disorder, etc). Wepner (1997) further describes networks know as 'brain trusts' where students can gain access and communicate with experts in different content areas and on a variety of topics. For instance, Wepner (1997) describes one such 'brain trust' that is found on the Internet Public Library Web site, which contains an 'Author Interview' feature allowing students the ability to ask an author personalized questions. Furthermore, Jackson et al. (2006) conducted a review of literature that included findings pointing towards improvements in educational outcomes, for those students involved in networked communities of learners, specifically for students identified as "at-risk." The MacArthur Foundation also reports results that indicate a smaller, yet significant number of students, become involved with online groups that include peers outside of their communities, but who share common, specialized interests (i.e., extreme sports or creative writing). According to the MacArthur Report (2008), this form of online communication not only extends relationships beyond locale, but it also provides young people the opportunity to publish their work online, creating heightened visibility and reputation, and allowing others to provide immediate feedback.

Alternative Learning Products. In addition to the resources available online to increase communication with peers and experts, tools on the Internet also allow students to use and create alternative formats to report research projects and other learning products using tools such as PowerPoint, creating Web pages, contributing to blogs and wikis, posting to discussion boards, and posting on video Web sites such as YouTube. According to Thompson (2003), teachers who allow students to use the Internet in their classrooms report superior projects and student output. The Internet also provides various means to aid students in synthesizing the information they find online through the multitude of concept maps, outlines, and prewriting activities that available on the Web (Castellani & Jeffs, 2001).

Practical Purposes. Not only does the Internet increase opportunities for improving communication skills and provide an alternative for students to report what they have learned, teachers can also use the Internet for more practical purposes. Among other uses, teachers have reported using the Internet to increase communication with parents via online means, like facilitating parent involvement in the homework process, (Salend et al., 2004). In addition, Bull and Kimball (1997) report teachers using virtual parent teacher conferences and IEP meetings to increase participation and parent involvement in the education of their children Dede (1999). Another way teachers have been known to use the Internet is by allowing students to submit homework assignments online (Salend et al., 2004), which can benefit students who have attention and organizational difficulties.

Motivation

One final theme that has repeatedly emerged in the process of reviewing current literature on the benefits of integrating the Internet into education is the identification of the motivational factor the Internet has on students with disabilities. According to Bayha (1998), teachers reported that using the Internet in their classrooms improved student motivation and attendance due simply to the nature of the Internet. This may be partially explained because of the perception among students that being Internet savvy produces a higher social status and that the skills are attractive to posses. Although results of the academic outcomes of Michigan's Freedom to Learn program have yet to be disseminated to date, preliminary results in this study also declare significant improvements in student motivation along with technology skills that come from implementing the Internet into learning (Jones, n.d.).

According to Franklin and Ferguson (2005), using technology to teach reading can be both engaging and motivating and can help students of various abilities, while Thompson (2003) reported that using reading software on the Internet to teach reading has improved both the reading abilities and motivation of students. Hutinger, Clark, and Johanson (2001) further specified the benefits of implementing the communication and reading opportunities on the Internet into instruction with young children, provide an opportunity for beginning readers and writers to communicate their experience with others that combines their inherent motivation with technology and their innate motivation to read and write. Other researchers have further specified the benefits by noting that reading online holds the interest of the students longer than reading traditional text, and spurs further interest through the unique opportunities available in electronic texts, such as hyperlinks and multimedia (Bayha, 1998; Wepner, 1997).

Additional reports include online activities that have also improved the motivation of students with disabilities. The use of WebQuest projects, for example, is one way to engage and motivate students to read about particular subjects online (Thompson, 2003). Moreover, Elder-Hinshaw, Manset-Willimanson, Nelson, and Dunn (2006) point out that using multimedia inquiry projects prove to be a motivating activity for older students with reading disabilities due to the novelty of the multimedia and the authenticity of the task; consequently, increased motivation also influences student engagement in the learning process. Castellani and Jeffs (2001) reiterate the notion of the link between multimedia and improved motivation, reporting multimedia and hypermedia enhances the motivation to learn for students with high-incidence disabilities, and as a result, teachers affirm that using the Internet makes engaging students easier, particularly for lessons that students typically find mundane such as repeated readings and isolated skill instruction (Castellani & Jeffs, 2001).

Specific programs geared towards transition planning for students with disabilities have also echoed the benefit of increased motivation and student participation when using the Internet to conduct career planning and development (Izzo, Murray, & O'Hanlon, 2004). Not only do results indicate that students are more engaged, but also increased motivation is due, in part, to the student belief that the Internet makes learning relevant, also teaching them technology and Internet skills that will be required in either higher education or work placements (Izzo, Murray, & O'Hanlon, 2004).

Roschelle et al. (2000) offer both support and suggestions for integrating the Internet into education with the most potential for positive academic outcomes stating that the most positive effects on academic performance will emerge when instruction on the Internet it is linked with the following four fundamentals of learning: active engagement, group participation, frequent feedback, and real-world connections. Consequently, in the context of education, the Internet has contributed numerous benefits when implemented into instruction. These benefits include a substantial increase in access to information and learning tools, improved methods of communication, easily implemented adaptations, and enhanced levels of motivation and engagement; however, this remarkable teaching tool also poses extraordinary challenges and barriers, which necessitate the need for instruction for both teachers and students to overcome these challenges in order to be competitive in a digital society.

Barriers to Online Literacy

Despite the tremendous potential the Internet holds as a tool to improve academic achievement, the Internet can also pose substantial challenges and barriers to meaningful implementation. One of the major challenges to integration is the digital divide that exists for students with disabilities and other minority groups. In addition, increased access to information can also prove overwhelming for students who lack skills in effectively searching, filtering through an abundance of information, and evaluating information for reliability and validity; therefore, teaching students online literacy skills is crucial for the Internet to enhance academic achievement. Because of these barriers and challenges to Internet learning, a critical need to teach online literacy is apparent; therefore, many educators are looking to researchers to help identify best practices, yet the lack of literature, is also spawning the call for more research efforts.

The Internet is a tremendous tool with enormous potential to enhance education; however, rapid changes to the Internet and new technology occur almost daily making what we learn and teach today, often obsolete tomorrow. Documented in the literature is an additional challenge that teachers face due to the lack of training and support regarding the Internet. Teachers often find locating information on the Internet to be a difficult task for both themselves and their students. Likewise, sifting through the vast amount of information available on the Internet and determining whether or not that information is reliable is another challenge posed to Internet users. To further accentuate this problem, teachers and students using the Internet have to face access issues and challenges resulting from the digital divide; consequently, although the Internet provides extraordinary opportunities and benefits, for students with disabilities, numerous barriers exist impeding meaningful integration in a majority of classrooms today. While dated in terms of the technological innovation that has transpired since 1997, Wood, Roach, and Reinke (1997) defined specific challenges that are common to students with disabilities that still ring true, for the most part, today. This group of researchers indicated that students with disabilities experience greater access issues and are more likely to lack of technology in their learning environments than their non-disabled peers (Wood, Roach & Reinke, 1997). In addition, teacher concerns that students with disabilities, particularly those with emotional or behavior difficulties, will access inappropriate material, also impacts more uniform implementation of the Internet in lessons and activities (Wood, Roach & Reinke, 1997).

D*igital Divide*

The Digital Divide Network (n.d.), as described earlier, defines the Digital Divide as the gap between people who enjoy the benefits of technology and those whose lives could be significantly improved by it. Digital Divide.org (n.d.) further explains that the real issue is not merely the lack of access to digital technologies, but the lack of benefits derived from that access. Unfortunately, too many people are on the wrong side of the digital divide with people from middle and upper class economic status typically possessing most of the high-quality access because not only are they able to afford the cost of quality technology, but designers recognize where the most potential profit exists; therefore, even when the poor have access, the products and services are typically low in quality and created for the rich, further limiting access (Digital Divide.org, n.d.). Although many citizens may have physical access to the Internet, they are still excluded due to the design of the technology (Harrysson, Svensk, & Johanson, 2004). Often included in this group are children, the elderly, and people with disabilities. The industry has responded by using the concept of 'universal design' to create products that all people, regardless of their background knowledge, can access and use (Harrysson, Svensk, & Johansson, 2004). Because of the lack of access, students from diverse backgrounds develop stereotypes and fears regarding technology resulting in an additional barrier, which creates an even greater need to offer these students more access along with strategy instruction in order to remove such barriers. Among the factors segregating groups of people from physical access are minority group status (i.e. African Americans and Hispanics), SES status, parent educational attainment, disability status, and age (the elderly) (NCES, 2001) .

The Digital Divide and Students with Disabilities. According to Enders and Bridges (2006), more than 70% of people with disabilities are on the wrong side of the digital divide, and schools need to make an effort to bridge this divide. Jackson (2003) explained that when research emerged indicating that a digital divide existed and would separate the wealthy and the poor, great concern and efforts were made by schools to remedy this disparity and provide Internet access to general education students, yet the same effort has not been afforded to students in special education programs. A comprehensive study of United Kingdom (UK) students by Abbott and Cribb (2001) revealed that the rapid increase in Internet use by mainstream students was not mirrored in special education students, and a similar trend is revealed in the United States with researchers asserting that the technology needs of students with disabilities are largely being ignored (Abbott & Cribb, 2001; Cronis & Ellis, 2000; Donlevy, 2000; Hopkins, 1998), with little effort to collect data on using and gauging the effectiveness of digital technologies for students with special needs (Castellani, 2000).

Researchers indicate that one reason for this particular digital divide rests on the demand by school administrators for evidence of the advantages of using technology with this population of students before spending millions of dollars on technology; however, a sufficient research base has not yet been established (Castellani, 2000; Hauser & Malouf, 1996). Consequently, general education classrooms are typically the recipients of computers, software, and Internet access, and students in special education settings are denied the same level of access enjoyed by their nondisabled peers. The re-authorization of IDEA recognizes that too many students in special programs fail to achieve the level/scores comparable to students in general education environment, and consequently, many drop out of high school (Donlevy, 2000) to acquire low paying jobs along with a diminished social status (Hauser & Malouf, 1996). Thus, this divide is in direct violation of components of the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) that mandate students with disabilities have access to the general education curriculum. Cronis and Ellis (2000), therefore, suggest that technology be used to bridge the gap between expectations for special education and general education students in order to fulfill the requirements of IDEA (2004).

Another reason noted by researchers for the digital divide includes the lack of training for special education teachers to integrate technology into their classrooms. Although studies have shown that teachers who use technology and the Internet in their classrooms find it an effective tool for accommodating individual needs, developing technology competencies, and for transition services including career development, special education teachers are not trained to integrate technology into their curriculum (Cronis & Ellis, 2000). While many have called for the digital divide to be bridged through more research on instructional technology for students with disabilities, Cronis and Ellis (2000), assert that an additional plea needs to be launched to bridge the existing research to practice gap. Bridging this digital divide and shrinking the gap in research to practice will aide educators in realizing the importance of technological devices and how they can support instruction and facilitate learning for students with disabilities.

Although children with disabilities benefit from access to the Internet and technologies, additional measures need to be taken to ensure that this access is equitable.

Hutinger, Clark, and Johanson (2001) argue that universal design measures need to be employed in creating Internet technologies; however, schools can still make attempts at equalizing disparities by offering increased opportunities and access to students in marginalized groups and providing instruction for students who experience access difficulty due to design and accessibility. In addition, process tools and learning environments need to be developed specifically for students with disabilities in order for them to benefit from the Internet's potential to expand their life experiences and offer them an equal opportunity to achieve standards expected of all children (Hutinger, Clark, & Johanson, 2001).

Lack of Teacher Training and Support

Although many states are recognizing the importance and benefit of integrating technology into classrooms and are making it a priority to offer access, teacher, in-service training and support remains the responsibility of the individual districts and furthermore, is often inadequate (Attwenger, 1997). Evidence can be found in a U.S. Department of Education (1997) report that stated special education teacher training lacks ongoing in-service training in the area of technology (U.S. Department of Education, 1997). Stunningly, a survey, of teachers revealed that over half reported never using the Web; over 70% reported never using listservs to gather information; and over 75% reported never extending the use of the Internet into their classroom instruction (Wood, Roach, & Reinke, 1997). One explanation for this lack of implementation is that almost half of the teachers surveyed (46%) felt incompetent in using the Internet, and 71% stated a strong need for Internet training (Wood, Roach, & Reinke, 1997). More proof lies in a study by

Pierce (1998) that reported teachers did not feel competent in effectively using the Internet to do research themselves, therefore, they were unable to instruct students with the necessary skills or provide assistance. The same study also revealed that teachers, both young and old, felt inadequate to tackle current and ever changing demands of integrating the Internet into instruction whether they were just never taught the skills, as the case in the older teachers, or received superficial and/or inadequate training, as in the case of the younger teachers.

According to Attwenger (1997), while 94% of teachers & administrators agree integrating technology in their classrooms improves learning, 50% of the same respondents further asserted that more effective training is also necessary. Werner (1994) further supports the lack of training by stating that teachers lack the skills and strategies to effectively use the Internet; therefore, they are hesitant and ineffective in their efforts to implement the Internet into the lessons of their students. Werner (1994) further distinguishes those teachers in small, rural schools experience an even greater scarcity of training opportunities to address their lack of skill (Werner, 1994). In an attempt to bridge this gap, some districts and universities are offering online teacher training with the goal of integrating the Internet into the curriculum, particularly in special education classrooms (Werner, 1994).

Another rationale for lack of integration of the Internet can be simply explained by fear. Teachers cited fear as the driving force behind their lack of integration: this includes fear of technology, fear of change, and fear of being replaced by technology (Pierce, 1998). In addition, teachers reported feeling overwhelmed by the new roles and increased time demands that interactive technologies have on lesson planning and implementation. Several teachers also report not having student computers available in their classrooms; therefore, they often find scheduling classes in the computer lab to be an additional barrier to integration (Pierce, 1998). Although teachers face mandates to use instructional technology, they lack sufficient training and understanding of how technology improves instruction, and how to integrate the technology effectively to elicit intended outcomes (Pierce, 1998). Teacher training, therefore, needs to be structured to reduce the anxiety teachers feel towards integrating technology into their classrooms while providing opportunities for teachers to build confidence and proficiency using the Internet, so that they can confidently and competently instruct and assist students in online research (Pierce, 1998.) Rossi, Mullick, and Bauder (2000) further found that while many in-service trainings pertaining to the Internet include opportunities for exploration and hands-on activities, but few include modeling techniques or mentoring for integrating the Internet into their lessons. Rossi and colleagues (2000) believe that modeling and reinforcement is necessary it training programs in order for teachers to feel competent in modeling and guiding their own students through the processes using various Internet tools. From the many results that indicate a lack of teacher training and support for implementing the Internet into instruction, some effort has been made at creating and implementing more effective training for teachers.

After evaluating the failures of the common, one day, in-service workshop for training teachers to integrate the Internet into their instruction, Gallagher (2000) created a new training model providing ongoing training on a weekly basis in the classroom setting, and although findings indicated major improvements in teacher confidence using the Internet, the results showed an initial improvement in the number of lessons that involved the Internet, but during year two of the intervention, the number of lessons dropped back down close to baseline. Wood, Roach, and Reinke (1997) provide recommendations to improve technology literacy in one particular state in the U.S., and interestingly, next to providing funds and Internet access, the remaining two pertained to teacher training and support: (a) ensure every elementary classroom has Internet access, (b) provide extensive Internet training as part of preservice, inservice, and professional development; (c) provide funds for additional technology; and (d) provide opportunities teachers to integrate technology into classroom instruction. In light of the existing literature, it is imperative that new and innovative ways of training teachers are developed in order to improve integration of the Internet into classrooms to empower teachers to negate the inequities of the digital divide, and to create a student body competent to compete in a digital age.

Lack of Internet Literacy Skills

Contributing to the various impediments maintaining the gap between students with disabilities and use of the Internet is the very nature of the Internet itself that requires students to be well-versed in a very specific set of skills and strategies in order for them to capitalize on rich web-based resources. The added challenges associated with online reading environments have found students unprepared to meet those major demands. Abbott and Cribb (2001) provide specific examples of skill deficits that pose greater access issues for students with disabilities, the skills required to locate and access

Web sites, and to send emails. While this list is clearly not comprehensive, a closer look at the literature revealed three major challenges faced by students with disabilities when reading on the Internet (a) students lack effective search strategies to find relevant information; (b) they are deficient in strategies to filter and sift through the massive amounts of information accessed online; and (c) they lack methods of checking and determining the reliability and validity of online sources.

McKenzie (1995) found that in many cases, students have not learned effective search strategies, and therefore, they often find their attempts at gathering information to be time-consuming and unproductive, marked by repeated side-trips to Web sites unrelated to their topics. One specific skill deficit is students' inability to use Boolean operators that would improve the focus of their search and help to avoid common errors and irrelevant search results (Pierce, 1998). In addition, ineffective searches often result in an overwhelming amount of information, and many students have not been taught skills for synthesizing the information to acquire a deeper understanding and construct new meaning (McKenzie, 1995).

Researchers also caution that easy access to an immense amount of information can increase cognitive load and become overwhelming rather than beneficial (Azevedo & Cromley, 2005; Bulger, 2006; Dede, 1999). According to Bulger (2006), such access can be counterproductive for students who are not skilled in filtering, resulting in frustration and information overload. In addition to sorting through a multitude of information, reading on the Internet requires students to explore embedded links, discriminate between relevant and non-relevant information, and process graphics and text simultaneously, which can decrease comprehension and retention (Kerr & Dworet, 1996; Mayer & Moreno, 2003). Bulger (2006) further specified that online media can actually distract students from the text, demanding more sophisticated navigation and filtering strategies, often difficult for students with disabilities, when attempting to increase their levels of comprehension.

Because information is always changing on the Internet, a third obstacle is finding information that is accurate, relevant and timely (Gabbard, Federation for Children with Special Needs, & National Early Childhood Technical Assistance System, 2001). Pierce (1998) explains that while print materials are often peer reviewed or go through some type of evaluative process prior to publication, no such process exists on the Internet; hence, students are required to scrutinize online resources for reliability, a skill with which they are not generally adept. Several researchers also indicate that the benefit of having an increased amount of information available online is often weakened by the complexity involved in finding and identifying credible information advancing the argument that instruction of online literacy skills are critical (Bulger, 2006; Brand-Gruwel, Wopereis & Vermetten, 2005; Gabbard, Federation for Children with Special Needs, & National Early Childhood Technical Assistance System, 2001).

Pierce (1998) summed up the apparent lack of skill students exhibit in the area of online literacy by pointing out that much of Internet literacy instruction that students receive is insufficient for acquiring and becoming fluent in online research strategies. In fact, Pierce (1998) alludes to a common instructional model for teaching students to conduct Internet research. In many schools, this approach includes the classroom teacher assembling his/her students in the library or media center where Internet research instruction is implemented in one, large group lesson conducted by media center or library staff. During such training, educators cover the basics of how to conduct research on the Internet; however, according to Pierce (1998), this method does not provide sufficient time for students to apply and explore the strategies, nor strategies for evaluating the reliability and validity of information found on the Internet. Furthermore, this type of instruction fails to include follow-up lessons and activities; therefore, reinforcement of these skills and strategies are often left to the responsibility of English Language Arts (ELA) classroom teachers resulting in inconsistent and often insufficient follow-up. In light of the unique challenges that come with online reading, the individual needs of students with disabilities, and a lack of skills for effectively overcoming those barriers, educators must address and teach the skills and strategies necessary to produce students competent in online literacies.

Need for Teaching Skills

Internet use has become rampant in society and therefore has also encroached upon all areas of education. Preliminary findings indicate use of the Internet in learning environments can greatly benefit students with disabilities and improve academic achievement; nonetheless, the Internet, by nature, also poses great challenges and barriers to capitalizing on all it has to offer. As a result, educators must not only increase their efforts to integrate the Internet into their lessons more frequently, but they also must teach students the skills and strategies they require to master online literacy. Despite a shortage of research studies on the subject, much of the literature that does exist repeatedly urges educators to take steps to bridge the digital divide and to teach students with disabilities the skills and strategies that they will require to meet the demands of a highly technical world. The need for teaching Internet literacy is so vital that Engleton and Dobler (2007) deem preparing students to meet the new dimensions of online literacy as one of the most crucial challenges for educators in the 21st century.

In order to overcome the challenges preventing more widespread integration of the Internet into classroom instruction, researchers indicate a significant need for additional and higher quality teacher training, more opportunity for student use in school, and an increased effort to provide instruction on skills and strategies specific to improving online reading comprehension. Perhaps the most compelling argument indicating the need for instruction in the area of Internet literacy comes from a recent Horizon Report (2007), which affirmed that the information literacy skills of students entering colleges and universities have not improved since 1993 when use of the Internet exploded. On the opposite end of the continuum, researchers have demonstrated that students with disabilities as young as three years of age can be taught to learn and retain online literacy skills, and can benefit academically from integration; therefore, Hutinger, Clark, and Johanson (2001) have challenged the educational system to include technology early in life and to update technology regularly so that all children can meet the demands and adapt to changes in society. These two examples spanning the continuum from pre-kindergarten to college-age make obvious a significant need to expand and improve efforts in K-12 education to prepare students with disabilities adequately to meet the demands of a digital society.

Need to Improve Online Reading Comprehension

Online research and learning has become increasingly more common, but this sophisticated source of information lacks the ability to teach; therefore, merely providing access to the Internet is insufficient, and students, especially students with disabilities, need to be provided instruction for online learning in order for them to benefit from it (Dabbagh & Bannan-Ritland, 2005; Ray & Atwill, 2004). Researchers and educators alike repeatedly call for online literacy instruction; however, while several special education researchers report findings of Internet literacy skills that students with disabilities lack, few articles have attempted to comprehensively conceptualize the necessary skills, or to provide strategies and/or instructional models to teach them. As a result, an instructional framework needs to be borrowed from the general education literature. As a result, the seminal work in the area of new literacies, largely spearheaded by Dr. Donald Leu at the University of Connecticut, was examined, as it provides an excellent framework that serves to conceptualize the new literacies of the Internet and ICTs to move us closer to effective instructional models for teaching new literacies. Leu et al. (2004) define new literacies of the Internet and ICTs as the skills, strategies and dispositions required to become proficient users of the Internet and ICTs that are constantly, changing, evolving and influencing our personal and professionals lives. These new literacies include five functions of online reading comprehension: (a) identifying important questions; (b) locating information; (c) evaluating information; (d) synthesizing information within and across online sources; and (e) communicating answers to others (Leu et al, 2004).

While Leu et al (2004) provide the major functions needed for new literacies, research involving students with disabilities and new literacies offer detailed account of specific new literacy skills and strategies that students lack. For example, a study by Pierce (1998) revealed that when faced with online inquiry tasks, high school students with and without disabilities: (a) fail to properly plan before going on the Internet; (b) do not use effective search strategies such as Boolean logic or keyword searches; (c) struggle to focus on relevant information when faced with an overwhelming quantity of search results; and (d) do not check the reliability and validity of the information they find, failing to distinguish between reliable sites such as EBSCO Host and a public blog. The inability of students to competently perform these important new literacies warrants the need for teaching online research strategies while also providing multiple opportunities for application and reinforcement (Pierce, 1998). Current literature on special education and the Internet repeatedly cites a need for instruction of specific online skills, most notably in three of the five online reading comprehension components: locating, evaluating, and synthesizing.

Searching. Due to the massive amounts of information readily available on the Internet, students need to be taught to navigate and filter through the information effectively in order to avoid frustration and cognitive overload (Izzo, Murray, & O'Hanlon, 2004). In addition, Salend (2005) makes the plea that students need to be taught certain skills and strategies to navigate the Internet effectively, efficiently, safely, and responsibly. One of these necessary skills, according to Salend (2005), includes teaching students to conduct searches that produce appropriate and useful material, and

Izzo, Murray, & O'Hanlon, (2004) reiterates stating that teachers need to provide instruction to students with disabilities on navigation and search strategies enabling them to meet academic standards in both reading and technology. In 2001, Dalton & Grisham predicted that learning the skills and strategies necessary to effectively and efficiently locate and use reliable information on the Internet will be a necessary skill for our students in the near future. Once a search is conducted, and information is located, the next step is for students to evaluate the information they acquired.

*Evaluating***.** Gabbard, Federation for Children with Special Needs, and National Early Childhood Technical Assistance System (2001) explained that in many ways, the Internet is just as difficult as it is useful citing one major obstacle: determining reliable information online. The Horizon Report (2007) expounded by noting that the wide range of quality of information found on the Internet demands that students improve their skills in research, critical thinking, and evaluation in order to profit from the benefits of instant access to information. Nancy Patterson (2003) points out, that evaluation to determine if a Web site offers information that is both relevant and reliable may be the most important step in completing an inquiry project using the Internet. Therefore, due to the complexity of evaluating reliable and relevant information on the Internet, Salend (2005) calls for students to be given instruction on scrutinizing online information and provided with guidelines for evaluating Web sites and verifying the information using strategies such as identifying who created the site and why and dates the Web sites were created and updated to ensure relevance. Izzo, Murray, & O'Hanlon (2005) assert that teaching students to analyze search results and Web sites can also improve critical thinking skills that will aide in their transition into adulthood, and even more relevant to students today is to teach students to check the credibility of online contacts including those in quest of their friendship on social networking sites like Facebook (Bulger, 2006).

Synthesizing. Dede (1999) declares that access to a massive amount of information and data, does not necessarily equate with increased student knowledge or motivate students to internalize new ideas and information; therefore, students require training in comprehension and synthesis strategies, or they may falter in the wake of unstructured and overabundant information. Salend (2005) further explained that students should also be taught to connect the information they find on one online source to other sources of information online or offline furthering the need to teach synthesis skills. Students require instruction to master the new literacy skills of sorting through a multitude of information and finding patterns of knowledge; consequently, educators need to structure lessons and create online learning experiences to meet the demands of Internet literacy (Dede, 1999). One additional area, transition services, emerged in the special education literature eliciting support for teaching online strategies beyond the major functions of online reading comprehension.

Transitioning into Adult Life

Aside from the urging to include instruction due to students' lack of skills in the components of online reading comprehension, other researchers advocate for the integration of Internet literacy instruction with transition planning to enable students with disabilities to compete in an increasingly technological society. In fact, as far back as the early 1990s, researchers were predicting that students would need to be skilled users of computer and Information and Communication Technologies (ICTs) in order for them to succeed in the workforce across disciplines and trades (Attwenger, 1997), but rather than add ICTs as an extra component to the curriculum, Dede (1999) recommended that the Internet be implemented as regular practice across content areas for achieving all academic standards. Izzo, Murray, and O’Hanlon (2005) held the belief that special educators could meet the challenges of NCLB and IDEIA (2004) by merging transition planning and standards-based education with online literacy instruction; furthermore, they contended that this integration in the curriculum will result in increased student success in both academics and their transition into the workplace or post-secondary education and training. Consequently, the authors implemented an effective transition program around those principles. Izzo, Murray, and O’Hanlon (2004) agreed that online literacy instruction is necessary to prepare students to compete in a global economy, and Luecking, Fabian, and Tilson (2004) add that neglecting to teach and develop these fundamental skills in students with disabilities further disadvantages a group of students who are already plagued by poor, post-high school outcomes, and the digital divide. According to Dede (1999), in order to prepare students for 21st century society, educators must expand traditional definitions of literacy and allow opportunities for experiences and immersion in current multimedia and information technology; therefore, Salend (2005) also indicates a more contemporary need for students to be taught Internet etiquette (“Netiquette”) and safety skills to protect both their privacy and their well being including: avoiding giving out personal information, advertisements, offensive sites, mischief, and viruses. Because children are growing up in the

Communication/Information Age, teachers must emphasize student learning in authentic, technology-enriched environments to teach them to question, collaboratively pursue answers, collectively develop products, and become lifelong learners (Hutinger, Clark, & Johanson, 2001).

Reasons for teaching students with disabilities Internet literacy skills are plentiful based on an emerging pool of literature. Rampant Internet and ICT access and use in the U.S. indicates that competency in these new literacies will soon be essential life skills, if they are not already, and consequently, should be included in our academic standards and schools' curricula. Additionally, documented evidence of a digital divide for students with disabilities also makes increased access and instruction of online skills even more necessary for this population of students. The countless potential benefits of teaching students Internet literacy strategies, and the effect on academic outcomes, is yet another strong argument for including instruction. Finally, students lack online skills making them ill prepared to meet the challenges on Internet literacy, which further establishes a critical need to provide students with disabilities Internet access and instruction. Due to the numerous and valid reasons for teaching Internet literacy to students with disabilities, the current literature reflects recurring calls to implement Internet instruction and use in all learning environments; consequently, a novel and comprehensive intervention has been developed by the Teacher Internet Comprehension to Adolescents (TICA) project.

Elements of the Current Intervention

Due to the nature and complexity of online reading comprehension, it has proven difficult to define and conceptualize, let alone, determine the most effective means for instruction; therefore, the intervention, Internet Reciprocal Teaching (IRT) was created by the TICA research team based on multiple theoretical frameworks and perspectives, but primarily based on a combination of Leu et al (2004) new literacies theoretical model and Reinking's (2001) engagement of online reading perspective (Castek, 2007; Coiro, 2003; Leu et al, 2004; Reinking, 1997). In order to develop IRT, a pilot study was conducted to determine what skills and strategies students currently use online. This study led to the development of a preliminary taxonomy of skills. Next, an evidenced-based practice for improving reading comprehension, Reciprocal Teaching, was identified and chosen based on the substantial effect sizes with a median effect size of .32 on standardized tests, and a median effect size of .88 on experimenter-developed tests (Rosenshine & Meister, 1994). Next, the reciprocal teaching model (Palincsar & Brown, 1984; Palincsar, 1986) was adapted to address all the components of the new literacy model of online reading comprehension including: (a) identifying important questions, (b) locating information, (c) critically evaluating Web sites, (d) synthesizing information within and across multiple sources, and (e) communicating ideas to others through a variety of online formats (Leu et al., 2004). Also included in the IRT framework were the three types of knowledge for strategic reading comprehension as identified by Paris, Wasik, and Turner (1991): (a) declarative knowledge (knowing what); (b) procedural knowledge (knowing how); and, (c) conditional knowledge (knowing when), with the ultimate goal of teaching students the skills and strategies necessary to become proficient in applying conditional knowledge to online reading. Therefore, declarative and procedural knowledge of a strategy must be developed prior to attempting to teach conditional knowledge. Finally, the initial version of IRT was developed, implemented, and adapted during year two of the TICA project through a formative (or design) experiment in order to improve the IRT instructional model based on the two main theoretical components: Online Reading Comprehension and Reciprocal Teaching.

Online Reading Comprehension

In order to better comprehend how IRT was conceptualized and developed, a more comprehensive description of the theoretical underpinnings of online reading comprehension must be addressed. Leu (1996 & 1997) began early research into understanding and promoting similarities and differences between online and offline literacy. His pioneering effort spurred a greater understanding of how students learn online, and his linkage of literacy to deixis (time and space dependent words in literacy) helped shape the discussion about how literacy was unfolding as the Internet diffused into classrooms, households, and students' minds through the late 1990s. By this time, Leu had identified four emerging trends in online literacy: (a) being literate will require students to acquire new and increasingly sophisticated navigational strategies; (b) becoming literate will change from an end state to an endless developmental process; (c) literacy on the Internet will require new forms of critical thinking and reasoning; and (d) new forms of literacy will be required for comprehension on the Internet (Leu, 1997).

With a paradigm shift in literacy imminent, Leu called for a change in the focus of literacy and literacy instruction (Leu, 1998; Leu, 2000). This significant call for adapting literacy instruction helped bridge the gap between the traditional model of offline literacy with the new model of online literacy including the Internet and Information and

Communications Technology (ICT). No longer could teachers and researchers address literacy exclusively through printed text without expanding literacy to include the new technology and the new literacies that are woven into its nexus. Subsequent studies refining his early work helped elucidate findings, insights, and emerging trends in the field (Leu, 2001; Leu, 2004; Reinking, 2001). And, based largely on Leu's work, it has come to be understood that reading online requires new forms of reading comprehension; therefore, new instructional models are required to ensure that students acquire the skills and strategies needed to maximize new literacies of reading, writing, and communicating online (Leu et al., 2004).

Recognition that online reading comprehension appears to require additional, somewhat different, and often more complex reading comprehension skills and strategies (Coiro, 2003; Coiro, 2007; Coiro & Dobler, 2007; Leu, Castek, et al., 2005; Leu, Zawilinski, et al., 2007) has led researchers to explore their differences. According to a study by Leu and colleagues (2005), online reading comprehension differs from traditional reading comprehension in the following ways: (a) anyone can publish on the Internet, thus critical evaluation of information on the Internet is vital; (b) students follow unique paths when reading online, with no two readers following the same path; (c) multimodal texts present information in formats that differ from traditional texts and include sound, image, color, and animation; and (d) text features such as menu bars, titles, headings, and subheadings differ from site to site. Due to noted differences, teaching effective and efficient strategies through strategic approaches becomes increasingly important in 21st century schools.

From the original four emerging trends of online reading comprehension identified by Leu and Coiro (2009) further refined the dynamic trends, summarizing the differences as follows: (a) students need new skills beyond those measured by offline reading comprehension; (b) dispositions toward the Internet affect online reading abilities; (c) students often seek answers on the Internet collaboratively; (d) reading processes should inform reading instruction; and (e) the nature of reading comprehension is changing because of digital technology.

Coiro (2005) has continued to define the developing research framework around online reading comprehension. Several key thoughts have emerged from her work. First, reading skill level and the need for purposeful search strategies may be inversely related. Second, Internet texts require higher levels of thinking for comprehending information and generating inferences on the Internet. As such, teachers must maintain a close link between the skills that students require and how they design their lessons. Third, students fluent in online reading display “persistence, flexibility, a healthy sense of skepticism, and confidence” (Coiro, 2009). Fourth, students need new comprehension skills to function on the Internet. She describes and loosely defines these skills as: (a) evaluating a long list of search results and making inferences about searched information; (b) locating information within a Web site while navigating within the site; (c) evaluating the authenticity and reliability of information; and (d) synthesizing information into new knowledge that can be communicated by students. Furthermore, because students often move back and forth between these functions, it may be advantageous to break these into separate steps during the learning process, particularly for students with disabilities, to make the task more manageable.

Since these learning processes are different, distinct approaches to pedagogy are needed in order to improve online reading comprehension. Such approaches include teaching lessons requiring students to use real-time data sites, Web sites that incorporate children's literature, online tools where students synthesize and record information, online venues linking literary experiences to appropriate expository experiences, and Web-based communication tools for posting/publishing student work to increase engagement (Leu, 2001; Leu, et al., 2004). Leu (2002) and Leu et al. (2004) describe two specific approaches to facilitate improvement in online literacy. The Internet Workshop approach utilizes a form of jigsaw, cooperative learning where students complete separate tasks online, report back to the group, and assist each other in learning. Another alternative is the Internet Project approach that incorporates student driven, inquiry-based experiences that focus on gathering ideas, information, and data to solve a problem.

Most educators agree that the Internet can enhance student learning across content areas (Eagleton & Dobler, 2007); however, strategic instruction has not yet become a common practice in classrooms. In fact, according to Gunn and Hepburn (2003), approximately 73% of teenagers in America, ages 12 to 17, are teaching themselves strategies for finding information on the Internet using the trial and error approach, or they are relying on friends and classmates to teach them these strategies rather than looking to educators for guidance. This approach can be problematic, as it opens the door misinformation, inefficient, or ineffective strategies to be developed. Therefore, educators must take a more active and strategic approach to teaching effective Internet reading comprehension strategies that accommodates not only the added complexities of online reading, but also continuous innovation that warrants new online strategies. As a result, creating an intervention based on the Reciprocal Teaching model provides a solid framework.

Reciprocal Teaching

First appearing in reading journals in the 1980s (Oczkus, 2003), reciprocal teaching can be described as a scaffolded discussion procedure based on four strategies that good readers demonstrate when comprehending text: predicting, questioning, clarifying, and summarizing (Palincsar & Brown, 1984). In the reciprocal teaching model, students engage in a more social rather than traditional form of learning and are given the opportunity to assume the role of the teacher by modeling the four strategies using think-aloud methods (verbalizing thought processes), followed by a discussion (Oczkus, 2003). Moreover, reciprocal teaching was designed to aid in students becoming more reflective in their use of strategies. Well known and widely regarded and used, reciprocal teaching comes highly recommended by the National Reading Panel (National Institute of Child Health and Human Development, 2000) as a research validated teaching practice to improve students' reading comprehension. Numerous studies with diverse samples of students in a variety of settings have consistently yielded results supporting the effectiveness of the intervention. In fact, after reviewing 16 studies, Rosenshine and Meister (1994) determined reciprocal teaching to be a model that improves reading comprehension for students of all ages. An early study on the efficacy of reciprocal teaching found that after only 15-20 days of the intervention, students' scores on a reading comprehension assessment increased significantly from 30% to 80%, and a subsequent study by Palincsar and Klenk (1991) elicited similar initial gains. Further examination of reciprocal teaching found that students not only improved initially but were also able to maintain improvement a year later (Palincsar & Klenk, 1991).

Having shown early promise as an effective intervention, researchers were soon testing the efficacy of reciprocal teaching in various settings. Reciprocal teaching was initially designed for middle school students; however, studies revealed adapting the practice and implementing it in elementary schools also demonstrated improvement in reading comprehension for elementary aged students (Cooper, Boschken, McWilliams, & Pistochini, 2000; Palincsar & Brown, 1989; Palincsar & Klenk, 1991). Furthermore, research also supported use of reciprocal teaching for struggling readers in urban settings (Cooper et al., 2000; Carter, 1997). The results of replicated studies using reciprocal teaching have validated its efficacy for improving reading comprehension for students of various ages and leaning needs; therefore, the IRT model was created to replicate the same type of intervention to elicit gains in online reading comprehension.

Internet Reciprocal Teaching

The initial IRT model was informed by the taxonomy of online reading comprehension strategies that came from analysis of year-one data of the TICA project. The chosen theoretical models were then integrated to identify the following goals for IRT: (a) to develop strategic online reading; (b) to develop awareness of specific skills needed for efficient online reading; (c) to model and scaffold strategies collaboratively toward increasing reading comprehension; (d) to apply interdependent and complementary strategies during authentic online reading experiences; and (e) to facilitate collaborative dialogue in order to develop useful skills and awareness that transfer to new reading contexts (Leu, et al., 2006). Once the IRT model was outlined, lessons were developed and implemented during a formative experiment conducted in five schools during the 2006/2007 school year. Lessons varied throughout the five schools based on the content and standards of the individual school districts, but all IRT lessons were based on the following principles and were required to include the following components: (a) develop democratic dialog and discussion, (b) allow strategies to emerge and be used in relation to specific content, (c) gradual release of responsibility beginning with teacher modeling and scaffolding, to student-to-student modeling and scaffolding, to students sharing in instruction; (d) recognize students as informants; (e) involve all components of Internet reading ability in the current model: question, locate, evaluate, synthesize, and communicate; (f) take advantage of opportunities to privilege struggling readers, (g) actively engage students in meaningful activities, and (h) engage students in a full range of evolving Internet activities (National Reading Conference, 2008). Based on these essential components of IRT lessons, a ten-week, twenty lesson, formative experiment was conducted implementing IRT and making adaptations as necessary. During the formative experiment, when changes to IRT were made, researchers documented the adaptations as well as their outcomes to determine the efficacy of those changes. At the conclusion of the formative experiment during 2006/2007, researchers from the TICA project met, examined data sources from the five sites, and adjusted the intervention where necessary to improve the IRT instructional model.

Further examination of year two data led to the addition and reorganization of the taxonomy of skills into a logical sequence of three phases to address the skills and strategies necessary for students to become proficient online readers. Phase I of IRT consists of teaching the basic skills students need to gain access to and navigate the Internet. The following components describe Phase I: (a) introduce basic skills and strategies that may be precursors to online reading comprehension; (b) teach the nuts and bolts skills (e.g. copy and paste, creating folders, etc.); (c) establish classroom routines and procedures; (d) establish rules for computer and Internet use; (e) use more direct instruction with small group experiences; (f) utilize high levels of teacher scaffolding; (g) develop a climate of teaching one another in small groups and in working with partners; (h) observe which groups/partners work well together and make adjustments as necessary; and (i) avoid total teacher directed learning and invite students, as experts, to share strategies and skills. Prior to moving to Phase II of IRT, most of the students in the classroom must have mastered the basic skills checklist (National Reading Conference, 2008) (Appendix A).

When a majority of the students in the classroom are able to demonstrate mastery of nearly all of the skills and strategies outlined in the basic skills checklist (Appendix A), the teacher can begin Phase II of IRT. This phase is designed to gradually move from teacher-directed instruction of skills and strategies, towards problem-based learning experiences tied to the curriculum. Phase II focuses on the following skills and strategies: (a) teach important online reading comprehension skills and strategies through problem based learning experiences; (b) design activities so students encounter specific strategies; (c) begin phase with modeling and explicit instruction, but scaffold instruction; eventually minimizing teacher talk as much as possible posing problems for students to solve in small groups; (d) initially focus on questioning, locating and critically evaluating; (e) later shift focus to synthesis and communication with a variety of online communication tools (email, blogs, wikis, Google docs, IM); (f) develop online reading comprehension skills and strategies in the context of completing purposeful activities geared toward curriculum goals; (g) use moderate levels of teacher scaffolding; and (h) increase use of peer-to-peer supports (National Reading Conference, 2008). Transition from Phase II to Phase III of IRT should begin when a good number of the students in the classroom are able to demonstrate proficiency on most of the skills in the checklist for Phase II (Appendix B).

Phase III of IRT is designed to provide application, extension, and eventually promote generalization and fluency of the skills and strategies learned in Phases I and II of IRT. Phase III is defined by the following guidelines: (a) application, extension, and continued development of online reading comprehension skills and strategies with inquiry projects and possibly collaborative online projects, (b) work takes place individually and in small groups with the teacher acting more as a facilitator, (c) initial focus on independent inquiry with support from groups and classmates, (d) later focus may shift to collaborative projects with other classrooms first as a whole group and eventually with small groups and/or individuals (National Reading Conference, 2008). (Appendix C). Although IRT is grounded in theory and preliminary qualitative analyses appear to support the effectiveness of the Intervention, only one large, rigorous study has been conducted to date, and results from that study have not yet been disseminated; therefore, an insufficient amount of evidence exists to determine the effectiveness of IRT.

Studies Reported in the Literature

A systematic search was conducted to identify studies pertaining to Internet use and students with disabilities. In addition, studies were also targeted that included interventions for teaching one or all of the components of online reading comprehension for students with disabilities. First, an online search of Academic Search Premier, the Educational Resources Information Center (ERIC), and PsychINFO databases was conducted using variations of the following keywords: students with disabilities combined with Internet, "using the Internet;" instructional technology, online reading comprehension, reading on the Internet, and Internet learning. In addition, special education was also combined with all of the above keywords. An ancestral search of the reference list in selected articles was then conducted. Because research on the topic was so scarce, criteria for inclusion in the literature review were rather loose including:

(1) Included individuals between the ages of 5 and 21 who were identified as having a high-incidence disability (LD, EBD, MR);

(2) Used experimental or quasi-experimental, single subject, design (formative experiments), mixed methods, or any qualitative research design;

(3) Included at least one quantitative or qualitative measure of academic outcome under the broad category of language arts; and

(4) Reported results for students with high-incidence disabilities (in some cases learning difficulties).

The initial computer search yielded 208 articles. From this total, 86 were selected to evaluate further. After reading 86 abstracts, 67 articles were identified that loosely related to the topic and were skimmed to determine eligibility in the review of literature. The follow-up ancestral search of relevant studies identified an additional 39 articles pertaining to the topic; therefore, a total of 106 articles were skimmed and/or read to determine inclusion in the review of literature, or to identify articles that provided information relevant to the rationale of this study. Although a majority of the articles were useful in building a rationale, only 18 studies remained that met the criteria for inclusion; 11 intervention studies and seven survey studies. The review of survey studies, however, included a total of nine surveys (six teacher and three student) because two of the survey were conducted within the context of the intervention studies included in the literature review. The 11 intervention studies were composed of various methods including five quantitative studies, five qualitative studies, and one mixed methods study. A synthesis of the findings can be found below.

Survey Studies

A total of nine survey studies were reviewed for the purposes of synthesizing the findings; six of the studies surveyed either special education teachers, or teachers who instructed students with disabilities. An additional three survey studies were evaluated that included either a sample of all special education students, or a large sample that included both special education students and a large number of students considered “at-risk.”

Teacher Surveys

Six teacher surveys were analyzed for this portion of the literature review, and while four of the surveys were stand-alone studies, the remaining two were surveys completed by teachers within the framework of a larger, intervention study. Across the six studies, a total of 1,531 educators were surveyed, yet one of the studies included both teachers and school administrators. One of the studies was a national survey, three were regional, and the remaining two were state-wide surveys. One of the studies surveyed elementary teachers, one survey included high school teachers, two included middle school teachers, and four more were administered to teachers grades K-12. The purpose for each study varied somewhat with two studies attempting to quantify teachers’ use of the Internet in the classroom, while two others sought to identify teachers perceptions of what Internet skills students need to be taught, and the instructional applications for those skills. One study intended to identify the barriers to Internet use for students with disabilities, and lastly, a post-intervention survey was conducted with teacher participants to ascertain their perceptions as to the efficacy of the Freedom to Learn Program.

Synthesis of Teacher Surveys

Internet Use. A synthesis of the teacher surveys found that overall; teachers are not regularly using or integrating the Internet into their classrooms (Abate 2000; Attwenger, 1997; Heaviside, Rowand, Hurst, & McArthur, 2000; Pierce, 1998; Wood, Roach, & Reinke, 1997) and revealed some of the barriers preventing such implementation (Heaviside, et al., 2000; Pierce, 1998). Although outdated, Attwenger (1997) reported a shocking 21% of teachers never use the Internet at school, and an overwhelming 92.5% of teachers indicated they rarely use the Internet at school ranging from one to ten logins per week. Even more dismal are results of Wood, Roach, and Reinke (1997) that resulted in 55% of teachers indicating they never use the Internet in school, and only 2% of the sample reported using the Internet extensively. Email was among the most frequently used tool on the Internet by teachers who use the Internet at school; however, 68% of teachers reported never using email in school followed by 13% who used it occasionally, 10% used email moderately, and an alarming 3% reported using email extensively (Wood, Roache, & Reinke, 1997). In addition to email, a majority of teachers (79%) reported using the Internet in school most frequently for other purposes including; researching subjects, reinforcing learning, and to generate interest in learning (Attwenger, 1997).

Integration of the Internet into Teaching. With low levels of teacher Internet use in school, it is not unexpected to also see limited reports of teachers using the Internet during instruction, or modeling the use of technology and the Internet for their students. The study conducted by Wood, Roache, and Reinke, (1997), revealed that 79% of teachers surveyed indicated they never used the Internet in classroom instruction, 18% used the Internet occasionally, and 3% did not respond. In fact, on a on a four-point Likert scale where one indicates “never” and two indicates “rarely,” a median score of 1.4 was reported indicating that teachers almost never model procedures for using technology including the use of spreadsheets, E-mail, the Internet, databases, presentation software, simulations, graphics, hypermedia and tutorial software (Abate, 2000). The only resource teachers indicated using in class with students on an "occasional" basis was the use of word processors (Abate, 2000). Ironically, open-ended questions on the survey by Pierce (1998) demonstrated that about half (51%) of the teachers surveyed were concerned that their students had not learned to properly use online directories and search engines, and about one-third (30%) voiced apprehension that students were not skilled in using keyword searches. An additional 23% responded they did not feel their students were able to search the Internet efficiently, and 21% believed that students did not possess the skill set necessary to evaluate the validity of the information they found online (Pierce, 1998). Nevertheless, survey results reveal the absence of use and instruction on the Internet despite the recognition that students are in need of greater access and skill.

Teacher Confidence. One explanation for the lack of integration of the Internet into classrooms is revealed through survey results that indicate teachers' lack of confidence in their own competence using the Internet. This conclusion can be inferred from the findings that less than one-third of teachers surveyed considered themselves experienced users of technology (Abate, 2000), and on an open-ended portion of another survey, eight of the 43 teachers stated that they did not feel competent conducting research on the Internet, and therefore felt unable to teach or assist students (Pierce, 1998). This trend of compromised teacher confidence can also be found in the Wood and colleagues (1997) survey report that found almost half (46%) of teachers reported they felt incompetent on the Internet, 26% believed they were somewhat competent, only 9%

designated themselves as competent, and 2% held they were highly competent. Encouraging, however, are the findings that point toward positively affecting confidence levels for teachers pertaining to the using and integrating the Internet into instruction. The post-intervention survey of 279 participants revealed that with Internet training and support teachers reported increased confidence in their overall computer skills, as well as, confidence in integrating personal computers (PCs) and the Internet into instruction, aligning the Internet with curriculum standards.

Need for Teacher Training. An additional revelation into inadequate implementation of Internet use in classrooms is the documented desire for teacher training. A vast majority (88%) of teachers surveyed in the Attwenger study (1997) indicated their wish for a course on integrating computers and the Internet into their curriculum; likewise, 71% indicated a strong need for Internet training, and 47% reported a strong need for curriculum development opportunities integrating the Internet (Wood, Roache, & Reinke, 1997). Furthermore, findings from the Heaviside et al. study (2000) designate insufficient teacher training as the number one response (47%) when teachers were asked to identify the barriers to Internet use specifically for students with disabilities. The open-ended portion of the survey by Pierce (1998) discovered that older teachers reported never learning to use the Internet effectively, and younger teachers indicating that although they had received training, that they felt the training was inadequate to meet the demands of integrating the Internet into their classrooms.

Limited Availability to the Internet. Results of survey data revealed that restricted availability is yet another barrier to integrating the Internet into teaching. According to

Heaviside and colleagues (2000), survey results found that students with disabilities in public school settings were equally as likely to have physical access to the Internet as those without disabilities; however, additional results in the same study contradict this notion by indicating diminished amounts of actual availability of computers with Internet access: 34% of public schools surveyed reported a lack of computer availability for students with disabilities, and 38% more cited inadequate availability to input and output devices that would increase access to the Internet for students with disabilities. Similarly, results from Wood, Roache, and Reinke, (1997) revealed that 86% of classrooms were not wired for Internet, but access was available in common areas such as the library (35%) and computer labs (30%). Furthermore, 62% reported a strong need for equipment. These findings directly contradicted results from the National Centre on Educational Statistics (NCES, 2005) that reported nearly 100% of public schools possessed access to the Internet, and 93% provided this access in instructional areas. This increased access to the Internet in classrooms across the U.S. indicates that appropriate instructional strategies using the Internet are needed.

Additional Findings. Additional barriers revealed through survey data included the lack of evaluation and support services for implementing the Internet into teaching (Heaviside et al., 2000), and time constraints in schools (Pierce, 1998). From the post-intervention survey of the Freedom to Learn program (Jones, n.d.), teachers reported that providing students with laptops, Internet access, and a curriculum geared around those provisions seems to be a promising practice to improve student motivation and learning. More than 90% of teachers reported improved student comfort and proficiency, as well as student motivation and student-teacher interactions. A summary of teacher surveys is found in Table 2.

Table 2: Summation Teacher Survey Studies.

Citation	Subjects	Setting	Design	Purpose
Abate (2000)	N = 42 Teachers	Grade 5 – 7 Suburban middle school	Survey	Teacher and student Internet use
Attwenger (1997)	N = 67 42% Special Education Teachers	Northeast	Survey	Teacher Internet Use
Heaviside, Rowand, Hurst, & McArthur (2000)	N = 1000 School administrators & Teachers	National K-12	Survey	Barriers of Internet Use and advanced telecommunica tions for students w/disabilities
Jones (n.d.)	N = 279 Teachers	77 middle schools Michigan	Survey (following intervention study)	Perceptions following participation in the Freedom to Learn program
Pierce (1998)	N = 43 Teachers	Grade 9 – 12 Three district high schools in Northeast	Survey with free responses within intervention study	Skills students need to conduct research on the Internet
Wood, Roach, & Reinke, (1997)	N = 100 Teachers	Elementary school (Grades 1 – 6) South Dakota	Nine-item survey	Perceptions of Internet components and instructional applications

Student Surveys

In addition to surveys, which included teacher perceptions of Internet use, three additional studies examined the perceptions of students and their parents, all of which were conducted as a part of a larger, intervention study. Two of the survey studies included participants in Michigan's Freedom to Learn program, which allocated notebook, personal computers (PCs), Internet access, and an alternative, online driven curriculum to students from the bottom 100 performing middle schools in the state. Although results from students with disabilities were not reported as a group, the sample included students with disabilities, and due to the nature of the total population, a large percentage of participants came from lower SES backgrounds, and many were considered "at-risk." The third survey was a post-intervention survey based on participants in a highly regarded, transition program called Disabilities, Opportunities, Internetworking, and Technology (DO-IT), which featured an online peer-mentoring component for students with disabilities. This study included students with both low and high incidence disabilities: Learning Disabilities (LD), Visual Impairments (VI), Hearing Impairments (HI), Traumatic Brain Injury (TBI), Other Health Impairment (OHI) and Multiple Disabilities (MD). The total number of participants across studies was 4320 students, from grades 6 -12. All three studies included student perceptions on the respective interventions, and the surveys also included students' perceived value of certain components of the Internet, while one of the three also reported self-efficacy measures regarding the Internet.

Synthesis of Student Surveys

Recent reports indicate students are using the Internet more in their learning. A summary of the results revealed that students valued the Internet, as well as various resources on the Internet (McHale, n.d; Jones, n.d.; Kim-Rupnow & Burgstahler, 2004). In general, students also indicated an overall beneficial impact on their learning (McHale, n.d; Jones, n.d.; Kim-Rupnow & Burgstahler, 2004). More specifically, in evaluating the technological components of the DO-IT program, scholars reported frequent use of the Internet, high interest in online activities, and enjoyment communicating via the Internet with their mentors and peers (Kim-Rupnow & Burgstahler, 2004). In fact, 70% of the students reported using the Internet for communication and to complete activities at least every week; 40% said used it daily; and 66% stated they used email at least once per week (Kim-Rupnow & Burgstahler, 2004).

Value for the Internet. In the same study, (Kim-Rupnow & Burgstahler, 2004) participants indicated high levels of value for the Internet with 73% of respondents rating the year-round access to the Internet as extremely valuable, and none of the participants recorded a score of one on a five-point Likert with one equaling “not valuable” to five indicating “extremely valuable.” Furthermore, nearly all (98%) of the participants rated the technology-enhanced, summer program component at a three or above, and a considerable number of participants regarded online access to mentors (87%) and online communication with peers (77%) as quite valuable with a score of three or above (Kim-Rupnow & Burgstahler, 2004). Similarly, a noteworthy amount (87%) of the student participants in the Jones (n.d.) study indicated the perceived value of having a PC and

Internet access by expressing their desire to participate in the Freedom to Learn project the following year. In addition, a majority of students in both studies on the Freedom to Learn project, approximately 60%, reported they felt the notebooks had increased their interest in learning (McHale, n.d; Jones, n.d.), and 60% said that homework was easier to complete with the PC (Jones, n.d.). Over half of the students (54%) in the McHale (n.d.) study also felt they learned more during the intervention, and perceived that participation in the program would lead to better jobs in their future (51%).

Improved Self-Efficacy. In addition to valuing opportunities on the Internet, DO-IT project scholars also reported increases in perceived skill levels on the Internet at three different points in the intervention, one prior to the intervention, the next after the Summer technology-enrichment training, and finally upon exiting the program. On a Likert scale of one through five (one being very low and five being very high), the mean score prior to the intervention began at 2.66; it then increased considerably after the summer program, with a mean of 3.86; and finally topped out at a mean of 4.56 at the end of the transition program. Results revealed that students' self-efficacy increased significantly at each time-interval, indicating the positive impact of training followed by year-long Internet access and use on students' perceived skill levels on the Internet. (See Table 3)

Table 3: Summation of Student Survey Studies.

Citation	Subjects	Setting	Design	Purpose
Jones, (n.d.)	N = 4245 (majority - 6th graders)	100 low performing middle schools Michigan	Survey within intervention study	Explore perceived value of the Freedom to Learn program and access to notebooks, Internet, and modified curriculum
Kim-Rupnow & Burgstahler, (2004)	N = 75 Students w/ LD, VI, HI, SI, Multiple Disabilities and TBI		Retrospective survey	Participants in tech-based exemplary transition program (DO-IT) for college-bound students with disabilities
McHale (n.d.)	N = 4245	100 low performing middle schools Michigan	Survey within intervention study	Explore perceived value of the Freedom to Learn program and access to notebooks, Internet, and modified curriculum

Intervention Studies

Quantitative Studies

A literature search was conducted resulting in five quantitative, intervention studies and one mixed methods study with both a quantitative and qualitative component. All of the studies were either experimental or quasi-experimental, with the exception of one, which was an observational study. One of the studies further distinguished itself as a longitudinal study. The studies all varied in their purposes, with two of the studies providing students with PCs and Internet access in order to determine the effect on academic achievement. Two additional studies evaluated interventions teaching Internet literacy on research skills and other academic achievement measures, and the two remaining studies examined the effectiveness of interventions to teach strategies for synthesis and communication (two of the five components of online reading comprehension), and the interventions' effects on academic outcomes.

Studies on Synthesizing and Communicating

Englert, et al. (2007) conducted a quasi-experimental study of 35 elementary school students with disabilities from six special education classes across five urban schools. A majority of the participants had learning disabilities and the mean age was 10.6. This study investigated the effects of scaffolding students' writing performance in two conditions, one with online scaffolding materials from Technology-Enhanced Learning Environments on the Web (TELE-Web), and the other with paper and pencil graphic organizers. Therefore, both synthesizing and communicating components of online reading comprehension were included in the study.

TELE-Web is Internet-based software containing structural devices that students can use to frame thoughts, words, and ideas (Englert, Zhao, Collings, & Romig, 2005). It assists students by providing a cognitive anchor for organizing their written passages according to the basic elements of expository text, prompting them to include an opening statement, supporting details, and a concluding sentence. Results of the study indicated that students in the TELE-Web condition produced longer passages, and received significantly higher ratings on the primary traits associated with writing quality. The greatest effects were found in students' abilities to create more coherent pieces based on their topics and in producing effective topic sentences. Additional improved academic outcomes were revealed through MANCOVA's, which showed statistical significance in the following areas: introduction to paper (.017), introduction to category (.000), breadth (.012), conclusion (.039), organization, (.041), punctuation (.016), and total words (.024). Statistically significant scores were not found however in the areas of depth, word consciousness, spelling, or capitalization.

The second study evaluating the synthesis component of online reading comprehension examined the outcomes of three different note taking conditions from online texts for students with disabilities (Igo, et al., 2006). Like the Englert et al. (2007) study, Igo, et al. (2006) included students with disabilities exclusively; however in contrast, this study focused on 15 middle school students, most of whom were labeled as learning disabled (LD) (11), labeled emotional disturbed (ED) (2), and the remaining two labeled other health impairment (OHI), from a single classroom in a single district. The study was conducted in a rural middle school in the southeast with a significant population of students coming from low socioeconomic status (SES) and migratory backgrounds who were also described by their teacher as low achieving and low motivated readers. Also comparable to Englert et al. (2007), the study also evaluated an online resource that aided students in synthesizing information from a reading passage, although conversely, note-taking was targeted rather than graphic organizers and scaffolding resulting in communication through the composition of expository writing passages.

Igo et al. (2006) used three conditions for notetaking: (a) paper and pencil notes, (b) typed notes, and (c) copy and pasted notes where all conditions were measured by an immediately cued recall test, a delayed cued recall test, and a multiple choice assessment.

Researchers hypothesized that writing or typing notes would result in superior outcomes on test measures for recall of information, as these two conditions would provide more opportunity for students to paraphrase online text as opposed to simply pasting notes from text. However, inconsistent outcomes resulted regarding the most effective type of note-taking across three employed measures indicating that such an assumption may not necessarily apply to students with LD.

Results revealed a significant effect on the immediately cued recall test for written paper and pencil notes rather than the pasting condition. And, the typed notes fell between the two with no significant differences present between the other two. In contrast, however, results from the multiple choice test signified significantly higher scores for the copy and pasting condition than for either hand written or typed notes, and no significant effects were reported for the delayed recall test after four days. Therefore, although scores on the multiple choice assessment for the copy and paste condition were significantly higher, the inconsistency across tests did not indicate higher levels of learning through pasting of notes. In addition, delayed cued recall test results, which produced the poorest scores, indicated that students, on average, did not engage in deep processing while note-taking (Igo et al., 2006).

Studies on Increased Levels of Internet Access

The next two studies included a much larger sample of students. Neither reported special education student results as a disaggregated group, but both of the studies targeted "at-risk" students. Due to evidence of a digital divide for poor and minority students, Jackson and colleagues, (2006) specifically targeted 140 students from minority backgrounds (83% African American) and low income families (less than $15,000/year) to include in the HomeNetToo Project, which provided students home computers, Internet access, and technology support in a longitudinal study conducted over the course of two years. The other study, (McHale, n.d.) included 23,000 students and 1,500 teachers across the 100 lowest performing middle schools in Michigan. Again subjects in the study were deliberately targeted due to poor school performance and demographics indicating that a significant portion of the subjects in the chosen 100 schools consisted of minority students from poor families who were identified as “at-risk” based on low test scores. Like Jackson et al. (2006), this study also equipped “at-risk” students with personal computers and Internet access, but unlike the Jackson et al. (2006) study, students in Michigan’s lowest performing schools received laptop computers that they used both in and out of school, and their curriculum was modified to include more online inquiry and project-based activities.

Although quantitative data from the McHale (n.d.) study related to academic achievement have not yet been analyzed, an observation study conducted by a third-party, objective research group produced preliminary findings. Through direct, classroom observation conducted during the intervention, results indicated apparent increases in cooperative learning, experimental learning, critical thinking activities, and an increase in the frequency of student-led, classroom discussions beyond the nationally normed levels. Without post-intervention results, however, it is impossible at this time to determine whether observed changes in classroom instructional practices will actually result in improved academic outcomes. Preliminary findings of this study not only observed changes in classroom instruction, but they also reveal challenges faced in implementing the program, such as high costs associated with maintaining the program and the need to deliver extensive and ongoing professional development for teachers.

Findings from the Jackson et al. study (2006) and the HomeNetToo project are associated with positive outcomes in academic achievement. In contrast to most research examining the frequency and nature of Internet use, which rely on self-reported data, Jackson et al. (2006) analyzed actual recordings of online activity of participants to elicit more accurate data on the frequency and nature of Internet use. Results indicated a slightly lower frequency of use than can be found in most survey studies with students reporting their level and facility of Web activity. Jackson et al. (2006) found that students used the Internet at home daily for approximately 27 minutes over six separate sessions, during which they visited an average of ten domains per day. In contrast to other survey studies, they also found a student's frequency of emailing to be rather low with less than one email sent per week on average. Consistent with other findings however, was the result that African American students and younger children used the Internet less frequently than did European Americans or older students, but similar to other studies, gender differences were not found (Jackson et al., 2006).

The results on academic achievement were most encouraging indicating that after controlling for other variables, more time on the Internet resulted in higher standardized test scores in reading comprehension and overall reading achievement and higher grade point averages at the six month interval, 12 month interval, and 16 month interval. However, math scores could not be predicted from higher levels of Internet use (Jackson et al., 2006). Overall, the Jackson et al. study (2006) found that providing “at-risk” students, who are affected by the digital divide, with technology and access to the Internet produces positive results in grade point averages as well as reading achievement, and although academic achievement measures have not been analyzed in the McHale study, preliminary findings through classroom observations reveal positive changes in the classroom environment, which will hopefully also produce positive effects on academic achievement.

Studies on Internet Research Skills

The remaining two studies that met the criteria for inclusion in this literature review were both intervention studies conducted in general education settings, but both also disaggregated their results based on a sub-sample of students with disabilities being served in inclusive classrooms. Both of the interventions included a program of instruction for conducting research on the Internet including several components of online reading comprehension: searching, evaluating, synthesizing, and communicating. The interventions included instruction in advanced search strategies as well as skills in evaluating the reliability of information on the Internet. In addition, both studies reported significant increases on post-test measures.

In general, Izzo, Murray and O’Hanlon (2004) found improvements in reading scores and both research critical thinking skills. In addition, Izzo, Murray, and O’Hanlon (2004) found improvement on a pretest to posttest online information literacy test with a 15.8% increase in test scores demonstrating that students were able to locate, process, and evaluate Web-based information more efficiently and effectively indicating more sophisticated skills in critical reading, research, and technological literacy.

The study by Izzo, Murray and O'Hanlon (2004) employed the Internet to facilitate standards based learning in the context of career development. The instructional intervention taught students to access and compare and contrast possible careers through oral, auditory and visual comprehension (Izzo, Murray & O'Hanlon, 2004). The intervention involved components including accessing and using screen reader software, self-monitoring activities to evaluate their own writing, and vocabulary building activities. In addition, the intervention taught students to evaluate Web sites, analyze search results, and to narrow or broaden their searches all requiring critical thinking skills (Izzo, Murray & O'Hanlon, 2004). Each session also involved students evaluating the credibility of online information, which included reading comprehension exercises and quizzes modeled after SAT formats (Izzo, Murray & O'Hanlon, 2004).

Findings indicated engagement in learning improved with the intervention, and showed that using the Internet for career development also resulted in enhanced engagement among participating students because it made learning more relevant to them (Izzo, Murray & O'Hanlon (2004). Career Development scores from pretest to posttest measures also significantly improved. In addition, students with disabilities who reported undecided plans after high school decreased 16.7% to 5.3%, and students deciding on a four-year college after high school increased from 33.3% to 47.4% (Izzo, Murray & O'Hanlon, 2005). Furthermore, students with disabilities indicating the need for assistance finding a job after high school decreased significantly from 62.5% to 36.8% (Izzo, Murray & O'Hanlon, 2004).

In addition, like Englert et al. (2007), Izzo, Murray, and O'Hanlon (2004) found improvements in synthesis and communication components of online reading comprehension. Their results indicated that by developing guided notes for Web-based content requiring students to fill in key information, they could elicit increases in retention of information and written expression related to the content (Izzo, Murray & O'Hanlon, 2004). Furthermore, findings indicated that using software such as PowerPoint, e-portfolio, and digital media software to summarize student research conducted on researched careers also improved retention (Izzo, Murray & O'Hanlon, 2004). According to Izzo, Murray, and O'Hanlon (2004), exercises related to the synthesis of information found online also resulted in higher order thinking skills as well as self-discovery (Izzo, Murray & O'Hanlon, 2004). Therefore, Izzo, Murray and O'Hanlon (2004) concluded that educators can achieve academic standards by infusing technology and information literacy with transition planning to elicit academic and online improvements that are required for success in a highly technical world (Izzo, Murray & O'Hanlon, 2004).

The study by Pierce (1998) was a multifaceted study that began with observation data, and followed the findings with two interventions: one teacher inservice training program to improve Internet research skills of teachers and support integration of the Internet research lessons for students; and one student instructional unit teaching students to conduct research on the Internet. Like Izzo, Murray, and O'Hanlon (2004), Pierce

(1998) found academic benefits associated with instructing students to conduct online research. Prior to the study, problems with traditional methods of educating students on Internet research were identified. Pierce (1998) found that many schools rely on a media center or library orientations to provide students with the training they need to conduct online research, usually presented during one orientation period for all high school English/Language Arts classes. Pierce (1998) further notes that this instruction does not usually include time for students to apply and practice the skills they are taught in the orientation, resulting in insufficient knowledge and skill for students to conduct research on the Internet. However, interestingly, the study also found that student perceptions do not reflect their lack of skill, as a survey revealed that students perceive they have the ability and knowledge to effectively do research on the Internet. A district-wide survey showed that 69% to 81% of students felt competent conducting research on the Internet independently; however, observations of those same students revealed a gap in perceptions compared with demonstrated skill.

Results from the observation study exposed that students, in fact, were not using effective search strategies: (a) they failed to appropriately plan prior to searching; (b) they neglected to check the validity of materials, (c) they did not use Boolean operators, (d) they did not apply keyword searches (which are more effective and efficient) rather than subject searches; (e) they got lost in cyberspace by taking repeated side trips to sites not related to their research topic; and (f) they became overwhelmed by great quantity of information they collected (Pierce, 1998). In other words students seemed to lack effective strategies and instead they searched indiscriminately without sorting and sifting through relevant material, checking the reliability of the sources gathered, or synthesizing the information they found in multiple sources. Yet, the amount of information students were able to find from searching often gave them a false sense of task accomplishment (Pierce, 1998).

Through the observation portion of the study, Pierce (1998) concluded that unless students are taught the skills and strategies to effectively search, evaluate, and synthesize the information found on the Internet, they will likely gain little wisdom to show for their time and effort researching topics online. Therefore, Pierce (1998) developed an intervention to systematically teach effective Internet research strategies and provide ample opportunity for practice and reinforcement not found in typical library and media center orientations. The intervention included an instructional unit for (a) search engines and subject directories, (b) search strategies, (c) think, pair, share activities, (d) evaluation strategies, and (e) a form to guide the evaluation process to determine valid and reliable sources from invalid and unreliable sources.

Results of the intervention program revealed significant improvement for all students as well as students with disabilities. Students with disabilities (LD) improved by 37 (out of 100 total points) points from pretest to posttest, while all students improved 44 points from pretest to posttest assessment. Students receiving special education, exhibited median scores significantly lower than regular education students on the pretest and posttest, but both made comparable gains in mean scores.

Table 4: Summation of Quantitative Intervention Studies.

Citation	Subjects	Setting	Design	Intervention/ Treatment	Dependent Measures	Results
Englert, Zhao, Dunsmore, Collings, & Wolbers (2007)	N = 35 elementary students with disabilities mean age = 10.64 20 = treatment 15 = control	6 sped classes across 5 urban schools	Quantitative Quasi-experimental study	Intervention – TELE-Web (Technology-Enhanced Learning Environments on the Web)	Writing samples (scored w/rubric)	Improved overall quality of expository writing passages in the following areas: Introduction and conclusion introduction to category increased breadth Improved organization, punctuation, and total words Topic sentence production More topically coherent pieces
Igo, Riccomini, Brunning, & Pope (2006)	N = 15 Students with disabilities11 = LD 2= ED 2 = OHI	7th and 8th grade middle school rural southeast	Mixed Methods	3 conditions Web-based note-taking tool – Chart (copy and paste) Web-based note-taking tool – Chart	2 researcher constructed tests on facts in text – 2 occasions, 1 directly after note-taking, 1 four days later	Inconsistent results Written notes increased performance on immediately cued recall test Typing notes yielded no significant affect on performance of

				(type) Paper and pencil note-taking chart	18-item multiple choice test Qualitative – interviews and student notes	any of the three measures Copy and pasted notes resulted in significantly higher scores on the multiple choice test No evidence of deep processing for any of the three conditions
Izzo, Murray & O'Hanlon (2004)	N = 176 Students with and without disabilities Greater than 30% students with disabilities	3 Ohio high schools grades 9 and 10 Inclusive classrooms	Quantitative Experimental study	Ohio State University's CBI program	25 item online literacy test Pre-posttest transition plan results	Significant improvement online literacy assessment representing improved critical reading skills, improved researching strategies, and improvements in technological literacy increase efficiency retrieving, processing and evaluating Web-based information skills represent critical reading, research, & technology literacy standards.

Jackson, von Eye, Biocca, Barbatsis, Zhao, & Fitzgerald, (2006)	N = 140 Ages 10 – 18 (mean = 13.8)	Midsized urban community Midwest U.S.	Quantitative Longitudinal field study	HomeNetToo Project 16 months	Automatic and continuous recordings of Internet use GPA's State assessment scores for reading and math, Home visit observations Surveys	Average Internet Use: 27 minutes per day 6 sessions per day, 10 domain visits per day less than one email per week Most use for gathering information African American children use the Internet less than other groups Younger children use the Internet than older children More Internet was connected with: higher reading achievement on standardized test in reading comprehension and total reading scores, and higher GPA's
McHale (n.d.)	23,000 students	100 low performing	Quantitative	HP notebooks Wireless	Pedagogical strategies	Increases in: Cooperative learning,

	1,500 Teachers	middle schools Michigan	Direct observation	access Inquiry and project-based instruction	Classroom student interaction	experimental learning, critical thinking activities, and frequency of student-led discussions beyond national norms
Pierce (1998)	N = 41 students with 15 students with disabilities (LD)	Grades 9-12 High school Northeast U.S.	Quantitative Experimental Study	Instructional Unit: Researching on the Internet	66 item pre and post test of online research skills and strategies	Significant improvement of online research skills for students with and without disabilities including knowledge of search engines, directories, search strategies, and evaluation of online resources
	N = 26 (teacher in-service training)	High school Northeast U.S.		2 teacher workshops	Workshop evaluation form	All teachers reported relevancy of workshop All teachers but one indicated intention to use materials and information with students

Qualitative Intervention Studies

Four qualitative studies, plus the qualitative portion of the mixed methods study met the criteria for inclusion in this review of literature. All of the studies included students with disabilities exclusively with the exception of one, which examined teachers of students with EBD and/or LD (Castellani, 1999). The five studies encompassed more than 225 children and adolescents with disabilities and five special education teachers.

Teacher Study

The Castellani study (1999) examined the perceptions of five teachers of students with emotional and learning disabilities regarding their participation in an eight month, university in-service training course for special education teachers to integrate the Internet into instruction. Results of this study revealed challenges and barriers special educators face integrating the Internet into instruction, but it also indicated benefits of doing so that can result from positive in-service and support.

The findings of this study indicated that teachers who teach students with disabilities face more challenges when planning to integrate the Internet into instruction. Teachers of students with disabilities voiced concerns regarding issues and risks of taking students to the computer lab. They also conveyed frustration with issues such as the large amount of printing students do and their students being unable to “trouble shoot” for themselves requiring significant amounts of teacher one-on-one attention. Another barrier teachers discussed was the exorbitant amount of time involved in planning Internet activities. The time involved in previewing Internet sites and difficulty with locating information were specifically identified as barriers, which special education teachers felt were especially difficult for those teachers early in their career juggling so many priorities. Another concern voiced by participants was allowing students with disabilities (particularly those with behavioral issues) the freedom to email and interact with other students. Although teachers saw the potential benefits for learning, they expressed concerns about allowing students complete control over which sites they were accessing, whom they email, and the contents of the email (i.e. inappropriate language). Interestingly, overall, some teachers perceived using the Internet as more stressful while for others it decreased stress. The expressed stress level expressed directly correlated to their familiarity with the Internet and perceived competence.

Despite concerns, teachers in the study also identified positive aspects of integrating the Internet into special education classrooms. One teacher voiced an affinity for using the Internet during classroom instruction because it matched her teaching style and her philosophy on how students learn. Another benefit cited by participants was their feeling that using the Internet allowed students a sense of accomplishment, and can accommodate students with different abilities allowing them to work at their own pace. Moreover, teachers expressed that when students have completed a task, the Internet provides an engaging way for them to seek other information. Many of the participants felt students were better behaved and experienced less inappropriate behavior during lessons that involved the Internet. One participant also described the Internet as an inexpensive way of keeping the class relevant through access to current events and the availability to experts on particular topics. Additional results showed that prior to the intervention, special education teachers used the Internet in their classrooms mainly as a search and retrieval tool. But over the course of the eight months, their lessons involving the Internet became much more student directed. Teachers also demonstrated increasing competence in adapting content on the Internet to fit individual reading levels during the intervention.

Conclusions from this study indicated that teachers need ongoing support for implementing the Internet into instructional activities, and further recommends that in-service training should provide ideas, and time to plan and support inclusion of the Internet. In addition, researchers felt that teachers also need to be exposed to the literacy opportunities on the Internet for students with disabilities through in-service training.

Student Studies

Of the four remaining qualitative studies involving students with disabilities, three of the four involved middle school students through adulthood (Harrysson, Svensk, & Johansson, 2004; Hutinger, Clark, & Johanson, 2001; Igo et al., 2006), and the additional study involves early childhood students, ages three through eight (Burgstahler, 1997). One of the studies examined how individuals with mild to moderate disabilities navigate the Internet to determine barriers in doing so (Harrysson, Svensk, & Johansson, 2004). Two more studies explored both the academic and social outcomes of building a community online (Burgstahler, 1997; Hutinger, Clark, & Johanson, 2001) and the remaining study examined methods of taking notes from Web-based text (Igo et al., 2006).

Harrysson, Svensk, and Johansson conducted an observational study in 2004 of seven individuals ages 15 to 44 with mild to moderate developmental disabilities.

Through this study, Harrysson, Svensk, and Johansson (2004) set out to describe how individuals with mild to moderate disabilities navigate the Internet and investigated cognitive barriers that prevent access in using tools of Mircrosoft Internet Explorer Web Browser specifically. Multiple methods of qualitative data were collected and analyzed including videotaping, participatory field observations (with minimum researcher interaction), and post-task interviews. During sessions, participants were allowed to freely explore the Internet while researchers asked questions regarding why the participant used certain actions and asked for opinions regarding Web site layouts and/or designs. Results of this study provided a greater understanding of participant perceptions, abilities to navigate the Internet, and the barriers that impede Internet access for individuals with disabilities.

The study found that participants verbalized positive perceptions associated with the Internet describing the Internet as “awesome.” One individual expressed this perception by stating “you are with it,” when asked what they think of people who can use the Internet well. Through direct observations, researchers also found the most popular Web pages accessed by those in the study were related to music, sports, nature, food preparation, adventure, and job traineeships. Results of the study also identified dispositions to be a major factor associated with competency in navigating the Internet. In short, those who verbalized a great deal of self-confidence using the Internet also navigated very quickly, to the point of almost displaying carelessness; whereas, students who were less confident in their Internet skills, navigated in a much more reserved and cautious manner.

Harrysson, Svensk, and Johansson (2004) provided an in depth description of both the well-developed navigation skills of the participants as well as the limitations they experienced. Results revealed that individuals demonstrated competence using certain navigation tools in Microsoft Internet Explorer Web Browser, such as: (a) the close function in upper right hand corner of Web pages; (b) the backward and forward buttons; and (c) the scrolling function to move up and down on Web pages. In addition, participants were able to identify and open links and recognize that a change in the shape of the cursor from an arrow to a hand indicated a link. Comparatively, students experienced difficulty using Web browser functions such as (a) finding and using "Favorites," (b) choosing among the list of "favorites," and (c) and saving a "favorite" on their own. Furthermore, individuals also struggled with certain search strategies including using correct spelling of keywords and then choosing a link from a large selection of search results. Perhaps the most problematic barrier identified in the study was the participants' inability to enter a Web address directly into the address bar. A final cognitive threshold that appeared was difficulty comprehending online text due to reading difficulties. Additional factors emerged from the findings that hindered online competency for the participants. One such finding suggested that progress was hindered when online tasks were not perceived as relevant and meaningful for the students. At times participants lacked the desire or willingness to comply with task directions or complete specific tasks. Another factor found to be crucial to the successful completion of an online task was the researcher's ability to ensure understanding of the task; however, researchers noted that merely simplifying instructions to one or two steps of actions did not necessarily make the task more intellectually easy for the participants. Unavailability of assistive technology was another obstacle identified by the research that hindered greater Internet accessibility for individuals with mild to moderate disabilities. A joystick, squeezable mouse or slow cursor speed are among assistive tools that could serve to enhance physical access to technology. Overall, Harrysson, Svensk, and Johansson (2004) found that individuals with mild to moderate developmental disabilities can learn to use some functions of Microsoft Internet Explorer without adaptations; however, due to cognitive deficits, these individuals could greatly benefit from adaptations such as search engines that graphically illustrate links or aid users in prioritizing search results.

A second student-centered qualitative study, conducted by Burgstahler (1997) sought to explore the peer-to-peer computer mediated communication (CMC), between participants of the DO-IT. The role of CMC in easing social isolation and improving academic and career goals of students with disabilities was closely examined by analyzing 7073 email messages exchanged between 38 DO-IT Scholars over a two-year period. Students included a wide range of disabilities including mobility, visual, hearing, health impairments, and/or specific learning disabilities. Additional forms of data were also collected and analyzed including surveys of students and their parents, focus groups, and parent letters.

Intriguing findings emerged revealing an overwhelmingly positive perception of CMC for both students and their parents. A majority of the scholars reported using the Internet daily and communicated an affinity for computers and the Internet stating, “It is fun and engaging.” Several more expressed that communicating over the Internet helped them to overcome physical, cognitive, and communication difficulties resulting from their disabilities. One participant expressed feeling more comfortable communicating online because, “CMC kinda hides what type of disability you got.” Additionally, students explained that computers gave them access to people and resources they did not have prior to the study. In the words of one scholar regarding the Internet, “It’s easy, fast, and you can download things. I use it every day I can… I love to use everything online.” Subjects in the study reported using their Internet accounts to communicate via email more than anything else, and felt it provided a sense of independence and self-confidence. As one student described, the CMC component of the DO-IT program provided a sense of possibility. He stated, “As for what I learned about myself? I learned that there are not boundaries. In today’s world, a disability is no barrier.” Scholars reported that making and sustaining friendships with other students who have disabilities is the most significant benefit of DO-IT program. They are pleased with the ability to meet people across time and space and feel a greater level of acceptance form others like them. Emails between scholars revealed discussions that enhanced social skills such as how to make and keep friends and the importance of friendships. One student described the CMC experience by stating, “I’m not so self-conscious or uncertain about myself,” while others reported the peer support online as being “emotionally uplifting. Participants reported how the Internet enabled them to access information much more easily than before the intervention. For example, one student explained that the advantage of email is the ability to gain more information at one time without having to take notes as someone is talking because the information on the Internet can be saved and referred to over and over again.

Parents echoed similar positive sentiment regarding the value of peer social support through CMC. One parent reported that the program had given her daughter greater self-confidence and allowed for her to establish lifetime friendships. Another parent commented on the richness of the bonding experience, noting that perhaps the bonds were so strong based on the common often painful experience they all shared of being misunderstood due to their disabilities despite their many talents and abilities. Yet another parent reported believing that the biggest benefit of the DO-IT program was her son's constant use of the computer when he had little interest in using computers prior to the intervention.

Results of analyzing the content of scholar emails revealed students predominantly communicated about two main topics, either academic or social. Analysis of the data expressed the most frequent topic of academically oriented discussion contained in student emails was related to technology and the Internet, yet the most frequent social theme contained in emails was of students sharing by providing and/or seeking personal information, with almost all of the messages including scholars disclosing personal information about themselves. Further analysis indicated that students tend to provide information rather than seek it in their messages. Closely following personal disclosure, emails revealed that scholars often requested ideas or sought advice from other scholars including seeking advice for overcoming challenges related to their disabilities. Themes emerged revealing that students also encountered barriers to using email including expressions that misinterpretations of messages occurred. One scholar explained this nuance beautifully saying, “It’s difficult to show or understand expressions or emotions in emails.” A number of scholars additionally voiced concern regarding potential violation of privacy using email.

Emails pertaining to academics most frequently included topics of technology and the Internet; however, academic challenges were also addressed in the emails traded between scholars. Emails included discussions of academic issues in science, mathematics, transition and other academic areas. Contents of emails also showed that students assist each other in the same ways they would in a school setting. For example, one student asked for suggestions as to where to get the periodic table, while another asked those who had taken Trigonometry advice on how to use a graphing calculator. Email exchanges additionally showed evidence of students tutoring each other or acting as role models to their peers, often providing encouragement. In addition, a relatively smaller, although significant, number of email messages were related to careers. Scholars recognized the value of learning to use the Internet for both academic and future career purposes. Parents reiterated such beliefs by agreeing that learning to use the Internet was priceless for their children in developing job skills. Overall, Burgstahler (1997), through examination of the CMC experience in the DO-IT program, found that online communication tools were positively received by students with disabilities and their parents and added benefit both socially and academically.

Hutinger, Clark, and Johanson (2001) conducted a two year project that included 167 children, 102 (61%), of whom possessed mild to moderate disabilities including motor, visual, and hearing impairments, Cerebral Palsy, learning disabilities, attention deficit disorder (ADD)-hyperactive type, and ADD-inattentive type. An additional 51 students (30.5%) were identified as “at risk,” and the remaining 14 children (8.3%) had no label. The study focused on building a cooperative Web-based community called Technology in Early Childhood: Planning and Learning about Community Environments (TEChPLACEs) across four participating early childhood classrooms that educated students ages three to eight. The final report of this study discusses results gathered from multiple sources of data including teacher reflections, teacher surveys, teacher competencies, copies of teacher email messages, teacher journals, teacher process forms, panel meeting minutes, informal interviews, observations, incident records database, and staff meeting minutes. While barriers to implementation were reported, positive student outcomes were identified in the areas of communication, language development, higher level thinking skills, and social benefits, and encouraging teacher outcomes were evident as well.

Although initial barriers to the implementation of TEChPLACE’s program were noted by researchers including receiving misinformation regarding the school Internet connections, backorders on necessary equipment, incompatible software, collaboration difficulties, and hacker interference, academic and social gains experienced by participants outweighed the hurdles. Results indicated that students increased their levels of communication and demonstrated gains in language development, written composition, and sending emails. They demonstrated competence in writing and sending email messages to administrators, community members, family members, and students in other classrooms nationally and abroad. All of the students participating in the study became more fluent in vocabulary related to technology, Web-page development, and Web sites. Children demonstrated increased levels of communication through gains in their language development, fluency in technology vocabulary, fluency in spoken and printed text, and demonstrated proficiency in composing letters including address, welcome, body and closing, and applied letter composition to email messages. Researchers also reported improvement in participants' proofreading abilities, noting that these young children were able to identify errors in adult letters, including construction errors and misspellings. Additionally, use of TEChPLACEs strengthened the home-school connection by including parents and families in the process of learning through email. This communication improved awareness of various careers of parents who shared information about their careers via email. Another unanticipated outcome was the increased number of parents inquiring about and investing in technology after seeing the benefits of their child's involvement.

Additional academic outcomes were documented using a Developmental Checklist based on national standards for children ages three through eight. Eight of nine target students significantly improved in all eight categories of the checklist, which included: Internet, technology, mathematics, science, social studies, expressive arts, literacy, and social interaction. The remaining child was able to demonstrate improvements in seven of the eight categories. Furthermore, because the intervention was carefully designed to include the participation of all students in the process of Web page development, higher level thinking skills also improved.

Further evaluation of the intervention revealed that students across ages benefitted from TEChPLACEs. The preschool students were able to integrate letter and word recognition in their email interactions and older students gained an understanding of audience by recognizing differences in the reading and writing abilities of the younger students in the project. Therefore, the older students adapted their writing and emails to younger students, being mindful of the capabilities of their audience, and created shorter and less complicated messages when writing to younger students. In addition, students were able to communicate internationally by including a fifth grade class in Nova Scotia and an individual student in Antarctica.

In addition, results indicated that the novelty of the intervention did not seem to wear off as students maintained high levels of motivation and engagement in reviewing their Web pages regularly and making suggestions for changes or additions. In addition, students demonstrated immense pride in their Web page due to high engagement.

Students in the TEChPLACEs project also showed evidence of improved social skills. They were able to illustrate increased skill levels in negotiation as they began seeking decisions based on a consensus rather than making demands. Researchers and teachers also reported improved cooperation in group activities both related and unrelated to the project, and they also reported an increased level of tolerance for others and their ideas. Students were also able to demonstrate an improved ability to compromise and utilize higher level thinking skills. In addition, students improved their social skills significantly including developing skills in democratic decision-making and increased acceptance of the diversity and value of all students' contributions of ideas.

In addition to benefits for participating students, teachers also expressed positive outcomes derived from their participation in the project. In fact, all four participating teachers reported increases in their levels of comfort, confidence, and competence working with the Internet and creating Web pages. In addition, teachers were able to demonstrate increased levels of technology integration into daily curriculum. An unanticipated outcome emerged that was marked by an adjustment of teaching styles. Teachers accredited the adjustment to an increased recognition that their students were capable of much more than they originally anticipated. As a result, more opportunities for student control and input into classroom activities were observed and reported. Researchers concluded that the use of TEChPLACEs in early childhood settings seemed to result in positive outcomes for teachers as well as expand learning by allowing students greater access to the general education curriculum and experience with innovative learning tools. In addition, the results demonstrated improvements in student academic development, social development, and numerous unanticipated positive results to the overall classroom environment.

The final study noteworthy of mention in this review of literature is the qualitative portion of the mixed methods study by Igo, et al. (2006). This study examined the effects different methods of note-taking had on recall of Web-based information. Researchers sought to examine the overwhelming preference for the copy and paste method of note-taking from the Web for students with disabilities. Through student interviews, this phenomenon was explained by their indication that copy and paste techniques removed their spelling and grammar concerns while taking notes, freeing them to focus on content. Only two of the students preferred writing notes and explained this preference describing writing as the easiest method for them. Importantly, through interviewing those particular students, they expressed confidence in their spelling abilities as opposed to the students who preferred copy and paste methods. A majority of these participants verbalized concern with spelling for both writing and typing notes. Another theme emerging from the qualitative component of the mixed-method study identified that many of the participants indicated that typing was difficult for them and expressed frustration for having to constantly look back and forth between the Web-based text and the keyboard to find letters. From this explanatory qualitative study, important findings point out certain barriers students with disabilities face in reading online text. In addition, it also generated useful tools available on the Internet that may assist students in acquiring online information. See table 5 for a summary of qualitative studies.

Table 5: Summation of Qualitative Intervention Studies.

Citation	Subjects	Setting	Design	Condition	Data	Results
Burgstahler, (1997)	N = 38 students with disabilities	high school	Qualitative Exploratory Study	DO-IT Program	Emails Student surveys Focus groups Parent surveys Parent letters	Improved communication, social skills, competency using technology and the Internet
Castellani, (2000)	N = 5 teachers of students with emotional and learning disabilities	8 month university course/in-service	Qualitative	University training course for integrating technology in classrooms	Interviews, post survey, electronic course discussions, teacher journals, lesson plans	Increased teacher confidence and competency integrating technology Increased student engagement Decreases in problem behavior Ongoing training and support is needed
Harrysson, Svensk, & Johansson,	N = 5 individuals with	lower secondary special	Qualitative	Participatory field observations of online activities	interviews, 2 videotaped observations	Competence in navigation skills such as

(2004)	disabilities ages 15-44	education program adult special education program				scrolling, opening and closing Web pages and links Difficulty with specialized skills such as using “Favorites” and selecting relevant information from search results page
Hutinger, Clark, & Johanson, (2001)	N = 176 Ages 3-8 N = 102 wide range of disabilities N = 4 teachers	4 rural school districts: preschool for children with disabilities, 2 inclusive kindergarten classes 1 inclusive 1st grade class	Qualitative	TEChPLACEs 2-year project students built a cooperative community on the Internet	teacher reflections, teacher surveys, teacher competencies, copies of email messages, teacher journals, teachers process forms, panel meeting minutes, informal interviews, observations, incident database, and staff meeting	Improvements in language development, communication skills, social skills, written expression, and vocabulary fluency Increased levels of home-school involvement Teachers increased frequency of Internet integration,

					minutes	confidence and competence using technology
Igo, Riccomini, Brunning, & Pope (2006)	N = 15 Students with disabilities1 LD = 1 ED = 2 HI =2	7th and 8th grade middle school rural southeast	Mixed Methods	3 conditions Web-based note-taking tool – Chart (copy and paste) Web-based note-taking tool – Chart (type) Paper and pencil note-taking chart	Qualitative – interviews and student notes	Preference for copy and paste method of notetaking from Web-based text Reduces spelling concerns and frustrations with typing

Synthesis of Intervention Study Findings

The review of literature examined ten total intervention studies, five quantitative studies, four qualitative studies and one mixed methods study. Overall, participants in the ten studies numbered 23,626 students, ages three to 44 and an additional 1535 teachers. However, one of the studies observed the classrooms of 1,500 teachers and 23,000 students contributing a majority of the total sample size; consequently, 626 students and 35 teachers were examined in the remaining nine studies. The interventions targeted various levels. Two of the studies engaged early childhood through elementary (Englert et al., 2007; Hutinger, Clark, & Johanson, 2001) two focused on middle school classrooms (Igo et al., 2006, McHale, n.d.); and two more targeted high school students (Burgstahler, 1997; Pierce, 1998). While the final two studies also included high school students, the Jackson et al., 2006 study included additional grades of fourth through twelfth. The final study contained high school students through adulthood (Harrysson, Svensk, & Johansson, 2004). Four of the studies included students with disabilities exclusively totaling 93 students; three additional studies included both students with and without disabilities in inclusive settings totaling 393 students (170 students with disabilities and 223 students without disabilities); and the remaining two studies included 23,140 students identified as "at-risk" whose samples likely contained students with disabilities, but did not report the findings in disaggregate groups.

Although four studies included teachers, only one study examined teachers exclusively. Results were encouraging and indicated that with training and support, teachers experienced increases in the frequency of integrating the Internet into their classroom instruction and/or indicated their intentions to do so (Hutinger, Clark, & Johanson, 2001; Pierce, 1998). Training and support also increased teacher confidence and competence both using and integrating the Internet into their instruction (Castellani, 2000; Hutinger, Clark, & Johanson, 2001). McHale (n.d.) also observed changes in the instructional practices of teachers participating in a program that provided training and support for using technology and the Internet with students. Changes included increases in cooperative learning, experimental learning, critical thinking activities, and student-led discussions. The research in this area also acknowledged the need for ongoing training and support for teachers that can be costly and therefore difficult to continually implement (Castellani, 2000; McHale, (n.d.); Pierce, 1998).

All ten of the intervention studies reviewed reported positive academic and/or social outcomes for students with disabilities who participated in online instruction or activities. Academic gains were evident in three main areas: (a) literacy, (b) online research (online reading comprehension), and (c) modeling effective social skills. Literacy improvements were evident for written expression (Englert et al., 2007; Hutinger, Clark, & Johanson, 2001) including increased achievement in the areas of content, mechanics, composition organization, and special skills such as considering audience and proper letter and email format. Reading achievement gains were apparent in three of the studies (Izzo, Murray, & O’Hanlon, 2004; Jackson et al., 2006; Hutinger, Clark, & Johanson, 2001) citing gains in critical reading skills, reading comprehension, vocabulary fluency, and total reading scores on standardized tests. In addition, Hutinger, Clark, and Johanson (2001) reported improved achievement on national standards for early language development, and one final study (Jackson et al., 2006) reported overall higher grade point averages associated with higher occurrences of Internet use in a longitudinal study.

In addition to literacy skills, a review of interventions involving the integration of the Internet into instruction results in enhanced student achievement in the area of online research strategies, which entails one or all of the components of online reading comprehension. Studies by Izzo, Murray, and O'Hanlon (2004), Pierce, (1998), and Burgstahler (1997) report that with intervention students with disabilities show improvements in research skills by increasing efficiency in retrieving and processing information on the Internet (Izzo, Murray, & O'Hanlon, 2004). More specifically, Pierce (1998) presented gains in student abilities to effectively use search strategies, while Harrysson, Svensk, and Johansson (2004) further described that while individuals with mild to moderate disabilities showed competence in search certain search and navigation strategies such as using search engines, scrolling, and accessing links, they also experienced difficulty using other search strategies such as typing directly into the address bar, using the "Favorites" function, and selecting relevant information from the multiple options found on the results page of a search engine. With intervention, other improvements in researching skills were discovered through students increased ability to evaluate online sources for reliability (Pierce 1998; Izzo, Murray, & O'Hanlon, 2004).

The literature base pertaining to integration of the Internet into instruction additionally indicated a beneficial effect on the social skills of students with disabilities. Tools available on the Internet cannot only improve communication skills and social interaction (Burgstahler, 1997; Hutinger, Clark, & Johanson, 2001), but they may also reduce the social isolation that many students with disabilities experience and enhance the ability and opportunity for students to establish and maintain friendships (Burgstahler, 1997). Furthermore, increased student engagement (Castellani, 2000; McHale, n.d.), decreased problem behaviors (Castellani, 2000), and increased levels of home-school involvement (Hutinger, Clark, & Johanson, 2001) have all been reported in the literature as observable, beneficial results of integration of the Internet into instruction.

Conclusions

Evidence in the literature demonstrates an apparent benefit for integrating and instructing students with disabilities in Internet literacy skills and strategies. While several academic benefits are evident, few studies have been conducted to examine the efficacy of specific interventions on the topic. Therefore, the current study seeks to examine the intervention, IRT, originally created for students at risk, in order to determine its effectiveness for students with disabilities in inclusive settings, and thus contribute to the scarce literature base on the topic.

Purpose of the Study

Due to the lack of research and the apparent need and benefit of teaching online literacy to students with disabilities in the emerging body of research, this mixed methods study sought to examine the effectiveness of an intervention, Internet Reciprocal Teaching (IRT), and to explore online reading comprehension skills and strategies among students with high incidence disabilities in inclusive settings. A mixed methods, triangulation research design was employed, which uses different but complementary data collected on the same phenomenon (Creswell & Plano Clark, 2007). In this study, a quasi-experimental research design was used to test the effectiveness of IRT by examining pretest and posttest assessment measures of online reading comprehension as well as survey data for seventh grade students with high-incidence disabilities in the inclusive, English/Language Arts classroom. Concurrent with the quantitative data collection, qualitative verbal protocol data and video recordings of actions were collected during an online activity to explore the reading comprehension strategies employed by the targeted population of students. The reason for collecting both quantitative and qualitative data is to bring together the strengths of both forms of research to compare the results from two different perspectives that individually may not address the complexity of online reading comprehension (Creswell & Plano Clark, 2007).

Research Questions

1. Is Internet Reciprocal Teaching (IRT) an effective intervention to improve online reading comprehension for middle school students in inclusive, general education settings?
    a. Is there a difference in effectiveness of IRT for general education students versus students with disabilities?
2. What online reading comprehension strategies do middle school students in inclusive general education settings use?
    a. Is there a difference in the online reading comprehension strategies used by students with and without disabilities and between treatment and control conditions?

3. Is Internet Reciprocal Teaching associated with changes in students' self-reported data for facility with, frequency of use, and self-efficacy on the Internet?

4. Do the online reading comprehension strategies used by students with and without disabilities in the qualitative data support and converge with the pretest and posttest online reading comprehension scores from the quantitative data?

Summary

This chapter sought to provide evidence from the literature that defines a need for the current study through the evident lack of research in the area, the potential benefits, and the theoretical basis indicating the intervention possess potential to provide beneficial academic outcomes. A systematic review of the literature was also conducted resulting in a synthesis of current survey studies, and intervention studies, both quantitative and qualitative. Chapter three then provides a description of how this intervention study was designed and implemented.

CHAPTER THREE: METHODS

Introduction

Chapter three includes the purpose and methods of this study conducted concurrently within the context of a larger study. Consequently, a detailed description of the TICA study is provided, followed by the research design used in this dissertation. The chapter also includes descriptions of the settings, the recruitment of participants, the measures used in the study, and a description of the three phases of the intervention and post assessment. Lastly, explanations for data collection procedures and data analysis processes are reported for both the quantitative and qualitative data.

Purpose

The purpose of this mixed methods study is to address the effectiveness of an intervention, Internet Reciprocal Teaching (IRT), and to explore online reading comprehension skills and strategies used among students with high incidence disabilities in inclusive settings.

TICA Project

The examination of Online Reading Comprehension among seventh-grade students with high incidence disabilities was conducted as a part of a larger, three year study, Teaching Internet Comprehension to Adolescents (TICA, http://www.newliteracies.uconn.edu/iesproject/), which was funded by the Institute of Education Sciences (IES), U.S. Department of Education, Grant #R305G05154. The study was a collaborative effort by two primary researchers and their research teams: Dr. Donald Leu and the New Literacies Research Team of the University of Connecticut, and

Dr. David Reinking and the Internet Reading Research Group, Clemson University. The principal goals, research questions, and where the current study fits within the larger TICA project are summarized.

Year One (2005/2006). The Year One purpose was to develop a theoretical, data-driven framework to produce high levels of comprehension, engagement, and learning for seventh grade students in rural and urban districts with a significant population of low-achieving readers most at risk of dropping out of school (TICA Teacher Training Manual, 2006). From the analysis of Year One, a preliminary taxonomy of skills and strategies was developed, an intervention (IRT) to teach online reading comprehension was created, and an instrument to assess online reading comprehension, the ORCA-Iditarod, was also established.

Year Two (2006/2007). The second year of the study was designed to field-test viable approaches of implementing IRT in order to improve online and offline reading comprehension. Therefore, a formative experiment was employed to determine the ability of IRT to increase Internet reading comprehension strategies to improve both online and offline reading, academic engagement, and achievement. Outcomes of the Year Two analysis directly informed adjustments to the IRT instructional model and revisions to the ORCA-Iditarod for Year Three.

Year Three (2007/2008). Year Three of the TICA project was titled: Developing Internet Comprehension Strategies among Poor, Adolescent Students at Risk to Become Dropouts. Year Three was intended to examine the effects of IRT on enhancing reading comprehension (both online and offline), school performance, and engagement compared with control classrooms. However, students with learning disabilities were not a primary focus of this research in Year Three.

Due to a lack of research of online literacy of students with disabilities (Abbott & Cribb, 2001; Attwenger, 1999; Castellani, 1999; Castellani & Jeffs, 2001; Hutinger, Clark, & Johanson, 2001; Roschelle, Pea, Hoadley, Gordan, & Means, 2000; Williams, 2006), this current study was conducted in conjunction with Year Three of the TICA project to determine if IRT is an effective intervention for students with disabilities in the inclusive setting and to further examine the Internet comprehension strategies that this sample of students employ compared with their non-disabled peers.

Research Design

A mixed methods, triangulation design convergence model was employed to examine the above research questions. The triangulation design convergence model, as described by Creswell and Plano Clark (2007), is a model in which the researcher collects and analyzes both quantitative and qualitative data separately on the same phenomenon (in this case, online reading comprehension), and then converges the results by comparing and contrasting the quantitative and qualitative results during interpretation. The quantitative portion of the study used a quasi-experimental design (Cook & Campbell, 1979) to scrutinize the effectiveness of the intervention; IRT using pretest and posttest online reading comprehension measures and survey data. Additionally, a multiple case study design based on a common event (an online reading comprehension activity) was used for the qualitative portion of the study. The data consisted of transcriptions of interview data, verbal protocols and video recordings of online student actions in order to examine more closely the online reading comprehension strategies used by seventh grade students with disabilities, and then to compare those results to students without disabilities. The quantitative and qualitative results were then converged, compared, and contrasted.

Setting

The study was conducted in three school districts; one in a southeastern state and two in a northeastern state. Middle schools from each state were purposefully targeted based on their high percentages of students who come from low socioeconomic backgrounds and are considered at risk for dropping out of school. This population was the primary focus of the TICA project due to the likelihood that poor, minority, adolescents who have difficulty with reading comprehension will fall further behind their peers as the Internet becomes a more integral part of society because online reading comprehension is rarely taught in schools.

Middle School A

The first middle school, located in the southeast, is in a relatively urban setting on the outskirts of a mid-sized city. The middle school contains approximately 900 students, grades six through eight, with a large population (approximately 70%) of students labeled as economically disadvantaged based on their qualification for free and reduced lunch. Furthermore, this estimation is believed to be low, as school administrators have found that parents from their Hispanic population are reluctant to submit the paperwork required for qualification in the free and reduced lunch program. Middle School A also exemplifies ethnic diversity with the population consisting of more than 15% of the population coming from Hispanic descent, 42% from African American backgrounds, and 41% being identifying as Caucasian. The remaining 2% of students are Asian/Pacific Islander and American Indian/Alaskan Native.

Through contacts made in Year Two of the TICA project, teacher participants from School A included three seventh-grade, general education teachers who teach English/Language Arts classes. From the three participating teachers, one teacher was assigned as the treatment and one as the control. Because one of the participating schools dropped out of the study just prior to beginning Year Three, the remaining seventh grade, English/Language Arts teacher at the school was approached and agreed to participate. Due to the number of available seventh grade classes, two sections of her classes were randomly assigned to the treatment condition, and one was randomly assigned to the control condition. Consequently, five total classroom sections served as the treatment divided between one of the participating teachers, and the remaining five classes served as the control classes. Each of these general education classes had a range of 24 - 30 students with a variable number of students with disabilities ranging from one through eight per classroom and a total 23 students with disabilities, 13 in the control group and 10 in the treatment group. Refer to Table 6 for demographic information of School A.

Middle School B

The second school is located in a suburban setting and serves over 1000 students, grades five through ten. School B enrolls a significant population of economically disadvantaged students with 73% qualifying for free and reduced lunch. The population at Middle School B represents diversity with a population of 33% Caucasian, approximately 60% African American, and almost 6% Latino. Three, seventh-grade, language arts teachers participated in the study; one teacher with three classroom sections served as the treatment group, while another teacher taught two sections, and yet another teacher taught an additional class section, which comprised the control condition of the study. The number of participating students in each of the classes ranged from 10 - 18 students per class with a range of zero to four students with disabilities per class receiving instruction in the inclusive setting. See Table 6 for School B's demographic data.

Middle School C

The third participating school is located in an urban setting in the northeastern part of the United States. This school is unique compared to the other two schools, as the middle and high school student populations are housed in the same building. Middle School C enrolled 1,160 students, grades six through twelve, and was somewhat more diverse than the previous two schools with 5% Asian/Pacific Islander, 35% Hispanic, 33% African American, and 26% Caucasian. Roughly 34% of the students in this school were classified as economically disadvantaged. Middle School C contained two, seventh grade teacher participants assigned randomly to treatment and control, with three participating sections of students for each teacher serving as the treatment and control groups respectively. The classroom numbers in this school ranged from 18 - 25 students per class, with ten students with disabilities in the treatment classrooms, but zero in the control classrooms. Although this school does not use a tracking system, it was ironic that none of the control teacher's class sections included students with disabilities. One possible explanation for this phenomenon was that because of the logistical issues from scheduling, the control teacher had students who were enrolled in seventh-grade Algebra classes; therefore, the students with disabilities in this particular school may not have achieved the standards required to take Algebra in the seventh grade. This inequity made it difficult to compare pre and post assessments for students with disabilities in the intervention and control categories at this particular site (see Table 6 for participating schools).

Table 6: Demographics of Participating Schools.

Enrollment Grades		School A 879 Students (6-8 Grades)	School B 1,016 Students (5-10 Grades)	School C 1,160 Students (7-12 Grades)
Gender	Male	51%	50%	59%
	Female	49%	50%	41%
Race	American Indian/ Alaskan Native	0.2%	0.5%	0.4%
	Asian/Pacific Islander	1.4%	0.9%	5.3%
	Hispanic	15.4%	5.4%	35.1%
	Black	42.1%	60.1%	33.2%
	Caucasian	41%	33.1%	25.9
SES	Free Lunch	59%	59%	34%
	Reduced Lunch	9%	14%	11%
Economically Disadvantaged students		68.2%	73.3%	45.1%
School-wide Reading Proficiency		8.6%	43%	58.3%
Students w/ Disabilities other than speech		19.4%	17.6%	

Participants

Teachers

For this study, participating teachers from the larger TICA project were contacted in person and via email to ask for voluntary participation to further examine the targeted sample of students with disabilities being served in their inclusive English/Language Arts classrooms. Eight seventh-grade general education teachers agreed to participate in the study, and seven of the eight served at least one student with disabilities, negating the need to examine students from the eighth teacher. Of the participating teachers, six were female, two were male, and seven of the eight teachers were Caucasian with one female, African American teacher participant. Years of teaching experience ranged from two to 36, yet half of the participants (four of eight) had less than five years teaching experience. A majority of teachers (seven of eight) had earned Master's degrees in education; four of which had continued their education beyond an M.Ed, with at least ten additional hours. Five of the participating teachers held teaching certificates in middle school and secondary English/Language Arts, while two held certificates solely in middle school English/Language Arts. A final teacher was dual certified in special education, K-12, as well as middle school and secondary English/Language Arts. Five teachers reported having zero to three hours of coursework in special education, an additional teacher reported having nine hours, and two teachers reported having 30 or more hours of special education coursework. Refer to Table 7 for demographic data on teachers.

Teachers provided self-reported data (scale of one through ten) regarding their comfort level for integrating the Internet into their classrooms, and included the online tools they use most frequently. Most of the participating teachers (six of eight; three control/three treatment) reported high levels of comfort (eight or higher on a scale of one to ten) for integrating the Internet into instruction with only one of the control teachers indicating a low comfort level with a score of three. All of the teachers in both groups reported using the following online resources for professional purposes: (a) email, (b) online lesson plans, and (c) Web pages. In addition, three teachers (two control, one treatment) reported using Wikis; two teachers (one control, one treatment) indicated they use Blackboard, two teachers (one control, one treatment) uses IM, and one teacher in the treatment group uses blogs for professional purposes. When asked which online resources teachers used most often, all of the teachers in the control group responded with email and lesson plans; however, one additional teacher included Web pages and another cited "teacher resources such as rubric maker, novel aids, and puzzle maker for vocabulary." Two of the teachers in the treatment group testified to using web pages most often with one of the two adding email and lesson plans as well. The remaining teacher in the treatment group reported most often using search engines for professional reasons (see Table 7). The teacher information datasheet is found in appendix D.

Table 7: Teacher Demographics.

Variable		Control Group	Treatment Group
Gender	Male	2	0
	Female	2	4
Race	Caucasian	3	4
	African-American	1	0
Years Teaching	0-5	1	3
	10-15	1	1
	16-20	1	0
	30+	1	0
	Range	4-36	2-14
	Mean	17.75	5.5
# hours of special education training	0-3	2	3
	4-6	0	0
	7-12	1	0
	12+	1	1
Degree	B.A/B.S	1	0
	M.Ed.	1	1
	M.Ed.+10	0	2
	M.Ed.+20	0	1
	M.Ed.+30	1	0
Areas of Certification	English/LA 7-12	3	2
	English/LA (middle)	1	1
	Dual Cert. (English & Special Education)	0	1
Comfort scale	3-5	1	0
	6-7	0	1
	8-9	2	2
	10	4	1

Research Assistants

To maintain high fidelity implementing IRT, members of the TICA research team (doctoral students employed as research assistants funded by IES at both the University of Connecticut and Clemson University) delivered instruction in all of the participating class sections. Eight research assistants, working in pairs, delivered instruction in 11 class sections of the four participating teachers across three middle schools. All of the participating researchers were Caucasian; two males, and six females. Moreover, all of the researchers possessed earned Master's degrees and were enrolled in doctoral programs. The K-12 teaching experiences ranged from three to 12 years, with various certifications including: (a) two elementary education certifications, with three and seven years experience; (b) one speech/language pathology certification, six years experience; (c) one French certification, six years experience; (d) one dual certification, elementary education/special education, eight years experience; (e) one English education certification (grades nine through twelve), eight years experience; and (f) one multiple certifications: elementary education, supervision, and reading and language arts consultant, 12 years experience.

Students

From the larger TICA project sample of participating students (n=396), the researcher identified students with disabilities receiving instruction in the inclusive setting and noted their disabilities. Students who qualified for special education services based on the respective state requirements determined whether or not they qualified to participate in the dissertation study. In both states, the guidelines for qualification for special education closely mirrored the general requirements found in the Individuals with Disabilities Education Act (IDEA, 2004).

Fifty-three students with disabilities were originally identified and included as participants; however, nine students were eventually excluded from the dissertation study either because parental permission was not acquired or subjects were lost through attrition over the course of the study. Forty-four total students with disabilities remained, 17 in the control group and 27 in the treatment group. A majority, 39 of the 44 identified students, qualified for special education services under the category of Learning Disabilities (LD), three qualified with Emotional/Behavioral Disabilities (EBD), and the remaining two possessed the label of Other Health Impairment (OHI). The sample was moderately skewed based on gender consisting of 16 females and 28 males. Refer to Table 8 for student demographics.

Once 44 students with disabilities agreed to participate, a similar sample of students without disabilities was derived in order to compare the effects of the intervention for students with and without disabilities. To ensure that the groups were similar, general education students were matched to special education students based on two variables: (a) general reading ability and (b) Internet access and use outside of school.

Matching Procedures. Students with disabilities and their peers without disabilities were matched to minimize variables that may affect the outcome of the intervention. Therefore, students without disabilities from the larger TICA study were selected based their similarity to students with disabilities in the study based on two criteria: (a) The Test of Word Reading Efficiency (TOWRE), and (b) The Survey of Internet Use. Great care was taken in systematically matching students with disabilities to their non-disabled counter parts for sampling purposes. Prior to the study, researchers agreed that student reading ability along with their access and frequency of use of the Internet at home could influence the results of the study. In addition, researchers wanted to minimize other variables such as school differences and teacher effect; therefore, student data was sorted in an Excel spreadsheet first by condition (control or treatment); then, by teacher; and finally by descending standard TOWRE scores. After sorting, a pool of possible matches was compiled between students with and without disabilities according to their standard scores on the TOWRE within a range of eight points. Data was then resorted by group, TOWRE scores, and the score recorded on the survey pertaining to the frequency of Internet use outside of school. This score was a self-reported ranking on a Likert scale ranging from one = never to six = several times per day. Best matches were then determined by comparing the original pool of possible pairs with exact Likert responses from the survey in most cases. In some cases, however, exact matches in Likert scores were not possible; therefore, in those few cases, students were matched within a range of one or two scores above or below to determine the remaining pairs.

Also, in an attempt to minimize the teacher effect, when possible, students were matched from the same class sections or at least by the same teacher. For a few cases, suitable matches were not found within the TOWRE score range, Likert scale range, and by teacher, so those particular students were at least matched within the same school. A typical example of matching is included. A student with a disability in the treatment group with a Total Word Reading (TWR) standard score of 82, and Likert score of one (indicating that she never uses the Internet outside of school) was matched with her non-disabled peer with a TWR score of 83 and a Likert score of two (indicating Internet use outside of school less than once per week). Both girls were from the same school, had the same teacher for language arts, but one was in the second period class while the other, the fifth period class.

Table 8 provides a summary of descriptive statistics of the TOWRE scores by group. On average, students in the control group with and without disabilities scored slightly higher than those in the treatment group except in phonemic decoding efficiency, in which case, students with disabilities in the treatment group out performed those students with disabilities in the control group. Also apparent was the trend of general education students to score somewhat higher on the SWE and TWR scores when compared with special education counterparts. See Table 8 for descriptive statistics by group.

Table 8: TOWRE, Standard Scores by Condition and Group.

		Sight Word Efficiency	Phonemic Decoding Efficiency	Total Word Reading
Control- no disability	Average	92.6	90.1	89.6
	Median	92.0	90.0	90.0
	std dev	9.1	12.3	12.0
Treatment-no disability	Average	91.4	86.3	86.7
	Median	91.0	86.0	86.0
	std dev	7.4	10.9	10.6
Control-disability	Average	88.8	83.9	84.9
	Median	88.0	85.0	85.0
	std dev	8.7	26.1	16.0
Treatment-disability	Average	87.7	86.7	84.6
	Median	90.0	86.0	86.0
	std dev	9.9	16.1	13.6

After matching procedures, the total sample size consisted of 88 students (44 students with disabilities, 44 students without disabilities). Unfortunately, due to random assignment and the absence of students with disabilities in the control group in Middle School C, more participants (54) were involved in the treatment condition with the remaining 34 students participating in the control condition. Forty-two of the subjects came from the Northeastern state (22 from Middle School B, 20 from Middle School C), and the residual 46 students resided in the southeastern state (Middle School A). The southern state contained 13 students with disabilities and 13 students without disabilities in control group, and 10 students with disabilities and 10 without disabilities in the treatment group. The sample derived from the Northeastern state included 21 students with disabilities, and 21 without disabilities.

At the onset of the study, students ranged in age from 11 to 14 years, and diversity was also evident in the sample. Participants were basically evenly distributed among three races: (a) African American with 31.8% (28 of 88) of the sample; (b) Hispanic with 33% (29 of 88) of the sample; and (c) Caucasian with 30.7% (27 of 88) of the total sample. The remaining 4.5% (four of 88) identified themselves within the category "Other," and indicated they were biracial on the open-ended extension of the question. Despite differences in numbers, a further examination of each group (control and treatment) respectively, indicated a similar distribution of percentages among races with the exception of Caucasian participants who represented a larger percentage of the sample in the control condition. The control group included 10 of 34 (29.4%) African American students, 11 of 34 (32.4%) Hispanic students, and 13 of 34 (38.2%) Caucasian students. Similarly, descriptive data from the treatment group revealed a sample consisting of 18 of 54 (33.3%) African Americans subjects, 18 of 54 (33.3%) Hispanic subjects, 14 of 54 (25.9%) Caucasians, with a small yet remarkable additional race with four of 54 (7.4%) students who indicated they were biracial. The data is summarized in Table 9.

Table 9: Student Demographics

		Control N=34	Treatment N=54
Disability status	Students with disabilities	17	27
	Students without disabilities	17	27
Race	% African American	29.4	33.3
	% Hispanic	32.4	33.3
	% Caucasian	38.2	25.9
	% Other (biracial)		7.4

Although Internet use in school may have varied slightly between the three participating schools and their teachers, statistically significant differences were not evident at the pre-intervention phase; therefore, assumptions were made that scores derived on school Internet use scales would not be a necessary factor affecting the outcomes on similarities between groups. However, based on previous research implicating the existence of a digital divide for students from minority backgrounds, students from homes of lower socioeconomic status, and for students with disabilities, describing differences among groups for Internet use outside of school is an important factor to examine (Abbot & Cribb, 2001; Castellani, 2000; Cronis & Ellis, 2000; Hutinger, Clark, & Johanson, 2001).

Results from The Survey of Internet Use given during the preassessment phase indicated that the majority of students in both the treatment and the control groups possessed Internet access at home and in several other locations. In fact, only 20.6% of the control sample (N = 34) and 16.7% of the treatment sample (N= 54) lacked an Internet connection at home. Additionally, students in both groups identified using the Internet at school, at home, at a relative's house, a friend's house, and a public library; however, far fewer indicated use at an Internet café or community center. Of the indicated locations, a majority of the students, over half in both groups, reported using the Internet most frequently at home (55.9% of control and 68.5% of treatment). Roughly 25% of students in both groups identified the next most prevalent location for Internet use was someplace else, and finally, 17.6% of control students reported using the Internet most often at school with only 7.4% of the treatment group asserting the same. Table 10 shows a comparison by condition as to where students have access to the Internet.

Table 10: Student Characteristics of Internet Use.

Location of Internet Use	Control (N=34)	Control (%)	Treatment (N=54)	Treatment (%)
School	25	73.5	40	74.1
Home	25	73.5	34	63.0
Public Library	20	58.8	22	40.7
Internet Café/Comm. Center	7	20.6	2	3.7
Relatives house	23	67.6	30	55.6
Friends House	20	58.8	29	53.7
Other	9	26.5	6	11.1

Measures

Five different assessment measures, three quantitative measures and two qualitative measures were used. The three quantitative measures were; (1) The Test of Word Reading Efficiency (TOWRE), (2) The Survey of Internet Use, and (3) The Online Reading Comprehension Assessment (ORCA)-Iditarod. The qualitative measures used were (1) verbal-protocol, think-alouds and (2) Camtasia software (http://www.techsmith.com/camtasia.asp), recordings of online activities. With the exception of the TOWRE, all of the assessments were developed, field-tested, and refined in years one and two the TICA project. The following section provides a description of each measure including the reliability and validity. Refer to Table 11 for a summary of each measure.

Table 11: Descriptive Information of Instruments.

Measure	Type	Purpose
ORCA	Quantitative	Measure online reading comprehension performance
TOWRE	Quantitative	Measure accuracy and fluency of sight word reading and phonemic decoding
Survey of Internet Use	Quantitative	Self-reported information on the frequency and nature of Internet use at home and at school
Verbal Protocol, Think-Alouds	Qualitative	Description of thought processes during strategy use
Camtasia Recordings	Qualitative	Description of strategy use and online activity

TOWRE

The TOWRE was used in this study as a measure to obtain a sample of students without disabilities who had similar reading ability to those students with disabilities. As described by the assessment developers, Torgesen, Wagner, and Rashotte (1999), the Test of Word Reading Efficiency (TOWRE) is a measure of an individual's ability to pronounce words accurately and fluently by testing two skills (sight word reading and phonemic decoding) that are critical to overall reading success. The TOWRE consists of two sub tests: (a) Sight Word Efficiency (SWE), which assesses the number of real, printed words that are accurately identified and read within 45 seconds; and (b) Phonemic Decoding Efficiency (PDE), which measures the number of pronounceable, printed, non-words that are accurately decoded within 45 seconds. The TOWRE was designed to be a quick and easily administered assessment to measure the fluency and accuracy of print-based word reading strategies in order to identify students who are falling behind. It is not however intended to provide detailed information for guiding instruction (Torgesen, Wagner, & Rashotte, 1999); therefore, the TOWRE scores in this study were used to include general education students in the sample who's overall reading ability, as measured by the TOWRE, closely matched those of their peers with disabilities. In addition, had the groups of students been significantly different (as determined by t-tests) the TOWRE was intended to be used as a covariate; however, the groups did not significantly differ ($F(1, 86) = .843$, p =.3.61); therefore, it was unnecessary to use the covariate in the data analysis.

Reports provided in the TOWRE manual (Torgesen, Wagner, & Rashotte, 1999) indicate reliability and validity data. The TOWRE was normed using 1,500 individuals, ages six through twenty-four in thirty states and provides four types of scores: (a) raw scores, (b) standard scores (mean = 100; standard deviation = 15), (c) age/grade equivalencies, and (d) percentiles. Reliability measures are as follows: (a) internal consistency reliability = .93 (SWE) and .94 (PDE) with a total score of .96. (b) time sampling reliability (constant over time) = a total score between .89 and .94, and (c) Inter rater reliability = .99 (Torgesen, Wagner, & Rashotte, 1999). Conclusions can be drawn that the TOWRE shows a high degree of overall reliability and is consistently high across all three types of reliability measures; therefore, results can be interpreted with confidence.

The TOWRE manual (Torgesen, Wagner, & Rashotte, 1999) also accounts for several measures of validity. Concurrent validity was measured using two established reading assessments: (a) The Woodcock Reading Mastery – Revised, and (b) The WRAT – R, and reliability = .85 (PDE) and .89 (SWE). These data clearly show that performance on the SWE and PDE of the TOWRE are strongly predicative of students' abilities to perform more complex reading tasks on the Woodcock Reading Mastery and the WRAT-R; therefore, the TOWRE can be used to identify students who are likely to have difficulty with broad reading growth and is a valid measure of critical reading sub skills (Torgesen, Wagner, & Rashotte, 1999). Finally, a factor analysis conducted on the TOWRE yielded a chi-square of .383 (p=.536) with one degree of freedom and a comparative fit index (CFI) at a maximum possible value of 1.0. Consequently, the factor analysis supports the validity of the TOWRE, and it can be concluded from the reports contained in the manual that the TOWRE is a valid and reliable measure of word reading efficiency and, therefore, an indicator of overall reading ability (Torgesen, Wagner, & Rashotte, 1999).

ORCA-Iditarod

Pre and post measures of The ORCA-Iditarod were implemented to assess the effectiveness of the IRT intervention. The ORCA-Iditarod measures gains in online reading comprehension, and, therefore, can be analyzed to determine improvement from pre to post assessment and evaluate significant differences between those students who were provided the IRT intervention and those students who were not.

Two members of the research team created the ORCA-Iditarod during the second year of the TICA project, and it measures online reading comprehension performance among large groups of students in an online quiz interface. The ORCA can be described as an authentic and comprehensive series of tasks that fit within a forty-minute time limit. Further, the ORCA measures students' ability on the five constructs of the new literacies: (a) developing questions, (b) locating information, (c) evaluating Web sites for relevance and reliability, (d) synthesizing within and across sources, and (d) communicating using online means. The instrument items prompt different aspects of the five new literacy constructs and appear to be useful for capturing performance-based aspects of strategic online reading comprehension.

Based of the results of the TICA project, the reliability of the overall instrument was alpha = .793 on the pre-test and alpha = .725 on the post-test. Further, the reliability for each factor can be found in the following table, Table 12.

Table 12: Reliability for Online Reading Comprehension Assessment (ORCA – Iditarod)

Scale	Items	Reliability (alpha) (Pre-test)	Reliability (alpha) (Post-test)
Locating	2a, 2b, 2c	.758	.784
Critical Evaluation	3a, 3b	.905	.916
Critical Evaluation	4a, 4b, 4c, 4d, 4e, 4f, 4g	.631	.619
Synthesis & Communication	5a, 5b, 5c	.710	.655

The assessment consisted of 15 items that included true false questions, multiple choice questions, open-ended questions, and performance tasks. Each question was scored using a rubric that was established through a collaborative discussion with the TICA grant team. Multiple choice and true/false questions were assigned a one if answered correctly and a zero if answered incorrectly. The additional questions involving short answer or performance items were scored using criterion specified in the rubric. The ORCA was initially scored by two members of the TICA grant, and to ensure accuracy, 20% of the assessments for the current sample were rescored. Scores were initially compared with an inter rater agreement of .93, and after discrepancies were discussed, an inter rater agreement of .98 resulted. The rubric can be found in Appendix D.

The Survey of Internet Use

The Survey of Internet Use was used from pre to post assessment to measure gains in the frequency and facility of Internet usage and to examine significant differences between treatment and control groups. Like the ORCA, the survey uses an online quiz interface to measure the frequency and nature of Internet use of students both inside and outside of school. Using a six-point Likert scale, students rate their frequency of use for various Internet activities. For example, students were asked to report how often they posted responses to blogs on the Internet, and the scale incorporates six levels of frequency: one = never; two = less than once per week; three = once per week; four = a few times per week; five = once per day; and six = several times per day. The components of the assessment include: (a) demographic information; (b) scale for frequency and nature of Internet use in school (27 questions); (c) scale for frequency and nature of Internet use outside of school (27 questions); and (d) scale for self-efficacy of online skills and strategies (9 questions). To measure self-efficacy, students were asked to rate their skill level on a scale from one (beginner) to seven (expert).

Reliability of the assessment was calculated using a Spearman-Brown Correlation = .9389, and a coefficient alpha = .9345. Additionally, an item analysis revealed a p-value range from .31 to .86, and the test discrimination values range from .33 to .59. With an eight-factor solution, 56.245% of the variance was explained with a KMO of .906. As shown in Table 13, the Survey of Internet Use is a reliable instrument as indicated by alpha scores for each scale.

Table 13: Reliability for Survey of Internet Use

Scales	Items	Reliability (alpha)
Online content area reading (in school)	7	.902
Online content area reading (out of school)	8	.927
Internet leisure use (in school)	5	.793
Internet leisure use (out of school)	11	.932
Discussion boards (in school)	2	.713
Discussion boards (out of school)	4	.875
Pop culture communication (in school)	7	.771
Internet Self-Efficacy	9	.926

Verbal Protocol

The qualitative portion of the study used Verbal Protocol, Think-Alouds, along with Camtasia recordings of real-time actions on the Internet during an online activity that incorporates the five components of online reading comprehension: questioning, locating, evaluating, synthesizing, and communicating. Directions for the online activity and verbal protocol are found in Appendix F. Analyzing qualitative data in this way can indicate a more complete and in-depth description of students' online skills and both the effective and ineffective strategies they employ. Again, results of the analysis can then be compared across groups of students in both treatment and control, and with and without disabilities. Verbal protocols were conducted using the think-aloud methods recommended by Afflerbach (2002) and Pressley and Afflerbach (1995) to examine the thought processes tied to strategy use during online reading comprehension. According to Ericsson (2002) protocol analysis is method of collecting valid data on thought processes by obtaining verbal descriptions of thought sequences from subjects. Ericsson and Simon (1993) further argue that verbal protocols conducted during task completion reveals the closest connection between thinking and verbal reports. Therefore, online activities were structured to allow students to engage in online reading while thinking aloud. The online activity was prefaced by a few short interview questions, and the actual activity was recorded using Camtasia software, which allowed for all of the students' online actions to be video recorded along with an audio recording of their verbal, think-aloud data. Using Camtasia software to record both video and audio in real time is a new and innovative way to capture online reading comprehension processing.

Prior research in reading comprehension has often gathered data in one of three ways: (a) eye movement studies (e.g., McConkie, Kerr, Reddix, & Zola, 1988; Rayner, 1998), (b) miscue analysis (Goodman & Burke, 1973; Leu, 1982), and (c) think-aloud verbal protocols (Afflerbach, 2002; Pressley & Afflerbach, 1995); however, each of these methods of collecting reading comprehension data have limitations. Using think-aloud, verbal protocols with video and audio capture technology allows a means of documenting the complexities of online reading comprehension in real time with a continuous picture of what students are reading, how they are navigating, as well as their verbal, descriptions of the strategies they are employing.

The verbal protocol activity consisted of five short interview questions followed by a series of online reading comprehension tasks during which the participants were asked to think-aloud while they navigated through and read information on the Internet. To create a greater understanding of think-alouds for students, a brief demonstration was conducted on thinking aloud while reading online prior to the start of the activity. Following the online activity, students were asked to reflect on their online activity experience on two follow-up interview questions. During the session, students completed a structurally prompted think-aloud activity, being prompted at fixed structural intervals. For this session, each student was asked to (a) search and locate particular information on the Internet; (b) evaluate two Web sites for reliability; (c) synthesize their findings by typing responses to the activities' questions in a word document; and (d) communicate their synthesis of information by emailing their completed responses as an attachment.

The tasks required students to think aloud, but when the student failed to do so, the researcher prompted students by asking probing questions such as "Can you tell me what you are thinking?," or "Why did you choose that particular Web site?" As appropriate in structurally prompted think-aloud activities, researchers may prompt student verbal responses during different structural locations during the online reading comprehension task; consequently, prior to the activity, researchers agreed to include prompting at the following structural locations: (a) when students read search engine results, any web page, or information about a site's reliability; (b) when students selected a search engine; and/or (c) just before students clicked on a link or tab.

Procedures

Participant Recruitment

Potential participating teachers were identified, districts and classrooms were examined to determine if they contained the technology required to deliver the intervention. All the schools had high-speed wireless Internet, and in one of the schools, every classroom was equipped with their own laptop cart, which included approximately 30 laptops. Two of the schools, however, did not possess required technology in each classroom; hence, funds from the grant provided Macintosh laptop carts for participating teachers' classrooms.

After securing the required technology for all of the sites, the participating teachers were asked about their willingness to allow the researchers to conduct three days of pre-intervention assessments, three days of post-intervention assessments, and implementation of forty lessons of the intervention for two days a week for approximately twenty weeks. From the remaining pool of willing participants, teachers were randomly assigned as treatment and control groups, and their respective class sections assumed the same assignment to treatment and control conditions.

Pre-Assessment

A total of eighteen (eight control and ten treatment), seventh grade, English/Language Arts classes were selected to participate in the study. Prior to the start of the school year, a team of two researchers was assigned per treatment teacher and made arrangements to meet with the teachers for lesson planning. To maintain fidelity of the intervention, a team decision was made that the research assistants, rather than the participating teachers, would deliver the intervention. During the second week of school, researchers spent two days in their assigned classrooms conducting classroom observations and distributing parent and student consent forms to obtain permission for student participation in the study.

The third week of school marked the start of the pre-assessment phase including the TOWRE, the Survey of Internet Use, The ORCA – Iditarod, The School Success Profile (SSP), and the (AMOOR); the latter two assessments were included in the TICA study, but excluded from analysis for the purposes of this dissertation. The SSP is an online survey that is intended to measure a student's risk for dropping out of school. The TICA study intended to use this assessment to measure the effects of IRT on school engagement.

Treatment

Once pre-assessments and make-up assessments were completed, researchers began implementing IRT approximately two days per week, forty-five minutes per day, for twenty weeks totaling 40 lessons, while remaining mindful and maintaining flexibility around district-wide assessments and holidays. The IRT Intervention was divided into three phases described below.

IRT: Phase I. The initial phase of IRT contained lessons to teach the prerequisite, basic skills necessary to facilitate more complex strategies encountered in phases II and III. IRT lessons were integrated with the content and standards being taught in the classroom, but directly taught skills in the areas of computer basics, Web searching basics, navigation basics, and email basics. IRT in computer basics included teaching students simple but necessary skills in using a mouse/track pad, opening programs, creating new files and folders, copying, cutting and pasting text, and naming and saving files. Web searching basics included such skills as opening search engines, using forward and back buttons, refreshing, simple keyword searches, and typing addresses in the address window. Navigation basics lessons included teaching students to use maximize and minimize windows, toggle between windows, split screens, and open and quit applications.

The final area of basic skills addressed in phase one implemented lessons in email basics including composing, editing and sending email messages, replying to messages, and attaching documents. When the researchers and the classroom teacher agreed that a majority of students were able to demonstrate mastery on most of the objectives contained on the Basic Skills Checklist, then Phase II lessons began. Evaluation of student mastery was determined through teacher observation, graded assignments, and records of the basic skills checklist, but the level of mastery was left to the discretion in each individual classroom researcher and teacher. The amount of time for each participating class varied depending on the background knowledge and skill level of the students. See Appendix A for the Basic Skills Checklist.

IRT: Phase II. Once a majority of the students in the classroom were able to demonstrate mastery of the basic skills, Phase II of IRT was implemented. Phase II was comprised of the five components synonymous with online reading comprehension: (a) understanding and developing questions, (b) locating information, (c) critically evaluating information, (d) synthesizing information, and (e) communicating information.

During this phase of IRT, lessons on understanding and developing questions included strategies for both teacher-generated and student-generated questions. Lessons focused on strategies for determining appropriate questions based on audience, purpose, and the nature of the inquiry activity. Other exercises included strategies or determining a clear topic and focus of a research question for more effective searching purposes. Additional lessons targeted strategies for modifying research questions, as many participants demonstrated difficulty in doing so; therefore, teachers modeled methods for narrowing and expanding the focus of research questions, developing new, or revising existing research questions.

Researchers taught strategies for efficiently and effectively locating information both by using search engines, and then strategies for finding specific information within Web sites. Lessons for this component of online reading comprehension encompassed specific keyword search strategies such as topic and focus, single and multiple keyword entries, and phrases. In addition, lessons entailed specialized search strategies using quotation marks, synonyms, Boolean operators, and advanced search tool options. Lessons for using search engine results taught students to identify commercially sponsored results, to skim main results for relevant links before reading summaries more carefully, and to understand the meaning of bold face terms found in results. Instruction also centered around understanding the meaning of URLs, knowing when to use the history pull down menu, bookmarking a site, and using specialized search engines for images, videos, and other media.

Additionally, students learned strategies for locating sources when initial searchers were unsuccessful. Identified as an area of weakness, students were taught strategies for adjusting keywords, narrowing or expanding searches, reading results pages to identify alternate vocabulary to use in refined searches, and/or to switch to other search engines to obtain desired results. For locating information within a Web site, students were taught to quickly skim and scan a site to determine the usefulness before reading more carefully to find the required information. Other strategies included teaching students to use internal search engines, to use Web site structure to locate information, and to predict information contained in links and tabs.

An integral part of Phase II taught students strategies to critically evaluate information they found online. These lessons focused on identifying bias, reliability and accuracy of Web-based information. Therefore, students were taught to recognize and evaluate the author of a web site, and to recognize bias and propaganda. Lessons also included strategies for determining the reliability of Web sites by comparing multiple sources of information, identifying the form and purpose of Web sites, and by recognizing indicators of reliability such as URL cues, reputation of sponsors and authors of the site, working links, grammar, and logical ideas. During this phase, teachers directed students to various spoof Web sites and those containing clear bias to illustrate and provide practice in determining the reliability of online information.

Teaching students to synthesize information involved strategic instruction for determining relevant from irrelevant information from multiple media sources including text, audio, video, tables and graphs. In addition, IRT lessons taught strategies for effective note-taking and paraphrasing and information organization. These lessons applied online and offline tools for managing information such as electronic file folders. In addition, it required instruction on paraphrasing and effective note taking strategies using both paper and pencil note-taking sheets, and Word document note taking. Time in this phase was also dedicated to teaching students how to save and properly cite online sources. Efficient methods and tips for synthesizing and storing information were also addressed including copy, paste and split screen features.

Finally, Phase II of IRT lessons targeted online means of communicating information gathered and producing final products. To address these skills, students were taught the procedures involved in email, instant messaging, blogs, Google Docs, wikis, and presentation software (i.e. Moviemaker and PowerPoint), but they were also taught to consider audience, person and voice in their compositions, keeping in mind that wording will influence the reactions of others. In addition, general knowledge and procedures for using online editing tools such as spell check, dictionaries, and thesauruses. Lessons also focused on opening, sending and receiving emails including downloading and uploading attachments. Blogs were also used to share information, and students were taught to read, post, and reply to others.

IRT: Phase III. Implementation of Phase III of IRT began when the team of researchers determined that a majority of the students in the classroom were able to demonstrate mastery of a majority of the skills on the Phase II Checklist. Hence, the onset of Phase III was different for each classroom based on the individual needs of the students in that classroom. Phase III lessons marked a change in role for both the teacher and the student; whereas, the teacher acquired the role of a facilitator and the students exercised more control and independence by developing their own research questions as well as selecting and using the strategies for searching, evaluating and communicating their final products. For example, in Phase II of IRT, one class read the novel, Out of the Dust and completed a thematic unit on the Dust Bowl and Great Depression. During this unit, IRT lessons taught specific strategies for questioning, locating, evaluating, synthesizing and communicating online tied to an inquiry project on the Dust Bowl. For completion of the project, students chose from a list of teacher-generated research questions. They were then provided with specific strategies and structure (i.e., note-taking sheets and/or handouts) for locating, evaluating, and synthesizing their information. All students then completed a short documentary on the Dust Bowl using Moviemaker.

Phase III, provided the opportunity for reinforcement and generalization of skills. Therefore, a Phase III lesson differed by allowing students to create their own research questions based on another novel, Scorpions. The book contained multiple themes including gangs, minorities, weapons, drugs and alcohol, friendships, decision-making, juvenile delinquency, working mothers, single mothers, etc. Students freely determined their own research questions based on the suggested themes, or identified their own theme in the novel. Once the classroom teacher approved their research questions, students employed and documented chosen strategies to search and locate reliable information on their research question. The teacher also provided a list of possible inquiry project products, and students decided which online tool they would use to present their findings. For the remainder of the project, the teacher acted as a facilitator providing students mini-lessons on skills or strategies as needed. Students also shared newly discovered strategies along the way. One final intended outcome of Phase III was to provide students the opportunity to participate in a telecollaborative project across states.

Control

Over the course of the intervention phase, participants in the control classrooms did not receive Internet Reciprocal Teaching instruction. In the southeastern state, one of the control teachers with four control classes was a very experienced teacher who had expressed low levels of confidence in using the Internet herself; therefore, she reported that she rarely, if ever, integrated activities using the Internet into her instruction. Additionally, she also reported she never provided her students with Internet literacy instruction, although she did allow her students to use classroom laptops for writing purposes including Microsoft Word applications. The other control teacher in the southeast, with two treatment and one control section, was confident in her own Internet skills and, therefore, regularly implemented the Internet into her instruction. Although researchers explained how using the same lessons in the treatment and control classrooms could compromise the integrity and fidelity of the research, they found occasions when they observed her teaching Internet-based, IRT type lessons in her class, which was designated as control.

Post Assessment and Fidelity

During the course of the intervention, two members of the research team conducted fidelity measures of IRT lessons roughly every five weeks. The instrument is in Appendix E. After the completion of lesson 40, researchers administered the post-assessments of four of the five pre-intervention measures with the exception of the TOWRE, which was given only as a pretest to use as a covariate in the TICA study and as a measure to determine inclusion into the sub-sample for this dissertation study.

When post-intervention and make-up assessments were completed, participants with high-incidence disabilities were identified and matched with similar non-disabled peers in order to derive the sub-sample of students included in this mixed methods dissertation study. Great care was taken in matching students not only on the previously described criteria of general reading ability and home Internet access and use, but also students with disabilities were matched with general education students in all cases within the same school, in most cases by teacher, and when possible within class sections as well. Careful matching was conducted as an additional measure to control for and minimize the effects of other variables such as school differences and teacher effect.

Once the sample of students was selected for the dissertation study, scheduling and travel arrangements were made to further examine students with disabilities (and similar, non-disabled peers). However, in order to conduct the qualitative portion of this study, additional tasks were required making it necessary to secure separate IRB approval. After being given IRB consent to proceed, parent and student permission forms were hand-delivered to the local school, and mailed to the two out-of-state schools. Upon receiving signed parent permission forms, 43 of the total participants were given an online reading comprehension activity to complete while also using think-aloud methods based on Afflerbach (2002) and Pressley and Afflerbach (1995) to elicit online skill and strategy use.

Participating students engaged in a researcher-selected and amended online reading comprehension activity while thinking aloud to provide insight into the thought processes driving their strategy use. The verbal protocol sessions were recorded using Camtasia software (http://www.techsmith.com/camtasia.asp), which recorded real-time audio of student' verbal think-aloud responses, and at the same time, video of all student movements and actions on the computer screen. A total of 43 students completed the verbal protocol session; however, due to problems in video and audio recordings, only 32 viable recordings remained. Of the remaining verbal protocols, students were arranged by condition, treatment and control, and then by group, disability and no disability. For comparative purposes, four students from each group were then selected randomly totaling 16. Each activity was then transcribed by recording verbatim think-aloud statements, online actions along with time stamps. Once transcriptions were complete, the data was uploaded into NVIVO and analyzed.

After finalizing data collection, quantitative data was coded (i.e. into numeric expressions), cleaned (i.e. double checked for accuracy), and prepared (missing data addressed) for analyzing using SPSS software. Qualitative data of Camtasia software recordings were transcribed in preparation for data analysis using NVivo 8 software (http://www.qsrinternational.com). After analyzing each respective data set, they were then converged using data mixing procedures for comparing and contrasting quantitative and qualitative results.

Data Collection

Pre-intervention assessments were collected for all students participating in the TICA project using three measures: (a) the TOWRE, (b) The ORCA – Iditarod, and (c) The Survey of Internet Use. During the intervention, the researcher also collected fidelity measures and growth curve modeling measures approximately every five weeks.

Following the twenty-week IRT intervention, pre-intervention measures were repeated as post-assessments. To derive the sample of students for this dissertation study, students with disabilities were identified and then matched with similar general education students based on two factors: nearly equivalent TOWRE scores and similar self-reported scores from the out of school Internet use portion of the Survey of Internet Use. After identifying students with disabilities and their similar general education counterparts, verbal protocol activities were conducted individually to further examine online reading comprehension skills and strategies among students and generate comparisons across groups.

Data Analysis

Quantitative Data

The quantitative pre and post-intervention measures: The Survey of Online Reading and the ORCA – Iditarod were first analyzed using independent sample t-tests to check for significant differences in the groups. Since the TOWRE was used in sampling and no significant differences were detected between groups, it was unnecessary to use the TOWRE scores as a covariate, and ANOVA's were used to analyze the pre-and post assessments for the ORCA and the Survey of Internet Use. Despite findings from the t-tests indicating the groups did not significantly differ on the ORCA pretest, a more conservative approach was chosen to analyze the data using gain scores because the control group scores were higher than the treatment group at pre-test and due to the low number of points on the test.

Qualitative Data

Four types of qualitative data were collected and analyzed including: (a) pre and post activity interview data; (b) verbal protocols during the activity; (c) recordings of online actions (records and time stamps of actions on the Internet); and (d) student emails containing responses to the online activity questions. The pre-interview data was contextual in nature and was analyzed in order to ascertain student preference of online resources as well as their understanding of reliability, which was an essential component for understanding and completing the online activity and describing their beliefs about reliability. Video recordings of actions were analyzed to determine preferred skills and strategies while online within the context of the components of online reading comprehension. Verbal protocols conducted concurrently with video recordings were examined to gain insight into why students employ certain skills and strategies online. Copies of email messages were also analyzed to describe how students approach searching and locating information online, how they go about determining the reliability of a Web site, and how they synthesize and communicate their findings. All four types of data were analyzed and triangulated in an attempt to explain results from the quantitative findings.

Qualitative data analysis consisted of both constant-comparative (Bogdan & Biklen, 2003; Merriam, 1988) and abductive (Onwuegbuzie & Leech, 2006) methods. Abductive coding methods (Onwuegbuzie & Leech, 2006) use both inductive and deductive coding procedures. The following procedures were employed: (a) data from each of the qualitative sources were transcribed; (b) transcriptions were then coded first using deductive methods based on the major components of online reading comprehension; established as primary nodes in the coding system using NVIVO 8 software; and (c) data contained within each node was then analyzed inductively and through constant comparative analysis for emerging themes; and (d) finally themes were further analyzed to determine similarities and differences across condition and group.

Inter rater reliability was conducted on 25 percent of the verbal protocols to determine reliability. Prior to coding, raters met to settle on good examples of efficient and effective strategies. Discussions were then conducted after coding each verbal protocol to reach appropriate levels of inter rater reliability. As the coding of the verbal protocols continued, the need to reconsider descriptions of themes (or nodes) rose periodically, and discussions were conducted by researchers until agreement was reached and node descriptions were revised. This approach allowed for coding skills and strategies within the developing theories of Internet reading comprehension while also allowing for new categories and strategies to emerge from the data.

Mixed Methods Analysis

After collecting and analyzing each individual data set, the data were purposefully converged to analyze the data for similarities and differences based on the triangulation design convergence model of mixed methods research. The researcher then developed interpretations of how the qualitative data validated, confirmed or contrasted with the quantitative data and extended the results by providing more descriptive and well-substantiated conclusions about the online reading comprehension phenomenon.

Research Questions

1. Is Internet Reciprocal Teaching (IRT) an effective intervention to improve online reading comprehension for middle school students in inclusive, general education settings?
    a. Is there a difference in effectiveness of IRT for general education students versus students with disabilities?
2. What online reading comprehension strategies do middle school students in inclusive general education settings use?
    a. Is there a difference in the online reading comprehension strategies used by students with and without disabilities and between treatment and control conditions?
3. Is Internet Reciprocal Teaching associated with changes in students' self-reported data for facility with, frequency of use, and self-efficacy on the Internet?

4. Do the online reading comprehension strategies used by students with and without disabilities in the qualitative data support and converge with the pre and post test online reading comprehension scores from the quantitative data?

Summary

Chapter three identified the purpose and the research methods of the current study. A detailed description of the setting, participants, intervention, and measures was also included. Procedures, data collection and data analysis were also covered. Chapter four provides the quantitative, qualitative and mixed methods findings. The results are presented according to each of the four research questions.

CHAPTER FOUR: RESULTS

Introduction

The purpose of this chapter is to present the results of data analysis. This study examined the effectiveness of Internet Reciprocal Teaching (IRT) and explored online reading comprehension skills and strategies among seventh grade students with high incidence disabilities in inclusive classroom environments within the context of a larger study. The analysis of the data is presented in the following sections: (a) quantitative results, (b) qualitative results, and (c) mixed methods results. The quantitative section covers research questions one and three. Research question two is addressed in the qualitative section, and results of research question four are reported in the mixed methods section at the end of the chapter.

The effectiveness of Internet Reciprocal Teaching (IRT) was analyzed using a two condition ANOVA based on condition (treatment and control group) and by groups of two types of students, those with and without disabilities. Survey data was also analyzed by a two condition ANOVA (treatment group and control group), and by two types of students (with and without disabilities). In addition, qualitative data were collected in order to further examine the effectiveness of IRT and observe the online reading comprehension skills and strategies used by a selection of students with and without disabilities in both the treatment and control group. Four data sources were gathered and analyzed including: (a) pre and post activity interview data; (b) video recordings of online actions during the assigned activity; (c) verbal protocol data during the online activity; and (d) typed responses to questions contained in the activity. The qualitative data was analyzed using NVIVO8 software to conduct three levels of analyses. Level one analysis consisted of deductive analyses based on the five components of online reading comprehension: question, locate, evaluate, synthesize, and communicate. Data within each component were then inductively examined to identify themes that emerged from the five components of online reading comprehension skills and strategies. The final level of analysis conducted was a horizontal analysis that examined similarities and differences across groups of students; treatment, control, students with disabilities, and students without disabilities. To finalize the data analysis of the study, qualitative and quantitative results were then triangulated to determine if the data converged to answer research question number four.

Quantitative Results

The following section describes data analysis and the results for each research question. Due to the design on the study, data analyses for the first two research questions were combined.

Research Question #1

Is Internet Reciprocal Teaching (IRT) an effective intervention to improve online reading comprehension for middle school students in inclusive, general education settings? Is there a difference in effectiveness of IRT for general education students versus students with disabilities?

T-tests were conducted on the pre-assessment of the ORCA, the TOWRE, and the self-reported frequency of home Internet use scores from the Survey of Internet Use to determine if the groups differed prior to the intervention. The results of the t-test for the

TOWRE yielded no significant differences between groups, $F(1, 86) = .843$, $p = .361$; therefore, TOWRE scores were not needed as a covariate in analysis. Regarding the ORCA pre-assessment, significant differences between the groups were not found, $F(1, 86) = .084$, $p = .773$, but, through an examination of mean scores on the ORCA pre-assessment, students in the control group ($M = 5.28$, $SD = 3.109$) scored higher than the treatment group ($M = 4.81$, $SD = 3.102$); therefore, gain scores were used to analyze the results of the effectiveness of IRT. A summary of statistics on the preassessment measures are found in Table 14.

Table 14: T-Test for Preassessment Instruments.

Measure	Control M	Control SD	Treatment M	Treatment SD	*Df*	F	P
TOWRE	87.26	14.130	85.67	12.131	1, 86	.843	.361
ORCA	5.18	3.109	4.81	3.102	1, 86	.773	.773

On the ORCA, A 2 X 2 analysis of variance (ANOVA) was conducted to evaluate the efficacy of the Internet Reciprocal Teaching condition and disability (students with and without disabilities) for online reading comprehension improvement from pre to post assessment. Results from the ANOVA yielded significant main effects for the condition (treatment versus control), $F(1, 84) = 4.306$, $p = .041$, for the test of online reading comprehension; however, significant effects were not observed by group (with disabilities versus without disabilities), $F(1, 84) = .177$, $p = .675$. Furthermore, the interaction effect was also not significant, $F(1, 84) = 1.059$, $p = .309$.

Table 15: Analysis of Variance for ORCA-Iditarod Gain Scores

Source	*Df*	*SS*	*MS*	*F*	*P*
Condition	1	65.214	65.214	4.306	.041
Group	1	2.680	2.680	.177	.675
Interaction	1	16.043	16.043	1.059	.306
Error	84	1272.174	15.145		

Because sample sizes differed in this study, violations of the equal variance assumption can be problematic; therefore, a post hoc Levene's test for equality of the variances was conducted indicating that homoscedasticity could be assumed. In addition, Cohen's d was calculated to determine the effect size. A medium (see Cohen, 1988) effect size (*ES* = .46) was found associated with the differences of gain scores between the treatment and control conditions.

The ORCA-Iditarod measure, descriptive statistics were reported for students in the treatment group (*M* = 3.444, *SD* = 3.903) who statistically outgained students in the control group (*M* = 1.677, *SD* = 3.820) from pre to post assessment; however, students in the treatment group without disabilities (*M* = 3.704, *SD* = 4.286) did not significantly outgain students in the treatment group with disabilities (*M* = 3.185, *SD* = 3.541).

Research Question #3

Is Internet Reciprocal Teaching associated with changes in students' self-reported data for facility with, frequency of use, and self-efficacy on the Internet? Research question three has three parts: (a) a scale of facility with and frequency of use on the Internet in school (b) a scale of facility with and frequency of use on the Internet outside of school; and (c) a self-efficacy scale rating level of skill using various facilities on the Internet.

Again, independent sample t-tests of the preassessment of Survey for Internet Use, on all three scales, were conducted to test that the population variances of the two groups were equal. From the results, it was determined that the groups did not vary on scales (a) Internet use in school, $t(68.520) = .009$, $p = .993$; and (b) Internet use outside of school, $t(77.819) = -.539$, $p = .592$; however, on (c), scale of self-efficacy, the two groups differed and the sample sizes were unequal; therefore, the t value for unequal variances are reported, $t(71.152) = 2.35$, $p = .022$. Descriptive data is supplied in Tables 16 and 17.

Table 16: Descriptive Data for Pre Survey of Internet Use by Condition.

Scale	Group	N	M	SD
Pre-Composite	Control	34	1.93	0
In School	Treatment	54	1.92	0
Pre-Composite	Control	34	2.79	1.04
Out of School	Treatment	54	2.92	1.20
Pre-Composite	Control	34	4.89	1.66
Self-efficacy	Treatment	54	4.03	1.68

Table 17: T-Test for Preassessment Composite Scale Scores for Survey of Internet Use

Source	Control (N=34)	Treatment (N=54)	T	P
Internet use in school	1.93	1.92	.009	.993
Internet use outside of school	2.79	2.92	-.539	.592
Scale of self-efficacy	4.89	4.03	2.35	.022

Due to results of the independent t-tests, two separate ANOVAs of student perceptions on scales (a) and (b) were analyzed by a two condition (treatment group and control group) by two groups (students with and without disabilities) ANOVA to determine if changes in student self-reported data occurred as a result of IRT. Data focusing on the facility and frequency of Intent use in school (Scale a), did not reveal significant main effects for condition, $F(1, 84) = 1.719$, $p = .193$; however, significant main effects, $F(1, 84) = 8.350$, $p = .005$, were found by group, demonstrating average self-reported scores for students with disabilities were significantly higher than average scores of their nondisabled peers. Furthermore, no significant interaction effects were evident between condition and group, $F(2, 84) = .540$, $p = .465$. ANOVA data are presented in Table 18.

Data on the facility with and frequency of Internet use outside of school revealed no significant differences were indicated for condition, $F(1, 84) = .910$, $p = .343$, or for disability (students with and without disabilities), $F(1, 84) = 2.214$, $p = .141$. Likewise, no significant interaction between the condition and students with and without disabilities were apparent, $F(1, 84) = .893$, $p = (.362)$. A summary of ANOVA results can be found in Table 18.

Because significant differences were found between groups on the self-efficacy scale of student perceptions, gain scores from pre to post survey results were calculated, and an ANOVA was conducted on the gain scores for the self-efficacy scale based on condition and disability. Results did not reveal significant main effects for the IRT condition, $F(1, 84) = .281$, $p = .598$, or for disability, $F(1, 84) = .014$, $p = .906$. A significant interaction between condition and disability group $F(1, 84) = .147$, $p = .702$ was also not apparent. Statistics are presented in Table 18.

Table 18: Analysis of Variance for Survey of Internet Use

Source	*Df*	*SS*	*MS*	*F*	*P*
In School Use					
Condition	1	1.360	1.360	1.719	.193
Disability	1	6.609	6.609	8.350	.005
Interaction	1	.427	.427	.540	.465
Error	84	66.453	.791		
Out of School					
Condition	1	1.321	1.321	.910	.343
Disability	1	3.213	3.213	2.214	.141
Interaction	1	1.217	1.217	.893	.362
Error	84	121.911	1.415		
Self-Efficacy					
Condition	1	.695	.695	.281	.598
Disability	1	.035	.035	.014	.906
Interaction	1	.364	.364	.147	.702
Error	84	207.910	2.475		

Understanding the perceived effectiveness of Internet Reciprocal Teaching was an underlying goal of the research. As such, descriptive information is presented in Tables

19 through 24 that represent the change in preassessement to postassessment perceptions of subjects in the study.

Table 19: Comparison of Settings for the Control Group as Measured by the Change from Pretest to Posttest.

	In School		Out of School	
This is how often I do the following:	No Disability	Disability	No Disability	Disability
I use the Internet	-0.1	0.5	0.4	0.4
I use search engines	0.6	0.9	1.2	1.1
I read email	-0.5	0.2	0.1	0.2
I use Instant Messenger (IM)	-0.2	-0.1	0.6	0.1
I read blogs	0.2	0.3	0.5	0.6
I use chat rooms	-0.4	-0.1	0.6	0.5
I read Internet discussion boards	0.4	0.3	0.5	1.0
I use the Internet to download music	-0.2	0.2	0.8	0.5
I use the Internet to post to discussion boards	0.1	0.2	0.3	0.9
I look at who created information I am reading on the Internet	-0.6	0.6	-0.2	-0.8
I use the Internet to find images	-0.1	0.1	0.5	0.6

I use the Internet to read about movies, music, sports stars, or other entertainment topics	-0.1	0.8	0.5	0.9
I use the Internet to view clip art and pictures	0.1	0.6	-0.4	1.5
I use the Internet to read manga or comics	-0.1	0.4	0.1	1.6
I use the Internet to help me decide what to buy	0.1	0.5	0.6	1.0
I use the Internet to play online games	-0.9	0.8	-0.1	0.8
I check the accuracy of information I read on the Internet	-0.3	0.5	0.3	0.7
I use the Internet to create Web sites	0.2	0.5	0.6	1.0
I use the Internet for school-related assignments	-0.1	0.6	0.6	1.0
I use the Internet for things other than school assignments	-0.6	0.7	1.0	0.1
I use the Internet to read about science	-0.2	0.1	-0.4	0.7
I use the Internet to read about	-0.4	0.2	-0.4	0.4

social studies				
I use the Internet to read about current events	-0.4	-0.1	-0.5	0.4
I use the Internet to read about literature	-0.6	0.4	-0.6	0.8
I use the Internet to read about math	-0.4	0.4	-0.6	0.8
I use the Internet to read about other school subjects	-0.4	0.4	-0.2	0.4
I use the Internet to read information about my hobbies	-0.4	0.5	-0.1	0.1
AVERAGES	-0.2	0.4	0.2	0.6

Table 20: Comparison of Settings for the Treatment Group as Measured by the Change from Pretest to Posttest.

	In school		Out of school	
This is how often I do the following:	No Disability	Disability	No Disability	Disability
I use the Internet	0.6	0.1	0.0	-0.1
I use search engines	1.3	1.0	0.6	1.0
I read email	0.4	0.6	-0.1	0.1

I use Instant Messenger (IM)	0.7	0.9	0.9	0.2
I read blogs	0.2	0.8	0.7	0.0
I use chat rooms	0.2	0.5	-0.1	-0.5
I read Internet discussion boards	0.4	0.5	0.9	0.2
I use the Internet to download music	-0.1	0.7	0.3	-0.4
I use the Internet to post to discussion boards	0.4	0.8	-0.2	0.0
I look at who created information I am reading on the Internet	0.8	0.9	0.2	0.1
I use the Internet to find images	0.6	0.9	0.9	0.0
I use the Internet to read about movies, music, sports stars, or other entertainment topics	0.2	0.3	0.2	-0.8
I use the Internet to view clip art and pictures	0.3	-0.2	0.8	-1.3
I use the Internet to read manga or comics	0.4	0.2	0.2	-0.1
I use the Internet to help me	0.2	0.4	0.6	0.2

decide what to buy				
I use the Internet to play online games	0.0	-0.1	0.1	-0.4
I check the accuracy of information I read on the Internet	0.9	0.9	-0.1	-0.4
I use the Internet to create Web sites	0.1	0.4	-0.1	-0.4
I use the Internet for school-related assignments	0.4	0.6	-0.6	-0.4
I use the Internet for things other than school assignments	0.9	-0.3	0.0	0.0
I use the Internet to read about science	-0.8	0.0	-0.5	-0.1
I use the Internet to read about social studies	-0.7	0.0	-0.3	0.3
I use the Internet to read about current events	-0.3	0.5	-0.3	0.5
I use the Internet to read about literature	0.3	0.6	-0.2	0.2
I use the Internet to read about math	-0.2	0.2	-0.2	0.3

I use the Internet to read about other school subjects	0.3	0.3	-0.1	0.0
I use the Internet to read information about my hobbies	-0.2	0.5	0.2	0.2
AVERAGES	0.3	0.4	0.1	-0.1

Table 21: In School Facility with and Frequency of Internet Use by Condition and Group as Measured by the Change from Pretest to Posttest.

	Control		Treatment	
This is how often I do the following AT SCHOOL:	No Disability	Disability	No Disability	Disability
I use the Internet	-0.1	0.5	0.6	0.1
I use search engines	0.6	0.9	1.3	1.0
I read email	-0.5	0.2	0.4	0.6
I use Instant Messenger (IM)	-0.2	-0.1	0.7	0.9
I read blogs	0.2	0.3	0.2	0.8
I use chat rooms	-0.4	-0.1	0.2	0.5
I read Internet discussion boards	0.4	0.3	0.4	0.5
I use the Internet to download music	-0.2	0.2	-0.1	0.7
I use the Internet to post to	0.1	0.2	0.4	0.8

discussion boards				
I look at who created information I am reading on the Internet	-0.6	0.6	0.8	0.9
I use the Internet to find images	-0.1	0.1	0.6	0.9
I use the Internet to read about movies, music, sports stars, or other entertainment topics	-0.1	0.8	0.2	0.3
I use the Internet to view clip art and pictures	0.1	0.6	0.3	-0.2
I use the Internet to read manga or comics	-0.1	0.4	0.4	0.2
I use the Internet to help me decide what to buy	0.1	0.5	0.2	0.4
I use the Internet to play online games	-0.9	0.8	0.0	-0.1
I check the accuracy of information I read on the Internet	-0.3	0.5	0.9	0.9
I use the Internet to create Web sites	0.2	0.5	0.1	0.4
I use the Internet for school-related assignments	-0.1	0.6	0.4	0.6
I use the Internet for things other	-0.6	0.7	0.9	-0.3

than school assignments				
I use the Internet to read about science	-0.2	0.1	-0.8	0.0
I use the Internet to read about social studies	-0.4	0.2	-0.7	0.0
I use the Internet to read about current events	-0.4	-0.1	-0.3	0.5
I use the Internet to read about literature	-0.6	0.4	0.3	0.6
I use the Internet to read about math	-0.4	0.4	-0.2	0.2
I use the Internet to read about other school subjects	-0.4	0.4	0.3	0.3
I use the Internet to read information about my hobbies	-0.4	0.5	-0.2	0.5
AVERAGES	-0.2	0.4	0.3	0.4

Table 22: Out of School Facility with and Frequency of Internet Use by Condition and Group as Measured by the Change from Pretest to Posttest.

	Control		Treatment	
This is how often I do the	No	Disability	No	Disability

following OUTSIDE OF SCHOOL:	Disability		Disability	
I use the Internet	0.4	0.4	0.0	-0.1
I use search engines	1.2	1.1	0.6	1.0
I read email	0.1	0.2	-0.1	0.1
I use Instant Messenger (IM)	0.6	0.1	0.9	0.2
I read blogs	0.5	0.6	0.7	0.0
I use chat rooms	0.6	0.5	-0.1	-0.5
I read Internet discussion boards	0.5	1.0	0.9	0.2
I use the Internet to download music	0.8	0.5	0.3	-0.4
I use the Internet to post to discussion boards	0.3	0.9	-0.2	0.0
I look at who created information I am reading on the Internet	-0.2	-0.8	0.2	0.1
I use the Internet to find images	0.5	0.6	0.9	0.0
I use the Internet to read about movies, music, sports stars, or other entertainment topics	0.5	0.9	0.2	-0.8

I use the Internet to view clip art and pictures	-0.4	1.5	0.8	-1.3
I use the Internet to read manga or comics	0.1	1.6	0.2	-0.1
I use the Internet to help me decide what to buy	0.6	1.0	0.6	0.2
I use the Internet to play online games	-0.1	0.8	0.1	-0.4
I check the accuracy of information I read on the Internet	0.3	0.7	-0.1	-0.4
I use the Internet to create Web sites	0.6	1.0	-0.1	-0.4
I use the Internet for school-related assignments	0.6	1.0	-0.6	-0.4
I use the Internet for things other than school assignments	1.0	0.1	0.0	0.0
I use the Internet to read about science	-0.4	0.7	-0.5	-0.1
I use the Internet to read about social studies	-0.4	0.4	-0.3	0.3
I use the Internet to read about	-0.5	0.4	-0.3	0.5

current events				
I use the Internet to read about literature	-0.6	0.8	-0.2	0.2
I use the Internet to read about math	-0.6	0.8	-0.2	0.3
I use the Internet to read about other school subjects	-0.2	0.4	-0.1	0.0
I use the Internet to read information about my hobbies	-0.1	0.1	0.2	0.2
AVERAGES	0.2	0.6	0.1	-0.1

Table 23: Change in Self-Efficacy Scores from Pretest to Posttest by Condition and Group.

	Control		Treatment	
	Disability	No Disability	Disability	No Disability
Searching for general information on the Internet.	0.65	0.88	0.81	0.81
Reading information on the Internet	1.06	0.12	1.03	0.93
Sending email messages	0.41	0.47	1.00	0.04
Keyboarding (typing quickly and accurately)	0.35	0.65	0.26	1.56
Using the Internet in general	0.71	0.82	0.56	0.59
Using the Internet to answer a question	0.12	0.88	1.04	1.15
Searching for specific information	1.29	0.59	0.44	1.41
Searching for topics related to school subjects	0.88	0.29	0.67	0.93
Searching for topics of personal interest	0.71	0.65	0.56	0.78
AVERAGES	0.69	0.59	0.74	0.91

Table 24: Comparison of Students Top Five Rank Ordered Internet Facilities by Group, and Setting Based on a Positive Change from Pretest to Posttest.

	Disability		No Disability	
	In School	Out of School	In School	Out of School
I use search engines	1	1	1	6
I use Instant Messenger (IM)	2	5	13	1
I look at who created information on the Internet	3	11	24	9
I use the Internet to find images	4	14	9	3
I check the accuracy of information on the Internet	5	21	16	18

Qualitative Results

What online reading comprehension strategies do seventh grade students in inclusive general education settings use most and least frequently? Is there a difference in the online reading comprehension strategies used by students with and without disabilities?

Research Question #2

Four different types of qualitative data were gathered in an attempt to describe the online reading comprehension strategies of selected participants. The data collected included: (a) pre and post verbal protocol activity interviews, (b) video recordings, (c) audio recordings, and (d) student artifacts consisting of word documents and emails containing answers to questions in the online activity. The intention of the first four interview questions was to gather contextual data on Internet proficiency explanations and student preferences using the Internet. The subsequent sections report the qualitative findings for the interview questions followed by the results of four (of the five) components of online reading comprehension. Results of the interview question responses are presented by both condition (treatment and control) and group (with and without disabilities).

Interview Question 1

Question one asked students to report the type of computer, Mac or PC, which they felt most proficient using. While some students in the sample indicated they were capable of using either a Mac or a PC, all but three reported they felt most competent using the PC. Differences between the treatment and control were evident, as none of the participants in the control group preferred a Mac over a PC. However, only those students from the treatment group in the two northeastern schools were provided exposure to Macs made available through grant funding, which provided treatment classrooms mobile, Mac laptop carts. A comparison of student responses to computer preferences can be found in Table 25.

Table 25: Computer Platform Preference.

Group	Control	Treatment
No disabilities	Mac = 0 PC = 4	Mac = 2 PC = 2
Disabilities	Mac = 0 PC = 4	Mac = 1 PC = 3

Interview Question 2

Question two asked, "How did you get so good at using the Internet?" Responses to this question yielded three basic themes: (a) either they indicated they were self-taught; (b) they learned from a teacher or a class at school; or (c) they learned from a family member, which included parents, siblings, and cousins. Exemplar quotes by theme are found in Table 26.

Table 26: Exemplar Quotes Representing Origin of Students Internet Proficiency.

Theme	Exemplar quote
Self	"I go to Google, and start looking for things, and find them somehow without anyone else."
Teacher/class	"Teachers taught me how to use the Internet, and my Language Arts class uses it a lot."
Family	"My mom Yahoos things, and she sends me to the computer to find stuff; plus my cousins."

Students indicate they taught themselves how to use the Internet over all of the other methods of learning with ten total references. Following closely, students identified family members or teachers as their source of Internet knowledge with eight total references for each. At least one participant from each group provided responses from each of the main themes with the exception of students without disabilities in the control group. Members of this group did not indicate they acquired their knowledge from a teacher. Aside from the noted exception, differences across groups were not apparent, and students across groups consistently identified their source of Internet skill through a family member or self. One difference surfaced indicating that slightly more students with disabilities (in treatment and control) identified teachers as their primary source of gaining skills on the Internet; whereas, only four students without disabilities indicated the same. A comparison of total responses across groups can be found in Table 27.

Table 27: Origin of Proficiency Themes Presented by Condition and Group.

	Control	Treatment
No disabilities	Self-3	Family-2
	Family-2	Teacher/class-1
	Teacher/class-0	Self-1
Disabilities	Teacher/class-4	Self-3
	Self-3	Teacher/class-3
	Family-2	Family-2

Interview Question 3

Question three asked students to report, which Web browsers they were best at using when surfing the Net. Three categories emerged, (a) Internet Explorer, (b) Firefox, and (c) Safari; however, only one major theme, as participants in the study reported being more proficient using Internet Explorer over other common Web browsers such as Firefox and Safari. Although a handful of students in the study reported an ability to use all three common browsers, when forced to determine which one they were best at using, all but one chose Internet Explorer. A single student in the treatment group expressed feeling more skilled using Safari, and one remaining student in the same group, reported being equally skilled using all three.

Interview data results were corroborated through one noteworthy example during the online activity. Within the treatment group, one young man with a disability demonstrated his proficiency using Firefox. During the qualitative data collection time period, the most updated version of Firefox had not yet been downloaded on the researcher's laptop, and the researcher was unaware of the new tab feature available on Firefox. After inquiring about the tab feature, the student right clicked and selected "open all tabs," and figured out how to open the page he was attempting to access with a new tab. This resulted in allowing him to open the home page of the Web site, Dog Island in the new tab, so that both the disclaimer link he had been currently viewing and the home page were visible together in the new tab. This student's skill level was particularly exceptional, as similar and/or such advanced strategies were not found in any of the other cases in this study. Group results can be found in Table 28.

Table 28: Web Browser Preference by Condition and Group.

Group	Control	Treatment
No disabilities	Internet Explorer= 4	Internet Explorer= 3
	Firefox= 0	Firefox= 0
	Safari= 0	Safari= 1
Disabilities	Internet Explorer= 4	Internet Explorer= 4
	Firefox= 0	Firefox= 1
	Safari= 0	Safari= 1

Interview Question 4

In an indirect way, question four solicited student opinion as to areas of online literacy that most needed to be taught in classrooms. Students were asked, “What do you think is the most important thing about reading on the Internet that most students don’t know”? Two basic themes indicating the most essential skills of online reading comprehension emerged as a result of data analysis: (a) determining reliability of a Web site, and (b) knowing search strategies. The remaining responses fell within one of two additional categories either (c) students had no answer the question, or (d) student responses were unclear. Exemplar quotes are presented in Table 29.

Table 29: Exemplar Quotes Representing Student Opinion as to the Most Important Skill for Students to Acquire when Reading on the Internet.

Theme	Exemplar quote
Reliability	"….to see who made the site first because it tells you if the site is reliable and is telling you good information or not."
Search strategies	"Look for specific things. If you have a question, just try to type the same question (in the search bar), but in a different way if it doesn't work. It takes a little while."
No answer	"I don't know,"
Unclear	"Um, about like the history and stuff…" And after probing, he added, "… um I mean the history about the Internet."

The most prevalent response (six responses) signified that students believed determining the reliability of a Web site was among the most important strategies that needed to be taught; furthermore, this skill was valued equally in the control group as well as in the treatment group (three responses in each group). Slightly less frequent than determining reliability (four total responses), respondents stressed the importance of students learning effective search strategies. While some students indicted the importance of search strategies and/or checking the reliability of online sources, the remaining six responses indicated that some students found this to be a more complex question to answer, and either provided no answer (three responses) or offered a response that was unclear (three responses). Table 30 displays a comparison of total responses across groups.

Table 30: Most Important Skill Themes Presented by Condition and Group.

Group	Control	Treatment
No disabilities	Reliability-1	Reliability-2
	No Answer-2	Search strategies-1
	Unclear-1	Unclear-1
Disabilities	Reliability-2	Search strategies-2
	Search strategies-1	Reliability-1
	Unclear-1	No answer-1

Interview Questions 5, 6, & 7

Responses to the final pre-task interview question and both of the post-task interview questions were embedded in subsequent sections on four of the five assessed domains of online reading comprehension. Data derived from student answers to these particular questions directly related and therefore were included with the other data that were coded and analyzed using deductive methods based on the four (of five) included domains; as two of the questions directly related to evaluating Web sites for reliability, and the remaining question focused on experienced difficulty while searching and locating information on the Internet.

Including these responses within the domains of online reading comprehension served the function of enhancing the reliability of the findings through triangulation of the data sources by examining the similarities and differences between students' verbal responses, their actual online actions, and their subsequent conclusions they generated during the online activity. As a result, the remainder of the qualitative data was analyzed and reported according to four of the five functions (or domains) of online reading comprehension: (a) locating information, (b) evaluating Web sites for reliability, (c) synthesizing information within and across Web sites, and (d) communicating information electronically. In addition, basic online skills emerged as an extraneous theme and included those skills that were relevant, but which fell outside the five functions of online reading comprehension.

Domains of Online Reading Comprehension

Qualitative results of basic skills plus the four assessed functions of online reading comprehension follow including: (a) basic skills, (b) searching, (c) evaluating, (d) synthesizing, and (e) communicating. Since students were provided questions in the directions for the online activity, they were not asked to perform any tasks related to the generating questions function of online reading comprehension. For that reason, this function was not included in the results.

Findings of the qualitative data analysis are presented based on the most prevalent themes that emerged either (a) based on the number of references cited in NVIVO, or (b) because significant actions or statements appeared in over fifty percent of respondents. Where appropriate, the number of NVIVO references are included, but should be interpreted cautiously, as the numbers are somewhat arbitrary. While they can help identify major themes and frequently used strategies in this sample of students, references include verbal statements, actions, and written responses. As multiple data sources serve to provide evidence of converging data, the differing units cannot necessarily be compared. In addition, due to the nature of the online activity, an emerging theme based on a strategy could include one or two students employing a particular strategy several times, or several students using a strategy only once. Additionally, thematic results are presented by condition (treatment and control) and by group (with and without disabilities).

Overall, the efficiency with which students completed Activity 1 and were able to complete at least the first two tasks of Activity two is interesting to note. With the forty minute time limit, only six of the 16 students in this study completed Activity 1 with enough time to at least start Activity two. While twice as many students in the treatment group (three with disabilities and one without) and twice as many students with disabilities (one in the control group and three in the treatment) completed part of Activity 2, the numbers are too low to compare groups. However, it is somewhat surprising that students with disabilities in the treatment group seemed to be most efficient in completing the online tasks at the same frequency as all three other groups combined. A summary of the number of students who completed through part two of Activity 2 is provided in Table 31.

Table 31: Comparison of Most Efficient Students as Measured by Those Who Completed a Portion of Activity 2 by Condition and Group.

	Control	Treatment
No disabilities	1 student	1 student
Disabilities	1 student	3 students

Basic Skills

Before the four assessed domains of online reading comprehension are reported, several common strategies emerged from the data that fell outside of the five domains on online reading comprehension. All of these online actions were categorized under basic skills and strategies, many of which were addressed and taught in Phase I of the intervention. Students across the four groups demonstrated competence in several basic skills, as all 16 participants were able to demonstrate competence in the following:

(1) use of a track pad,

(2) creating a new word processing file,

(3) typing entries in a word processing file,

(4) deleting text,

(5) naming a word processing file,

(6) saving a word processing file,

(7) opening new windows,

(8) opening new tabs,

(9) minimizing and maximizing windows,

(10) toggling back and forth between windows

(11) opening and quitting applications, and

(12) using the back button to return to a previous Web page

In addition to demonstrated competence by all participants in the basic skills above, a majority of the participants also displayed a few additional basic skills. For instance, when asked to change the location of a saved document from the "my documents" folder to the desktop, 13 of the 16 participants were able to do so using the "save as" feature without assistance. The remaining three participants required assistance (verbal directions) to complete the task. Furthermore, while not always using standard keyboarding skills, almost all of the participants typed with speed and accuracy relative to their age-levels; although as expected, some students were more proficient than others. Only in one case, a student in the control group without disabilities, appeared to struggle greatly with typing, and he further verbalized this observation when he stated, "I don't use that (referring to Microsoft Word)." When the researcher asked, "You don't use Microsoft Word,?" The student responded, "No, I don't like to type." In one other instance, a student with a disability in the treatment group requested a mouse before beginning the online activity, but quickly decided it was acceptable that one was not available and adequately navigated using the track pad.

In contrast, a handful of expected basic skills were lacking or observed infrequently by participants in this study. For example, when communicating their answers in a word document, many of the participants both with and without disabilities displayed difficulty with spelling at one time or another; however, less than one half utilized the spell and grammar check tools provided in Microsoft Word. Another astounding observation revealed that very few students chose to use copy and paste functions (four of the 16); however, of those who did, all four demonstrated a clear competency in doing so. Also interesting were two instances when students in the treatment group from the northeastern school attempted to click and drag information from a Web site to their word document, as a function in Mac computers; therefore, they had to be told that function did not work on a PC. These students required verbal assistance to copy and paste.

Searching

Due to the intricate nature of how students go about searching for and locating information on the Internet, this domain was by far the most arduous and complex area to code and analyze. Transcriptions containing online actions, verbal think-aloud data, and both verbal and written responses were initially coded using deductive methods into the four included domains. When coding of all 16 participant transcriptions was complete, the resulting NVIVO node for the search domain was massive; therefore, further inductive methods were needed to identify child nodes within the larger domain of searching. Supplementary, level two analysis revealed three major child nodes within the larger search node including: (a) general search strategies, (b) strategies for locating particular Web sites, and (c) locating specific information within a Web site. Due to size and the amount of data, node c was then further split into two sub categories based on the two specific Web sites students were asked to evaluate; Dog Island and World Wildlife

Fund. Each of the above child nodes were then analyzed, again using inductive methods, to identify emerging themes to provide a more in-depth description of the general search and locate strategies used by students within and across groups.

General Search Strategies. The online activity provided numerous opportunities for students to use general search strategies. Students were asked to locate two specific websites, Dog Island and The World Wildlife Fund in Activity 1. For those students who completed Activity 1, they were asked to find specific information on the Web such as a picture of a telephone and a video of an eagle flying. The online activity called for students to email their responses to activity questions; therefore, general search strategies may have also been employed to locate school website email accounts or Epals accounts. Within general search strategies, three major themes emerged: (a) student preference of the search engine, Google; (b) keyword or key phrase search strategies (c) all or partial URL's in the address bar; and (d) advanced search features. Table 32 provides a list of themes with exemplar quotes or actions.

Table 32: General Search Strategies Themes and Exemplar Quotes/Online Actions.

Theme	Exemplar quote
Google preference	"I like it (referring to Google) because I use it all the time, and I can pretty much find whatever I want on there."
Keyword/Key phrase Search	"dog island" "video of eagle flying"
URL in Address Bar	"www.google.com" "youtube.com"
Advanced search strategies	"The most important skill I needed to find the picture of the phone is to look for good picture in a place that has only pictures like Google images or Photobucket."

Students in the study showed a distinct preference for the search engine, Google. Even when presented with the default home page, MSN Live, almost all of the students changed search engines to Google either by typing www.google.com directly into the address bar, or by using a keyword search entering "Google" into the search bar of the MSN homepage. The only notable exceptions were three students in the control group. Two remained on the MSN search engine to begin their search; however, in both cases, when they failed to locate the required Web site, they ultimately changed search engines and used Google to locate the Dog Island Web site. Another exception arose when a student in the control group chose Yahoo stating, “because, um, that is my homepage (referring to Yahoo), and it’s … I could find pretty much what I want really easy on it; I’m used to it.” Again, however, this student ultimately changed to Google.com when after nine minutes of searching to locate specific information (who created Dog Island), he was unable to do so. A comparison of the results across groups is presented in Table 33.

Table 33: Comparison of Search Engine Preference Themes across Condition and Group (number of references in parentheses).

	Control	Treatment
No disabilities	Google (15) MSN (3)	Google (21)
Disabilities	Google (8) MSN (1) Yahoo (4)	Google (17)

After opening a search engine, the keyword (key phrase) search method emerged as the most common search strategy consistently across groups with more than 30 references. Students typed key phrases or key words into a search engine’s search bar. Specific keyword search terms included Dog Island, World Wildlife Fund, and Telephone were found in all four groups, but a few subtle differences were discovered which are referenced in Table 34. An interesting finding included at least one student in each group who entered a URL-like address in the search bar of a search engine, perhaps demonstrating a misunderstanding in the difference between an address bar and search bar. While this strategy did not inhibit successful search results, it is slightly more inefficient than simply typing the keywords.

As noted in Table 34, a few instances resulted in students adapting or refining their keywords for various reasons. In one instance, the word “telephone” was too broad of a keyword search used in Google, but was effective when used in Google Images. Another example presented itself when the Google Video was blocked by a district firewall resulting in the student changing the search term from “eagle” to “video of an eagle flying” in a general Google search. A sole keyword search failed to produce relevant search results: “creater of dog island.” The student did correct the spelling error after one failed attempt, but did a general Google search in an attempt to locate a question in activity one asking students to find out who created Dog Island. Slight differences also occurred in the phrasing of search terms, but did not necessarily effect their ability achieve productive search results. A summary of keyword search terms across groups is provided in Table 31.

Table 34: Keyword Search Terms by Condition and Group.

	Control	Treatment
No disabilities	Effective:	Effective:
	"Dog Island"	"dog island"
	"world wildlife fund.com"	"world wildlife fund"
	"World Wildlife Fund"	"Epals"
	"Braxton"	"Braxton Middle School"
	"telephone"	"telephone pictures"
	"video of an eagle"	"eagle video"
	"how to hunt"	
	Required Adapting:	Required Adapting:
	"eagle"	"dogisland.com"
		"dogisland"
		"telephone"
Disabilities	Effective:	Effective:
	"Dog Island"	"Dog Island"
	"dog island"	"dog island"
	"World Wildlife Fund"	"dog island: free forever"
	"google"	"World Wildlife Fund"
	"www.google.com"	"Google"
	"Braxton middle"	"Epals.com"
	"telephone"	"telephone"
	"video of eagle flying"	"eagle flying"
		"flying eagle"
		"how to hunt"
	Required Adapting:	Required Adapting:
	"creater of dog island"	
	"reason for this Web site,"	

After keyword search, typing a URL or partial URL in the address bar surfaced as the second most commonly used strategy among participants with 25 references. As discussed earlier, several students launched Google to conduct their search, and at least one example in each of the four groups included the student typing some form of Google.com in the address bar to access the search engine. Using this strategy proved effective allowing students to achieve their intended result of accessing the Google search engine. Generalizing this strategy to locating other, highly familiar Web sites such as Photobucket and Youtube also produced positive results. In contrast, attempts at generalizing the same strategy for more specific Web sites proved problematic and ineffective in locating a needed Web site. To illustrate, one student in the control group failed to access his school email by typing “www.braxtonmiddle.com” in the address bar not realizing the standard domain name for U.S. public schools as “.k12.(state abbreviation).us”. Although caution should be used in generalizing, for this sample of students, the treatment group did demonstrate fewer references of ineffective URL searches with zero while the control group cited four references. In addition, it is interesting to see that students with disabilities (18 references) in both groups used this strategy far more often than did their nondisabled peers (seven references). Table 35 presents the results across groups.

Table 35: Comparison of Effective and Ineffective URL Search Strategies across Condition and Group.

	Control		Treatment	
	Effective	Ineffective	Effective	Ineffective
No Disabilities	Google.com (4)	Braxton (1)	Google (2)	
Disabilities	Google (2) Google.com (1) yahoo.com (2)	www.braxtonmiddle.com (1) www.braxton.com (1) dogisland.com (1)	Google (6) Epals.com (2) Youtube.com (1) Photobucket (1)	

Taken collectively, data revealed 13 references of more sophisticated or advanced search strategies in three main themes: (a) use of specialized databases, (b) use of search assist features, and (c) use of internal search engines. To locate specific information such as a picture of a telephone or a video of an eagle flying, some students accessed specialized databases such as Google Images or YouTube rather than conducting a general search in a Google or Yahoo. In addition, three instances emerged of participants using the search assist feature that provides a dropdown menu with search term options of previously searched terms. While caution should be exercised in making assumptions from such a small number of students, it does appear that in this sample of students, occurrences of advanced search strategies appeared more frequently for students with disabilities (10 references) as opposed to just three references for students without disabilities. In addition, twice as many specialized databases were used in the treatment group, and the selection seemed to be more varied in this group as well. A comparison across groups for advanced search strategies is provided in Table 36.

Table 36: Comparison of Advanced Search Strategies across Condition and Group (number of references in parentheses).

	Control	Treatment
No disabilities	Specialized Databases (1)	Specialized Databases (2)
	-Google Images	-Google Images
		-YouTube
Disabilities	Specialized Databases (2)	Specialized Databases (4)
	-Google Images	-Google Images
	-Google Video	-Google Video
		-YouTube
		-Photobucket
	Search Assist Feature (1)	Search Assist Feature (2)
	Internal Search Engine (1)	

General search strategies for this sample of students revealed a preference for Google search engine, and predominance of the keyword search method. While results found other general search strategies to be less prevalent; nonetheless, they warrant mention, and therefore were also reported. Once search strategies were employed to elicit search results, students then needed to locate a relevant Web site in order to locate the information they were seeking. The next section reviews the strategies students used as they sifted through search results.

Locating a Relevant Web Site. As general search strategies emerged through analysis of the qualitative date, so did strategies unique to locating a particular website online. The two main tasks in Activity 1 required the students to locate specific Web sites; Dog Island and World Wildlife Fund. The directions further provided clues for students to determine whether or not they had found the correct site such as: a blue background, the words "Free Forever," and a black and white picture of a panda in the top left hand corner of the Web page. After completing Activity 1, six of the 16 participants had time to begin the second activity involving additional opportunities to search for relevant Web sites, but without being given parameters as to a specific Web site (see Appendix F).

After students made use of predominately keyword search methods of a search engine to elicit a results page of relevant hits, they then embarked on two main strategies for choosing a particular website: (a) skimming or reading link descriptions on the results page; or (b) arbitrarily choosing the first (or subsequent) hits. This section provides examples of the two main themes, and a summary of students' overall abilities to effectively and efficiently locate the specified Web page along with their ability to adapt search strategies when their initial attempts to locate a Web site failed. Table 37 displays the results of the two main themes that surfaced as significant strategies for locating a specific Web page.

While only the two above themes were included due to their numerous references across groups, or examples were present in more than fifty percent of the total participants, a few more unique strategies merited mention: (a) recognition of sponsored links; (b) accessing additional pages of search results; and (c) acknowledgement of previously viewed Web sites.

Three references occurred that indicated students recognized the sponsored links at the top of the results page, by their deliberate action to pass over the sponsored links and clicking immediately on the first non-sponsored link. This recognition was also verbally confirmed when one student stated, "I won't pick this one because they paid to do that." Even fewer occasions included students proceeding to more than one page of search results after scanning all the link descriptions of the first page and then proceeding to page two and/or three of the results. Finally, two participants used clues of previously viewed Web sites to aid in their search. One indicated he was choosing the highlighted link because, "I know it's on here; see; it's a different color (pointing to it with the cursor); someone else was already on it." Yet another student accessed the history feature in the address bar to find both the previously accessed 'Dog Island' Web site as well as the 'World Wildlife Fund' Web site.

While a few occurrences of unique strategies were cited, a majority of students used one or both of the two main strategies described above. After acquiring a list of search results on a particular search engine, many students demonstrated using (a) strategic methods for selecting relevant Web sites by reading or skimming the descriptions and looking for keywords or phrases that matched the directions for the task. Still others demonstrated less effective/efficient methods by (b) opening each link on the results page moving sequentially through the results or by randomly choosing a link without reading or reason. These students would then wait for the page to open to check for clues from the directions.

Because in many cases it was impossible to determine if a student was reading or skimming information in the description under the results links, researchers agreed to include references from the data in this category if: (a) a student read the information aloud; (b) a student moved the cursor along the words they were reading or skimming silently; or (c) they provided a clear and specific explanation for choosing a particular link that demonstrated they had read, or skimmed that specific information. For example, when trying to find the Dog Island Web site, two students with disabilities (one in the treatment and one in the control) declared that they chose the first link in the results page because, “it said free forever.” This response clearly indicated they were both cognizant and actively skimming for those clue words provided in the directions. Table 38 contains the results.

Table 37: Student Use of Strategies for Locating a Web Site by Condition and Group (number of references in parentheses).

	Control	Treatment
No disabilities	Skim/read links (4)	Skim/read links (5) "it says free forever"
	Random choice (11) "cause it was the first one." "just trying each one."	Random choice (5)
Disabilities	Skim/read links (7) "because it mentioned campaigners,"	Skim/read links (10)
	Random choice (4)	Random choice (2)

More often than not, students in the treatment group used deliberate strategies to locate a specific Web page by reading or skimming the link descriptions as opposed to randomly clicking a link and waiting for the page to open to check for relevancy. In contrast, an inverse relationship in the ratio of references was discovered in the data from control participants with a total of 11 references citing examples of students reading or skimming the results page before choosing a link, and 15 references of students arbitrarily choosing Web sites from the results page. In addition, far fewer occurrences of random choice were found in the treatment group (seven references), but more than twice as many were apparent in the control group (15 references). Interestingly, one should note the evidence of students with disabilities (17 references) in both conditions skimming the link descriptions much more frequently than their non-disabled peers (nine references).

For the most part, locating the required Web sites to complete activities one and two proved rather uncomplicated for a majority of participants. In fact, of the 22 total references of students arbitrarily choosing from the search results page, only one of those examples was attributed to difficulty locating the World Wildlife Fund Web page. These results likely occurred because at least the first three links of the results page, regardless of chosen search engine, were all links to the requested World Wildlife Fund Web site. One participant with a disability in the control group overlooked the first three appropriate links, and initially clicked on the link titled "World Wide Fund for Nature - Wikipedia, the free encyclopedia." His choice produced further confusion because the Web page did contain a picture of a Panda, as indicated in the directions, delaying the student's eventual realization that the site was the incorrect page to complete the task.

Like World Wildlife Fund, students choosing Google as their search engine also experienced little difficulty in locating Dog Island, as it was not only the first entry listed on the results page, but it also included the words "Free Forever" in the link title. Consequently many of the participants chose this link, identifying the words "free forever" as rationalization for choosing that particular link. However, those students who used MSN and Yahoo to search for Dog Island experienced more difficulty.

Consider an example of a young lady with a disability in the control group. She used a keyword search using MSN, and quickly chose the first link on the page titled "Dog Island.com" with "Rae Roeder Realty" listed just under the title in the description. When asked why she chose that particular one, she said, "Because it was the first one and it said Dog Island.com." The student then spent time looking over the page before the researcher reread the directions for the activity prompting her to reconsider her selection.

At this point, the student adapted her strategy, and returned to the results page, this time scrolling down the page appearing to skim the link descriptions. Confirmation of her new strategy was revealed when prompted by the researcher, and she responded "I am seeing if these sights could be the right one." She moved the cursor over a few links, and then hovers over "Island Dog Inc," and reads aloud, "What if you could end animal cruelty? (the description appearing under the link)." The researcher probes, "So you are looking underneath to read the descriptions?" and, the student responds, "Yes."

After accessing another incorrect Web site from the search results, and searching for approximately three minutes, the student grew frustrated and says, "I can't find it." The researcher then asks the student, if she can think of anything else she might do to find Dog Island, she types "Google.com" in the address bar, conducts another keyword search, and clicks on the first entry, this time with successful results. Once again, when prompted about her choice, she verbally confirmed her change in strategy to skimming the link description saying, "Because it (the link description) said free forever."

Although separated into two areas for reporting the results of such a large function of online reading comprehension, general search strategies and locating a relevant Web site taken collectively resulted in the ultimate ability for students to efficiently and effectively locate a Web site to complete the tasks contained in the activity. Therefore, Table 38 reports the number of attempts by task it took for students to successfully locate a needed Web site.

Table 38: Results of Success in Locating a Web site across Condition and Group (number of references in parentheses).

	Control	Treatment
No disabilities	Dog Island Web site	Dog Island Web site
	-Locate 1st attempt (2)	-Locate 1st attempt (2)
	-Locate 2nd attempt (1)	-Locate 2nd attempt (1)
	-Locate 3rd attempt (0)	-Locate 3rd attempt (1)
	-4 or more attempts (1)	-4 or more attempts (0)
	World Wildlife Fund	World Wildlife fund
	-Locate 1st attempt (4)	-Locate 1st attempt (4)
	-Locate 2nd attempt (0)	-Locate 2nd attempt (0)
	-Locate 3rd attempt (0)	-Locate 3rd attempt (0)
	-4 or more attempts (0)	-4 or more attempts (0)
	Other Web sites	Other Web Sites
	-Locate 1st attempt (2 refs)	-Locate 1st attempt (4)
	-Locate 2nd attempt (1 refs)	-Locate 2nd attempt (2)
	-Locate 3rd attempt (2)	-Locate 3rd attempt (1)
	-4 or more attempts (1)	-4 or more attempts (1)
Disabilities	Dog Island Web site	Dog Island Web site
	-Locate 1st attempt (2)	-Locate 1st attempt (3)
	-Locate 2nd attempt (1)	-Locate 2nd attempt (1)
	-Locate 3rd attempt (1)	-Locate 3rd attempt (0)
	-4 or more attempts (0)	-4 or more attempts (0)
	World Wildlife Fund	World Wildlife fund
	-Locate 1st attempt (3)	-Locate 1st attempt (3)
	-Locate 2nd attempt (0)	-Locate 2nd attempt (0)
	-Locate 3rd attempt (1)	-Locate 3rd attempt (1)
	-4 or more attempts (0)	-4 or more attempts (0)
	Other Web sites	Other Web Sites
	-Locate 1st attempt (2)	-Locate 1st attempt (4)
	-Locate 2nd attempt (2)	-Locate 2nd attempt (5)
	-Locate 3rd attempt (0)	-Locate 3rd attempt (0)
	-4 or more attempts (1)	-4or more attempts (0)

Very little difference was found in comparing the number of successful first attempts for locating a Web site across groups, and in comparing two or more attempts. Similar results were discovered whether comparing differences between treatment and control conditions as well as students with and without disabilities. Only three references were found of students requiring more than four attempts to locate a Web site. Two of the three references came from one student without disabilities in the control group.

This particular student first experienced trouble locating Dog Island. He began by using a keyword search in Yahoo, and then proceeded to use the ineffective strategy of arbitrarily choosing from the search results hits, the first three sequentially, and the remaining four arbitrarily. After seven attempts of clicking a link and waiting for the page to load, the researcher prompted the student to try a new strategy. The student then changed search engines choosing Google, and quickly chose the first entry without reading the link description; however, this time he accesses the correct Web page. Ironically though, he immediately returns to the results page failing to realize (or remember the criteria) he has located the correct page. As he clicks the second entry in the results, the researcher prompted him nonverbally by pointing to the directions, and the student pauses and then returns to the previous Web site realizing that it was the correct site. He later experienced difficulty locating his school's homepage by attempting to simply type his school's name as the URL in the address bar. Similarly a student with a disability in the control group also attempted to locate the school's Web site by using the ineffective dotcom method typing "www.braxton.com," and to complicate matters, he misspelled the school name as well.

While each of the first two categories of Table 38 (Dog Island and World Wildlife Fund) are easily comparable due to the equal number of students across groups per task, the third category (Other) makes it more difficult to compare. The Other category reports the number of attempts before successfully locating Web sites needed to complete tasks in activity one, such as locating a school home page or Epals to access email. In addition, this category included the number of attempts to locate Web pages with specific information for those six students who progressed on to the second activity. Therefore, caution should be exercised in comparing across groups, as each group had unequal numbers of total attempts.

Close examination of specific tasks revealed some generalities. For instance all of the students were successful in locating a picture of a telephone, and all but two accomplished this by accessing Google Images, a specialized search engine. For those not using a specialized search engine, a typical progression of search steps is provided in the following example. One student attempted to locate a picture of a telephone using a general keyword search "telephone" in the Google search engine. Her choice of keywords was too broad to provide her efficient access to images of a telephone; therefore, after reading through descriptions of the first three hits on the results page, she revised her keyword search using the terms "telephone pictures." Subsequently, she was able to quickly locate a picture of a telephone.

Locating a video of an eagle flying proved somewhat more challenging for students due to district firewalls, yet five of the six students were still able to accomplish the task. While students in one school were successful in using specialized databases, Photobucket and Google Video, the district firewalls in another school prevented other students from accessing YouTube. Although students were able to access Google Video to successfully conduct a keyword search of an eagle flying, the results page generated a list that included some YouTube links, which were inevitably blocked requiring more careful consideration of the URLs before choosing an appropriate link. An emblematic example is apparent when one student's efforts to conduct a search using Google Video was thwarted by the district firewall, he simply returned to the Google search engine and adapted his keyword/phrase search to "video of eagle flying." He was then able to identify a Web site on the results page that contained a video of an eagle flying.

As the previous section provided the results of general search strategies used by students in the sample, this section further described search strategies used once the a search results page was accessed through a search engine. After an appropriate Web site was acquired, the next step was for students to locate specific information within that Web site. The next section explores ways students embarked on that task.

Locating Information within a Web site. For a majority of students in the sample, locating specific information within a Web site seemed to be a more cumbersome task. Dog Island is a hoax Web site that students were asked to locate in the first activity. Once located, students then sought specific information within the site regarding who created the Web site and why they created the site. Likewise, students were also instructed during activity one to locate information as to why a second Web site focusing on environmental conservation was created, and also to locate information within the Web site that teaches how to hunt. This section focuses on how students went about locating information within these two Websites.

Analysis of the data revealed six major themes indicating the strategies used for locating information within a Web site. Emerging themes included: (a) scanning the layout of the homepage; (b) seeking copyright information; (c) accessing relevant tabs or links; (d) skimming text for information; (e) reading text for information; and (f) using the internal search engine. A summary of themes with exemplar quotes/online actions are provided in Table 39.

Table 39: Locating Information within a Web site: Emerging Themes and Exemplar Quotes/Online Actions.

Theme	Exemplar Quote/Online Action
Scanning homepage	Student moves cursor across tabs at the top of the World Wildlife Fund Web site, and then uses the scroll bar to scroll to the bottom of the homepage and then back to the top.
Seeking copyright information	"It (referring to the creators name) should be right here (points to the copyright date and disclaimer statement at the bottom of the home page of Dog Island"
Accessing relevant tabs	Clicks on the "Company Information" link of Dog Island saying, "seems like this would have who created it."
Skimming text	Moving the cursor quickly over the text
Reading text	Reading aloud or verbalizing a summary of text
Internal search engines	Types "how to hunt" as a keyword search in the internal search engine of the World Wildlife Fund web page.

Like conventional text reading strategies, students used scanning, skimming, and reading methods to locate information. However, unlike conventional reading, the students in the sample used additional strategies unique to online reading including accessing relevant tabs or links, examining copyright information and using internal search engines to locate information.

Numerous references (23) of students scanning the homepages were recorded when students used the scroll bar to scan the entire page, and examined the layout, the tabs and the links on both the Dog Island and World Wildlife Fund pages. In addition to scanning the Web site, all students across groups also employed skimming strategies (20 references) most often on the homepage, but several participants also skimmed information on the tabs or links they chose to access. References of skimming were coded in the data when students moved the cursor quickly across the text, or scrolled slowly down a page containing text. Reading was more difficult to detect from the data; however 17 references were noted in cases when students either read aloud or moved the cursor slowly across text and then were able to summarize what they read.

Examining the most common themes for locating information within a Web page unique to online reading revealed that accessing relevant tabs to locate information was the most prevalent strategy used. In fact, 48 references were recorded of students accessing links or tabs relevant to the information they were attempting to locate. In contrast, 23 separate references were noted of students accessing tabs or links that were irrelevant to the task. Far fewer occurrences were found of students particularly seeking out the copyright information on the homepage. Although more often an indicator of students checking the reliability of a Web site, one of the assigned tasks asked students to locate the creator of the Web site, which might warrant such action. Copyright references were documented if a student provided verbal confirmation they were seeking copyright information, or if they moved their cursor specifically across that information. Finally, four instances were found of students using internal search engines in attempt to locate specific information within a Web site. A summary of references across groups for each strategy can be found in Table 40.

Table 40: Results for Locating Information within a Web Site by Theme (number of references in parentheses).

	Control	Treatment
No disabilities	Scan homepage (9)	Scan homepage (8)
	Seek copyright (1)	Seek copyright (3)
	Skimming text (3)	Skimming text (5)
	Reading text (2)	Reading text (7)
	Internal search engines (1)	Internal search engines (0)
Disabilities	Scan homepage (5)	Scan homepage (9)
	Seek copyright (2)	Seek copyright (2)
	Skimming text (4)	Skimming text (8)
	Reading text (2)	Reading text (6)
	Internal search engines (2)	Internal search engines (1)

Scanning the homepage proved to be a rather universal strategy evident across groups and with very little difference in the number of references in each respective group. Skimming strategies were most apparent on the homepages of both Web sites; however, several participants skimmed information on the tabs or links they chose to access and search for specific information. For example students clicked on the "Company Information" link of Dog Island, and the "What We Do" tab of World Wildlife Fund in order to skim text to find answers to the questions they sought. While the number of references in this sample of students was similar across groups, students with disabilities in the treatment group showed more evidence of skimming with eight references, which was more than both control groups combined.

Skimming and reading were strategies usually used in conjunction with one another. A prime example was from a student who accessed the FAQ tab on the Dog Island Web site. He then skimmed through the questions in this section that did not interest him, and slowed to read more carefully, those specific questions that caught his eye like one asking for advice about a dog that is picked on by neighborhood raccoons, and another asking if a fat dog could make it on the island. This student was particularly amused by these sections warranting his attention, and commented on the content being rather "weird" as he put it.

Reading strategies on the World Wildlife Fund site proved more troublesome for students who read aloud, due to more complicated vocabulary and a higher lexile of the text on the Web site. In fact, one student demonstrated her difficulty with the vocabulary by reading aloud and asking for assistance with seven challenging words within one paragraph. Overall, the occurrences of actual reading and skimming were more frequent among students in the treatment group with 13 references compared to just four references in the control group. Again, it was very clear that students were reading text when they read aloud, which occurred for about half of the references, but judgments had to be made when students were reading silently by the criteria outlined previously. When interpreting these results, it is important to remember that students use very different strategies to locate information, and students in the treatment group may have accumulated higher incidences of skimming and reading because they explored more links within a Web site to find answers. In fact this phenomenon is true with the treatment group exploring a total of 38 links or tabs, while the control group explored 27 total links or tabs. Results of this phenomenon are covered in the following section.

It was also interesting to note the similarities and differences in the choices students made pertaining to the tabs and links students accessed deeming those particular tabs as helpful to answer the task questions. Student choice of tabs on the Dog Island Web site was particularly intriguing, as in general the more relevant tabs and links tended to be ignored. Although links such as "Contact Us" or "Company Information" may have logically been the most relevant links to answer who created Dog Island and why, they were located in a more obscure location at the top of the Web site and did not stand out as obviously as the other tabs; therefore, those links were chosen rather infrequently. Instead, the most frequent choice for students was "FAQ" with 10 references, followed by "Press" with six total references.

In contrast the layout, overall tone, and clearly defined tab titles seemed more conducive to student success in locating information pertaining to why the Web site was created. In fact, all of the students in the study went to either the “Who We Are” tab or the “What We Do” tab to answer that particular question. Only a very few students explored additional links including the “Experts” link, and the “Places” link. Rather than finding specific information on the site that stated why the World Wildlife Fund Web site was created, a vast majority of students across groups simply inferred why the Web site was created after only a few minutes of searching. Exceptions existed in only four cases where students actually located a specific statement on the What We Do page, and then they paraphrased that statement, copied it word for word toggling back and forth, or they copy and pasted specific information into their word document.

Overall, students in the treatment group cited many more occurrences of accessing relevant tabs or links (26 references) as opposed to 16 references in the control group. The ratio of relevant to irrelevant tabs for treatment was also greater with 26:12; while the control group’s ratio was 16:11. Table 41 provides a summary of the various tabs and numbers of students who accessed each tab or link by group.

Table 41: Results for Accessing Relevant and Irrelevant Tabs/Links across Groups (number of references in parentheses).

	Control		Treatment	
No Disabilities	Relevant tabs (8 references)		Relevant tabs (12 references)	
	Dog Island	WWFund	Dog Island	WWFund
	-FAQ's (2) -Company Information (1)	-Who We Are (1) -What We Do (4)	-Visit (1) -FAQ (3) -Company Information (1)	-Who We Are (2) -What We do (3) -President More Info (1) -Experts (1)
	Irrelevant tabs (7 references)		Irrelevant tabs (7 references)	
	Dog Island	WWFund	Dog Island	WWFund
	-Photos (1) -Facilities (2) -Around the Island on a Boat (1) -Press (1)	-Climate (1) -Species (1)	-Product (1) -Rates (1) -Press (1)	-Places (1) -Climate (1) -Why act now (1) -Protect the future of nature (1)
Disabilities	Relevant tabs (8 references)		Relevant tabs (14 references)	
	Dog Island	WWFund	Dog Island	WWFund
	-FAQ (3)	-Who We Are (2) -What WE Do (3)	-Contact us (1) -Visit (1) -Send Your Dog (1) -Disclaimer (1) -FAQ (2)	-Who We Are (3) -What We do (4) -Experts (1)
	Irrelevant tabs (4 references)		Irrelevant tabs (5 references)	
	Dog Island	WWFund	Dog Island	WWFund
	-Daily discoveries (1) -Facilities (1) -Press (2)		-Help with dogs (1) -Facilities (1) -Press(2)	-Tiger photo (1)

Although not evident enough in the data to identify it as a theme, some students in the sample chose to use the internal search engine to attempt to locate two different things; the creator of the Dog Island Web site and Information teaching them how to hunt on the World Wildlife Fund. Although using internal search engines would generally signify an effective strategy, it was not necessarily effective or efficient, in part because the keywords students chose were flawed or required adjusting which students failed to do. For example, one student typed “reason for this Web site,” which was not specific enough particularly because he failed to click the option to search within the Dog Island Web site, resulting in a general Google search. Use of the internal search engine was used similarly on the Wildlife Fund Web site in an attempt to locate information on how to hunt; therefore, a student used a keyword search, “how to hunt.” After scanning the first page of the results of the internal search, he concluded that the information was not available on that particular site concluding, “Because they are trying to save the animals, not kill them.”

When asked to find information on the World Wildlife Fund Web site that would teach them how to hunt, rather than actually searching for this information; again nearly all of the students across groups quickly inferred that they would not find such information on this site because the intention of the site is to conserve wildlife, rather than kill it. Only four students chose to seek the information before making an inference. One student in the treatment group explored additional tabs on the page in an attempt to find information on hunting, and one student in the control group used similar methods, but concluded the no information about hunting was available on the site because, “there isn't a hunting tab on this page." More thorough coverage of student responses and inferences is covered in the synthesize section of analysis.

Four major themes emerged for students attempting to locate specific information within a Web site. These themes included: (a) scanning the layout of the homepage; (b) skimming text for information; (c) reading text for information; and (d) accessing relevant tabs or links. Although not numerous enough to condone identifying, two additional strategies emerged including (e) seeking copyright information, and (f) using the internal search engine. Once a Web site was located, students' next duty was to evaluate the reliability of that Web site.

Evaluate

In order to examine the strategies students use to evaluate the reliability of Web sites, four separate data sources were analyzed and triangulated: (a) interview data, (b) verbal protocol data, (c) online actions, and (d) student products. During the pre-activity interview, student definitions of reliable Web sites were recorded and analyzed. Subsequently, during the online activity, video recordings of online actions, audio recordings of think-alouds, and student products (word documents containing responses to the activity questions) were analyzed regarding student evaluation of the reliability of two Web sites, Dog Island and the World Wildlife Fund. Post-activity interview data was then analyzed pertaining to advice offered by students on how best to determine the reliability of Web sites. This section therefore first identifies the major themes that emerged from the two interview questions providing a definition and offering advice on the reliability of Web sites. It further examines student evaluation of the two given Web sites and their assessment of which was most reliable. Finally, overall major themes are presented for strategies used to determine if a Web site is reliable across all data sources including online actions, think-aloud data, and written responses found in student artifacts.

Based on previously discussed criteria for identifying major themes, two major themes emerged through student definitions of what constitutes a reliable Web site. The first and most prevalent theme was (a) trustworthiness followed closely by (b) truthfulness. Although not major themes, student responses also included: (c) the ability to conduct research, (d) accuracy, and (e) free of cost.

Table 42: Emerging Themes for Student Definitions of Reliable Web sites.

Theme	Exemplar quote/online action
Trustworthiness	"Trusted pieces of information; you can trust it to find answers."
Truthfulness	"Something you really believe is true…A dictionary is reliable; the information is true"
Ability to conduct research	"It means like a Web site is good to do research on."
Accuracy	(a website is reliable) "when your resource is 95% accurate, you can trust getting answers quickly and precisely."
Free of cost	"a site that doesn't try to sell you something."

All eight students without disabilities in both the control and treatment groups exclusively identified a reliable Web site as either one you can trust or one that contains true information. In addition, all eight students in the treatment group expressed that a reliable Web site is one you can trust. Some students verbalized more than one indicator of a reliable Web site like in the case of a participant who cited trustworthiness and accurate information stating, “A site that you can trust and gives you the right information.” Exemplar quotes by theme are available in Table 42.

Based on the criteria to determine themes, no clear themes emerged regarding advice to other students about determining the reliability of a Web site. Responses to this question were so varied, and evidently not enough student data was available to reach saturation. Had the responses been collapsed into broader themes, the richness and uniqueness of the responses would have been lost; therefore, varied categories of responses are provided in Table 43. A few responses were found by students in more than one group such as (a) verifying information with other Web sites; (b) verifying or contacting authors; and (c) if answers to questions could be found on the Web site. See Table 43 for a complete listing of response categories by group.

Table 43: Emerging Themes from Responses Pertaining to the Reliability of Web Sites (number of references in parentheses).

	Control		Treatment	
	Without disabilities	With disabilities	Without disabilities	With disabilities
What is a reliable Web site?	True (2) Trust (2)	Can do research on (2) Trust (1) Trust to find answers (1)	True (2) Trust (4)	Trust (4) Accurate (1) Free (2)
What would you tell other students is the best way to check if a Web site reliable?	Depends on prior knowledge and/or familiarization with Web site (2) Look at Web site for a long time (1) Doesn't try to sell something (1) Can be verified with other Web sites (1) Backs up with good evidence (1)	Ask others (1) Active hotlinks (1) Reading the Web site (1) Answers to questions on the Web site (1) No answer (2)	If offer refunds (1) Gives enough information (2) Answers to questions on the Web site (1)	Looks official (1) Verify authors/provides contact us or about us info (2) Can be verified with other Web sites (1)

Students were asked to rate each Web site based on whether or not they believed it to be very reliable, somewhat reliable, or not at all reliable, and then to provide reasons to support their evaluations. Dog Island was a spoof Web site; however, the layout of the home page contains various links, tabs, pictures, text, and an internal search engine that, at a glance, may make it appear authentic to students (see Appendix I). Nevertheless, simply scanning or skimming some of the links and/or information on the homepage should raise questions as to the site's authenticity. Further exploration of various links and tabs reveal the satire in both subtle and very obvious ways. Results for evaluating Dog Island for reliability for each group can be found in Table 44.

Table 44: Reliability of Dog Island Responses by Condition and Group (number of references in parentheses)(+ = reasons supporting reliability; - = reasons supporting unreliability).

	Control	Treatment
No Disabilities	Very (3) -"because it does not try to sell you something all it does is provide you with facts." - Because its the home page and it was (at the) top of the list when (I) searched for it" - "it's saying over 2,000 dogs	Very (0)

	needing a good home”	
	Somewhat + (1) -“they were telling about the island”	Somewhat + (1) -“I found email addresses on the website to make me think that (it was reliable)” Somewhat - (3) -“Because you don’t have contact information” -“because I think and it sounds a little fake” -“because the pictures look real but the information sounds untruthful”
	Not at all (0)	Not at all (0)
Disabilities	Very (0) Somewhat + (1) -“Because they should (showed) a little thing about dog island”	Very (0) Somewhat + (1) -“Because it asks me if I would like to send my dog to them and

		it also has a copyright date”
	Somewhat - (3) -“It didn’t have that much information in it” -“I think it might be fake but somewhat real.” -“It wouldn’t show me a webpage of my questions”	Somewhat - (0)
		Not at all (3) -“because it has a lot of bias in it like free forever, and not only the words show the bias the pictures show it to (too)” -“The disclaimer says everything” -“Because when you start looking around it tells you the website is a fake”

Only three (all from control group without disabilities) determined that Dog Island was a very reliable Web site. An additional three (all from treatment group without disabilities) asserted that the Web site was not at all reliable. The remaining ten students found the site to be somewhat reliable; however, closer inspection revealed that students who deemed the site somewhat reliable fell into two basic groups: (a) those who provided reasons to support the reliability, and (b) those who were suspicious and supplied reasons questioning the reliability. Of those choosing somewhat reliable, six respondents provided reasons that indicated unreliability, while the remaining four seemed to present answers that supported the reliability of Dog Island.

From these findings, it is fascinating to see that students with disabilities in both treatment and control groups (six of the eight) tended to question the reliability of the website more often than those without disabilities (three of eight). It is also encouraging to see that six of the students in the treatment group raised suspicions as to the reliability of Dog Island, whereas only three students in the control group did so. In this case, the results may support the quantitative findings that students in the treatment group may have benefited from IRT particularly in strategies to determine the reliability of Web sites while those in the control group may not have been exposed to the skills necessary to evaluate Web sites as effectively.

The second Web site that students were asked to evaluate is published by the World Wildlife Fund, which is an international fundraising organization that collaborates with various conservation groups dedicated to environmental conservation. While this Web site does provide factual information, and is published by a reputable organization, the primary purpose is to raise money for nature conservation, so they also depict clear bias towards their cause, which can affect the reliability. See Table 45 for a summary of the results.

Table 45: Reliability of World Wildlife Fund Responses across Groups (number of references in parentheses).

	Control	Treatment
No Disabilities	Very (1) - "because it gives good descriptions and backs up their statements with good evidence" - "Cause it was up top of my search"	Very (2) - "I found addresses and phone numbers" - "Because they help with the environment and I have heard of there (their) work" - because I (it) has contact (information) it (if) you need any information"
	Somewhat + (2) -"Because its (it's) about animals - "because it says that they are people who protects the nature"	Somewhat + (0)

	<u>Somewhat - (1)</u> -"but I don't think its all ture (true)"	<u>Somewhat - (1)</u> -"because it douse (does) not look like it has enough information"
	<u>Not at all (0)</u>	<u>Not at all (0)</u>
Disabilities	<u>Very (2)</u> -"It answered all my questions" -"because…it makes people be happy to see them (the animals)"	<u>Very (1)</u> - "because it gives me how to call them and how they do what they do and it also has its own copyright date."
	<u>Somewhat + (1)</u> -"because thy (they) help u (you) about animal"	<u>Somewhat + (3)</u> -"because it was just updated this year and it has facts to back its work up" -"Because it doesn't have a disclaimer so its not trying to fool anyone" -"because it shows info that if

		you go to another website, it will show the same thing"
	Somewhat – (1) -"It (has) some information but not the information I was looking for"	Somewhat - (1) -"But the information isn't really clear."
	Not at all (0)	Not at all (0)

Similar to results of evaluation of Dog Island, a majority of students (10) perceived the World Wildlife Fund Web site as somewhat reliable, and the remaining six believed it to be very reliable. For those who chose somewhat reliable, the reasoning indicated that students were either substantiating the reliability, or they were questioning the reliability. Two students did provide one example to support the reliability and one example to question the reliability in their answers. Comparisons across groups revealed that students in both control and treatment groups with and without disabilities were similar in their evaluations of the World Wildlife Fund Web site. A summary of the findings are presented in Table 46.

Ironically none of the participants reported bias as a reason for stating the Web site was only somewhat reliable; however, fifteen of the sixteen participants inferred that bias existed in the Web site in their answers to another question in the activity. A follow up question requested that students locate information on the World Wildlife Fund Web site that teaches them how to hunt. All most all of the students inferred that they were unable to find information on how to hunt on this Web site because it would be counterintuitive to the purpose of the Web site to conserve nature signifying they were cognizant of the bias. A sole participant in the control group failed to acknowledge the bias and deduced that the information simply was not present on the Web page because, "It don't tell me how to hunt because if it did, I would think it would be somewhere where I could just click on it."

One final post-activity interview question asked students to conclude which Web site they felt was the more reliable of the two, Dog Island or the World Wildlife Fund. Students unanimously reported The World Wildlife Fund Web site as the more reliable of the two citing various reasons that fell within one of the following categories: (a) amount or quality of information/facts differences in the two Web sites, (b) a malevolent or benevolent purpose in one of the two Web sites, (c) the inclusion or omission of author or creator information on the Web sites, (d) the Web site attempts or does not attempt to sell something, and (e) contained the answers to the questions for the activity on the Web site. A summary of responses can be found in 46.

From the pre-activity interview questions, through the actual activity, and the post activity interview questions, seven major themes emerged as to the strategies students use to evaluate Web sites for reliability: (a) look at the amount and quality of information, facts, and evidence provided on a Web site; (b) check that copyright information is provided on the page and is up to date; (c) see if author information and/or contact information for the authors are provided on the Web site; (d) determine if the information on the page seems believable/true or unbelievable/fake; (e) identify the purpose of the Web site as altruistic or benevolent or malevolent; (f) is the Web site trying to sell something; and (g) does the site contain answers to the questions you are seeking. While these themes were most prevalent other strategies were identified, but not numerous enough to constitute a theme. These strategies included: (h) verifying the information with information on other Web sites; (i) comparing information with prior knowledge on the subject and/or familiarization with the Web site; (j) check that hotlinks are active; (k) ask others for help. A summary of theme references by group is provided in Table 46.

Table 46: Emerging themes for the function of evaluate for control and treatments students (number of references in parentheses).

	Control		Treatment	
	Without disabilities	With disabilities	Without disabilities	With disabilities
Which Web site is the most reliable and why?	WWF (4) -gives more facts (2) -doesn't try to sell something (1) -people may steal your dog (1)	WWF (4) -more useful information (2) -answers were found (1) -dog island did not have answers (1) -shows more people giving to a good cause (1)	WWF (4) - provides author information (1) -doesn't trying to sell something (1) -good for animals (1) -has pictures and a lot of information (1)	WWF (4) -didn't have a disclaimer (1) -provides author information (2) -looks trustworthy (1) -more useful information (1) -includes links to search engines (1)
Evaluate a Web site for reliability: overall themes/strategies	Effective Strategies (12) -Info/Evidence/facts (5) -Copyright (1) -Author info (0) -Believable info (3) -Sells something (3)	Effective Strategies (8) -Info/Evidence/facts (5) -Copyright (2) -Author info (0) -Believable info (1) -Sells something (0)	Effective Strategies (17) -Info/Evidence/facts (3) -Copyright (3) -Author info (5) -Believable info (4) -Sells something (2)	Effective Strategies (23) -Info/Evidence/facts (5) -Copyright (9) -Author info (4) -Believable info (3) -Sells something (2)
	Ineffective Strategies (3) -benevolent purpose (3) -contains answers to questions (0)	Ineffective Strategies (8) -benevolent purpose (2) -contains answers to questions (6)	Ineffective Strategies (3) -benevolent purpose (2) -contains answers to questions (1)	Ineffective Strategies (1) -benevolent purpose (1) -contains answers to questions (0)

While students across all groups used effective strategies for determining the reliability of Web sites more frequently than they used ineffective strategies, the results also revealed that students in the treatment group did seem to apply more effective strategies for evaluating the reliability of Web sites compared with the control group. In fact, the ratio of effective to ineffective strategy use for students in the treatment group was 40:4; whereas, the same ration was 20:11 for the control group. In addition, students with disabilities in the treatment group performed best in on this function of online reading comprehension demonstrating 23 effective strategies and only one ineffective strategy.

Synthesize

As part of the first online activity, students had the opportunity to synthesize information in response to three separate questions: (a) Why was the Web site Dog Island created?; (b) Why was the Web site World Wildlife Fund created?; and (c) Why was information teaching them how to hunt difficult to find on the World Wildlife Web site?. With few exceptions, answers to all three questions were generally inferred by students after browsing the Web sites indicating that they were attempting to synthesize the information found rather than locating specific information and copying. Therefore two main themes for synthesizing strategies emerged: (a) making an inference after browsing the Web site in general, and (b) locating specific information and copying or summarizing. Table 47 presents themes with exemplar quotes for each question.

Table 47: Themes and Exemplar Quotes for Synthesis.

Question	Theme	Exemplar quote/online action
Why was Dog Island Created?	Inference after browsing site in general	"They wanted to give dogs a place that they can go to be free"
	Finding specific information on Web site and copying/summarizing	"This site was made in jest, for fun, for love of dogs and for love of life." (copied and pasted) "It said so right in the disclaimer; it was to have fun." (summarized)
Why was World Wildlife Fund Created?	Inference after browsing site in general	"to protect endangered species and conserve nature"
	Finding specific information on Web site and copying/summarizing	"so that humans and nature can live in harmony,"
Why was information on hunting difficult to find?	Inference after browsing site in general	"They are not going to tell people how to hunt on here (referring to the Web site) because they want to save wildlife"

For Dog Island, only one student located the actual reason for its creation contained on the Web page; the remaining 15 participants inferred the motives of the creator after browsing the Web site. The student who discovered the disclaimer link copied and pasted the reason the Web site was created into his answers; "This site was made in jest, for fun for love of dogs and for love of life." However, he then synthesized his own answer adding, "It said so right in the disclaimer; it was to have fun."

Examining the content of the responses yielded a predominant theme that emerged reflected an overall student belief that the Web site was created for altruistic reasons. In fact, 13 of the 16 student participants cited such a belief by providing reasoning such as, "they wanted to help dogs," or, "so dogs can be free." Only two student inferences alluded to skepticism as to why the Web site was created. These students thought the Web site was created because the authors were bored, or to make money saying, "it seems like they created the Web site so that you would send your dogs to them and they can make money off of your dogs." Table 48 provides emerging themes based on the content of responses to the first question.

After examining the World Wildlife Fund Web site, students were again asked why the Web site was created. In this case, only two of the 16 students actually located a statement that they believed reflected the reason for creating the website; one copied and pasted that statement, and the other toggled back and forth between screens to copy the exact phrasing. One additional student located a specific statement in text under the What We Do tab, but she then chose to paraphrase her answer. Three students located the same statement under the What We Do tab of the Web site. After identifying this statement, "From the Amazon to the Arctic, WWF is building a future where human needs are met in harmony with nature," one of the students with disabilities copied and pasted the statement into his answers, one paraphrased his answer stating, "so that humans and nature can live in harmony," and the final student toggled back and forth between the two windows to type the statement more exactly from the site, "they are building a future where human needs are met in harmony with nature." All of the remaining 13 students synthesized their answers after examining the Web site.

Like inferences generated for the purpose of Dog Island, the main emerging theme for the creation of the World Wildlife Fund was also altruistic reasons. In fact, all 16 participants asserted such reasons, but more specifically three key themes emerged including: (a) to conserve nature, (b) to promote their cause, and (c) and to provide information.

While overall responses were similar reflecting the intention of the World Wildlife Fund to conserve and protect nature and wildlife, a few students came to slightly different conclusions. For example, three students in the control group identified that primary reason for the Web site was to provide information to others. For example, one student stated that the Web site was created to, “explain to people about how to treat animals,” and yet another student expressed, “I think they made the site to teach people about animals and to help family and friends to meet animals. One response stood out from the others and indicated the student recognized that the authors of the Web site did have an agenda for promoting their cause. This student without disabilities in the treatment group specifically expressed, “They created the site to share information about their cause.” See Table 48 for results of themes across groups.

Similarities among responses and across groups may be more prevalent for this particular question in the activity perhaps because the World Wildlife Fund’s Web page clearly stated the mission and purpose of the group throughout the Web site; whereas, the purpose of Dog Island was more elusive to students. Drawing conclusions about the purpose of the Dog Island Web site required students to first identify the Web site as a spoof and then use more complex critical thinking skills to make inferences as to why the authors may have created such a site; unless of course, they located the disclaimer and read the explanation directly, which only one student actually did.

The third question asked students to locate information on the World Wildlife Fund teaching them how to hunt. A follow up question then asked students if they were unable to find this information, to explain why information about hunting may be difficult to find on this Web site. As described earlier in the reliability section, all but two of the students in the sample rather easily concluded that the World Wildlife Fund would not provide such information because their intent was to protect animals rather than hunt and kill them. One student expressed this rather articulately saying, “I can’t find it because they are trying to conserve nature not kill it.” Two students in the control group (one with a disability and one without) demonstrated difficulty synthesizing why information about hunting may have been hard to find on this site. Instead, these two students simply stated after searching within the site, that the information was simply not there, saying, “It don’t tell me how to hunt because if it did I would think it would be somewhere where I could just click on it.” Further the other student added, “because it doesn’t have a tab for it (referring to hunting).” These two examples not only indicate that the student failed to identify that the Web site may be biased resulting in purposeful omission of certain information, but also failed to consider that their search strategies may be flawed. Table 48 provides a summary of Emerging themes of the content of responses to the three synthesizing questions.

Results from this sample of students revealed the most prevalent synthesizing strategy used by most students was to create a general inference after browsing the Web site. The second most prevalent strategy utilized was locating specific information and copying or summarizing such a statement. Relatively no differences were found across groups for synthesizing.

Table 48: Results by Themes for the Synthesize Function across Condition and Group (number of references in parentheses).

	Control		Treatment	
	Without disabilities	With disabilities	Without disabilities	With disabilities
Why was the Web site Dog Island created?	To help dogs (3) Boredom (1)	So dogs can be free (3) Daycare for dogs (1)	To help dogs (3) Make money (1)	Author's amusement (1) So dogs can be free (1) Treat dogs with behavior problems(1) Daycare for dogs (1)
Why was the Web site WWF created?	Nature conservation (2) Provide information about animals (2)	Provide information about animals (2) Protect endangered species (1) To promote helping animals (1)	Nature conservation (3) To share information about their cause (1) Balance between humans and nature (1)	Nature conservation (2) Balance between humans and nature (2)
Why was information for hunting difficult to find on the WWF Web site?	Purpose to help, not hurt animals (3) Not included on site (1)	Purpose to help, not hurt animals (3) Not included on site (1)	Purpose to help, not hurt animals (3) Because it is a public Web site (1)	Purpose to help, not hurt animals (4)

Communicate

In the Communication domain of Online Reading Comprehension, two main areas materialized as the focal points for further examination within the online activity: (a) word document creation, and (b) email usage. Students differed in varying degrees in the formatting and written mechanics of their Microsoft Word documents. Also interesting were how students addressed their challenges in mechanics; predominately in the area of spelling. In examining the email usage of students in this sample, focus was placed on students ability to (a) access a student email account, (b) use common email features such as “compose”, “new,” “attach” “To,” and “Re.” Then standard “netiquette” for email messages was examined such as (a) considering audience, and (b) organized, clear, and concise messages.

Due to the directions and formatting of the online activity, it was assumed that students would format their Word documents in a similar format as the directions called for in an attempt to make their responses organized and clear to the reader; however, it was interesting to note that students in the control group were more conscientious of formatting their word documents to reflect attention to the directions given for the activity. Five of the eight control students and three of the four with disabilities used an outline format as seen in the directions. In contrast, only three of the eight students in the treatment group formatted their answers in the same manner as the directions called for; however, the differences in most cases were minor. For example, the students failed to use lettering (consistent with the directions), yet used numbering instead. Still others did not use either lettering or numbering to format their answer document, but simply started each answer on a subsequent line by single or double spacing in between answers.

Only one case showed a drastic difference where the formatting actually interfered with the readability and understanding of the student's answers. In this particular case of a student in the treatment group with no documented disability, the subject simply typed her responses in paragraph form with no separation of wording to indicate what question she was attempting to answer. Adding to the communication issues of this student's responses, she failed to use proper punctuation, spacing, and complete sentences making it very difficult to decipher where an answer to one question ended and another one began. The responses, as typed, and sent by the student are included below.

"ii don't thingg that this website has connection on the creater I thing that they created this website so that you could send pictures ,and talk about you dogs how they are what they do.ect Ithing it is some what reliable because you could send pictures and stuff.Also I thing that it in not reliable because you don't have contact information.. Yes I think this website is reliable because I has contact it you need any information, because of littering and damgering there habit..hunting is endangering the animals and that is the opposite of what is website is trying to do."

Lack of clarity and organization in formatting answers may indicate a need to directly teach even very basic skills in formatting and communicating thoughts clearly, so that others are able to derive meaning from student written communication.

Furthermore, many students, across groups, showed signs of difficulty articulating thoughts. For instance, on several occasions students seemed to sense that the Web site, Dog Island, was suspicious and lacked reliability; however, they had difficulty expressing why they had concerns, and in articulating those thoughts both through spoken and written word. A good example is found in one student's comments as he skims and scans the information on the Web site. He says, "There are some funny questions on here like this one about a dog being picked on by a neighborhood raccoon; that is weird." Although he seemed to sense reliability issues through his comments, he ultimately concluded that the Web site was somewhat reliable because, "they were telling about the island."

In the area of written mechanics, common areas of difficulty appeared: (a) complete sentences, (b) capitalization, (c) punctuation, and (d) spelling. Few differences occurred across groups in the area of mechanics, but overall, only five of the 16 total participants demonstrated the capacity for correct mechanics in their word documents; although, this does not necessarily indicate the inability to do so, perhaps just their inattention to this particular detail during the online activity. Through closer examination, students experienced the most difficulty expressing their answers in complete sentences. Writing complete sentences proved most difficult for students across groups with half (eight) of the participants communicating using incomplete sentences except in the case of the treatment group of students without disabilities where only one of the four students did not demonstrate the capacity to write complete sentences.

The final three areas of difficulty emerging under the communication domain of online reading comprehension resulted in just over a third of participants (six of 16) struggling with other areas of mechanics including capitalization, punctuation, and spelling. Interestingly, errors in capitalization were more frequent for students without disabilities. While less than half (three of eight) of students without disabilities in control and treatment groups used correct capitalization, almost all (seven of eight) students with disabilities in control and treatment groups used correct capitalization in communicating their answers. A similar trend in spelling errors emerged with most (seven of eight) students with disabilities using correct spelling in their final, word document responses as opposed to three of the eight students without disabilities who attended to errors in spelling.

Students across groups used similar strategies for correcting spelling errors. They (a) asked for assistance, (b) right clicked to utilize the spell check tool, or (c) deleted and retyped when the spelling error indicator appeared in the text. It was surprising that students with disabilities, who perhaps experience greater difficulties with spelling and capitalization, were actually the students who displayed more conscientiousness for correcting such errors. One possible explanation for this could be that students with disabilities participating in inclusive placements also received pull-out support in the resource setting. It is quite possible, that due to the common weaknesses of students with disabilities in the area of written mechanics, resource teachers may have explicitly taught students to use such tools available to them through technology; whereas, general education teachers may not see a need to focus on such skills for general education students.

One final area of mechanics included examining Word documents for proper punctuation. Although a difference was found between students with and without disabilities, it was not as drastic of a difference as those found in spelling and capitalization. Punctuation errors were found in four of eight students without disabilities, yet errors in the documents of only two of the eight students with disabilities were discovered. Unlike spelling and capitalization, punctuation errors were much more predominant in products of students in the treatment group, in which five of the eight students failed to punctuate their documents correctly or not at all. In contrast, only one student in the control group exhibited difficulty with punctuation in their word document. An explanation of these inconsistent results within written mechanics is somewhat elusive. While one may assume students in the treatment group would demonstrate enhanced mechanics in written expression using Microsoft Word, IRT instruction in the online reading comprehension domain of communicate focused more heavily on learning to use a variety of online communication tools such as email, IM, blogs, wikis, and creating Web sites; whereas, written expression components included factors, such as considering one's audience and communicating clear messages through written word rather than mechanics. Therefore, it is possible, that students in the treatment group neglected to attend to punctuation because mechanics where not emphasized in IRT.

Table 49: Results by Theme for the Communicate Function across Groups. (number of references in parentheses).

	Control		Treatment	
	Without disabilities	With disabilities	Without disabilities	With disabilities
Word processing document creation	Mechanics correct (1) Mechanics incorrect (3) -incomplete sentences (2) -capitalization (2) -spelling (3) -punctuation (1) Formatted correctly (2) Formatting incorrect (1) -failed to use outline format (1)	Mechanics correct (1) Mechanics incorrect (3) -incomplete sentences (3) -capitalization (0) -spelling (1) -punctuation (0) Formatted correctly (3) Formatting incorrect (1) -failed to use outline format (1)	Mechanics correct (1) Mechanics incorrect (3) -incomplete sentences (1) -capitalization (3) -spelling (2) -punctuation (3) Formatted correctly (2) Formatting incorrect (2) -failed to use outline format (2)	Mechanics correct (2) Mechanics incorrect (2) -incomplete sentences (2) -capitalization (1) -spelling -punctuation (2) Formatted correctly (1) Formatting incorrect (3) -failed to use outline format
How challenge was addressed	Asks (1) Retypes (1) Right clicks (1)	Asks (1) Retypes (1) Right clicks (1)	Asks (1) Deletes all words and retypes (1)	Asks (1) Right clicks (2)
Email usage	Unsuccessful (4) -couldn't remember password and login (2) -never used (1) -Ran out of time (1)	Unsuccessful (3) - couldn't remember password and login (1) -never used (1) -personal email blocked at school (1) Partially successful (1) -typed "at" instead of "@" (1) -no subject (1)	Partially successful (3) -did not attach word document (3) -no subject (2) Unsuccessful (1) -Ran out of time (1)	Successful (1) Partially successful (3) -difficulty locating file (1) -did not attach word document (1) -left message blank (2) -left subject blank (1)

Summary of Qualitative Findings

A summary of the major themes discovered in the qualitative findings are presented below. Table 50 is a review of those themes that emerged and were common in the overall sample of students across groups. A summary of the comparison of the results across groups is presented in the subsequent mixed methods section. The major themes are presented in Table 50.

Table 50: Summary of Qualitative Results of Emerging Themes by Category.

Category	Theme
General Findings	-students feel more competent using PC over Mac
	-students reported they acquired their Internet skills mostly by: 1st self, 2nd family member, and 3rd teacher/class
	-student preference of Internet Explorer over other Web browsers like Firefox or Safari
	-students demonstrated a mastery of basic computer skills and Internet navigation skills
Search	-preference for Google as search engine
	-predominate search strategies: keyword, typing all or partial URL in address bar, & advanced search strategies.
	-For locating specific information w/in a Web site students used the following strategies most frequently: scanning homepage, accessing relevant tabs, skimming text, reading text, seeking

	copyright information, and using an internal search engine.
Evaluate	-student perception that checking reliability of Web sites is the most important skill students needed to learn when reading on the Internet. -most prevalent themes for determining the reliability of a website in order: 1. look at the amount/quality of information, facts, and evidence 2. Check copyright information is provided and up to date 3. Determine if information seems believable or unbelievable 4. See if author and/or contact information is provided 5. Identify purpose of Web site as benevolent or malevolent 6. Is the Web site trying to sell something? 7. Does the site contain answers to questions you are seeking?
Synthesize	-most prevalent strategy was making an inference after browsing the Web site in general -2nd most prevalent strategy was locating specific information and copying or summarizing -students deduced that Dog Island and World Wildlife Fund were both created for altruistic reasons -students inferred that World Wildlife Fund would not contain

	information on how to hunt because it was counterintuitive to their purpose to conserve nature.
Communicate	-students organized or formatted their responses in an outline form using numbering or lettering or spacing -in many instances, students found it difficult to articulate thoughts, and put them in writing -students often communicated ideas using incomplete sentences -students demonstrated competence in opening email accounts, composing new messages, and using the To: address bar, and sending emails successfully -students failed to use the conventional Re: bar to include the subject of their emails -students failed to demonstrate how to attach a document to an email, and rather copy and pasted their responses into the email itself -students did not acknowledge a recognition of their audience verbally or in writing. They simple copied or attached their answers.

Mixed Methods Results

Do the online reading comprehension strategies used by students with and without disabilities in the qualitative data support and converge with the pretest and posttest online reading comprehension scores from the quantitative data? To display the mixed methods results, Table 51 provides a summary of the quantitative and qualitative findings and then provides the areas of convergence in the data.

Research Question #4

Table 51: Results of Mixed Methods Analysis

Quantitative Results	Mixed-Methods Results	Qualitative Results
ORCA Results -Significance b/t treatment and control -greater gains pre-post for students in treatment group -No significance b/t students with and without disabilities Survey Results Significance b/t students	Improvements in Online Reading Comprehension due to IRT -ORCA results = improvement in online reading comprehension for students receiving IRT -Survey results = Increase in frequency of use for students in treatment group for:	Differences b/t treatment & control groups: -treatment group fewer ineffective URL searches than control group -when choosing a relevant Web site from the search results page, far fewer students in the treatment group randomly clicked on a hit using the more effective strategy of reading the link description

with and without disabilities in frequency and nature of Internet use in school -greater gains pre-post Internet use in school for students with disabilities No significance b/t treatment and control on: -Internet use in school -Internet use outside school -Self-efficacy scale Increases (1 likert scale score) pre to post by group on survey items: -<u>Control/No Disability</u> 1. downloading music outside of school -<u>Control/Disability</u> 1. 1. using search engines at school.	1. Using IM in school 2. looking at who created information reading online at school 3. checking accuracy of online information in school Increase of self-efficacy in treatment group for: 1. reading information online 2. using the Internet to answer a question -Qualitative results = Treatment group showing 1. fewer ineffective URL searches strategies 2. fewer instances of ineffective search strategy randomly choosing search results link	-locating information w/in a Web site, students in treatment exhibited more instances of skimming actually reading text w/in Web site than students in control -students in treatment group had higher ratio's of accessing relevant to irrelevant tabs than the control group -students in the treatment group did seem to apply more effective strategies for evaluating the reliability of Web sites compared with the control group -synthesize revealed no differences between groups -students in control were more conscientious of

2. reading about sports and entertainment at school 3. playing online games at school 4. posting to discussion boards outside of school -<u>Treatment/No Disability</u> 1. look at who created info reading online at school 2. check accuracy of info at school 3. use internet for things other than school assignments at school 4. use IM outside of school 5. read discussion boards outside of school 6. view clip art and pictures outside of school -<u>Treatment/Disability</u> 1. use IM in school 2. look at who created info	3. more use of effective search strategy of reading the link description before choosing 4. more instances of skimming and reading text to locate info w/in a Web site 5. higher ratio's of accessing relevant to irrelevant tabs to locate info w/in a Web site 6. applied more effective strategies for evaluating the reliability of Web sites 7. more evidence of successful use of email	organizing/formatting word documents to increase readability -students in the treatment group failed to punctuate correctly more often than students in control. <u>Differences b/t students with and without disabilities:</u> -students w/disabilities reported learning from teacher or class more than students w/out disabilities (digital divide) -students w/disabilities used URL address search strategy more than students w/out disabilities. -students w/disabilities use advanced search strategies

read online at school	more than students w/out.
3. find images online at	-students with disabilities in
school	general skimmed link
4. check accuracy of info	descriptions more
read online at school	frequently than students
	w/out.
Decreases (1 likert scale	-student w/ disabilities in
score) pre to post by group	treatment group skimmed
on survey items:	text more often than any of
-Control/No Disability	the other groups when
1. playing online games in	attempting to locate specific
school.	info w/in a Web site.
-Control/Disability	-students with disabilities
1. look at who created info I	tended to question the
read online outside of	reliability of a Web site
school	more often than those
-Treatment/No Disability	without disabilities
1. use internet to read about	-students w/disabilities in
science at school	treatment group
-Treatment/Disability	demonstrated most frequent
1. read about sports and	use of effective strategies
entertainment online outside	for checking the reliability

of school	of a Web site.
	-students without disabilities demonstrated more errors in capitalization
Increase in Self-efficacy (1 likert scale score) pre to post for treatment group: 1. reading information online 2. using the Internet to answer a question	-students without disabilities had more frequent spelling errors in documents -students with disabilities used spell check more frequently than students without disabilities

While results of quantitative findings revealed that the average gain scores from pre to posttest online reading comprehension for students in the treatment group were significantly higher than average gain scores for students in the control group, qualitative findings further clarified specific domains of online reading comprehension where students in the treatment group may be employing more effective skills and strategies. For example students from the treatment group demonstrated greater frequency of effective strategies for locating information online such as: (a) skimming and/or reading information within a Web; and (b) accessing relevant tabs and links within a Web site than did students in the control group. Alternatively, students in the treatment group displayed fewer instances of ineffective search strategies such as URL/partial URL searches, and selecting search results hits either in order of their listing and/or randomly. Increases in self-efficacy were also reported by students in the treatment group for both reading information online and using the Internet to answer questions.

In addition, qualitative findings suggested that students in the treatment group seemingly applied more effective strategies for evaluating the reliability of Web sites compared with those in the control group. This qualitative finding was corroborated through triangulation of quantitative findings on the Survey of Internet Use that revealed increases post IRT in strategies for evaluation of Web sites including: (a) checking who created the information when reading online at school; and (b) checking the accuracy of online information at school.

In contrast, a few of the qualitative findings deviated from quantitative findings that indicated positive effects of IRT on the treatment group. For instance, students in control group seemed to be more conscientious when examining the communicate domain, at least when using strategies to organize and format word documents to make them more reader friendly to their intended audience. Moreover, students in the control group used proper punctuation more often than their peers in the treatment group. Comparison of students with and without disabilities in this study yielded no significant differences in quantitative ORCA gain scores; however, significant differences did emerge indicating higher scores for frequency and nature of Internet use in school. Increases in Internet use at school for students with disabilities converges with qualitative results that reveal students with disabilities reported learning online literacy from teachers or through a class at school more often than students without disabilities. With students with disabilities in this sample apparently receiving more instruction and more frequent use of the Internet at school may explain additional qualitative findings that indicate students with disabilities may be utilizing effective online reading comprehension strategies more often than general education students in the following areas: (a) advanced search strategies; (b) skimming results link descriptions before choosing a hit; (c) using skimming strategies to locate specific information within a Web page; and (d) questioning and checking the reliability of a Web. In addition, students with disabilities in this sample seemed to be more contentious when communicating information in certain areas of mechanics. These students made fewer errors in capitalization and spelling, and they tended to use spell check tools to assist more frequently than students without disabilities in the sample.

Summary

Chapter four presented the quantitative, qualitative and mixed methods results. The quantitative results presented findings to answer research questions one and three while the qualitative results were reported in order to answer research question two. Finally, areas of convergence were presented along with a summary of quantitative and qualitative results in the mixed methods section of this chapter. The following final chapter provides a discussion of the results, implications for practice, limitations of the study, and suggestions for future research.

CHAPTER FIVE: DISCUSSION

Introduction

This study explored the effects of Internet Reciprocal Teaching on students with high-incidence disabilities in inclusive settings. Therefore, the chapter begins by providing a brief review of the findings for each of the four questions. Chapter five then discusses quantitative results and qualitative themes previously presented. Furthermore, the mixed methods section explains areas of divergence and convergence of the qualitative and quantitative results, and discusses relevance to previous research and implications for practice. Limitations of the study are addressed, and recommendations for future research are also presented.

Summary of Results

The primary purpose of this study was to examine the effectiveness of an intervention, Internet Reciprocal Teaching, and to explore the skills and strategies students with high incidence disabilities use when reading online. Online reading comprehension achievement, self-reported nature and frequency of Internet use, self-efficacy of online literacy, and think-aloud data and actions during an online reading activity were all examined.

Quantitative Outcomes

Online Reading Comprehension Assessment

The first question of this study addressed the effectiveness of the intervention, IRT, for improving online reading comprehension for students with high-incidence disabilities and similar students without disabilities in the inclusive educational environment. The results revealed significant differences between the pre-intervention and post-intervention gain scores ($F(1, 84) = 4.306$, $p = .041$) of the students in the treatment group compared to pre and post gain scores of students in the control group. Therefore, students with high incidence disabilities and similar non-disabled students in the treatment condition of this study improved their online reading comprehension achievement after receiving IRT.

The second part of question one, the researcher sought to determine if students with high-incidence disabilities receiving IRT made gains in online literacy achievement commensurate with general education students, similar in reading ability. Mean gain scores for students with disabilities in the treatment group were compared with those of students without disabilities yielding no significant differences. Therefore, results from this study indicate that when provided with systematic instruction, IRT, students with high-incidence disabilities and their nondisabled peers enjoy similar improvement in online reading comprehension.

Quantitative results support previous research that indicate both students with and without disabilities achieve gains in online reading comprehension when provided with instruction designed specifically to teach online literacy skills and strategies (Izzo et al., 2004; Pierce, 1998). Although the interventions provided in Izzo et al (2004), Pierce (1998), and the current study were not exactly the same, they all targeted similar skills and strategies in at least two of the five functions of online reading comprehension including searching and locating information, and evaluating online sources as both relevant and reliable. Furthermore, both the Pierce (1998) and Izzo et al. (2004) studies were conducted in the high school environment, grades nine through 12; therefore, the current study with 7th grade students may indicate the beneficial nature of implementing instructional interventions of online reading comprehension earlier in a student's education.

Results from another study (Jackson et al., 2006) showed a significant relationship between increases in online reading and improved assessment scores in reading achievement and school performance (grades) by merely providing students with technology and Internet access, without instructional interventions. Since online reading comprehension strategies were not directly assessed, it is impossible to determine if improvements were made in this particular area; however, these findings do elicit careful reflection as to whether instruction of online reading comprehension is required, or if simply providing students with increased online opportunities will achieve the same results.

One argument might focus on the differences in offline and online reading comprehension outlined by Leu et al (2004) that describes the additional and unique skills and strategies needed to become proficient online readers. While merely providing increased access to the Internet may have had positive outcomes on offline reading ability in the Jackson et al. study (2006), the same outcomes may not generalize when assessing the unique functions of online reading comprehension such as locating and evaluating relevant and reliable information.

Another explanation to consider might be differences in the population of students in the two studies. While the current study examines students with disabilities, the previous study included participants who were considered “at-risk,” many due to an impoverished economic status. Hence, the academic gains found Jackson et al. (2006) could be that the participants’ poor school performance was due to their impoverished environment rather than their intellectual integrity being compromised by a learning disability or other impairment that impeded learning. Therefore, while the Jackson et al. (2006) study providing participants with online access increased their interaction and exposure to text, information, and educational materials resulting in improved academic outcomes; however, the same results may not be apparent for students with disabilities due to their difficulty with independent learning that may require more explicit instruction, especially in the unique functions of online reading comprehension.

A final point to reflect on was the amount of time before results in academic achievement manifested in the longitudinal study by Jackson et al (2006). Academic improvement was not evident at the six month interval, and in fact did not appear until one year after computers and Internet access were provided. Consequently, providing students with systematic instruction in online literacy may prove to be a more efficient way to elicit improved academic outcomes; therefore, further research is needed to explore these hypotheses.

Survey of Internet Use Results

After determining no significant differences were found between groups for the composite scale scores for frequency and facility of Internet use in and out of school, ANOVA results indicated that IRT had no significant effect on changes of self-reported scores from pre to post assessment. However, significant main effects were found among students with and without disabilities indicating that students with disabilities reported a higher frequency of Internet use when in school as opposed to students without disabilities. It is possible that these difference can be explained simply by the possibility that the self-reported data of students with disabilities was somewhat inflated, or that perhaps that these students have increased opportunities to use the Internet when pulled into smaller resource settings throughout their school days. Students with disabilities may also have acquired greater skills and strategies through IRT that has allowed them to work more independently online, possibly increasing their motivation and ability to engage in online activities in pull-out or resource settings.

Through a closer examination, differences were uncovered through changes from pre to post assessment regarding more specific facility of Internet use at home and at school between students with and without disabilities in the treatment group. Student reports of their facility of Internet use is approximately the same at home for students with and without disabilities in the treatment group. For instance both groups had similar rankings for using search engines and the use of Instant Messenger, with a high frequency at home; while the two groups also similarly ranked less frequently used facilities at home such items as looking at who created the information, and checking the accuracy of information on the Internet.

In contrast, within the treatment group when examining the greatest changes from pre to post intervention survey date, a distinct divergence was found between students with and without disabilities in how they use the Internet in school. Besides using search engines, which both groups ranked highest in use, students without disabilities use the Internet in a different way than students with disabilities. Students with disabilities reported using the Internet at school much more frequently in the following ways: (a) using IM, (b) looking at who created the Web site, (c) finding images, and (d) checking the accuracy of information on the Internet. In contrast, students without disabilities showed the greatest positive changes from pre to post for (a) reading discussion boards, (b) reading blogs, (c) creating Web sites, and (d) posting to discussion boards (See Table 43).

Results indicated that students receiving intervention reported using effective strategies such as checking for who created a Web site and checking the accuracy of information. This finding supported ORCA results that students in the treatment group had benefited from IRT on important components of online reading comprehension such as evaluating Web sites. Additionally, IRT seemed to have increased student exposure and therefore reports of accessing and reading alternate forms of communication such as creating Web sites and posting to discussion boards. The variation found between treatment and control students may be attributed to the treatment classroom and emphasis of the instructors; however, it is interesting to note that students with disabilities seemed to report greater awareness and changes in evaluating the reliability of what they are reading on the Internet over students without disabilities.

Averages from the survey showed students from the control group used email in school less than once per week, but average use outside of school was a few times per week. Treatment students indicated use of email slightly more often in school at once per week; however, they reported using email outside of school almost once per day. It is noteworthy that in both the control and treatment groups, students with special needs indicated using email more than their disabled peers in all settings.

These reports somewhat contradict findings by Jackson, et al. (2006), who recorded online activity to find that students used email outside of school less than once per week. The seemingly higher use of email for students with disabilities in this study was also slightly higher than results of a study by Kim-Rupnow and Burgstahler (2004). In this study, just less than half (40%) reported using email daily, and 66% indicated they used email at least once per week.

In terms of the self-efficacy scale, because independent t-tests on the pre-survey revealed significant differences between groups and sample sizes that were unequal, gain scores from pre to post survey were used to determine if IRT had a significant effect on students self-efficacy for using the Internet. The results of the composite score for self efficacy were somewhat disappointing, as increases in self-efficacy for students in the treatment group were expected as a result of IRT, yet were not manifested. In contrast, Kim-Rupnow and Burgstahler (2004) measured self-efficacy of participants during the DO-IT project at three timed intervals across the intervention. They found considerable increases in students perceived skill levels on the Internet from the start of the intervention, after training, and then again after completing the DO-IT program. Although similar findings were expected in this study, a possible explanation may be found in reports by Pierce (1998).

Pierce (1998) found that students' self-efficacy regarding their ability to use the Internet exceeded their actual ability. She found that students perceived themselves as quite competent in conducting research using the Internet; however, assessment and direct observation revealed that students were actually inefficient and ineffective in searching and locating both relevant and reliable sources of information and in their efforts to evaluate the reliability and accuracy of the sources found. Perhaps the lack of increases in self-efficacy in this study for students receiving IRT can be explained by what Pierce found; all students reported high levels of competency at the pretest because in fact, students are not aware of what they do not know about online reading comprehension. Therefore, at posttest, students in the treatment group could have acquired awareness as to the complexities of online literacy, and therefore not rated themselves as highly at posttest.

Support for the later explanation was found through a closer examination comparing the mean composite scores and sub-scores between treatment and control groups. Using a rating scale of one through seven, one being beginner and seven being expert, students in the control group with disabilities (pre = 4.9; post = 5.6) and without disabilities (pre = 4.9; post 5.5) rated themselves higher and closer to the expert level than students in the treatment group with (pre = 4.1; post 4.8) and without disabilities (pre = 4.0; post = 4.9) on the overall composite score on both the pre and post survey. In addition, students in the control group consistently rated themselves higher than students in the treatment group for every sub-skill on the pre-survey self-efficacy scale with one exception; students without disabilities in the treatment group rated themselves with a mean score of 5.1 based on their skill emailing which exceed the control group without disabilities at 4.9 and equaled the control group with disabilities mean score in that area.

On the posttest, similar results can be found with ratings for the control group consistently outranking those in the treatment group, but in this case with two exceptions; one for skill in emailing and the other for skill in keyboarding. Students with disabilities in the treatment group (5.5) rated themselves equally to students with disabilities in the control group based on their perceived skill in using email. Additionally, students without disabilities in the treatment group rated themselves higher (5.1) than any of the other groups on their keyboarding ability.

Examination of specific skills within the self-efficacy scale did reveal some noteworthy trends. While no increases over 1.0 from pre to post survey were present for students in the control group without disabilities, students with disabilities did report an increases from pre to post for reading information on the Internet and locating specific information online. After receiving IRT intervention, students with and without disabilities reported increased self-efficacy ratings over 1.0 in three specific skill areas, but only one common area; their ability to use the Internet to answer a question. Treatment students with disabilities also reported increases in their ability to read information on the Internet and send emails. In contrast, students without disabilities in the treatment group identified improvements in their ability to type quickly and accurately as well as their ability to search for specific information on the Internet after participating in the IRT intervention. These findings help support those by Burgstahler

(1997) who found that through the DO-IT program that students experienced gains in communication, social skills, competence using technology, competency using Internet, and competency using email.

Qualitative Outcomes

The second question was designed to obtain a greater understanding of the online skills, strategies, and behaviors students employ, and to identify trends or patterns among or across groups. Close qualitative examination of online reading comprehension strategies were also necessary to identify areas of online reading comprehension where IRT had an effect. Therefore, after the intervention concluded and post-intervention assessments were attained, qualitative data was gathered through an online activity.

The qualitative phase consisted of a pre-activity interview of participants followed by a series of online tasks, and concluding with a few follow-up interview questions. Interview responses, verbal protocol data, video recordings of online actions, and student products were all analyzed to discover typical and preferred online reading comprehension strategies, to explain why they employ certain strategies, and to further expound on the quantitative findings by examining similarities and differences across groups: treatment versus control, and students with and without disabilities.

Pre-Interview Findings

Results of interview responses revealed an overwhelming perceived proficiency and comfort level using a PC. Interestingly, none of the participants in the control group indicated a preference for the Mac; however, this phenomenon may be directly related to exposure, at least in regards to availability at school. Computer labs available within all three participating schools were comprised mainly of PC computers; therefore, only those students participating in the treatment group in the northeastern state had regular exposure to Mac computers due to grant funding that provided treatment classrooms with individual Mac laptop carts.

Participants in the study also indicated a clear preference for using Internet Explorer over other Web browsers such as Firefox and Safari. While all students in the control group reported feeling most skilled at using Internet Explorer, only two differed in their reports from the treatment group. Interestingly, the student in the treatment group who expressed being most capable using Safari did not choose to switch browsers during the online activity; however, the student who verbalized being equally skilled using all three browsers corroborated his response by switching from Internet Explorer to Firefox during the online activity. He further demonstrated his proficiency with Firefox by teaching the researcher how to use a new (in June, 2008) tab feature that had just become available in Firefox. This example also reiterates one of the key principles of IRT to provide students the opportunity to share in leadership and instruction due to the ever-changing nature of the Internet.

When asked how students achieved proficiency using the Internet, all participants responded in one of three ways. They indicated they either taught themselves, a family member had taught them, or they had training either through a teacher or a class at school. The only group that did not have at least one example of all three themes was the control group of students who did not have a disability. None of the four responders in this group reported being taught by a teacher or a class in school. While this result can be reasonably explained, somewhat inexplicable was the sole respondent of four in the treatment group of students without disabilities who indicated learning from a teacher or class. Because students in this group received IRT twice a week for a majority of the school year, more responses were expected that indicated some contribution of courses or teachers for students perceived proficiency. However, this finding could be explained by previous research as well as the focus within IRT on peer interaction and learning.

Results from a former study (Castek, 2008) may explain the lack of students in the treatment group without disabilities who reported a teacher or class as their main source for skill using the Internet. Castek's dissertation study (2008) found that the role of the teacher may need to be reconsidered when teaching students online reading comprehension strategies. Instead, her findings indicated that students may improve online reading comprehension more effectively through other students in collaborative, problem-solving learning activities. While this may explain why the students without disabilities in the treatment group may have responded as they did, it should also be noted that none of the 28 participants in Castek's study (2008) had a learning disability or IEP, and in fact all of the participants scored proficient or advanced on the California State Standards Test in English Language Arts. Therefore, such significant differences in the student samples make it difficult to generalize Castek's findings to students with disabilities or even at-risk students who comprised a majority of the participants in this study.

A common thread was noticed across groups, as two respondents in each identified family members as a source of knowledge for learning online skills and strategies. Specifically, parents, siblings, and cousins were all acknowledged for contributing to participants' online literacy; however, learning opportunities with family members would be highly dependent on Internet access at home. Therefore, the digital divide for students with disabilities (and students from minority and low SES backgrounds) must be considered; further driving the argument for schools to provide Internet literacy instruction in classrooms in an attempt to diminish the effects of the digital divide.

From this student sample, a possible trend was noticed when comparing students with disabilities to those without. Seven of the eight participants with disabilities acknowledged a teacher or class at school as the source of their adeptness on the Internet, but only one of the eight students without disabilities asserted the same. This finding makes sense in that students with disabilities generally are victims of the digital divide; therefore, they may have less opportunity outside of school to use the Internet and learn from family members or through trial and error. Results are also encouraging that at least these three schools may be aware of the need and providing more opportunity and instruction in online literacy. While impossible to generalize from this small sample, these results may warrant further examination exploring the digital divide for students with disabilities in school settings to see if this gap may be diminishing as indicated in the 2005 NCES report, and in contrast to earlier reports by Jackson (2003) and Abbot and Cribb (2001) that revealed students with disabilities were receiving less access to the Internet in classroom settings than non-disabled students.

Ten students (six of whom have disabilities) also elicited some concern with their indication of being self-taught in online literacy. This finding is consistent with Gunn and Hepburn (2003) who reported that approximately 73% of 12 to 17 year olds are using the trial and error approach to teach themselves strategies online. Although more outdated, Pierce (1998) also reported that students with and without disabilities believed themselves competent in online literacy; however, when directly observed, they failed to demonstrate effective and efficient skills and strategies.

Taken collectively, without systematic instruction of online reading comprehension, students, particularly those with disabilities, may be teaching themselves and reinforcing ineffective and/or inefficient online literacy strategies that could be detrimental to their progress. Historically, the most effective academic interventions for students with disabilities require explicit instruction followed by guided practice with corrective feedback before moving to independent practice and fluency building activities. Corrective feedback is particularly critical for ensuring that students with disabilities do not learn and reinforce ineffective strategies. Consequently, online literacy skills are far too important to be left for students to learn on their own; particularly those with disabilities. An intervention such as IRT that provides systematic instruction and modeling of online literacy skills followed by guided practice is essential in promoting the online literacy of students with disabilities.

The next question sought to elicit student recommendations for online literacy instruction; therefore, students were asked, “What do you think is the most important thing about reading on the Internet that most kids do not know? Responses to this question emerged in one of four general areas; (a) knowing search strategies, (b) determining the reliability of online sources, (c) uncertainty, and (d) unclear meaning.

While few students in the study identified the importance of search strategies was disappointing several students recognized the importance of determining the reliability of online sources. Tendency for students in this study to overlook the importance of searching was worrisome when considering the findings of Henry (2006). Henry (2006) argued that locating information may be the most imperative function of online reading comprehension for students to learn, because without it all other functions of online reading comprehension are impaired. Students in the study may not fully understand the importance of search strategies, or as argued by Pierce (1998), they may have a false sense of competence in this function. Pierce (1998) found that because of the number of hits and large amounts of information students were able to acquire from a topical search using a search engine, they perceived themselves as proficient locators of information despite observations revealing that much of the information was not relevant or useful in completing their inquiry projects. Through this lens, students may not perceive the importance of search strategies because their self-efficacy in this area is high.

Equally concerning were the number of students across groups who were unable to either comprehend the question or provide a clear answer, particularly in the treatment group after 40 lessons of IRT intervention. In consideration of grade level, and that nearly all of the participants either had a disability, or could be considered at risk, this question did require higher level thinking skills, which are often difficult for students with disabilities. In addition, unclear or uncertain responses from students in the control group could be rationalized by their lack of intervention, as these students may have little opportunity to read online, and therefore, may be unaware of the strategies needed to meet the demands of reading on the Internet. However, consideration for learning disabilities and other environmental factors that often impede the academic achievement of at risk students does not negate the need to set and maintain high expectations for these students.

In contrast, a positive trend was discovered in this sample of students indicating the importance in evaluating the reliability of online sources across groups. It is encouraging to find that many students in both the control and treatment groups were at least aware that evaluating the reliability of online sources is a necessary and important skill when reading online that is often overlooked by students.

Functions of Online Reading Comprehension.

Basic Skills. Before discussing the functions of online reading comprehension, basic online skills demonstrated by students in the study were summarized. Students across all groups demonstrated a basic knowledge and competence for using a PC and navigating the Internet. Although there were some variations by student in their efficiency, all were able to create, use, and save documents; as well as open, navigate, and toggle back and forth between online windows and documents. Students were all able to type, of course differences were observed in speed and accuracy, with only one student verbalizing his distaste for typing. With the exception of one student who requested a mouse, all students demonstrated the ability to use the track pad. Only about half of the participants took advantage of spelling and grammar tools in Microsoft Word, and few used copy and paste options.

Results of this study were closely mirrored in previous research by Harrysson, Swensk, and Johansson (2004) who found that students with disabilities were generally proficient in basic skills including opening and closing Web pages, navigating using back and forward buttons, scrolling functions, and recognizing and accessing links. Conversely, students in Harrysson's study (2004) struggled using more advanced skills such as using the "Favorites" tool. Likewise, no examples of use more advanced tools such as "Favorites" were evident in this study; however, students were not asked to use this feature in the activity and therefore it is impossible to assess whether or not they possess the ability to use such tools.

Specifically focusing on copy and paste features, findings from this study generally conflict with previous research (Igo et al., 2006) that indicated copy and paste was the preferred method of note taking from the Internet by students with disabilities; however, the infrequency of use, at least for students in the treatment group, may be explained by IRT lessons that emphasized strategies for synthesizing information from a Web site rather than copy and pasting. The functions of online reading comprehension are discussed in the subsequent sections.

Searching. Results from analyzing this function revealed the following themes for all students in the study: (a) preference for Google as search engine; (b) keyword search as a major search strategy; (c) typing all or partial URLs in address bar as a major search strategy. When considering strategies students employ for locating specific information within a Web site, the following strategies emerged: (a) scanning homepage (b) accessing relevant tabs, (c) skimming text, (d) reading text, (e) seeking copyright information, and (f) using an internal search engine.

Results of general search strategies revealed that students in the study clearly preferred Google over other search engines. Student preference of Google was consistent with findings from a Gunn and Hepburn (2003) who reported over 66% of their participants chose Google. After accessing their preferred search engine, students in this study applied the keyword search method most often to locate a Web site. Eagleton & Dobler (2007) also identify keyword search as a common strategy used among students. They further describe common keyword search errors as students using a keyword that is too broad. Perhaps due to the online activity, only a few instances in this study were found where students chose keywords that were too broad to elicit relevant results. These examples can be found in chapter four.

The next most prevalent strategy for locating a relevant Web site was the strategy of typing all or part of a URL in the address bar particularly for those Web sites they were most familiar with like “google.com” or “youtube.com.” This method usually allowed students to access the desired site quickly. Typing all or part of the URL in the address bar proved successful and efficient for acquiring familiar sites, but it became problematic in a small number of instances when students attempted to use this strategy for Web sites that have more complicated URLs or those not ending in .com, and/or misspelling part of the URL.

Ineffective use of this strategy has been called the “dot-com” formula by Guinee et al (2003), which is a strategy of a student typing www, their topic, and then .com, and is consistent with findings from Harrysson, et al (2004) who identified this method as difficult for students with disabilities to use successfully. On an encouraging note, only two instances of this strategy were discovered in the current study, and both students were part of the control group, possibly indicating the students in the treatment group benefitted from instruction in effective search strategies.

Although few examples existed, students, especially those in the treatment group, responded well and demonstrated the ability to adapt or refine their search strategies when their initial methods were unsuccessful. This included students finding alternative means of locating information when district firewalls blocked their progress. Eagleton & Dobler (2007) described the above-mentioned adapting or refining search strategies as Plan B strategies. They identify four main Plan B strategies used by students including: (a) switching topics, (b) visiting new websites, (c) trying new keywords, and (d) changing search engines. Because they were confined by the activity questions, no examples of students switching topics were evident in this study; however, a few examples could be found of students visiting new websites, trying new keywords, and changing search engines.

Few students in the study were observed using the more advanced search strategies taught in IRT; however, this finding is consistent with previous findings that revealed a majority of participants do not use complex keywords like Boolean operators (Jansen & Pooch, 2001). These relatively low numbers of advanced search strategies in this study could be partially explained since most of the students in the sample did not experience significant difficulty locating the required Web sites, possibly making those strategies unnecessary.

Because IRT instruction focused much time on teaching students effective and efficient search strategies, the researchers expected to see increased instances among the treatment group of applying the strategies taught. Therefore, the absence of more advanced search strategies, such as the use of Boolean operators, quotation marks, or the topic + focus strategy, was somewhat perplexing. However, it could also be argued that such strategies were not necessary since few of the students, particularly in the treatment group, experienced difficulty finding the assigned Web sites within a reasonable amount of time. Although disappointing, the absence of advanced search strategies was consistent with previous research by Eagleton and Dobler (2007) who found that many students are not cognizant of the advanced features of search engines, and, therefore, rarely use them.

Locating a Relevant Web Site. When searching for information on the Internet, every student embarks on a very unique process to achieve this goal (Leu, 1998; Coiro, 2005); therefore, analyzing each student's path is very intriguing, but can become a cumbersome task in attempting to identify common themes across students. Examination of the data, however, did reveal that after acquiring a results page on a search engine, predominantly using the keyword search method, students then embarked on locating a specific Web site by either the more effective strategy of (a) skimming or reading the link descriptions; or the less effective strategy of (b) arbitrarily choosing the first (or subsequent) hits. Eagleton & Dobler (2007) described similar results stating that novice or weak readers tended to click on the hits in numerical order, but that stronger readers were more strategic (or judicious) in their selections using domain names, URLs and the site descriptions to conclude if a search result will be an appropriate match for their research question.

Encouragingly, results of this study found many more references to the more judicious strategy then the alternate less effective strategy. Evidence of students using deliberate and effective strategies for choosing a hit from the results page was more ubiquitous in the treatment group than in the control group. More specifically, students with disabilities in the treatment group also outshined the other groups using deliberate strategies for choosing a Web site and very few references of arbitrarily choosing a link. Additionally, this group also contained the most students (three of four) who completed the first activity and participated in activity 2 compared with only one of four in each of the other groups, possibly indicating that these students had not only acquired skills and strategies through IRT, but also had enough opportunities online, that they had begun to also build fluency.

Another heartening result of analysis revealed only one student in the treatment group and two in the control used the more ineffective/inefficient strategy described by Henry (2006); the student chooses the first link, waits for the page to load, checks to see if it's the correct page, hits the back button to return to the results, and then proceeds to each successive link using the same method. The relative infrequency of this method was encouraging, and the student who used this method in the treatment group did so for the first two links, and then when she returned to the results page, she altered her strategy and began to read the descriptions provided. This student then further demonstrated an ability to problem solve when after reading several descriptions, it became apparent that what she was looking for may not be contained in the results, so she revised her keyword search.

It would appear that students in the treatment group did derive benefit from IRT by comparing the frequency of less effective, more arbitrary search strategies from the results page of a keyword search. While occurrences of less effective strategies in the control group numbered 15, similar strategies were only observed seven times in the treatment group. Students in the treatment group also refined their searches more readily than those in the control group, requiring less prompting to alter their strategies when they experienced difficulty.

Although very few students were able to begin activity 2, those who did displayed familiarization using media warehouse Web sites and search engines such as YouTube, Google Images, Google Video, and Photobucket. It was also affirming to find students ability to problem solve and refine their search strategies when they did not acquire their intended information through initial search attempts, or when district firewalls impeded their progress. Overall, students across groups displayed effective strategies for locating relevant Web sites from search engine results; however, students in the control group did so less frequently than those in the treatment group.

Locating Information Within a Web site: *Dog Island*. As Leu (1998) described, researchers in this study also found students followed very different and unique paths in their search to find who created this Web site and why, and the time and effort they expended on this task also varied greatly among students. Interestingly, most of the students with disabilities in both the control and treatment groups spent a greater amount of time, explored more and varied links, and spent more time scanning and skimming than students without disabilities.

In general, students in the treatment group did access more relevant tabs to locate specific information than did students in the control group; however, students across groups, lacked logical methods for choosing appropriate tabs both through their actions and words. Furthermore, almost all of the students scanned the Web site, some even skimmed parts of the text, but very few read more carefully. Also perplexing, many of the students across groups ignored links or tabs on the page that would likely contain the information sought, such as "company information" or "Contact Dog Island," to identify the creator, and instead they explored less relevant tabs such as "Press," "Photos," and "Products;" although, they may have accessed the later to gain more of a general impression regarding reliability. Most of the participants did seek out author information on the home page, and specifically also checked at the bottom of the page with the copyright information, but when they did not find it there, most of the students seemed to have difficulty applying a different strategy.

Despite the hoax, the Web site does provide two (fictitious) names as the founders of Dog Island in the "Company Information" link and additional names and email addresses in the "Contact Us" link; however, after searching, 12 of the 16 student participants responded to the question stating that they were unable to find who created the site. Two of the respondents did include the fictitious names from the Company

Information link, at least attempting to locate the information using a logical exploration of a link. One additional student in the treatment group who had a learning disability, listed the creator of the Web site as “Disclaimer,” indicating that he was using a strategy taught in IRT to look for author information often found at the bottom of a Web page along with copyright information, but clearly demonstrating that his vocabulary was not sophisticated enough to include disclaimer, and he therefore assumed it to be a name. One final student went a step farther, clicking on the disclaimer link, which revealed the Web site to be a hoax, but still responded that he could not find the person’s name.

Differences between groups in the qualitative data may indicate that students in the treatment group benefited from IRT in the following areas: (a) fewer ineffective URL searches than control group; (b) fewer instances of randomly clicking on a hit when choosing a relevant Web site from the search results page; (c) more us of the more effective strategy of reading the link description when choosing a Web site from the search results; and (d) more examples of skimming and actually reading text within a Web site when locating specific information than the control group.

Evaluate. Results from the evaluate function of online reading comprehension revealed a few overall themes from the present sample of students. First, students verbalized that checking reliability of Web sites is the most important skill students needed to learn when reading on the Internet. In order to evaluate a Web site for reliability, through online actions and verbalizations, students identified the following as critical strategies to do so: (a) look at the amount/quality of information, facts, and evidence; (b) check copyright information is provided and up to date; (c) determine if information seems believable or unbelievable; (d) see if author and/or contact information is provided; (e) identify the purpose of Web site as benevolent or malevolent; (f) determine if the Web site trying to sell something; and (g) does the site contain answers to questions you are seeking.

Similar findings are presented by Eagleton & Dobler (2007) identifying important strategies students need to learn in order to successfully evaluate the reliability of Web sites. They included, (a) checking the author(s) of the Web site to make sure they are a credible source; (b) checking that contact information is provided; (c) locating information that states a clear purpose for the Web site; (d) checking for objectivity (free of bias) in the Web site making sure all sides of an argument are provided; and (e) making sure that the copyright information is current; and (f) using URLs and domain names for cues to reliability. Similar themes for effectively evaluating the reliability of a Web site were found in this study with the exception of checking for objectivity and using URL cues, as no examples of these two strategies were found in this sample of students; however, some additional themes were identified.

Comparison of students across groups did indicate that students in the treatment group benefited from IRT when applying what they know to accurately assessing the reliability of Dog Island. A majority (six of eight) students in the treatment group identified Dog Island as an unreliable providing support of the unreliability. In contrast, only three students in the control group questioned the site's reliability; the remaining five students indicating Dog Island was either very reliable or somewhat reliable based on positive support for reliability. These results tend to support evidence that students receiving IRT acquired more effective strategies for determining the reliability of Web sites while those in the control group may not have possessed the tools necessary to evaluate Web sites effectively.

Less discrepancy was found between groups in their evaluation of the World Wildlife Fund. Given the three choices of very reliable, somewhat reliable, and not at all reliable, a majority, 11 out of the 16 students, chose the median answer, and none of the participants believed the Web site to be not at all reliable. Only one particular area of divergence emerged between data forms in regards to determining the reliability of the World Wildlife Fund. With at least three students identifying that attempting to sell something on a Web affecting the reliability of the site, it was surprising to discover that none of the participants recognized or commented on the World Wildlife Fund's solicitation of donations memberships and sales of merchandise. Because this site made these solicitations clear and apparent on both their homepage and by providing specific tabs and links for such content, recognition of such content by at least one student was anticipated.

Synthesize. Eagleton & Dobler (2007) identify synthesis as a very difficult skill for students to acquire. They define synthesis as a process skilled readers demonstrate by first by scanning text for key words, then reading the text more carefully, pausing to take pieces of information and combine it with prior knowledge, and finally adding personal meaning to the information. Because students in this sample were not particularly adept at revealing their thought processes through verbal protocols, it was very difficult to determine the extent to which students were synthesizing information. However, the various data collected helped to determine whether or not synthesis was taking place, and from this, two main themes emerged regarding strategies for synthesizing online information: (a) creating inferences after browsing the overall Web site, or (b) locating specific information within a Web page and copying or summarizing the information.

As part of the first online activity, students had the opportunity to synthesize why they believed the two different Web sites were created. In synthesizing information from the Web site, Dog Island, the principal emerging theme reflected student belief that the Web site was created for altruistic reasons. In fact, 13 of the 16 student participants cited altruistic reasons verbalizing such reasoning as, “they wanted to help dogs.” Similar results were found across all four groups with at least three of the four students in each group identifying altruistic reasons for the existence of the Web site. Because a majority of students did not recognize the Web site as a hoax, altruistic reasons seems to be a reasonable assumption based on the information provided in the Web site; however, it is concerning that students equate altruistic reasons with reliability.

Notable exceptions to citing altruistic reasons existed in three student responses. One in the control group simply stated that he believed the Web site was created “because they (meaning the authors of the Web site) were bored.” In addition, the student who found the disclaimer statement on Dog Island synthesized the authors created it to have fun. A third student inferred the Web site was created to make money saying, “it seems like they created the Web site so that you would send your dogs to them and they can make money off of your dogs.”

After examining the World Wildlife Fund Web site, students were again asked to synthesize why the Web site was created. All of the answers across groups communicated student belief that this Web site was also created for altruistic reasons. More specific themes emerged including: (a) to conserve nature, (b) to promote their cause, (c) and to provide information. Differences across groups were not apparent with only minor differences in student responses. Only three students in the treatment group, one without disabilities and two students with disabilities, located the same statement under the What We Do tab of the Web site. After identifying this statement, "From the Amazon to the Arctic, WWF is building a future where human needs are met in harmony with nature," and proceeded by copy and pasting the statement, copying the statement by toggling back and forth, or summarizing.

While overall responses were similar reflecting the intention of the World Wildlife Fund to conserve and protect nature and wildlife, a few students came to slightly different conclusions. For example, some inferred the primary reason for the Web site was to provide information and teaching others about animals. A final response stood out from the others indicating recognition that the authors of the Web site did have an agenda for promoting their cause.

With at least three students identifying that Web sites attempting to sell something as a factor affecting the reliability of the site, it was surprising to discover that none of the participants recognized or commented on the World Wildlife Fund's solicitation of donations memberships and sales of merchandise. Because this site made these solicitations clear and apparent on both their homepage and by providing specific tabs and links for such content, recognition of such content by at least one student was anticipated.

Also, as a component of IRT, students were not only taught to use strategies to determine the relevance and reliability of Web sites, but they were also taught to look for signs of bias within Web sites. This may explain why one of the students in the treatment group was able to recognize some level of bias in the World Wildlife Fund and infer that the Web site was created to promote the cause of the organization. This recognition of bias leads into the other task of this activity that required students to synthesize by making inferences about why information teaching people how to hunt was difficult to find on this site.

Almost all of the students 13 of 16 came to the conclusion rather easily that the World Wildlife Fund would not provide information on hunting because their intent was to protect animals rather than hunt and kill them. Again, differences across groups were not apparent; however, two students in the control group did demonstrate difficulty drawing conclusions to this question. Instead, after search for the information within the Web site, these two students concluded that the information just simply was not there failing to infer why this particular Web site may not contain information teaching how to hunt. One additional response indicated the student did not grasp the intention of the question. He stated, “It doesn’t teach you how to hunt because it’s a public Web site.”

Communicate. In the Communication domain of Online Reading Comprehension, two main areas materialized as the focal points for further examination within the online activity: word document creation and email usage. Across groups, data revealed that: (a) students organized or formatted their responses in an outline form but varied in how they formatted their responses commonly using numbering, lettering, or spacing; (b) many students in this sample found it difficult to articulate thoughts, and put them in writing; (c) students often communicated ideas using incomplete sentences; (d) students demonstrated competence in opening email accounts, composing new messages, and using the To: bar, and sending emails successfully; but (e) students failed to use the conventional Re: bar to include the subject of their emails; (f) they failed to demonstrate how to attach a document to an email, and instead copied and pasted their responses; and (g) students did not acknowledge a recognition of their audience verbally or in writing.

Due to the directions and formatting of the online activity, students were expected to format their word documents in a similar fashion; however, it was interesting to note that students in the control group were more conscientious formatting their word documents to reflect attention to the directions given for the activity. While a majority of students in the control group organized their answers as seen in the directions, only three of the eight students in the treatment group formatted their answers in the same manner. However, the differences in most cases were minor as in a few examples when students used numbers instead of letters. Still others did not use either lettering or numbering to format their answer document, but instead just simply started each answer on a subsequent line by typing enter either once or twice either single or double spacing in between answers. Only one case showed a drastic difference where the formatting actually interfered with the readability and understanding of the student's answers. (See example in chapter four).

Furthermore, many students, across groups, showed signs of difficulty articulating thoughts. In addition to the example provided in Chapter four where the student was suspicious of the reliability of Dog Island but failed to articulate that suspicion, several discrepancies were found in comparing students typed responses with their verbal data. These inconsistencies indicated students may struggle with written expression, mechanics, or simply typing efficiently.

In the area of written mechanics, common themes appeared in the following areas; (a) complete sentences, (b) capitalization, (c) punctuation, and (d) spelling. Few differences occurred across groups in the area of mechanics, but overall, only five of the 16 total participants demonstrated the capacity for correct mechanics in their word documents. However, students may possess the capability for mechanics, but during this activity, may have overlooked this particular detail, focusing more on content.

Through closer examination, students experienced difficulty equally among using complete sentences, capitalization, spelling and punctuation with very slight differences across groups making it difficult to make assumptions. However, students in the control group appeared to struggle less than students in the treatment group in the areas of complete sentences, capitalization and punctuation. Interestingly, errors in capitalization, spelling and punctuation were more frequent for students without disabilities than special education students.

Although students across groups used similar strategies for correcting spelling errors; either they asked for assistance, they used the right click technique to utilize the spell check tool, or they simply deleted and retyped; it was surprising that students with disabilities, who perhaps experience greater difficulties with spelling and capitalization, were actually the students who displayed more conscientiousness for correcting such errors. One possible explanation for this could be that students with disabilities participating in inclusive placements also received pull-out support in the resource setting. It is quite possible that due to the common weaknesses of students with disabilities in the area of written mechanics, resource teachers may have explicitly taught students to use such tools available to them through technology, whereas general education teachers may not see a need to focus on such skills for general education students. For students with special needs, these findings mirror those of Hutinger, Clark, & Johanson (2001) for improving communication and written expression, but, they do not parallel the findings for students without disabilities.

One final area of mechanics included examining word documents for proper punctuation. Although a difference was found between students with and without disabilities, it wasn't as drastic of a difference as those found in spelling and capitalization. Punctuation errors were found in four of eight students without disabilities, yet errors in only two of eight student documents were discovered. Unlike spelling and capitalization, punctuation errors were much more evident in products of students in the treatment group, in which five of the eight students failed to punctuate their documents correctly or not at all. In contrast, only one student in the control group exhibited difficulty with punctuation in their word document.

An explanation of these inconsistent results within written mechanics is somewhat elusive. While one may assume students in the treatment group would demonstrate enhanced mechanics in written expression using Microsoft Word, IRT instruction in the online reading comprehension domain of communicate focused more heavily on learning to use a variety of online communication tools such as email, IM, blogs, wikis, and creating Web sites; whereas, written expression components included factors such as considering your audience and communicating clear messages through written word rather than mechanics. Therefore, it is possible, that students in the treatment group neglected to attend to punctuation because mechanics where not emphasized in IRT.

In contrast to the lack of improvement found in written expression for treatment students in this study, previous research (Englert et al, 2007; Izzo et al., 2004; Hutinger et al., 2001) all showed evidence of improved written expression after respective interventions, and more specifically in areas of punctuation and proofreading. On the other hand, like the current study, after participating in the TELE-Web program, Englert et al., (2007) did not find improvement for the treatment condition students in spelling or capitalization. These similarities my indicate that alternate methods for teaching students capitalization and spelling using online tools may need to be evaluated and altered.

More encouraging results were found in the area of email usage. Treatment students demonstrated more effective methods of at least partially successfully sending emails as opposed to only one student in the control group who experienced similar success. Control students struggled sending emails because they were unable to remember password and login information for accessing email accounts. A few also expressed they had never used email at school, and therefore did not know how to go about sending emails. On the other hand, students in the treatment group were able to successfully access and send emails, but failed to follow conventional rules for emailing such as using the subject bar and including a message to address their attention to audience. In addition, the instructions requested students send their answers as an attachment, but only half of the group did so, the remaining half copied and pasted their answers into the message box of the email.

Results for the treatment group in the communicate domain was disappointing, considering the gains in communicating found in results of Hutinger, Clark and Johannson (2001). General results revealed increased levels of written composition, and sending emails; specifically citing improved use of standard letter composition such as including a welcome, body and closing applied to email messages. The current did not experience such success in this area, as none of the students applied what they had learned through IRT by structuring their email message as described above. In fact, many failed to include a message to go along with their responses at all. Hutinger, Clark and Johannson (2001) also found evidence among participants of them considering audience and adapting their writing being mindful of their audience. No evidence was found in the current study of students considering audience either verbally or in writing.

A lack of improvement in this area may be explained by the synonymous conclusion of researchers that 40 lessons were insufficient for students to acquire and become fluent in all five domains of online reading comprehension. In fact, a majority of the research assistants indicated spending a significant amount of time in Phases I and II of IRT that focused heavily on basic skills, searching, locating and evaluating strategies with less time to teach and provide opportunity for students to build fluency in synthesis and communicate domains of online reading comprehension.

QUAN-QUAL Data Mixing

This study concluded that IRT enhanced online reading comprehension equally for students with and without disabilities when used as a targeted, purposeful intervention. It also resulted in increased self-reported, in-school Internet use for students with special needs. After the intervention, students in the treatment group also reported using IM more frequently in school as well as checking who created and the accuracy of online information more often indicating more sophisticated evaluation strategies. Furthermore, students in the treatment group also reported significant increases in their self-efficacy for reading online and using the Internet to answer questions. Qualitative findings provide further insight into what areas of online reading comprehension were most enhanced by IRT.

Qualitative findings converged with improvement with online reading comprehension for students in the treatment group in general search strategies, locating a specific Web site from the search results page, locating specific information within a Web site, evaluating the reliability of Web sites, and emailing. Differences in synthesizing online information were not found between groups in results of the study.

In examining search and locate strategies, students in the treatment group were more likely to use effective strategies such as keyword searches, and less likely to use ineffective strategies such as URL searches or the .com method. Second, locating a relevant Web site from the results page revealed students in the treatment group used more deliberate and strategic methods for choosing a Web site from the results page, while students in the control group resorted to more arbitrary strategies. Third, while most students across groups used effective methods to scan tabs and links within a Web page, and skim the homepage, students in the control group demonstrated greater instances of skimming and reading information when seeking specific information, and they were much more likely to access tabs and links relevant to answering their questions. Although the qualitative sample was small making it difficult to generalize, qualitative data in the searching function of online reading comprehension provided a greater understanding of the specific search strategies used by students with and without disabilities, and areas where IRT seemed to improve search strategies. Therefore, gains for the treatment group in the quantitative data may partially be explained by the improvements in searching and locating information.

Evaluating Web sites for reliability was a major focus of IRT. Qualitative analysis of the online activity indicated that students in the treatment group used more effective strategies to check the reliability of a given Web site; were more accurate in their determination of the reliability of a Web site; and provided clearer and more logical explanations for deeming a website reliable or unreliable. Again, the qualitative results for evaluating a Web site clarified, to some extent, the quantitative findings for improved achievement in online reading comprehension.

While qualitative analysis showed that students overwhelming synthesized information on a Web site by scanning and creating an inference, few students in this sample copied and pasted or even paraphrased specific information. No differences were found across groups for synthesis, and negligible differences were also seen for the communicate domain in the areas of organization and mechanics. However, students in the treatment group did demonstrate greater competency in access, composing, and sending email messages. Improvement of the ORCA for students with disabilities may be partially explained by student improvement in emailing after receiving the IRT intervention.

While no differences were found in the quantitative data between students with and without disabilities, some evidence contradicted those findings by appearing in qualitative evaluation. Overall, quantitative findings revealed several surprising areas where students with disabilities outperformed similar general education students. First, students with disabilities in this sample used more advanced search strategies than students without disabilities. They also exhibited more evidence of skimming techniques of both results page link descriptions and text with a Web site. Furthermore, students with disabilities tended to question the reliability and use more effective strategies for evaluation the reliability of Web pages. In regards to the function of communicate, students with special needs showed fewer capitalization, punctuation, and spelling errors, and when spelling errors did occur, they demonstrated use of spell check features more often than students without disabilities.

Some may find indications of students with disabilities performing better than their nondisabled peers as astounding; however, a few considerations must be addressed. The population of the larger TICA study deliberately targeted students in low-performing middle schools who were at risk to drop out of school; therefore the population from which the sample for this study was derived was comprised predominately of at risk students. In addition, matching procedures for this study selected students without disabilities who were similar in general reading ability to the students with disabilities in the study. Consequently, the sample of general education students in this study was not only likely to be at risk students, but they also probably were struggling readers. With this in mind, it is possible that students without disabilities in the sample experienced similar learning difficulties as students who had been identified with a disability; nevertheless, they do not qualify for special education services and hence do not receive additional support and intervention to address their learning problems. Based on these considerations, it may not be at all surprising that students identified with disabilities in this sample demonstrated greater achievement in some aspects of online reading comprehension.

Implications for Practice

Students with disabilities, as well as their peers with similar reading abilities, experienced significant gains from pre to post-intervention measures for online reading comprehension. Therefore, the results of the study indicate that Internet Reciprocal Teaching is an effective intervention model to improve the online literacy skills for students with special needs in inclusive settings.

Due to the increased complexity and demands of accessing, evaluating, and reading online text, results of the study reinforce the need for teachers to provide systematic instruction in online reading comprehension. Therefore, it is important for teachers to understand the mechanics involved in how students search and locate resources and information of the Web in order to better equip them with effective and efficient strategies.

In particular, teachers should implement effective strategies of IRT that elicited improvement areas such as searching and locating information, seeking relevant and reliable online sources, evaluating Web sites, and communicating through email and other electronic means. In addition, teachers need to consider areas where results of IRT were not as promising and focus on teaching strategies to enhance skills in synthesizing within and across online sources. In addition, teachers should emphasize advanced search strategies that are infrequently used by students and also problem solving strategies for refining searches when they are unsuccessful. Additionally, it is clear from the results that teachers must explicitly teach students to consider their audience and clearly and concisely communicate their ideas when using a variety of online communication tools. Further, results of the study seem to validate the necessity for overtly teaching mechanics in writing and unique tools available that students may access using technology.

Although the participating teachers recognized the benefit of implementing IRT in their classrooms, they also expressed concerns regarding their ability to continue the intervention effectively on their own. Major areas of concern in the current study and previous research (Attwenger, 1997; Castellani, 1999, Heaviside et al., 2000; McHale, n.d.; Wood, Roache, & Reinke, 1997) included feelings of inadequacy and/or unpreparedness by teachers as well as time and budget constraints. Teachers expressed a lack of confidence in their own online reading comprehension strategies causing some anxiety to implement IRT on their own without the support of the researchers. More specifically, they expressed being intimidated by the constantly evolving nature of the Internet, therefore adding to their anxiety about feeling prepared and up-to-date enough to provide instruction for online reading.

Their concern is well founded making the fidelity of implementing the IRT model all the more crucial, as the intervention was carefully structured to increase opportunities for democratic dialogue between teachers and students in order to accommodate and profit from the dynamic nature of the Internet. This, however, does require a paradigm shift for some teachers who prefer the exclusive leadership role in their classrooms to begin to share leadership with students and allow more opportunities for students to assume the instructor's role. Other studies indicated when implementing similar interventions with fidelity, with time, lessons became much more student directed (Castellani, 1999; McHale, n.d.), cooperative learning skills increase (McHale, n.d.), more opportunities for student control and input into classroom activities occur, and ultimately, teachers experience increased recognition that students are capable of much more than they originally anticipated (Hutinger, Clark, & Johannson, 2001). Formatting lessons according to basic IRT principles will ultimately result in great academic benefit for students with and without disabilities in online reading comprehension.

Another major area of concern for teachers is the time involved for both planning and implementing IRT into the classroom. Due to demands of current legislation and the implications of high-stakes testing, teachers conveyed apprehension veering from more traditional methods of preparing and delivering instruction to implementing use of the Internet that they perceived as less efficient use of their time to meet academic standards.

It does appear, in fact, that implementation of IRT does require extensive time planning lessons and in the initial implementation, it also involves training students in the basic prerequisite skills they need to acquire before instruction in the five functions of online reading comprehension can commence. While their concerns are authentic, online literacy is a necessary skill for all students if they are to be prepared to meet the demands in an increasingly technological society. Additionally, although not often included in high-stakes assessments, many states do include academic standards in technology and using online resources, and IRT is a promising practice for improving student competency in these areas while serving as an effective tool to also address other literacy standards.

Limitations of the Study

Several limitations must be considered for interpreting and generalizing the results of this study. One limitation to consider is the impact that treatment duration may have on outcomes. The current study included a twenty week intervention delivered approximately twice a week; however, all four research teams echoed similar reports that achieving mastery of a majority of the Phase II, IRT skills for most students took longer than anticipated resulting in either moving into Phase III too quickly or having insufficient time to properly implement Phase III of the intervention. Therefore, a longer treatment period may correlate with an increased impact on student achievement in online literacy.

Another limitation can be found with the qualitative portion of the study. The online activity was not structured to include one of the five functions of online reading comprehension; questioning, and one other domain, communicating, was limited in that only one online communication tool was examined. In addition, due to external factors, it was necessary to exercise a time limit of approximately 40 minutes for students to complete the online activity; therefore, not all of the exercises were completed by all of the students limiting comparison across subjects and groups as well as possibly preventing the emergence of additional themes.

Another, more pragmatic concern surrounding the study was the use of research teams in delivering instruction. While this enhanced fidelity, it may have hindered generalizability in that most of the time, three professionals were present in the treatment classroom delivering IRT instruction and providing support to students and staff. This configuration and ratio of teachers to students will not typically be found in classrooms, and therefore, the classroom teacher will shoulder the sole responsibility of planning and implementing the intervention that was shared by three professionals in this study.

Practically speaking, additional limitations are apparent. While one of the schools in the study was equipped with laptop carts in every classroom prior to the study, two additional schools were provided laptop carts through the grant. Being equipped with one laptop for every student within each classroom was directly related to the success of the study. Many school districts may not be able to provide this type of access, which may result in issues that would hinder the outcomes found in the study. Such factors might include larger groups of students sharing fewer computers, which would not afford every student multiple opportunities for practice and reinforcement of skills, or it may require teachers to move students to computer labs, which would add additional time and scheduling constraints. Furthermore, vast differences were found between schools regarding their network configuration and capacity. Frequent interruptions of Internet connections during IRT, stringent firewall settings preventing some instructional activities, and the condition of some of the laptops (such as missing keys) were among a few of factors that can potentially limit the effects of the intervention.

One final, and more site-specific intervention arose due to a last-minute, unavoidable change. As previously mentioned, just prior to beginning the study, a participating school withdrew their participation requiring the use of a third language arts teacher in an existing participating school. Due to the number of language arts sections, two treatment classes and one control class of the same teacher had to be randomly assigned. Although measures were taken to alert and emphasize the importance of only using IRT in the treatment classes, researchers reported arriving early to witness the teacher using IRT lessons with her language arts section that was designated as the control group.

Recommendations for Future Research

While students in the study achieved significant gains in online reading comprehension, academic gains in other areas of literacy were not examined that may correlate with student participation in IRT. Future research should examine the impact of IRT on offline literacy skills such as reading comprehension, vocabulary, making inferences, critical thinking, and written expression to see if students can generalize to other areas what they are learning online.

Although, IRT proved to elicit improvements in online reading comprehension in this study, future research should examine the effects of IRT in a more natural setting with classroom teachers delivering the instruction. Before this study can be realized, however, models for how best to train teachers to implement IRT must be investigated and explored.

Findings of the current study revealed issues related to time constraints affecting the progression through Phases I, II, and III of IRT. Additional research can address the impact of alternate treatment lengths and/or frequency on Internet literacy gains. Increasing the duration of IRT may improve outcomes, as students would be provided with additional opportunities for reinforcement and practice that might therefore enhance fluency and competency. Delayed, post-intervention data should also be collected to determine retention.

While this study only sought to investigate the effects of IRT on students with high-incidence disabilities in 7th grade, inclusive ELA classrooms, examination of a variety of groups of students, in diverse educational settings would also be beneficial. For example, IRT should be investigated in middle and high school grades, across the continuum of educational placements for students with disabilities. It may also be interesting to study other variables correlated with the implementation of IRT such as race, ethnicity, gender, SES, etc. Because intervention studies of online reading comprehension and students with disabilities are scarce, replications of this study, or the study of alternative interventions in online literacy would greatly contribute to the research base.

Conclusions

With significant increases to Internet access, increasing societal demands for online competency and the added complexity of reading on the Internet, effective interventions for teaching online literacy continue to grow in necessity, so that educators can prepare students for life beyond K-12 schooling. Moreover, despite the learning challenges that students with disabilities possess, they are required by law to have access to the general education curriculum, which includes access to tools and technology available to their same-aged peers. Therefore, academic interventions such as IRT are highly desirable because while they are designed for general education students, they are also flexible enough to accommodate the unique needs of students with disabilities to produce increased outcomes for both groups.

While students with disabilities included in the general education environment pose distinct challenges to general education teachers responsible for their academic achievement, IRT proved to be a beneficial and effective intervention for students with disabilities as well as their peers without disabilities. Providing teachers with an effective instructional model that meets a contemporary need in all students to improve online literacy and accommodates the special needs of students with disabilities is vital for educators. Doing so may improve general education teachers' willingness, confidence, and successes implementing inclusive practices and online literacy instruction.

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APPENDICES

APPENDIX A

TICA Basic Skills (Phase One) Checklist[1]	
Most of the students and all of the groups in my class know how to:	
Computer Basics	**Comment**
❑ Turn a computer on/off	
❑ Use the mouse/track pad	
❑ Follow classroom and school rules for computer use	
❑ Open programs and files using icons and/or the Start Menu (PC)	
❑ Log on and log off from individual file space	
❑ Create/open a new folder/file	
❑ Launch a word processor	
❑ Open a word processing file	
❑ Type a short entry in a word processing file	
❑ Copy text	
❑ Cut text	
❑ Paste text	
❑ Delete text	
❑ Name a word processing file and save it	
❑ Open a new window	
❑ Open a new tab	
Web Searching Basics	
❑ Locate and open a search engine	
❑ Type key words in the correct location of a search engine	

❑ Type addresses in the address window	
❑ Use the refresh button	
❑ Use the “BACK” and “FORWARD” buttons	
❑ Use a search engine for simple key word searches	
General Navigation Basics	
❑ Maximize/minimize windows	
❑ Open and quit applications	
❑ Toggle between windows	
E-mail Basics	
❑ Locate and open an e-mail program	
❑ Attach documents to e-mail messages	
❑ Compose, edit and send email messages	
❑ Receive and reply to messages	

[1] These skills and strategies inform and guide instruction during Phase One but they are not intended to limit instruction. New skill and strategy needs will emerge within each classroom. Each teacher must respond to (and document) those additional skill and strategy needs during the year. When most students and all groups can accomplish this list, the move to Phase Two will take place.

As the teacher, I consistently support the development of these dispositions among the students in my class:[2]		
	Dispositions	**My Lesson Evidence and Comments**
❑	**Persistence** I support the willingness to sustain effort especially when things become difficult and/or when a strategy appears not to be successful.	

❑	**Flexibility** I support students in keeping in mind alternative strategies for accomplishing goals, continually look for more effective and efficient ways of working online	
❑	**Collaboration** I encourage students to regularly seek out support and tp support others while working online.	
❑	**Critical Stance** I support students in developing a healthy skepticism to information online, regularly questioning its Source, reliability, stance, and accuracy.	
❑	**Reflection** I support students and encourage them to self-monitor and self-regulate during online literacy and learning tasks,	

[2] The evaluation of dispositions will be done from the teacher side, checking to make certain that these are included during instruction, largely because it is hard to evaluate if each student has these dispositions in place and regularly uses them.

APPENDIX B

	TICA Phase II Checklist[1]	
	Most of the students and all of the groups in my class know how to:	
	Understand and Develop Questions	**Lesson Evidence and Comments**
	Teacher-Generated Questions	
❑	Use strategies to ensure initial understanding of the question such as: • rereading the question to make sure they understand it. • paraphrasing the question. • taking notes on the question. • thinking about the needs of the person who asked the question.	
❑	Use strategies to monitor an understanding of the question such as: • knowing when to review the question. • checking an answer in relation to the question to ensure it is complete.	
	Student-Generated Questions	
❑	Determine what a useful initial question is, based on a variety of factors that include interest, audience, purpose, and the nature of the inquiry activity.	
❑	Determine a clear topic and focus for questions to guide the search for information.	
❑	Modify questions, when appropriate, using strategies such as the following: • narrowing the focus of the question. • expanding the focus of the question. • developing a new or revised question that is more appropriate after gathering information.	
	Locate Information	**Lesson Evidence and Comments**

	Locating Information By Using A Search Engine And Its Results Page	
❑	Locate at least one search engine.	
❑	Use key words in a search window on a browser that has this or on a separate search engine.	
❑	Use several of the following general search engine strategies during key word entry: • topic and focus • single and multiple key word entries • phrases for key word entry	
❑	Use several of the following more specialized search engine strategies during key word entry: • quotation marks • paraphrases and synonyms • Boolean • advanced search tool use	
❑	Copy and paste keywords and phases into the search engine window while searching for information.	
❑	Read search engine results effectively to determine the most useful resource for a task using strategies such as: • knowing which portions of a search results page are sponsored, containing commercially placed links, and which are not. • skimming the main results before reading more narrowly • reading summaries carefully and inferring meaning in the search engine results page to determine the best possible site to visit • understanding the meaning of bold face terms in the results • understanding the meaning of URLs in search results (.com, .org, .edu, .net) • knowing when the first item is not the best item for a question • monitoring the extent to which a search results page matches the information needs.	

	• knowing how to use the history pull down menu.	
❑	Monitor the multiple aspects of search engine use and make appropriate revisions and changes throughout the process	
❑	Select from a variety of search engine strategies to locate useful resources when an initial search is unsuccessful: • Knows the use and meaning of the "Did you mean...?" feature in google. • Adjusts search engine key words according to the results of a search. • narrows the search. • expands the search. • reads search results to discover the correct vocabulary and then use this more appropriate vocabulary in a new search. • Shifts to another search engine.	
❑	Bookmark a site and access it later.	
❑	Use specialized search engines for images, videos, and other media sources.	
	Locating Information Within A Website	
❑	Quickly determine if a site is potentially useful and worth more careful reading	
❑	Read more carefully at a site to determine if the required information is located there.	
❑	Predict information behind a link accurately to make efficient choices about where information is located.	
❑	Use structural knowledge of a web page to help locate information, including the use of directories.	
❑	Recognize when you have left a site and know how to return back to the original site.	
❑	Know how to open a second browser window to locate information, without losing the initial web page.	
❑	Know how to use an internal search engine to locate information at a site.	
❑	Monitor the reading of a web page and knows when it contains useful information and when it does not.	
	Critically Evaluate Information	**Lesson Evidence and**

		Comments
	Bias and Stance	
❑	Identify, evaluate, and recognize that all websites have an agenda, perspective, or bias.	
❑	Identify and evaluate bias, given a website with a clear bias.	
❑	Identify and evaluate the author of a website whenever visiting an important new site.	
❑	Use information about the author of a site to evaluate how information will be biased at that site.	
	Reliability	
❑	Investigate multiple sources to compare and contrast the reliability of information.	
❑	Identify several markers that may affect reliability such as: • Is this a commercial site? • Is the author an authoritative source (e.g., professor, scientist, librarian, etc.)? • Does the website have links that are broken? • Does the information make sense? • Does the author include links to other reliable websites? • Does the website contain numerous typos? • Does the URL provide any clues to reliability? • Do the images or videos appear to be altered?	
❑	Understand that Wikipedia is a reasonable, but imperfect, portal of information.	
❑	Identify the general purpose of a website (entertainment, educational, commercial, persuasive, exchange of information, social, etc.).	
❑	Identify the form of a website (e.g. blog, forum, advertisement, informational website, commercial website, government website, etc.) and use this information when cons	
	Accuracy	
	Synthesize Information	**Lesson Evidence and Comments**
❑	Understand both the specific information related to the task as well as the broader context within which that information is located	

❑	Synthesize information from multiple media sources including written prose, audio, visual, video, and/or tables and graphs.	
❑	Separate relevant information from irrelevant information.	
❑	Organize Information effectively.	
❑	Manage multiple sources both on and offline including: • Choose tools to meet the needs of managing information (file folders, electronic file folders, notebooks, email, etc.) • Cite sources • Take notes with paper & pencil, when appropriate. • Take notes with a word processor, when appropriate. • Type notes using short cut strokes such as highlight/cut/copy/paste	
	Communicate Information	**Lesson Evidence and Comments**
❑	Understand that messages have consequences and will influence how others react.	
❑	Use a variety of offline writing/editing tools such as a word processor spell checker, dictionary, thesaurus, pdf,, etc.	
❑	Copy/paste text or URL to use in the message.	
❑	Know how to use email including attaching and downloading attachments, logging in, sending messages, opening messages.	
❑	Know how to use IM	
❑	Know how to use blogs including reading and posting information.	
❑	Monitor communication of information for audience or voice (i.e. formal versus informal writing styles)	
❑	Uses a wide array of Internet-based forms of communication, such as: • email and attachments • blogs • wikis • Google Docs	

	• instant messaging • websites • presentation software	
❑	Is aware of the audience and the relationship between audience, purpose, medium, message.	
❑	Knows how to include multiple-media sources within messages.	
❑	Uses formatting such as headings and subheadings to communicate the organization of information within informational text.	

1 These skills and strategies inform and guide instruction during Phase Two but they are not intended to limit instruction. New skill and strategy needs will emerge within each classroom. Each teacher must respond to (and document) those additional skill and strategy needs during the year.

As the teacher, I consistently support the development of these dispositions among the students in my class:[2]		
	Dispositions	**My Lesson Evidence and Comments**
❑	**Persistence** I support the willingness to sustain effort especially when things become difficult and/or when a strategy appears not to be successful.	
❑	**Flexibility** I support students in keeping in mind alternative strategies for accomplishing goals, continually look for more effective and efficient ways of working online	
❑	**Collaboration** I encourage students to regularly seek out support and tp support others while	

	working online.	
❑	**Critical Stance** I support students in developing a healthy skepticism to information online, regularly questioning its source, reliability, stance, and accuracy.	
❑	**Reflection** I support students and encourage them to self-monitor and self-regulate during online literacy and learning tasks,	

[2] The evaluation of dispositions will be done from the teacher side, checking to make certain that these are included during instruction, largely because it is hard to evaluate if each student has these dispositions in place and regularly uses them.

APPENDIX C

APPENDIX D

TICA Teacher Information Sheet

1. My group of students served as the… experimental group control group

2. I have been teaching for ________ years.

3. I am certified to teach ____.

4. Highest degree earned:

Bachelor's degree

Master's degree

Master's + 10

Master's + 20

Master's + 30

Specialist degree

Ed.D. or Ph.D. degree

5. I have completed _______ hours of coursework in special education beyond the 3 required hours for most colleges and universities.

6. On a scale of 1 to 10 (1 being not at all comfortable, 10 being very comfortable), I would rate my comfort level for integrating technology into my classroom as a ____.

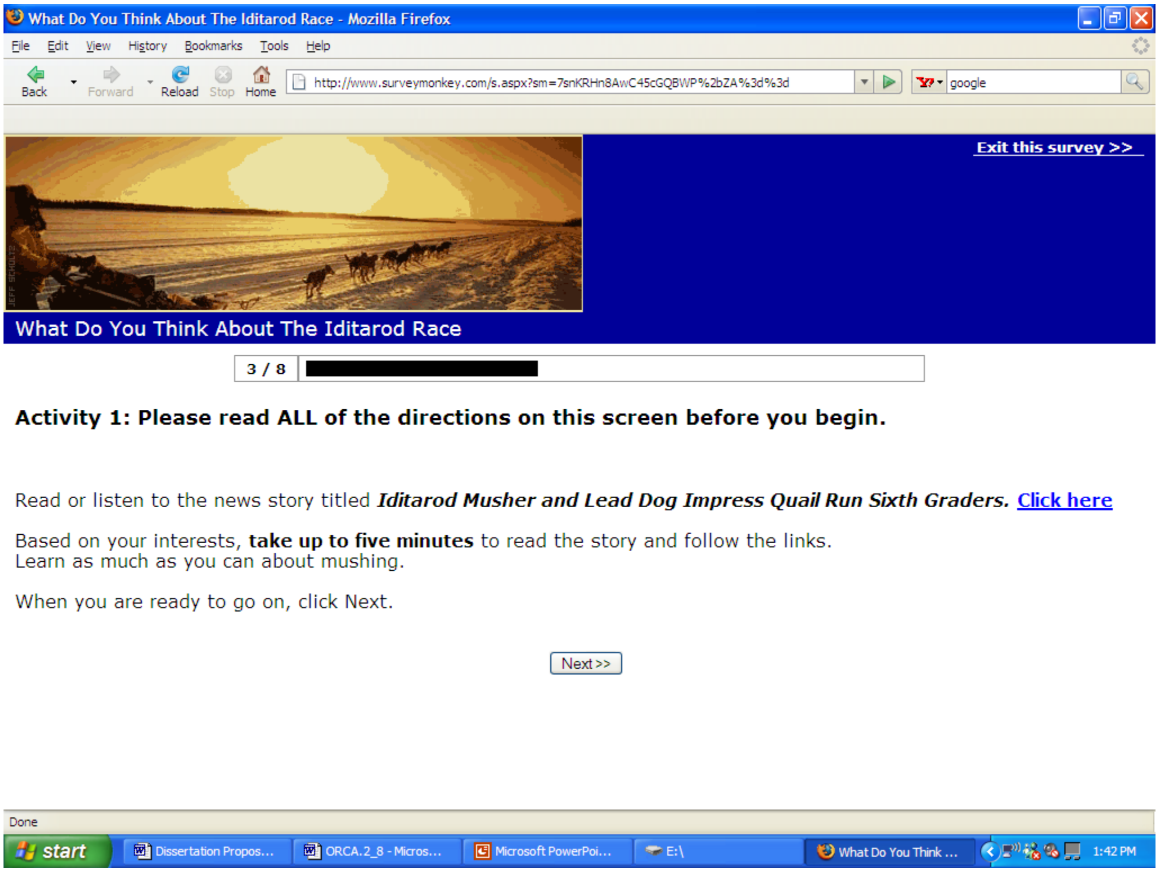
7. On a scale of 1 to 10 (1 being not at all comfortable, 10 being very comfortable), I would rate my comfort level for integrating the Internet into my classroom as a ____.

8. For professional reasons, I use the following online resources (circle all that apply)

Email	IM	Lesson plans	IEP documents
Facebook/Myspace		Wiki's	Webpages
Blogs	Blackboard	Chat rooms	Other: (please indicate)

Which resources would you say you use most often?

APPENDIX E


What Do You Think About The Iditarod Race - Mozilla Firefox
File Edit View History Bookmarks Tools Help
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google
Exit this survey >>
What Do You Think About The Iditarod Race
3 / 8
Activity 1: Please read ALL of the directions on this screen before you begin.
Read or listen to the news story titled Iditarod Musher and Lead Dog Impress Quail Run Sixth Graders. Click here
Based on your interests, take up to five minutes to read the story and follow the links.
Learn as much as you can about mushing.
When you are ready to go on, click Next.
Next >>
Done
start
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ORCA.2_8 - Micros...
Microsoft PowerPoi...
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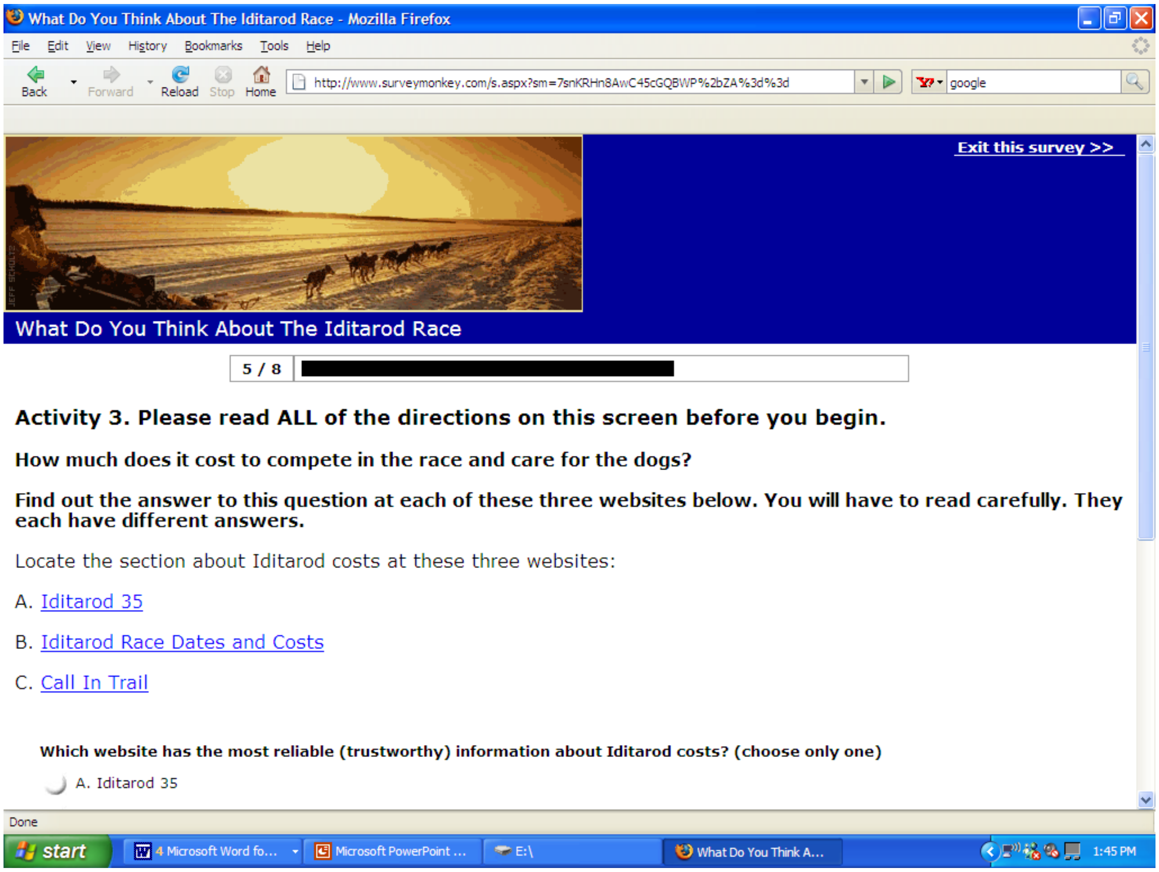
What Do You Think ...
1:42 PM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google
Exit this survey >>
What Do You Think About The Iditarod Race
5 / 8
Activity 3. Please read ALL of the directions on this screen before you begin.
How much does it cost to compete in the race and care for the dogs?
Find out the answer to this question at each of these three websites below. You will have to read carefully. They each have different answers.
Locate the section about Iditarod costs at these three websites:
A. Iditarod 35
B. Iditarod Race Dates and Costs
C. Call In Trail
Which website has the most reliable (trustworthy) information about Iditarod costs? (choose only one)
A. Iditarod 35
Done
start
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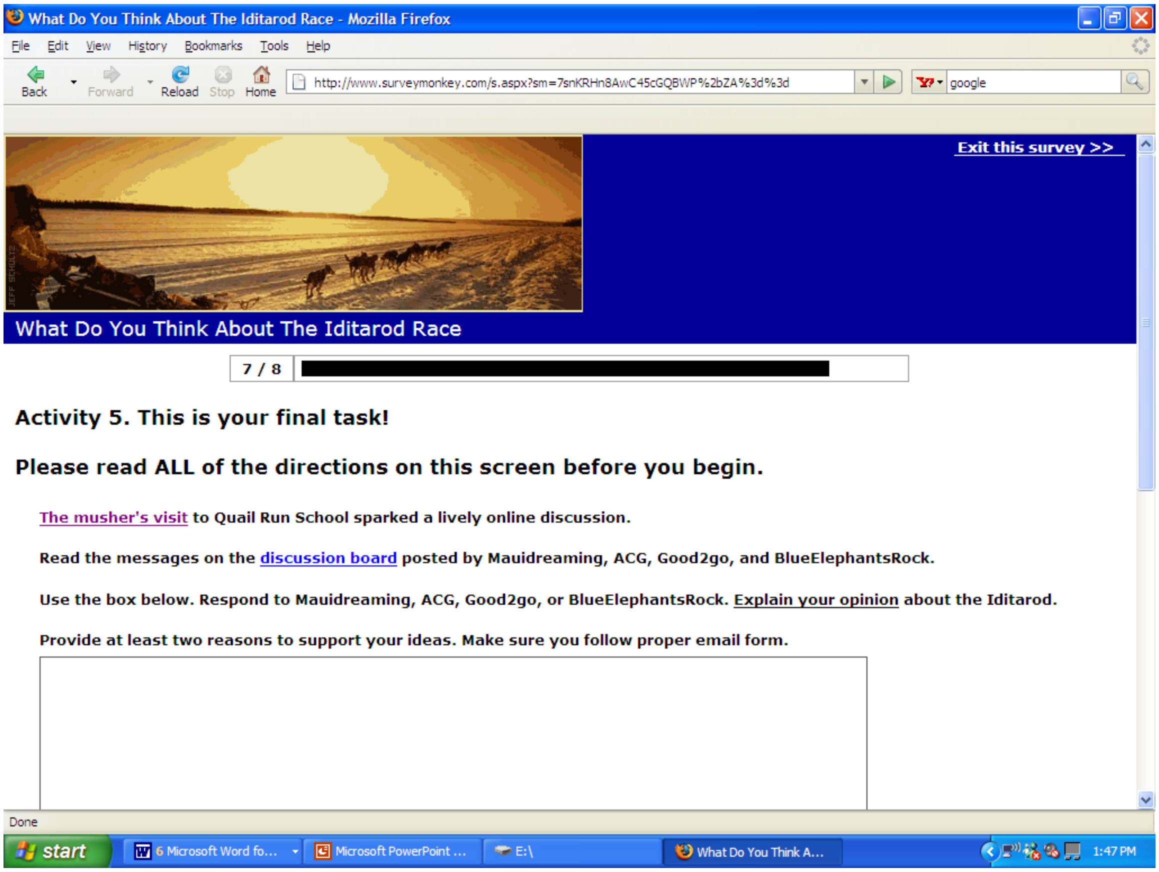
Microsoft PowerPoint ...
E:\
What Do You Think A...
1:45 PM


What Do You Think About The Iditarod Race - Mozilla Firefox
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http://www.surveymonkey.com/s.aspx?sm=7snKRHn8AwC45cGQBWP%2bZA%3d%3d
google
Exit this survey >>
What Do You Think About The Iditarod Race
7 / 8
Activity 5. This is your final task!
Please read ALL of the directions on this screen before you begin.
The musher's visit to Quail Run School sparked a lively online discussion.
Read the messages on the discussion board posted by Mauidreaming, ACG, Good2go, and BlueElephantsRock.
Use the box below. Respond to Mauidreaming, ACG, Good2go, or BlueElephantsRock. Explain your opinion about the Iditarod.
Provide at least two reasons to support your ideas. Make sure you follow proper email form.
Done
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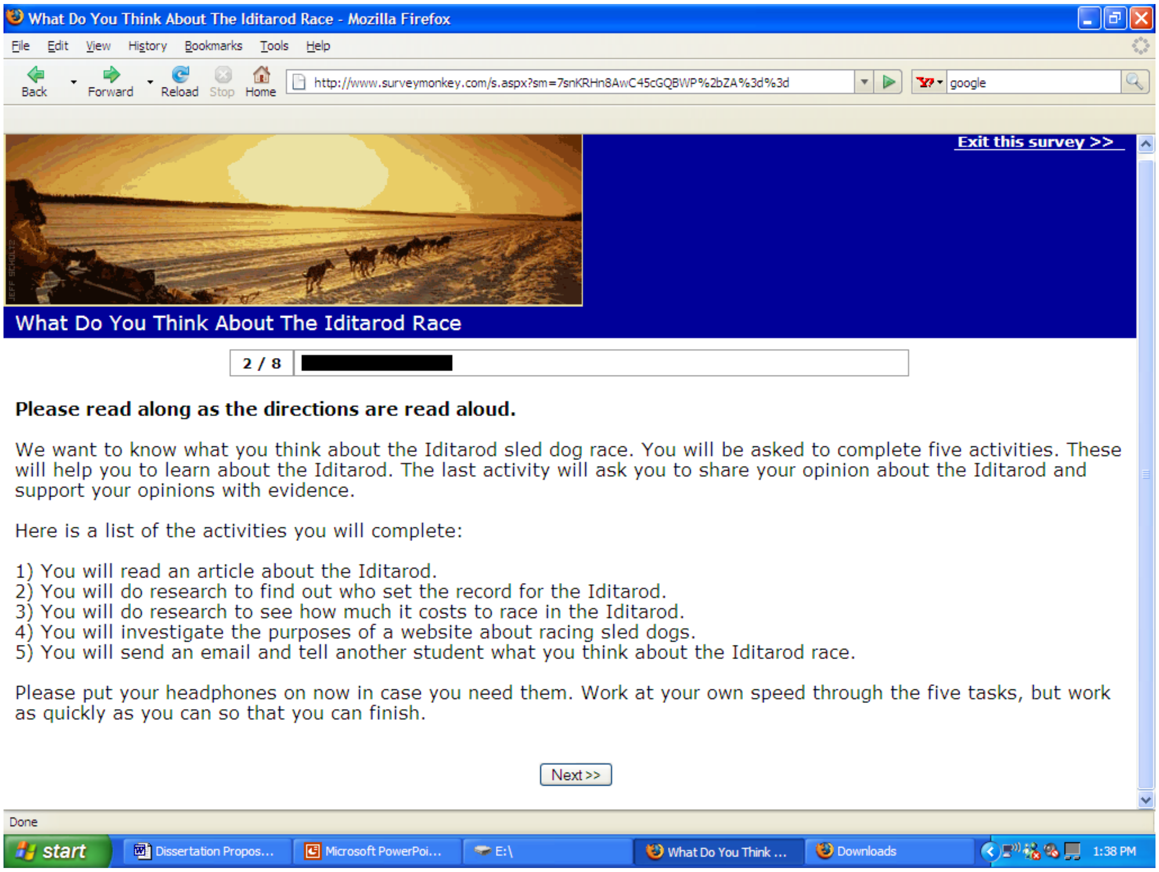
1:47 PM


What Do You Think About The Iditarod Race - Mozilla Firefox
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http://www.surveymonkey.com/s.aspx?sm=7snKRHn8AwC45cGQBWP%2bZA%3d%3d
google
Exit this survey >>
What Do You Think About The Iditarod Race
2 / 8
Please read along as the directions are read aloud.
We want to know what you think about the Iditarod sled dog race. You will be asked to complete five activities. These will help you to learn about the Iditarod. The last activity will ask you to share your opinion about the Iditarod and support your opinions with evidence.
Here is a list of the activities you will complete:
1) You will read an article about the Iditarod.
2) You will do research to find out who set the record for the Iditarod.
3) You will do research to see how much it costs to race in the Iditarod.
4) You will investigate the purposes of a website about racing sled dogs.
5) You will send an email and tell another student what you think about the Iditarod race.
Please put your headphones on now in case you need them. Work at your own speed through the five tasks, but work as quickly as you can so that you can finish.
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start
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Microsoft PowerPoi...
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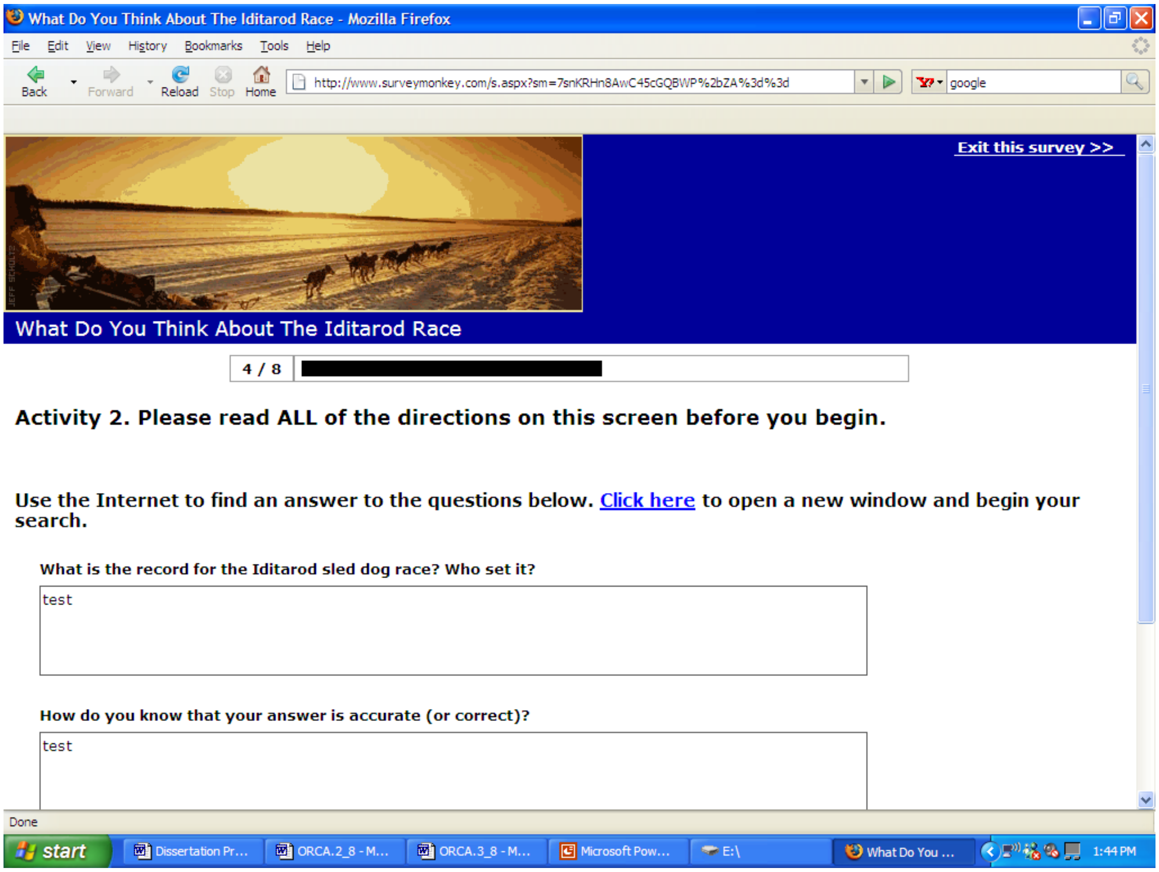
What Do You Think ...
Downloads
1:38 PM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http://www.surveymonkey.com/s.aspx?sm=7snKRHn8AwC45cGQBWP%2bZA%3d%3d
google
Exit this survey >>
What Do You Think About The Iditarod Race
4 / 8
Activity 2. Please read ALL of the directions on this screen before you begin.
Use the Internet to find an answer to the questions below. Click here to open a new window and begin your search.
What is the record for the Iditarod sled dog race? Who set it?
test
How do you know that your answer is accurate (or correct)?
test
Done
start
Dissertation Pr...
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What Do You ...
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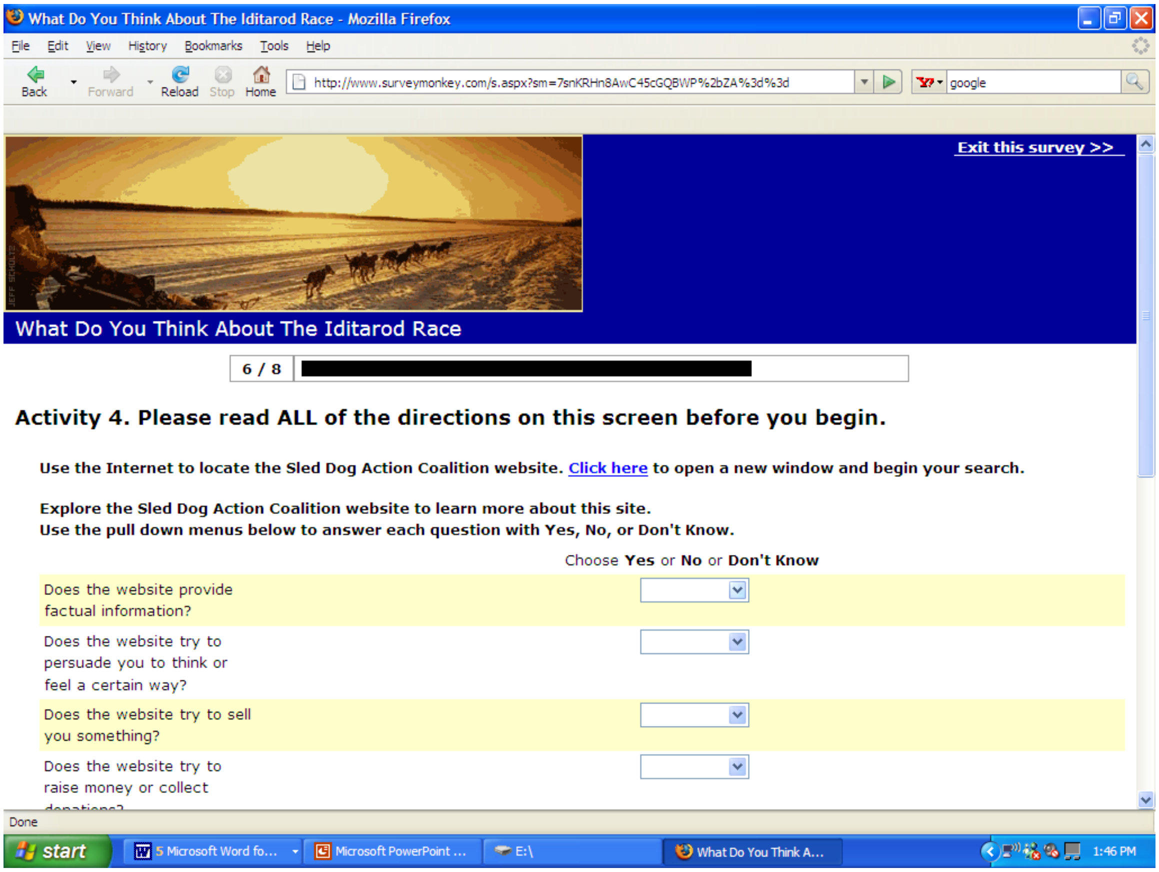
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google
Exit this survey >>
What Do You Think About The Iditarod Race
6 / 8
Activity 4. Please read ALL of the directions on this screen before you begin.
Use the Internet to locate the Sled Dog Action Coalition website. Click here to open a new window and begin your search.
Explore the Sled Dog Action Coalition website to learn more about this site.
Use the pull down menus below to answer each question with Yes, No, or Don't Know.
Choose Yes or No or Don't Know
Does the website provide factual information?
Does the website try to persuade you to think or feel a certain way?
Does the website try to sell you something?
Does the website try to raise money or collect donations?
Done
start
5 Microsoft Word fo...
Microsoft PowerPoint ...
E:\
What Do You Think A...
1:46 PM

APPENDIX F

VERBAL PROTOCOL TASK

DIRECTIONS FOR THE INTERVIEWER:

PRE-TASK INTERVIEW (5 minutes for each student)

(Push F9 to begin Camtasia recording. Verify that the red button on task bar is flashing to indicate recording or the green lines around the screen is flashing.)

To Put Them at Ease by Positioning Them as an Important Informant to Our Research

1. "Hi XXXX. My name is YYYY. I work at the Clemson University. We are studying how 7th graders read on the Internet. We would like you to help us learn how you read on the Internet. It will really help other students around the United States, and their teachers, if you can tell us how you use the Internet. We have some activities for you to do. They will help us learn how you use the Internet so well. Can you help us?"
2. If the student agrees to participate in the study, have them sign and initial the student consent form.
3. (Following student response.) Today, we're going to spend about 40 minutes together and I'm going to ask you to complete a few tasks. I am going to be recording where you are going on the computer, what sites you visit and how you get there so I can look back at it later and learn from you.

Proficiency Explanation (Record on Form A)

1. Are you used to using a Mac or a Windows PC or both?
2. How did you get so good at using the Internet?

3. Which programs have you used to surf the net? Internet Explorer, Safari, Firefox, or something else?
4. Which one are you the best at using?
5. What do you think is the most important thing about reading on the Internet that most kids do not know?
6. Tell me what the word reliable means to you? What else does it mean?
7. Can you give me an example?

Prior Knowledge About the Concept of "Reliable" to evaluate any changes. (1 minute) (Record on Form A)

1. Tell me what the word reliable means to you? What else does it mean? Is there anything else? Can you give me an example? If I said that a reliable friend is a friend that you can count on and trust, then what do you think I would mean by a reliable website?

THINK-ALOUD SESSION (30 minutes)

DIRECTIONS

How to do a think-aloud.

1. You're an expert reader on the Internet and I want to know how you do this. I'd like you to tell me what you are thinking while you are using the Internet.
2. For example, if I ask you to find information on the Internet and you go to goggle, then I want you to say out loud, "I am going to google because it is the search engine that I use all the time. Do you understand how to think aloud while you do something? This is what we want you to do when you are

reading. Do you have any questions about how to do this? (answer any questions)

3. Tell me everything you are thinking while you are reading on the Internet. It will help us help other students who are not as good as you are at using the Internet. There will be certain places where we really want to know what you are thinking. So, if you forget to tell us what you are thinking at certain places, we will ask you. OK?

Introduce the Students to the Computer

1. You may use whatever tools you like to find the answers to the questions on the Internet.
2. Here is a copy of the directions.
3. Read the task aloud to the student, and ask if they have any questions.
4. After they find and answer, you may read the next question aloud to them to prompt them.

Let's take about 30 minutes to do as many of these as possible. Remember to think aloud while you're working.

Record the start time on **Data Form A**. If they finish early, you can allow them to go on to Activity #2, but record the time and the end time. Only allow students 5 minutes to complete Activity # 2 or the remainder of the 30 minutes. Have students save all word documents with their first name and last initial.

If students are still on Activity #1 after 25 minutes have passed, let the student know they will need to finish up and begin composing their email message and attachment.

DIRECTIONS: INTERNET ACTIVITY

DURING THE THINK-ALOUD: PROMPT PROCEDURE FOR ELICTING ADDITIONAL THINKING ALOUD.

This is a *structurally prompted, think-aloud* session where we probe, inviting students to think aloud, at pre-selected locations, if they do not voluntarily share their thinking at these locations.

There are two types of locations where we want to probe if they do not tell us what they are thinking:

- When they are reading **any web page** (e.g., a goggle search engine key word entry page, a set of search engine results, a blog entry, and all pages at a traditional informational site.)
- When they are about to "click," make an interactive decision, just before they click on a link, while they are entering key words in a search engine, or while they are composing an email message. (They will use their school email)

If they are not thinking aloud, we will ask them one question at each of these locations where we expect important thinking to take place:

Can you tell me what you are thinking?

Do not provide any other information in your question!

Thus, if students are not thinking aloud, ask this question, one time, at locations such as these:

- When they are choosing the question to respond to, determine how they process questions and select a question.
- When they are reading any web page.
- When they read search engine results.
- When they read about information to establish a site's reliability.
- When they are trying to figure out how their email account works and where to go to compose an email.
- When they are composing an email response.
- When they are trying to figure out how to send an email message.
- When they are trying to figure out how to attach a document to an email.
- When they finish the activity to determine how they conclude that they are done.

And, ask the probe questions just before these click, or interactive, decision points.

- When they are selecting a search engine or when they are using a URL location strategy.
- When they about to click on a search engine result.
- When they about to click on ANY link.
- When they are about to enter search engine key words.

POST-TASK INTERVIEW

On Activity #1, which site was the most reliable? How do you know?

On Activity #2, did you have trouble finding any of the answers to the questions? If you did, what strategies did you use or could you have used to find the information.

Record on Form A. (also, make note of any interesting observations during the activity)

Press F10 to stop recording. You will have to wait a minute while it adds the audio, and then it will begin to play what you have just recorded. Click the SAVE button in the bottom, right hand corner and name the file: first name. last initial, teacher and period number. Exp. Cody.M_Gibbs6

RELEASE THE STUDENT

Release the student back to the classroom.

DIRECTIONS FOR ACTIVITY 1:

Can you evaluate these two websites for reliability?

A class in Pittsburgh, Pennsylvania is studying how to evaluate information on the Internet for reliability. Can you help them? **Write your answers in a word document**. **Attach the document to an email message, and send it to Ms. Robbins at krobbin@clemson.edu** She will send all your answers as an attachment to the class in Pittsburgh, so that they can learn from you.

A. Go to the site*: Dog Island*. It has a blue background and you will find the words "Free Forever." Evaluate the website for reliability and answer all the questions below. Write your answers on a word processor, and when you have finished part A and B, you will send your document as an attachment.

a. Who created this site?

b. Why did they create it?

c. Tell us if you consider this site very reliable, somewhat reliable, or not at all reliable?

d. Prove your choice. What information can you find that tells you that you are right? Explain.

e. What would you tell other students about the best way to determine if a site is reliable or not?

B. Go to the site: *World Wildlife Fund.* It has a black and white picture of a panda in the top left hand corner of the web page. Please answer these four questions. **Write your answers on a word processor. Attach the document to an email, and send your it to: krobbin@clemson.edu**

a. Why did the World Wildlife Fund create this site?

b. Find information at this site that teaches you how to hunt. If you can't find this information, tell us why it is hard to find.

c. Do you consider this site very reliable, somewhat reliable, or not at all reliable?

d. Prove your choice. What information can you find that tells you that you are right? Explain.

DIRECTIONS FOR ACTIVITY 2: Searching for information

Can you locate these items?

The class in Pittsburgh, Pennsylvania is also studying how to search for information on the Internet. Can you help them to search and locate the answers and the Internet address where you found these items? **Then, send an email message with your answers to Ms. Robbins at krobbin@clemson.edu**, and she will forward everyone's answers to the class in Pittsburgh.

1. Find a picture of a telephone.
    - Copy the picture and paste it into your word document.
    - List the address where you found this.
    - Explain to other students what you think the most important skill is to do this.
2. Find a video of an eagle flying.
    - List the address where you found this.
    - Explain to other students what you think the most important skill is to do this.
3. Find the site where two separate phrases appear: Ukunda schools and support our project. There is a picture of four people at this site.
    - List the address where you found this.
    - Explain to other students what you think the most important skill is to do this.
4. Go to the encyclopedia called Wikipedia. Find the site in Wikipedia that has information about the town called Midland, Michigan.
    - List the address where you found this.
    - Explain to other students what you think the most important skill is to do this.

DIRECTIONS FOR ACTIVITY 3:

Can you learn how to do something new on the Internet?

The class in Pittsburgh, Pennsylvania is also studying how to do something new on the Internet. Can you help them? Try to do these tasks. **Write your answer in a word document. Attach the document to an email message and send it to krobbin@clemson.edu.**

We want to see if you can learn how to do something new on the Internet, by yourself.

Follow these directions:

1. Go to the online encyclopedia, Wikipedia.
2. Find the entry for your city, or a nearby city, in your state.
3. Add or revise any information at this site. You may change anything or add anything that you wish.
4. Can you figure out how to do this? (If there is no entry for your city, please make an entry.)
5. If you can figure out how to do this, publish the changes that you made to the Internet.
6. **Tell us**: How did you figure out how to make an entry at Wikipedia? or Why could you not figure out how to do this?

VERBAL PROTOCOL FOR ONLINE READING COMPREHENSION TASK AND THINK-ALOUD

ADAPTED

TICA

Teaching Internet Comprehension to Adolescents

Each aspect of your work will be described here. You will also find all of the printed materials that you will require for this task, as well as a data collection sheet for duplication.

This document contains:

VERBAL PROTOCOL #2

There are five elements to your work as the experimenter in this study. Each is described below:

1. Researcher Setup (30 minutes at the beginning of each day's work)
2. Rules for Assistance to the Student
3. Pre-task Interview (10 minutes for each student)
    a. to put them at ease by positioning them as an important informant to our research.
    b. to gain information about how they learned to use the Internet and their definition of reliability.
    c. to gather suggestions about what teachers should teach about reading on the Internet.
4. Think-aloud Session (30 minutes)
5. End of Session Activities

I. RESEARCHER SETUP (approximately 30 minutes)

1. Plug power cord into electrical outlet (please do not rely on battery power)
2. Power on computer.
3. Plug network cable into network jack (or test wireless access)
4. Attach external mouse (if using one) and test

5. Open Internet Explorer and make sure it's set to default page MSN. Tools→Internet Options. Enter http://www.msn.com in address box for default home page.
6. Reset the browser log of web sites visited in IE. Do this by going to tools, and find the option for resetting Internet browser. Tools→Internet Options→click "clear history" button click OK to close menu window
7. Turn off auto-fill forms and clear history. Tools→Internet Options→Content Tab→AutoComplete button→Uncheck 3 AutoComplete Options→Click Clear Forms button and Clear Passwords button.
8. Reset security level to "low" Tools→Internet Options→Security tab→Custom Level button→Select "Low" from drop down menu at bottom of window→Click Reset button
9. Launch Camtasia Recorder (Start→All Programs→Camtasia Studio 3→Applications→Camtasia Recorder)
10. Plug microphone into jack (if needed).
11. Start recording with Camtasia (click red record button or F9), launch Internet Explorer, and test microphone ("testing 1, 2, 3...") Close IE window.
12. Stop recording with Camtasia (click square icon or F10).
13. Playback Camtasia file to ensure everything is working properly. (Playback of video should launch automatically.) Listen for audio to ensure it is capturing voice for the think-aloud.
14. Adjust volume if necessary (speaker icon in taskbar or on microphone unit).

15. Minimize Camtasia window. (A red button will appear on the taskbar).
16. Open Microsoft Word with a new word document in place and minimize.
17. Make sure you have printed out of the directions/note taking sheet for the student and the Interview/Prior Knowledge recording sheets. (see student folder)
18. If you have your own, additional, laptop, use this to take field notes during the session. Label each file with the name of the student and "notesVP2" (i.e. CindySmith_notesVP2). Save this file for each student.
19. Read the "Rules for Assistance" (below). You will need to follow these guidelines.
20. Retrieve the first student from class or wait until he/she arrives.

II. RULES FOR STUDENT ASSISTANCE: VP2B

During the activity, you may clarify the task, itself, but you may not provide any information about how to complete it:

- You may ask the student to explain the task, to make certain they understand it.
- If the student is a poor reader and you think he/she might benefit from you reading the directions again, you should read these to the student. Do not read web sites or anything else.
- Do not provide any other assistance.
- Only respond with non-value laden comments to any think-aloud responses. Use phrases like "OK," or "Keep going," or "Hm-hm," but don't do lots of

head nodding, or excessive praise that would indicate to the student that we want them to "do more of that particular thing."

Email Rules

- For Experimenter: Do not provide any assistance. If they ask a question, just say, “That’s a great question. See if you can figure it out on your own.” (Note: If the student struggles for 2 minutes or more, point out “Compose Mail” button and make a notation of this in your field notes.)

III. PRE-TASK INTERVIEW (5 minutes for each student)

(Push F9 to begin Camtasia recording. Verify that the red button on task bar is flashing to indicate recording. Start backup voice recorder.)

To Put Them at Ease by Positioning Them as an Important Informant to Our Research

1. “Hi XXXX. My name is YYYY. I work at the University of Connecticut/Clemson University. We are studying how 7th graders read on the Internet. We would like you to help us learn how you read on the Internet. It will really help other students around the United States, and their teachers, if you can tell us how you use the Internet. We have some activities for you to do. They will help us learn how you use the Internet so well.

   Can you help us?”

2. (Following student response.) Today, we’re going to spend about 40 minutes together and I’m going to ask you to complete a few tasks. I am going to be

recording where you are going on the computer, what sites you visit and how you get there so I can look back at it later and learn from you.

Proficiency Explanation (Record on Form A)

1. Are you used to using a Mac or a Windows PC or both?
2. Which one are you best at using?
3. How did you get to be so good at using the Internet?
4. Which programs have you used to surf the net? Internet Explorer, Safari, Firefox, or something else?
5. Which one are you the best at using?

Recommendations for Classroom Instruction (Explore a bit and record on From A)

1. What do you think is the most important thing about reading on the Internet that most kids do not know?

Prior Knowledge About the Concept of "Reliable". (Record on Form A)

- Tell me what the word reliable means to you? What else does it mean? Is there anything else? Can you give me an example?

IV. THINK-ALOUD SESSION (30 minutes)

DIRECTIONS: How to do a think-aloud:

1. You're an expert reader on the Internet and I want to know how you do this. I'd like you to tell me what you are thinking while you are using the Internet. Let me show you how to do this.

   (Show video: http://ctell1.uconn.edu/thinkaloudvideo.mov)

2. Do you see how to think-aloud while you do something? This is what we want you to do when you are reading. Do you have any questions about how to do this? (answer any questions)
3. Tell me everything you are thinking while you are reading on the Internet. It will help us help other students who are not as good as you are. There will be certain places where we really want to know what you are thinking. So, if you forget to tell us what you are thinking at certain places, we will ask you. OK?

Introduce the Students to the Computer

Point to each tool on the screen/taskbar required for the task, opening and minimizing it back on the bottom bar:

- Here's Internet Explorer
- Here is a MS word document
- And here is a paper and pencil.

- Hand students the printed copy of the directions, available at the end of this protocol. (p. 11)
- Read the task aloud to student to students and ask if they have any questions.

Let's take about 30 minutes to do as many of these as possible. Remember to think-aloud while you're working.

- Record the start time on **Data Form A**. If they finish early, record the end time. We will need both.

- After 25 minutes have passed, let the student know they will need to finish up and begin composing their email message and attachment.

V. PROMPT PROCEDURE DURING THINK-ALOUD ACTIVITY

This is a *structurally prompted, think-aloud* session where we probe, inviting students to think-aloud, at pre-selected locations, if they do not voluntarily share their thinking at these locations.

There are two types of locations where we want to probe if they do not tell us what they are thinking:

- When they are reading **any web page** (e.g., a google search engine key word entry page, a set of search engine results, a blog entry, and all pages at a traditional informational site.)
- When they are about to make a "click, or other interactive, decision," just before they click on link, while they are entering key words in a search engine, or while they using email or attaching a document to email.

If they are not thinking aloud, we will ask them one question at each of these locations where we expect important thinking to take place: ***Can you tell me what you are thinking?***

Do not provide any other information in your question!

Thus, if students are not thinking aloud, ask this question, one time, at locations such as these:

- When they are understanding and choosing the question to respond to determine how they process questions.
- When they are reading any web page.
- When they read search engine results.
- When they read about information to establish a site’s reliability.
- When they are trying to figure out how to email or attach a document to an email.
- When they finish the activity to determine how they conclude that they are done.
- Just before they click, or interactive, decision points.
- When they are selecting a search engine or when they are using a URL location strategy.
- When they about to click on a search engine result.
- When they about to click on ANY link.
- When they are about to enter search engine key words.
- When they select the compose box on an email.

VI. POST-TASK INTERVIEW.

- If the students completed Activity #1, ask them which site was the most reliable. Then ask them how the decided this. Record on Form A.

- If students completed all or part of Activity #2, ask them if they had trouble finding any of the answers to the questions? If they did, ask them what strategies they used or could have used to find the information.

VII. RELEASE THE STUDENT

- Ask the students not to tell anyone about what they did. It is a study, and we want to see how each student does, without knowing what the activity is.
- Release the student back to the classroom.

VIII. END OF SESSION

- Record the end time on Data Form A.
- When student has completed the online assessment, stop the Camtasia recording (F10).
- Save the Movie File As "lastname_VP2_date" (use the student's last name).

ATTACHMENTS

DIRECTIONS FOR ACTIVITY 1:

Can you evaluate these two websites for reliability?

A class in Pittsburgh, Pennsylvania is studying how to evaluate information on the Internet for reliability. Can you help them? **Write your answers in a word document**. **Attach the document to an email message, and send it to Ms. Robbins at krobbin@clemson.edu** She will send all your answers as an attachment to the class in Pittsburgh, so that they can learn from you.

1) Go to the site*: Dog Island*. It has a blue background and you will find the words

"Free Forever." Evaluate the website for reliability and answer all the questions below. Write your answers on a word processor, and when you have finished part A and B, you will send your document as an attachment.

a) Who created this site?

b) Why did they create it?

c) Tell us if you consider this site very reliable, somewhat reliable, or not at all reliable?

d) Prove your choice. What information can you find that tells you that you are right? Explain.

e) What would you tell other students about the best way to determine if a site is reliable or not?

2) Go to the site: *World Wildlife Fund.* It has a black and white picture of a panda in the top left hand corner of the web page. Please answer these four questions. **Write your answers in a word document. Attach the document to an email, and send it to: krobbin@clemson.edu**

a) Why did the World Wildlife Fund create this site?

b) Find information at this site that teaches you how to hunt. If you can't find this information, tell us why it is hard to find.

c) Do you consider this site very reliable, somewhat reliable, or not at all reliable?

d) Prove your choice. What information can you find that tells you that you are right? Explain.

DIRECTIONS FOR ACTIVITY 2:

Can you locate these items?

The class in Pittsburgh, Pennsylvania is also studying how to search for information on the Internet. Can you help them to search and locate the answers and the Internet address where you found these items? **Then, send an email message with your answers to Ms. Robbins at krobbin@clemson.edu**, and she will forward everyone's answers to the class in Pittsburgh.

1) Find a picture of a telephone.
   a) Copy the picture and paste it into your word document.
   b) List the address where you found this.
   c) Explain to other students what you think the most important skill is to do this.
2) Find a video of an eagle flying.
   a) List the address where you found this.
   b) Explain to other students what you think the most important skill is to do this.
3) Find the site where two separate phrases appear: <u>Ukunda schools</u> and <u>support our project</u>. There is a picture of four people at this site.
   a) List the address where you found this.
   b) Explain to other students what you think the most important skill is to do this.
4) Go to the encyclopedia called Wikipedia. Find the site in Wikipedia that has information about the town called Midland, Michigan.
   a) List the address where you found this.
   b) Explain to other students what you think the most important skill is to do this.

DIRECTIONS FOR ACTIVITY 3:

Can you learn how to do something new on the Internet?

The class in Pittsburgh, Pennsylvania is also studying how to do something new on the Internet. Can you help them? Try to do these tasks. **Write your answer in a word document. Attach the document to an email message and send it to krobbin@clemson.edu.**

We want to see if you can learn how to do something new on the Internet, by yourself. Follow these directions:

1. Go to the online encyclopedia, Wikipedia.
2. Find the entry for your city, or a nearby city, in your state.
3. Add or revise any information at this site. You may change anything or add anything that you wish.
4. Can you figure out how to do this? (If there is no entry for your city, please make an entry.)
5. If you can figure out how to do this, publish the changes that you made to the Internet.
6. **Tell us**: How did you figure out how to make an entry at Wikipedia? or Why could you not figure out how to do this?

FORM A: DATA COLLECTION SHEET – VERBAL PROTOCOL TASK

Student: ____________________ Online Task: Start _________ End ___________

School: ________________ Interviewer: _______________________ Date ________

Are you used to using a Mac or a Windows PC or both? Which one are you the best at using?

How did you get to be so good at using the Internet? (Open-ended question. Explore a bit)

Which programs have you used to surf the net? Internet Explorer, Safari, Firefox, or something else? Which one are you the best at using?

What do you think is the most important thing about reading on the Internet that most kids do not know?

Tell me what the word reliable means to you? What else does it mean? Is there anything else? Anything else? Can you give me an example?

Post-Task Interview

On Activity #1, which site was the most reliable? How do you know?

On Activity #2, did you have trouble finding any of the answers to the questions? If you did, what strategies did you use OR could you have used to find the information?

APPENDIX G

ORCA Rubric	
Item 2a	**Using a search engine to locate an information resource** ***What is the record for the Iditarod sled dog race?***
1	Answers 8:22:46:2 or 8 days, 22 hours, or 8:22. Other acceptable answers (see http://www.iditarod.com/learn/awards.html) • Five Most times won – (Rick Swenson) • First Woman To Finish (Mary Shields) • First Woman to Win (Libby Riddles) • First Musher From Outside Alaska To Win (Doug Swingley) • First Musher from Overseas to Win (Robert Sorlie)
0	Answers with incorrect responded or does not attempt.

Item 2b	**Using a Search engine to locate an information resource** ***Who set it?***
1	Answers: Martin Buser, M. Buser, Martin, or Buser Other acceptable answers (see http://www.iditarod.com/learn/awards.html) • Rick Swenson or Swenson, Or R Swenson (1977-78-81-82-91) Most Times Won • Mary Shields or Shields or M Shields (First Woman to Finish) • Libby Riddles (First Woman To Win) • Doug Swingley (First Musher From Outside Alaska To Win) • Robert Sorlie (First Musher From Overseas To Win)
0	Answers with incorrect response or does not attempt.

Item 2c	**Evaluating information based on the degree to which it is correct** ***How do you know that your answer is accurate (or correct)?***
3	Describes the use of two or more appropriate strategies such as: I checked the info on other websites and it was the same. I trust the person authoring the site. She's an expert because…
2	Provides one appropriate strategy such as the above.
1	Provides a partial or an ill-defined response.
0	Task not completed or does not evaluate accuracy.

Task Two Score: _____/5

Item 3a	**Verification of information for reliability and relevancy** ***How much does it cost to compete in the race and care for the dogs?...Which website has the most reliable (trustworthy) information about the Iditarod costs (choose only one)?***
1	Answers either A or C (move on to 3b)
0	Answers B (score a zero on 3b)

Item 3b	**Student evaluates information source based on the relevancy and reliability of the information.** ***How do you know your choice is the MOST reliable? Explain at least two reasons for your choice in the box below.***
3	Provides response with two strategies like the following: The site provides information consistent with other sources that I located. The author is an authoritative source (e.g., former musher, a musher, a newspaper etc.)

	The site is not just trying to sell me something. The author includes links to other reliable websites. The URL provides clues to the reliability. Unacceptable strategies: The website has the information I need. The website is up-to-date. The website has copyright information.
2	Provides response with one strategy from the list above.
1	Provides a partial or ill-defined response.
0	No supporting details were given or details evaluate neither relevancy nor reliability.

Task 3 score: _____/4

Item 4a	**Student evaluates information source based on the reliability of the information** ***Does the website provide factual information?***
1	Answers yes
0	Answers no
Item 4b	**Student evaluates information source based on the reliability of the information** ***Does the website try to persuade you to think a certain way?***
1	Answers yes
0	Answers no

Item 4c	**Student evaluates information source based on the reliability of the information**
1	Answers no
0	Answers yes

Item 4d	**Student evaluates information source based on the reliability of the information** ***Does the website try to raise money?***
1	Answers no
0	Answers yes

Item 4e	Student evaluates information source based on the purpose of the information ***Did you answer "Yes" to any question above? Please explain each "Yes" answer with evidence from the website Use the box below.***
4ei	**Answers "Yes" to 4a:** ***Does the website provide factual information?***
3	Provides two explanations of the yes answer(s) describing appropriate strategies.
2	Provides one explanation of the yes answer(s) describing appropriate strategies.
1	Provides a partial or ill-defined response.
0	Task not completed or answered "no" to the question.
4eii	**Answers "Yes" to 4b:** ***Does the website try to persuade you to think a certain way?***
3	Provides two explanations of the yes answer(s) providing evidence from the website.
2	Provides one explanation of the yes answer(s) providing evidence from the website.
1	Provides a partial or ill-defined response (i.e. "It makes you feel bad").
0	Task not completed or answered "no" to the question.

Item 4f	**Student evaluates information source based on the purpose of the information** ***What is the purpose of the site, Sled Dog Action Committee?***
1	Identifies the persuasive purpose of the website (move on to 4g).
0	Incorrectly identifies purpose (score zero points on 4 g).

Item 4g	**Student evaluates information source based on the purpose of the information** ***Provide at least TWO reasons to support our answer.***
3	Provide two logical reasons to support the identification of a persuasive purpose
2	Provides one logical reason to support the identification of a persuasive purpose
1	Provides a partial or ill-defined reason to support answer.
0	Task not completed.

Task 4 score: ____/14

Item 5a	**Synthesize: Integrating information from multiple resources.** ***Respond to Mauidreamin, ACG, Good2go, or BlueElephantsRock. <u>Explain your opinion</u> about the Iditarod. Provide at least two reasons to support your ideas.*** ******If the student does not respond in the text box, But DOES send an email, still count this response. If the email sent is different than the response in the text box, use the response in the TEXT BOX for scoring 5a and 5b.***
3	States an opinion. Provides two logical reasons to support their opinion about the website. Sample logical reasoning: • It's true that some of the racers just want the money. • Some of the dogs died of cold and food. • He really loves their dogs like it was a family member. They treat their dogs like gold he said. Unacceptable reasoning: • I think that the dog sled racing is an ok deal because it's just training. • I think the Iditarod is a good idea because it would show a lot of information to inform another people about Iditarod Race. • I wish they would get more people to participate in the Iditarod race.
2	States an opinion and provides one logical reason.

1	Either states an opinion or provides one logical reason.
0	Not attempted, wrote IDK (I don't know).

Item 5b	**Audience and Purpose: Skills and strategies used that relate to the purpose of communicating information** ***Make sure you follow proper email form.***
3	Includes a greeting and a body, indicating an awareness of their audience. (Dear ACG, Hi Good2Go)
2	Includes a body, and an awareness of their audience (I agree with YOU…).
1	Includes a body, but no clear audience or greeting (I agree with Good2Go, I would go with Mauidreaming, I think ACG is right…).
0	Not attempted or answers IDK (I don't know).

Item 5c	**Communicate: Use of one or more of the designated ICTs to share a response**
1	Successfully sent email via Epals interface.
0	Unable to send email via Epals interface.

Task 5 score: ______/7

Item 2 Score	Item 3 Score	Item 4 Score	Item 5 Score	Total Score	Percentage
________/5	______/4	______/14	______/7	______/ 30	______%

APPENDIX H

Fidelity of Implementation Checklist: Phase III

Date: ________________________ Teacher: ________________________

School:________ Observer: ________________________________

	Did not do	**Did on a limited basis**	**Fully implemented**
Phase III: General			
1. Laptops were used during the entire instructional period.	0	1	2
2. Lesson focused on at least one of the five major skill areas. Circle which ones: **Q L E S C** List the strategies for this session on the back of the form to discuss during a brief interview.	0	1	2
3. Approximately how many minutes of the instructional period were spent in student practice or exchange? (e.g. 25/50). Do not include teacher talk, only student time with the computers.	**___ /___ mins.**		
Phase III: Specific	**Did not do**	**Did on a limited basis**	**Fully implemented**

1. The instructional period began with an overview or reminder of inquiry project instructions.	0	1	2
2. Teacher provided an opportunity for students to apply, extend, and/or develop online reading skills in an inquiry project.	0	1	2
3. Teacher provided opportunities, within the unit, for student decisions regarding the elements of the inquiry project.	0	1	2
4. Teacher provided an opportunity, within the unit, for the students to telecollaborate with student(s) in another class about their project.	0	1	2
5. Teacher served as a facilitator as students worked as pairs, groups, or individuals.	0	1	2
6. Students shared skills and strategies within and/or across groups.	0	1	2
7. Teacher conducted a debriefing period at the end of the session where students and teacher could share strategies and skills learned during the period.	0	1	2

Total ______ / __18__ __________%

Following the observation, discuss with teacher the nature of the inquiry project and opportunities for students define their own problems or elements of the inquiry task. Ask teacher to name the location of the class with whom the students are collaborating. Write notes on back of form to detail teacher's comments regarding the elements of the instructional period

observed that may have differed from the Phase III model.

APPENDIX I

Dog Island Free Forever - Windows Internet Explorer
http://www.thedogisland.com/
Google Search
Directions Company Information Contact Dog Island
Home Send Your Dog Facilities Photos F A Q Visits Rates Press Products
Pets & Allergies
Identify Allergy Triggers & Talk to Your Doctor about the Results
Iams ProActive Health
Boost your dog's health & defenses with Iams PreBiotic formulas.
Dog Obedience Trainer
Learn how to train and take care of dogs with the Dog Obedience program
Ads by Google
February 17, 2010
Dog Statistics
Big Dogs: 1570
Medium Dogs: 988
Small Dogs: 334
Weather Forecast
Sunny/Clear
High: 74° F
Low: 58° F
Free Forever
Dog Island
ATTN DOGS! Sign Up & Become Free!
Every few days, we will send new email to help free your human's mind, and let you become a free forever dog!
Your Human's Email:
Your Name:
Sign Up (YAY!!)
Over 2,500 dogs are already enjoying a better life at Dog Island. Separated from the anxieties of urban life, dogs on Dog Island are healthy dogs who live a natural, healthy and happy life, free from the stress and hardship associated with daily live among humans.
They live with almost limitless space, and tens of thousands of rabbits, rodents, fish and other natural prey. Surrounded by thousands of other dogs, this is the only place for them to be truly social and create healthy families.
Take the Plunge!
Give your dog a chance at a better life. Dog Island is the solution to a free and natural life.
Read More >>
Save Money!
Recent legislation in several towns has taken the costs of Dog Islands out of tax money.
Read More >>
Daily Discovery
Dogologists around the world are studying the behavioral development on Dog Island. Exciting and new things are happening on almost daily basis.
Read More >>
Soothing Sounds
youpet