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A National Survey of Teachers on Their Perceptions, Challenges, and Uses of Information and Communication Technology

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A NATIONAL SURVEY OF TEACHERS ON THEIR PERCEPTIONS, CHALLENGES, AND USES OF INFORMATION AND COMMUNICATION TECHNOLOGY

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ABSTRACT

This study had five main purposes: (a) to investigate the extent to which literacy teachers nationwide integrate information and communication technologies (ICTs) into literacy instruction; (b) to investigate the extent to which ICTs are utilized in ways that promote the acquisition of literacy skills within digital environments; (c) to identify the perceived obstacles and challenges teachers face in their attempts to integrate ICTs into instruction; (d) to determine how literacy teachers define ICT integration and how they perceive the importance of ICT integration into reading instruction; and (e) to identify the distinguishing characteristics of teachers who report no or minimal integration of ICTs in their literacy instruction when compared to teachers who report extensive integration.

These issues were addressed using online survey methodology with a national sample of literacy teachers (n = 1442). Data were analyzed using descriptive statistics, Analysis of Variance (ANOVA), and regression analysis. Results indicated that: (a) literacy teachers use ICTs relatively little in instruction and with little variety; (b) they typically do not use ICTs in ways that enhance skills for reading in online environments; (c) lack of time, lack of equipment, and lack of professional development are major barriers to ICT integration; (d) a majority of teachers have an incomplete or narrow view of what constitutes ICT integration; and (e) professional development factors, teaching experience, beliefs about technology, technology skill, technology access and support, and perceived obstacles all predict teachers' ICT use at statistically significant levels. Implications for professional development and educational policy are discussed.

ACKNOWLEDGMENTS

At the beginning of my doctoral journey, someone referred me to a Website called *The Daily Motivator*, located at www.greatday.com. With a Web address like that, I couldn't resist taking a peek. When I opened the page, this quote by Ralph Marston appeared:

> A thousand disappointments in the past cannot equal the power of one positive action right now. Go ahead and go for it. If you've previously told yourself that it can't be done, this is the moment to change your assumption. When you can dream it, imagine it and visualize it, you can do it. Instead of making excuses, make some progress. Instead of looking back with regret, step forward with enthusiasm. Choose to define yourself based on the person you know you can become. Choose to see your life in terms of the best of what is possible

It would be easy to believe that it was this quote that pushed me to complete the demanding goal of earning a Ph.D., but that is incorrect. This quote merely made me feel lucky as I realized that I have a plethora of people in my life motivating me in similar ways everyday. I already knew I could be successful, thanks to a strong foundation and support system.

In the spirit of this quote, my mother instilled in me a drive to achieve and a fierce determination to quickly move past disappointments and make progress in every situation through her own difficult examples. My sisters showed me what it's like to define life by your own terms. My friends gave me the opportunities to do so. These

characteristics and examples were needed for me to even imagine pursuing a Ph.D., but determination alone is not enough. You need determination *and* an excellent mentor to navigate any doctoral experience.

My mentor came in the form of Dr. David Reinking. Determination was nearly all I had going for me when I met him. Dr. Reinking took me under his wing, never laughed at my ridiculous ideas and questions, and showed me what it means to be an "academic." I felt like I was learning a new language as he taught me the ins and outs of academia, but still remember the day and the feeling when I was able to instruct someone in subject matter that I had once considered impossible. I also had a wonderful committee. I can not give enough thanks to Dr. Linda Gambrell, Dr. Kathy Headley, and Dr. James Witte for sharing their limited time and energy with me.

Yet, all of this knowledge and guidance would have been purposeless without someone to cheer me on and remind me to receive the guidance and move forward. I was fortunate enough to have many such people for this task. I would not have known right from left at many times without the help of the "crookies", better known as my fellow doctoral students Jackie Malloy, Kathy Robbins, and Angie Rogers. I am not sure I could have persevered at times without the encouragement of my husband, Rusty, who is one of the most positive and encouraging people I have ever met. He not only understood my moments of frustration and panic when they occurred, but he also never chastised me for the extreme exercise endeavors I undertook to relieve the stress of those moments. He encouraged and fostered my accomplishments without concern for his own. Most importantly, he taught me how to relax…sometimes. He often accomplished the difficult

task of getting me to sit still and be present in the moment I was in. He also encouraged me indirectly by having such a great family. If anyone could compare to Rusty's positivity, it would have to be his brother, his brother's wife, and his parents.

So many people made this accomplishment possible that it is difficult to mention them all. Thanks to all of you for the ways you affected me academically and personally. I couldn't have done it without any of you. I am truly blessed.

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CHAPTER ONE

NATURE OF THE PROBLEM

Background

In the early 1980s, computer technology was introduced as an innovation that could be used in schools, and it was speculated that this new technology would change the face of education (Beck, 1980). Despite the excitement surrounding computers, Cuban (1986) cautioned educators that many technologies have promised to revolutionize education, and even replace textbooks, but they have fallen short of that prediction. More than a decade later, Cuban (1998) still admonished educators that despite schools having much equipment and many technological capabilities, many teachers do not fully or meaningfully integrate computer-based technologies into their instruction. He observed that computer technology cannot substantively transform schools unless it is used in innovative ways. In 2000, it was estimated that $38 billion had been spent on educational technology (Benton Foundation, 2000), and that amount has surely increased since the time of that estimate. In 2006, a National Center for Education Statistics (NCES) report (Wells & Lewis, 2006) detailed that 100% of schools had access to the Internet by the Fall of 2005. Despite this ubiquitous availability of technology in classrooms, it remains unclear how technology ca transform education in general and literacy education in particular (Kamil, Intrator, & Kim, 2000).

Digital technology, many would argue, is particularly important to literacy, because it has changed what it means to be literate and presumably the content and focus of literacy instruction (Kellner, 2000; Labbo & Reinking, 1999; Leu, 2001; Reinking,

McKenna, Labbo, & Kieffer, 1998). New information and communication technologies (ICTs), such as those made available on the Internet, have introduced new forms of literacies that are digital. These include the reading and writing skill sets required to effectively use ICTs, such as Web browsers, Web logs (blogs), word processors, email, presentation software, and instant messaging (Leu, Kinzer, Coiro, & Cammack, 2004). As new ICTs appear and as they continually evolve, the skills required to use them will continue to change.

Despite a lack of extensive research to guide an appropriate response among educators regarding how best to integrate digital literacy in classroom instruction (National Institute of Child Health and Human Development [NICHD], 2000), it is clear that the Internet has become a vital new dimension for reading and writing in schools (International Reading Association [IRA], 2002; Lebo, 2003; National Center for Education Statistics [NCES]; 2003). Not only is technology potentially useful in the classroom, but it may also prepare students for the changing literacy practices needed to succeed in higher education and in the workplace (Leu, 2000; New London Group, 2000). In what Reinking (1995) described as a post-typographic world, the ability to quickly locate and communicate information is necessary for success in daily life and in an increasingly global economy (Leu, 2000).

Nevertheless, the knowledge that digital technologies and the Internet are here to stay is apparently not enough to transform literacy instruction in many schools. Recently the Educational Testing Service reported that only 52% of 6,300 students were able to correctly evaluate the objectivity of a Website (Trotter, 2007). Further, only 40% of

those students knew how to use multiple search terms in a Web search to refine their search results. It is unlikely that these shortcomings can be attributed to a lack of access to technology, but rather to a lack of use of technology for more than perfunctory purposes in many classrooms. Further, the case has been well established that teachers and students are not using computers as effectively as they could be (Becker, 2000; Cuban, 2001; Wells & Lewis, 2006).

Although digital technologies are not always used effectively, it is important to recognize their potential for teaching and learning literacy skills in ways that are not possible with traditional print sources (Valmont & Wepner, 2000). Recognizing the potential and importance of technology, in 2002 the International Reading Association (IRA) issued a position statement on integrating literacy and technology in the curriculum, in which it is stated that literacy educators have a responsibility to integrate technology so that students can become fully literate in today's world (IRA, 2002). The IRA position statement also posits that students have a right to the following:

- Teachers who are skilled in the effective use of ICT for teaching and learning
- A literacy curriculum that integrates the new literacies of ICT into instructional programs
- Instruction that develops the critical literacies essential to effective information use
- Assessment practices in literacy that include reading and writing with technology tools

- Opportunities to learn safe and responsible use of information and communication technologies
- Equal access to ICT (IRA, 2002, n.p.)

Yet, these rights are far from being uniformly available in literacy classrooms where they are developed and promoted by informed teachers well practiced in teaching the skills associated with digital literacy. Our classrooms are not yet a place where all teachers are skilled ICT users and are integrating ICTs into their literacy instruction and assessment (McKenna, 2006). There is a clear need to determine how teachers use the technology they have and what can be done to help them integrate it more fully into their instruction (U.S. Department of Education, 2000; Becker, 1999).

With the emergence of rapidly changing technologies and ICTs, it is essential to remember that it is not just students who need to learn new skills and new literacy practices (Karchmer, Mallette, Kara-Soteriou, & Leu, 2005). Many teachers must also learn new literacy skills and practices associated with digital environments for reading and writing, and they must develop instructional activities and practices to develop students' abilities in this new domain of literacy. Teachers have reported that they do not use technology more extensively because they lack appropriate professional development in this area (Stolle, 2008). The NCES report titled *Teachers' Tools for the 21st Century* noted that only 10% of teachers believe that they are "very well prepared" to use the Internet for classroom instruction (U.S. Department of Education, 2000). The 2005 NCES report on Internet access in public schools indicated that 84% percent of schools in that study offered professional development aimed at integrating technology into the

curriculum (Wells & Lewis, 2006). But, the content and approach of in-service activities for teachers may not address adequately their beliefs about technology and the challenges that they face in their attempts to integrate technology into literacy instruction. For example, Karchmer (2001) called for more suitable professional development related to technology integration after interviewing teachers about the influences of technology in their literacy classrooms.

Some of the factors that have been identified as barriers to technology integration are inadequate access to ICTs at school (Stolle, 2008; Bauer & Keaton, 2005; Ertmer Addison, Lane, Ross, & Woods,1999), fear of the unknown (Stolle, 2008), difficulty in determining who benefits from ICTs and how those benefits can be determined (Stolle, 2008), uncertainty about the appropriateness of Internet material (Karchmer, 2001), lack of time (Bauer & Keaton, 2005), a focus on technical rather than academic skills (Honan, 2008; Stolle, 2008), and high stakes testing (Franklin, 2007). These studies provide a base for understanding the challenges of integrating ICTs into the classroom. However, they are not specific to literacy classrooms, nor do they examine the extent to which children are receiving instruction in the skills needed for online reading, writing and communicating. The present study examines the implementation of these skills and other uses of ICTs in the context of literacy classrooms.

Statement of the Problem

Although efforts have been made to characterize teachers' integration of ICTs into their instruction, the existing literature lacks breadth and depth. Of the studies that have been conducted, most have focused on the various ways teachers and students use

technology in the classroom, rather than how teachers integrate ICTs into their instruction (Russell, Bebell, O'Dwyer, & O'Connor, 2003).). The field also lacks any national data characterizing how teachers use ICTs in their instruction, their perceptions about what obstacles inhibit the integration of digital forms of literacy into their teaching, and what factors might enhance or inhabit the successful integration of ICTs into literacy instruction. Specifically, we lack any understanding of how educators are using ICTs in their literacy instruction and how they are changing literacy practices in their classrooms. Leu (2000) made a case for research in this area when he stated:

> [W]e require important new work evaluating how teachers optimize learning with the Internet, how new envisionments for literacy are initiated by this resource in the classroom, how the Internet may restructure traditional student-teacher relationships, and a host of issues related to the use of Internet technologies in the classroom settings. It is likely that this will be the most important area of research in the near future as this powerful resource enters classrooms around the world (p.756).

Purpose of the Study

Although there have been some reports of how teachers use ICT in instruction since Leu's (2000) call for research, technology changes so rapidly that it is unlikely that all of these reports reflect current circumstances. Periodically revisiting and extending previous research also allows for assessing whether progress is being made. The purpose of this study is to investigate to what extent ICTs have become a part of literacy instruction and to determine what teachers believe impedes the successful integration of

technology into literacy classrooms. The latter issue in particular has not been addressed in the existing research. Acquiring such data and the understandings such data may reveal will inform educators about how to cultivate, among other things, appropriate professional development for teachers. In addition, it may inform other researchers about what data might be most meaningfully gathered concerning the use of ICTs in literacy instruction and how to interpret that data. In the proposed study, factors that have previously identified as barriers to technology integration will be investigated along with additional variables that have been identified in the literature since earlier data have been collected. A second purpose of this study is to identify the demographic and environmental variables associated with teachers who do and do not integrate technology into their literacy instruction. For example, examining teachers' support systems for integrating technology, their personal stances toward technology, their teaching experience, and the quality of professional development they have received may reveal what makes teachers more or less able to successfully integrate ICTs into literacy instruction.

Significance of the Problem

Specifically, this study will explore how ICTs are integrated into literacy instruction, the obstacles and challenges to integrating ICTs into literacy instruction, teachers' perceptions about the importance of integrating ICTs into literacy instruction and the characteristics associated teachers who successfully integrate ICTs into instruction. Cuban (2001) argued that computers are oversold and underused in classrooms, and he provided many anecdotal examples. His claim is consistent with

findings that only 10% of teachers report feeling "very well prepared" to use the Internet in their classroom (U.S. Department of Education, 2000). Karchmer (2001) and Leu (2000) have called for more research on the potential of the Internet for literacy learning. This study will answer those calls by providing a national portrait of the applications of digital technologies present in classrooms. Further, it will suggest explanations why the potential of the Internet may not be fully realized in literacy classrooms. This research may serve as a guide for overcoming the challenges that teachers identify as obstacles to integrating digital technology into their literacy instruction. Further it may serve as a guide for cultivating appropriate professional development for teachers. Fundamentally, it may suggest reasons that digital technologies have not been widely integrated into the mainstream of literacy instruction and how they might be more fully integrated.

Research Questions

1) To what extent are literacy teachers in the United States integrating Information and Communication Technologies (ICTs) into literacy instruction?
2) To what extent are they utilizing ICTs in ways that promote the acquisition of literacy skills within digital environments?
3) How do they define ICT integration?
4) What are the perceived obstacles and challenges to integrating ICTs into literacy instruction?
5) What are teachers' perceptions about the importance of integrating ICTs into literacy instruction?
6) Are there distinguishing characteristics between teachers who report no or

minimal integration of ICTs into their literacy instruction and teachers who report extensive integration?

Definition of Terms

The following key terms are defined as follows for this research study:

21st Century literacies

The National Council of Teachers of English has adopted the following widely accepted definition of 21st century literacies (NCTE, 2008, n.p.):

> Literacy has always been a collection of cultural and communicative practices shared among members of particular groups. As society and technology change, so does literacy. Because technology has increased the intensity and complexity of literate environments, the twenty-first century demands that a literate person possess a wide range of abilities and competencies, many literacies. These literacies—from reading online newspapers to participating in virtual classrooms—are multiple, dynamic, and malleable. As in the past, they are inextricably linked with particular histories, life possibilities and social trajectories of individuals and groups. Twenty-first century readers and writers need to

- Develop proficiency with the tools of technology
- Build relationships with others to pose and solve problems collaboratively and cross-culturally
- Design and share information for global communities to meet a variety of purposes
- Manage, analyze and synthesize multiple streams of simultaneous information

- Create, critique, analyze, and evaluate multi-media texts
- Attend to the ethical responsibilities required by these complex environments

The NCTE definition of 21st century literacies will be used for this study.

Digital literacy

The term digital literacy is sometimes used interchangeably with the terms new literacies, new literacy studies, digital technologies, and digital media. For the purpose of this study, the definition recently presented in the Journal of Adolescent and Adult Literacy, which synthesizes much of the literature related to digital literacy, will be used. O'Brien and Scharber (2008) define digital literacy as

> …socially situated practices supported by skills, strategies, and stances that enable the representation and understanding of ideas using a range of modalities enabled by digital tools. Digitally literate people not only represent an idea by selecting modes and tools but also plan how to spatially and temporally juxtapose multimodal texts to best represent ideas. Digital literacies enable the bridging and complementing of traditional print literacies with other media.

Information and Communication Technologies (ICTs)

A report published by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) defines information and communication technologies as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information" (Blurton, p.1). Teachers and students use ICTs, such as computers, personal digital assistants, cell phones, interactive white boards,

digital and document cameras, digital video equipment, digital audio recorders and players, and digital projectors to communicate, create, disseminate, store and manage information.

Integration

Integration of ICTs occurs when they are the focus of instruction aimed at developing 21st century or digital literacies as opposed to simply supporting or supplementing conventional literacy instruction or teaching how to use computer-based applications.

Literacy teachers and literacy instruction

Literacy teachers are those who have specific responsibilities to teach reading or language arts. That definition typically includes all elementary school teachers and teacher at the middle-school level assigned to teach language arts. Literacy instruction is any instruction carried out by those teachers and aimed at increasing students' ability to read and write.

New literacy skills

There are many definitions and conceptions of the term new literacies (Coiro, Knobel, Lankshear, & Leu, 2008; Street, 1999; Gee, 2003; New London Group, 2000). For the purposes of this study, the definition from the largest and most recent work on new literacies (Coiro, Knobel, Lankshear, & Leu, 2008) will be used. According to this source, a new literacies perspective assumes that: (a) new information and communication technologies (ICTs) require a unique set of skills, strategies and dispositions; (b) as new technologies emerge, the literacy skills required to use them are

transformed; (c) new literacy skills are necessary for success in daily life and in an increasingly global economy, and (d) new literacies are multiple, multimodal, and multifaceted.

Online reading

In this dissertation, online reading refers to any form of text that is read on the Internet. This definition includes digital images and formats such as hypertextual links.

Professional development

Professional development refers to the training that a teacher receives towards the goal of developing new skills, knowledge, and competencies as they evolve in the field of education.

An Overview of the Study

This study used online survey research methods to examine the following: (a) literacy teachers' uses of ICTs in literacy instruction; (b) the extent to which they are utilizing ICTs in ways that promote the acquisition of literacy skills within digital environments; (c) teachers' definitions of ICT integration; (d) teachers' perceived obstacles and challenges to integrating ICTs into literacy instruction; (e) teachers' perceptions about the importance of integrating ICTs; and (f) the distinguishing characteristics of teachers who extensively integrate ICTs into literacy instruction. The sample consisted of literacy teachers, most of whom are members of the International Reading Association (IRA) or of a state or local affiliate of the IRA. A survey methodology was selected because it is well suited to the purposes of this study. That is, online surveys can be easily distributed to a sample within a large population and can be

completed independently without time constraints and other contingencies necessary for more conventional modes of survey research.

Further, survey methods have led to important findings in literacy research, including Austin and Morrison's (1961) classic "torchlighters" study aimed at revealing aspects of how teachers were prepared to teach reading, Austin and Morrison's (1963) follow up to that study, which surveyed administrators from 1,023 school districts about the content and conduct of reading instruction, and more recently, Baumann, Hoffman, Duffy-Hester, and Moon-Ro's (2000) replication of the latter study. The present study is organized into five chapters. This chapter has provided an introduction to the study, a statement of the problem, the significance of the problem, research questions, definition of terms, delimitations, and research methods. Chapter 2 provides a review of the literature relevant to this study. Chapter 3 presents details about the research methodology and instruments used in this study. Chapter 4 provides an analysis of the data. Chapter 5 summarizes the findings of this study and discusses the implications the implications these findings hold for the use of ICTs and the delivery of professional development.

CHAPTER TWO

REVIEW OF THE LITERATURE

This chapter provides an overview of the literature related to integrating ICTs into literacy instruction and the literature concerning the role of professional development in achieving that goal. Specifically, the first sections of the chapter address respectively the literature pertaining to the research questions presented in Chapter 1. The relevant literature for each of the questions is reviewed in relation to the rationale for this study. Next, the literature pertaining to professional development and the unique characteristics of professional development related to integrating technology into instruction is reviewed. That literature reveals the need for more focused, substantive, and extensive professional development to enable technology integration and the need for guidance to ensure that professional development activities address current circumstances and teachers' perceived needs.

What ICTs are being used in literacy classrooms?

This section reviews the literature substantiating the importance of the first and second research questions. Specifically, this section reviews the literature suggesting that teachers' uses of technology in literacy classrooms is important because (a) ICTs redefine reading; (b) ICTs are ubiquitous in workplaces and daily life; (c) there are concerns that teachers have not adequately integrated ICTs into instruction; (d) ICTs require new literacy skills; and (e) many students have difficulty with online reading skills.

Redefining Literacy

Conceptions of literacy have expanded during the previous 50 years. Reflecting that expansion literacy is now often referred to using the plural form *literacies,* because many researchers and educators believe that there are multiple types of literacy that must be achieved to become fully literate (Coiro, Knobel, Lankshear, & Leu, 2008; Anstey & Bull, 2006; Leu, Kinzer, Coiro, & Cammack, 2004; Warschauer, 2006). Consequently, it has become difficult to define the term literacy precisely. Today the meaning of literacy has evolved from being able to read and write using conventional materials such as paper and ink to being able to learn, comprehend, and interact with digital technologies in meaningful ways (Selfe, 1999). This redefinition has occurred since the introduction of (ICTs) in the latter years of the 20th century. Researchers and scholars have argued that digital technology changes definitions of literacy. For example, Leu and Kinzer (2000) noted that, "The convergence of literacy instruction with Internet technologies is fundamentally reshaping the nature of literacy instruction as teachers seek to prepare children for the futures they deserve" (p. 111). Reinking, McKenna, Labbo and Kieffer (1998) dedicated an entire volume to exploring how digital technologies transform basic components of literacy. Labbo, Reinking, and Mckenna (1998) considered how technological literacy differs from traditional literacy and characterized digital literacy as follows: "Digital literacy (a) requires the ability to be a lifelong learner, (b) often occurs in pursuit of other goals, (c) occurs in a social contexts, (d) requires strategic competencies, and (e) requires critical knowledge of assembly and production" (p. 277). Because technological advances can transform literacy, it is necessary to ensure that students are being prepared to acquire the skills needed to be literate when using ICTs, in

addition to printed texts. Therefore, it is important to determine the extent to which teachers have integrated ICTs into their literacy instruction and how they use them in their teaching.

ICTs in the Workplace and Daily Life

It is important to examine teachers' integration of ICTs into instruction because digital forms of reading and writing are increasingly commonly used in almost every job and profession. In what Reinking (1995) described as a post-typographic world, the ability to quickly locate and communicate information is necessary for success in daily life and in an increasingly global economy (Leu, 2002). Several researchers have argued that the Internet, for example, is an important part of daily life, and therefore should be included in the curriculum of schools (Labbo & Reinking, 1999; Lebo, 2003; Leu & Kinzer, 2000; National Center for Education Statistics, 2003). Leading organizations dedicated to advancing literacy have also recognized the importance of preparing students for a future in which ICTs are integrated into daily life. For example, the International Reading Association (IRA, 2002) issued a position stating that literacy educators have a responsibility to integrate technology so that students can become fully literate in today's world.

More recently, the National Council for Teachers of English (NCTE, 2008) also stated that 21st century literacies require readers and writers to:

- Develop proficiency with the tools of technology
- Build relationships with others to pose and solve problems collaboratively and cross-culturally

- Design and share information for global communities to meet a variety of purposes
- Manage, analyze and synthesize multiple streams of simultaneous information
- Create, critique, analyze, and evaluate multi-media texts
- Attend to the ethical responsibilities required by these complex environments (NCTE, 2008, n.p.)

ICTs are now common fixtures in communities, workplaces, and schools all over the world (Coiro, Lankshear, Knobel and Leu, 2008). Thus, it is important to determine how extensively teachers are integrating ICTs into literacy classrooms and what obstacles they face when attempting to integrate them into their teaching.

Inadequate Integration of ICTs into Literacy Instruction

Despite the widespread availability of ICTs in schools in the U.S., many scholars and commentators have questioned the extent to which they are being integrated substantively into instruction. For example, in 2000, it was estimated that $38 billion had been spent on educational technology in schools (Benton Foundation, 2000) and that amount has surely increased since the time of that estimate. In 2006, the National Center for Education Statistics (NCES: Wells & Lewis, 2006) reported that 100% of schools had access to the Internet in fall 2005. Yet, many scholars have argued that there is a distinct lack of meaningful and substantive integration (e.g., Cuban, 2001). However, despite the widespread belief that ICTs are not being integrated into instruction, there is a dearth of empirical information about the extent to which teachers are using ICTs in their

classroom instruction and how they are using them. Therefore, there is a need for data concerning the extent to which teachers are integrating ICTs into instruction. Such data would provide an understanding of how effectively technological resources are being utilized in literacy classrooms and provide guidance for developing curriculum, pre- and in-service education, and educational policy.

To what extent are ICTs being used to develop online reading?

ICTs require new literacy skills

Because ICTs transform the nature of literacy, new and different skills are required in order for one to become fully literate in today's world. Coiro (2003) stated that "The Internet, in particular, provides new text formats, new purposes for reading, and new ways to interact with information that can confuse and overwhelm people taught to extract meaning from only conventional print" (p. 458). Based on Sutherland-Smith's (2002) observations of students interacting with Internet-based text, there is also evidence that readers perceive that online reading is different than print-based reading. Although much is known about the skills and strategies readers need to comprehend conventional printed texts (National Institute of Child Health and Human Development, 2000; Pressley, 2000), little is known about the skills and strategies required for successful comprehension on the Internet and with other ICTs (Leu et al, 2004; RAND Reading Study Group, 2002).

Leu and his colleagues (Leu, Coiro, Kinzer, & Cammack, 2004) proposed that new skills, strategies and dispositions are needed for reading on the Internet and with other ICTs. These new literacies allow us to use the Internet and other ICTs to a) identify

important questions b) locate information c) evaluate information d) synthesize information across sources, and e) communicate information to others. The argument that a unique set of skills and strategies is required for reading on the Internet and with other ICTs is supported by findings from a study that found no statistically significant correlation between assessments of online and offline reading comprehension (Leu, Castek, Hartman, Coiro, Henry, & Lyver, 2005). This present study will explore the extent to which teachers use ICTs in the ways identified by Leu and his colleagues (Leu, Coiro, Kinzer, & Cammack, 2004): to identify questions, locate, evaluate, synthesize and communicate information.

Although an exhaustive review of the literature exploring differences between printed and digital texts is beyond the scope of this dissertation, representative studies can be cited (e.g.,Asha & Sprainger, 2007; Walsh, 2006). For example,Walsh (2006) examined differences between conventional printed and digital texts. She demonstrated that the differences lie in the affordances of the different modes of texts. She explained that although the process of meaning-making might occur in similar ways for each type of text, the processing of each mode is different. For example, the affordances made possible by each mode, such as the layout of chapters with printed text and the layout of visual images with digital text, serve different functions in constructing meaning. She concluded her work by confirming that researchers currently know little about how readers process multimodal texts as compared to printed texts, but she contended that the differences require new pedagogies and that more research needs to be conducted to determine what those pedagogies are.

Coiro (2003) pointed to the ways that online reading comprehension differs from comprehension of printed texts. She also worked with students to explore and identify the specific differences (Coiro & Dobbler, 2007). Using the new literacies perspective, Coiro and Dobbler (2007) investigated the reading comprehension strategies used to locate and synthesize information on the Internet. They found that successful online readers employed prior knowledge, inferential reasoning strategies, and self-regulated reading processes in similar, but more complex, ways that they do when reading print-based text. Their work suggests the need to teach students specific skills and strategies necessary for reading in online environments.

Although relatively little is known about the exact skills required for successful reading comprehension in online environments, it is becoming apparent that traditional reading skills are not sufficient for meaningful reading and learning to occur on the Internet. Consequently, it is important that teachers prepare students for reading in online environments, and a first step is to determine if and how literacy teachers are integrating skills related to ICTs into their instruction.

Difficulties with online reading

It is important to examine teachers' integration of ICTs into literacy instruction because research suggests that students have difficulty with some aspects of reading online. That difficulty may be explained, at least in part, if teachers are not integrating ICTs into their instruction and the skills necessary to contend with them. Whatever the case may be, it is important to uncover the reason to enhance appropriate integration.

The existing literature reveals that students perform poorly on reading-related tasks in online environments. For example, Schacter, Chung, and Dorr (1998) determined that students were not proficient at searching for information online when given a well-defined task. Conversely, students were more successful when given an ill-defined task, which suggests that students do not possess well-honed skills and strategies for searching. Wallace, Kupperman, Krajcik and Soloway (2000) found that students searched unsuccessfully because they looked for exact sentences and phrases, rather than making inferences about what search terms might produce the results they sought. Similarly, Large and Beheshti (2000) found that students had difficulty selecting appropriate search terms when asked to use the Web as an information source for a school assignment.

These findings lead to speculation about whether teachers are integrating ICTs into reading instruction and attempting to equip students with skills and strategies for reading in online environments. Students' poor performance at online reading tasks suggests that students may not be receiving instruction in these areas through the integration of ICTs into literacy teaching. Currently, there are no empirical findings about the extent to which literacy teachers are integrating ICTs into instruction. Thus, the role of instruction, or the lack thereof, in accounting for students' difficulties in reading in online environments remains distinctly speculative. Consequently, the first focus of the current study, determining the extent to which teachers integrate ICTs, becomes an important question. Further, it is important to understand *how* ICTs are being integrated. For example, although ICTs are perhaps being in literacy instruction they are perhaps not being used in ways that promote the acquisition of digital literacy skills.

How do teachers define integration of ICTs?

When considering teachers' uses of technology, it is important to consider how teachers define or perceive integrating ICTs into instruction. It has been proposed that new skills, strategies and dispositions are needed for readers to be literate in online environments (Leu et al., 2004), and that reading comprehension is achieved differently on the Internet (Coiro, 2003). According to the IRA (2001) and NCTE (2008) position statements, and the work of various researchers (Leu et al., 2004, Stolle, 2008) it is important that ICTs not merely be used to replicate existing practices such as presenting notes with digital presentation tools instead of a chalkboard. Dockstader (1999) contributed to a definition of ICT integration by stating what it is not :

> Integration is not substituting 30 minutes of reading for 30 minutes of computer skill development. It is, however, using computers to teach 30 minutes of reading. Integration is not providing application software like electronic encyclopedias, spreadsheets, databases, etc. without a purpose. It is not prepackaged programs that are often unrelated activities clustered around a particular topic that address few higher concepts or goals. Nor is it teacher created programs that cover special interests and/or technical expertise but do not fit content-area curriculum. Defining what technology integration is and is not is the first step in deciding how to integrate it into the classroom (p. 73).

Meaningful integration promotes the acquisition of skills that help students acquire digital literacy. Unfortunately, much of the research on ICT integration has looked only at the degree to which computers are used in the classroom and how they are being used,

not at how their use addresses well-articulated curricular goals. For example, Russell, Bebell, O'Dwyer, and O'Connor (2003) looked at teachers' integration of ICTs for lesson preparation, email, teacher-directed student use (e.g., writing papers), recording grades, delivery, and accommodations for special education students. Although these are certainly appropriate and potentially useful applications of technology, they do not necessarily imply meaningful integration of ICTs with, for example, existing curriculum standards, nor do they address new curricular standards related to digital literacy. Simply using a computer, for example, for word-processing or for creating PowerPoint presentations are not necessarily meaningful uses of ICTs in addressing curricular goals, and they do not foster the new skills, strategies, and dispositions associated with digital forms of reading and writing. Stolle (2008) found that teachers who believed they were incorporating ICTs into their instruction in a meaningful way, were actually using ICTs to perpetuate their existing practices. This finding points to the need to understand what teachers believe it means to integrate ICTs, perhaps toward changing their perceptions and beliefs and thus perhaps toward increasing integration of ICTs into the curriculum and authentically into their instructional practice.

There is some existing evidence about how teachers use ICTs in literacy classrooms, such as a lack authentic integration of ICTs. For example, in 2000, The National Center for Education Statistics (NCES) published a report detailing how teachers across the United States reported using technology (U.S. Department of Education, 2000). The report revealed, among teachers in that survey, that there was a pervasive use of ICTs for tasks only indirectly related to instruction. Eighty-five percent

of teachers in the study used a computer to create instructional materials at home, with 78% also doing so at school. Approximately half of all the teachers used ICTs for administrative and record-keeping purposes. Half of the teachers also used ICTs to communicate with colleagues, with 25% using the Internet to communicate with parents. Additionally, approximately 20% of teachers posted homework and assignments on the Internet. Only about half of the teachers with computers used them for any instructional purpose. Students were most frequently assigned to use technology for word processing and creating spreadsheets. Fifty-one percent of teachers reported using ICTs for research while 50 percent reported using computers for practicing drills. Fifty percent of teachers also reported using technology for solving problems and analyzing data. However, the NCES study revealed that the majority of teachers used ICTs to replace an existing practice related to conventional instruction often simply to make some tasks more efficient, rather than as a means to help students learn the skills, strategies, and dispositions needed to be literate in online environments. However, that study has not been updated since 2000, likely making it outdated and irrelevant given advances in technology and its use. Further, the survey conducted to collect these data did not specifically request information about using ICTs in relation to literacy instruction. The current study provides a more recent update and provides information specific to literacy instruction.

Another large study of teachers' practices related to using technology in the classroom was the Teaching, Learning, and Computing survey conducted in 1998. A report based on this survey (Becker, 1999) also revealed that teachers most frequently

used technology for non-instructional purposes. The most common use of computers was for creating printed handouts (66%). Teachers were asked about whether they had students use computers or the Internet for the following: Word processing, CD ROM, World Wide Web, games and drills, simulations, graphics, spreadsheets, multimedia authoring, email. Like the NCES report, that survey revealed that teachers used ICTs mostly for word processing (50%), whereas only 7% of teachers reported having students use email.

It is revealing that these surveys inquired only about the use of technology for now common purposes (e.g., word processing), but gave little attention to the Internet, which, at the time these surveys were conducted, was not a prominent example of ICTs. Consequently, the full importance of teaching children the skills, strategies, and dispositions for reading and comprehending online many not have been as evident as it is today. Thus, again, there is a need for research revealing how teachers use ICTs to teach online reading skills at a time that the Internet is more a part of literacy inside and outside school.

In summary, the literature points to the importance of knowing whether or not teachers understand what it means to meaningfully integrate ICTs into the classroom environment. If teachers have incomplete or narrow understandings of what it means to integrate ICTs into instruction in meaningful ways, they are less likely to seek out more meaningful integration. The present study aims to reveal what teachers believe it means to integrate ICTs into literacy instruction and thus to provide guidance, if necessary, to enhance more extensive and meaningful integration of ICTs into literacy instruction.

What are the perceived obstacles and challenges to integrating ICTs?

The literature clearly suggests that the potential of the Internet and other ICTs is not being fully utilized in literacy classrooms to foster literacy attuned to digital forms of reading and writing. However, there is little consensus about what precisely inhibits integration. Possible barriers to technology integration have been studied primarily using qualitative methods (Honan, 2008; Stolle, 2008; Warschauer, Knobel, & Stone, 2004, Zhao, Pugh, Sheldon, & Byers, 2002), mixed methods (Bauer & Kenton, 2005) and surveys (NCES, 2005). These studies have targeted elementary, middle and high school students. However, only one of the studies found in the present review focused on literacy teachers and literacy instruction (Honan, 2008). That study's specific findings will be discussed subsequently in this section. More generally, Stolle (2008) argued that the barriers that literacy teachers face are rooted in their longstanding commitment to and investment in printed materials and their consequent lack of knowledge about and experience with reading in online environments (see also Coiro, 2003).

Among the may published studies that examined barriers to technology in general, there was minimal overlap of the barriers identified in each study. This conclusion leads to reasonable speculation that a single small-scale study on the barriers that literacy teachers face does not provide a complete or reliable picture. Further, the range of factors considered is often limited in the existing studies. Thus, the survey used in the present study was constructed based on the literature reviewed here to investigate a broader range of possible barriers that literacy teachers face in integrating ICTs into literacy instruction. Table 2.1 compares and contrasts the findings of the studies

examined in this review of the literature. It illustrates the minimal overlap in the results of previous studies aimed at investigating the barriers that teachers face in integrating ICTs into instruction, and it identifies the comprehensive list of possible barriers that were incorporated into the items on the survey in the present study.

Table 2.1

Comparison of Barriers to Technology Integration Reported in Previous Studies

	Honan (2008)	Stolle (2008)	Warshauer et al. (2004)	Bauer & Kenton (2005)	Zhao et al. (2002)	Ertmer et al. (1999)
Focus on technical rather than academic skills	X		X			
Emphasis on product as outcome	X					
Placement of computers in school setting	X			X		
Lack of equipment for desired tasks		X		X		X
Lack of technical knowledge for technology tasks		X		X	X	
Fear of the Unknown		X				
Determining the benefits of ICT integration		X				
Workability of equipment & networks			X	X		

Logistical challenges such as varying skills & lack of home access	X	X			
Time to use ICTs within a class period		X			
Teachers' pedagogical stances			X		
Teachers' awareness of school culture			X		
Distance of ICT innovation from existing school culture			X		
Distance of ICT from teachers' existing practice			X		
Amount of required dependence on others			X		
Human infrastructure supporting ICT integration			X	X	
Existing technology infrastructure			X		
Social support for ICT integration			X		
Lack of time to plan for ICT integration				X	
Lack of relevance to the curriculum				X	
Mismatch of classroom management styles				X	

Lack of teacher confidence in technological skill	X

The only study that has investigated the barriers to ICT integration that are specific to literacy teachers is Honan's (2008) qualitative study in which she conducted semi-structured interviews with teachers regarding obstacles to using digital texts in their classrooms. In a series of five full-day meetings during which teachers engaged in discussions, arguments and reflections about possible literacy teaching practices, Honan discovered three major barriers that inhibited the use of digital texts: (a) a lack of teacher knowledge about students' use of digital texts outside of school, (b) a focus on teaching technical skills related to technology rather than the skills needed for successful online reading, and (c) emphasis on the production of a digital text as a final outcome product for a unit. Honan stated that the first of these barriers, a lack of teacher knowledge about students' technology use outside of school, was problematic because it hindered teachers from using various digital texts with which they believed students would not be familiar. The second barrier, a focus on technical, more than literacy, skills is consistent with other researchers' views, such as Warshauer et al. (2004), who argued that performativity characterized teachers' uses of ICTs in instruction. Finally, Honan argued that the focus on production of a digital text is problematic because it can take away from the focus on literacy. In other words, activities that involve the production of a digital product focus less on literacy skills and more on the appearance of the final product.

Honan (2008) concluded that the placement of computers in a central computer laboratory, can also be a barrier because that model of computer use in schools typically means that there are fewer computers available in classrooms for use throughout the school day. Although her study provided useful data, it was conducted with only four teachers at one school, and it may not be indicative of the barriers faced by teachers nationwide. However, the results from her study were used to inform the development of the survey used in the present study. For example, some of the questions in the survey that addresses possible barriers to integration ask specifically about the barriers discovered in her study and thus supplement the barriers identified in Table 2.1.

In another relevant study, Stolle (2008) gathered qualitative data from 16 participants who were high school English, social studies, and science teachers. She examined the tensions, complexities, conceptualizations and practices of teachers in relation to technology. Stolle's methods of data collection included systematic observations, in-depth interviews, focus group interviews, response data interviews, and a researcher's journal. She identified four major tensions that teachers tend to experience and that affect integration ICTs into instruction:

1. Lack of access to ICTs adequate for a task. Teachers had concerns about assigning homework that involved the use of ICTs because of their beliefs that some students might not have access to certain forms of technology outside of school. Additionally, teachers expressed that although they had technology in their classroom, they lacked equipment sufficient for the tasks they wanted to complete.

2. Lack of sufficient levels of ICT knowledge for a task. The teachers in the study did not believe that they were being taught how to effectively enhance literacy learning with ICTs.

3. Fear of the unknown. Teachers in the study feared that ICTs threatened traditional literacy practices.

4. Identifying who benefits from the ICTs and how the benefits can be determined. For example, teachers are unsure about the benefits to students when ICTs are integrated into instruction. Further, teachers are unsure about how to measure the benefits of teaching with ICTs.

In general, Stolle found that teachers often replicated existing literacy practices with technology instead of using technology in more innovative ways derived from the unique capabilities and uses of ICTs. Her study involved considerable data and in-depth analyses and thus provides more nuanced insights into what teachers believe about ICTs. However, her study was conducted across three different content areas (high school English, Social Studies, and Science) and is not specific to literacy teachers and literacy instruction. Nonetheless, the results of her study informed the survey used in the current study. For example, questions in the survey addressing barriers to integration ask specifically about the extent to which a lack of knowledge and equipment are barriers, both of which were barriers identified in Stolle's study. Likewise, the survey in the present study inquires about the usefulness of technology.

Bauer and Kenton (2005) conducted a mixed-methods study that illuminates the issues from another angle, because they focused on 30 teachers from several content

areas who were identified as having technological savvy. Teachers in the study completed a questionnaire to provide information on their background as well as their experience with, conceptions about, and use of computer technology. Bauer and Kenton also conducted observations and interviews with each teacher. Based on an open-ended interview, teachers reported the following obstacles they had to overcome in order to use computer technology in their instruction: (a) lack of equipment or poorly functioning equipment, (b) time to use technology within a standard class period, (c) the varying levels of students' skills, (d) lack of teachers' skills in using digital technology, (e) scheduling computer lab time, (f) unavailability and incompatibility of software, and (g) Internet crashes due to large numbers of students simultaneously searching Websites. Through their questionnaire and observations, they also discovered that teachers were merely using technology rather than integrating it into instruction. However, it is not clear how Bauer and Kenton developed the survey used in their study. Specifically, they do not offer any explanation of how the survey items were derived or whether there were efforts to establish the validity and reliability of the survey. Further, they considered integration to be "a reliance on computer technology for regular lesson delivery" (p.522), and seemed to acknowledge any use of computers as evidence of integration. Thus, the findings and conclusions of their study do not provide specific data that speak to the questions of the present study. However, obstacles identified in their work were considered in the development of the survey used in the present study. For example, the survey includes questions about the extent to which lack of equipment, lack of time

within a class period, student skill and teacher skill are perceived as barriers to integration.

Warschauer, Knobel and Stone (2004) conducted a qualitative study that did not specifically inquire of teachers about the barriers they faced in integrating technology, but compared the use of new technologies in a group of high and low socio-economic status high schools in California. Based on the patterns they observed across the schools, they characterized the following difficulties teachers experienced in integrating technology into the school curriculum:

1. *Workability*, which is how well equipment and networks actually function. Teachers in the study voiced dissatisfaction with having to plan back-up lessons in case the technology they chose to use was not working properly.
2. *Complexity*, which is the logistical challenges of integrating computers into instruction, such as taking students to the computer lab, differential skill levels with basic computer operations, and lack of access to computers at home for homework assignments.
3. *Performativity*, which is an emphasis on skills rather than more meaningful application such as locating and evaluating search engine results. Teachers emphasized being able to measure performance of technology-related activities, even at the cost of devaluing the process.

Their study did not explicitly address barriers to technology integration, but it is nonetheless useful in providing broad categories into which most barriers fall. Thus,

barriers included in the survey developed for the present study included factors in each of these 3 categories.

Zhao, Pugh, Sheldon, and Byers (2002), study paralleled Bauer and Kenton's (2005) work, because they investigated what factors facilitated or hindered the use of technology among teachers who had received a technology grant, and who were presumably savvy users of technology. They conducted case studies with 10 of the 118 teachers who had received funding for technology-related projects. The 10 case study teachers were selected on the basis of geographical location, grade level, and subject matter. Quantitative analyses showed no significant difference among the selected cases and the full set of cases. Therefore, the 10 cases were assumed to be representative of all 118 teachers selected as grant recipients. Zhao and his colleagues found three domains, each with several factors, that influenced the successful integration of technology into instruction. The first domain included teachers who were labeled as *innovators*. Three factors related to the innovators: technology proficiency, pedagogical compatibility, and social awareness of the school culture. Regarding technology proficiency, the researchers found that not only is understanding how to use equipment important, but understanding the enabling conditions of certain technologies is equally important. For example, in addition to knowing how to instruct students to read and send email, a teacher must have access to a functional network, networked computers, email software, and possibly even filter software. Pedagogical compatibility was deemed important because efforts to use technology were more likely to yield positive results when a teacher's pedagogical approach matched the technology or technology application he or

she chose to use. Awareness of school culture was deemed important because the researchers found that when teachers understood school resources and were sensitive to the needs and priority of colleagues their technology integration efforts were more successful.

The second domain was labeled the *innovation*, or project. The factors associated with the selected project that contribute to successful technology integration were the project's distance from the school culture, the distance from existing practice, the distance from available technological resources, dependence on others, and dependence on technological resources.

The final domain was the *context*, or school. The school-related factors that influence the integration of technology were the human infrastructure supporting technology integration, the technological infrastructure, and social support. Thus, their study revealed 11 factors related to technology integration, and identified several factors that were not mentioned in any of the studies previously reviewed here. However, it was conducted only with teachers who had already received a technology grant, and thus who are likely to have greater interest in, commitment to, and knowledge about digital technologies and their integration into the curriculum. These teachers already had an interest in using technology and are thus not representative of teachers who perhaps do not have technology available or those who do not have an interest in using technology as part of their instruction. Nonetheless, many of the factors revealed in their study were included in the survey used in the current study. For example, the survey includes items

about the human and technological support available to teachers, and about the pedagogical compatibility of technology with the teachers' beliefs.

In a more dated study, Ertmer, Addison, Lane, Ross, and Woods (1999), examined teachers' beliefs about the role of technology in the elementary classroom. They collected survey, interview, and observational data from seven teachers in one elementary school. They classified barriers to technology integration into first-order and second-order barriers. First-order barriers were those extrinsic to teachers, and included a lack of access to computers, lack of time, and lack of classroom help. Second-order barriers were those intrinsic to teachers, such as a teacher's beliefs or routines, lack of relevance, a mismatch with classroom management style, and a lack of teacher confidence about technology abilities. The results from that study were also used to inform the development of the survey used in the present study. Specifically, the survey in the present study inquires about teachers' confidence level in their ability to use technology. Further, in the analyses, self-report data were correlated with teachers' actual use of technology to compare the findings from Ertmer et al.'s (1999) study. Further, like Ertmer's study, the survey used in the present study inquires about equipment, time, support, and classroom management concerns as barriers to ICT integration.

Each of the studies reviewed here contributes to the base of knowledge regarding the barriers teachers face in using technology in a significant way. However, none of them are large-scale, national studies. Most were conducted within only a single school. Further, only Honan's (2008) study of obstacles to using digital text looked specifically at

literacy practices. That there is minimal overlap, as indicated in Table 2.1, in the barriers described in each of these studies makes clear that the obstacles that teachers face in integrating technology are broad and not yet fully understood. Further, obstacles may be different depending on grade level. Therefore, the present study provides a large-scale picture of the barriers that teachers face in integrating ICTs specifically into their literacy instruction.

What are teachers' perceptions about the importance of integrating ICTs?

Some scholars and researchers believe that an important determining factor in whether teachers successfully integrate ICTs into their classrooms is how teachers perceive the value of technology. For example, Hughes, Kerr, and Ooms (2005) determined that the more teachers see the connection between technology and the subject content they teach, the more likely they are to develop a technology-supported pedagogy. As noted by Ertmer (2005),

> Ultimately, the decision regarding *whether* and *how* to use technology for instruction rests on the shoulders of classroom teachers. If educators are to achieve fundamental, or second order changes in classroom teaching practices, we need to examine teachers themselves and the beliefs they hold about teaching, learning, and technology (p. 27).

Thus, one of the goals of the current study was to gain an understanding of how teachers perceive the importance of integrating ICTs into literacy instruction.

If teachers do not perceive ICT integration to be important in literacy classrooms, the first step toward ICT integration may be to raise their awareness about the necessity

of teaching students the skills, strategies and dispositions needed to be literate in online environments. Conversely, teachers may perceive the integration of ICTs into their literacy instruction to be important, but they may still not take steps to integrate ICTs into instruction, perhaps because of the barriers cited in the previous section. In that case, contextual constraints might be inhibiting teachers from integrating ICTs into instruction. For example, Ertmer, Gopalakrishnan, and Ross (2001) determined that teachers' self-reported beliefs about using technology in their teaching often did not match their classroom practices. The teachers in that study explained that these discrepancies occurred as a result of contextual factors, such as pressure from administrators, parents and peers, and curricular requirements. More than a decade ago, Scott, Chovanec, and Young (1993) obtained similar results in their study of the beliefs and practices of college professors. They found that institutional issues sometimes make the enactment of teaching and learning philosophies difficult.

Some researchers have examined how teachers' pedagogical beliefs influence the integration of technology (e.g. Garthwait & Weller, 2005; Kim, Grabowski, & Song, 2003). Ertmer (2005) suggested that it may be necessary to engage teachers in an exploration of their beliefs, and to provide them with opportunities to examine new practices supported by different beliefs to initiate change in the way teachers use technology. Thus, the literature suggests that teachers' beliefs about technology determine whether or not they integrate technology into their classrooms. As Dexter, Anderson, and Becker (1999) pointed out, "Although culture and context create norms of teaching practice . . . teachers can choose, within these limits, the approach that works for

them. This autonomy provides teachers with choices to adopt, adapt, or reject an instructional reform" (p. 224). Thus, it is important to determine how teachers perceive the instructional reform brought about by ICTs. The current study examines how teachers perceive the importance of integrating ICTs into instruction, and may thus serve as another indicator of why teachers are or are not integrating ICTs, and perhaps suggest what beliefs must be addressed to advance more authentic and meaningful integration of ICTs into instruction. In short, a better understanding of teachers' perceptions in this arena may help in fostering the conditions necessary for ICT integration to occur in literacy classrooms.

What are the distinguishing characteristics of teachers with high or low ICT integration?

Although scholars have studied the pedagogical beliefs and environmental factors that influence teachers' integration of ICTs (Becker, 1994; Ertmer, Gopalakrishnan, & Ross, 2001; Scott, Chovanec, and Young, 1993), there is no precedent for comparing specific demographic characteristics among teachers, in general or literacy teachers specifically, who do and do not extensively integrate ICTs into instruction.

Teachers who have children, particularly teenage children, may be influenced by their children to integrate ICTs into instruction. For example, research from the Pew Internet and American Life project (2007) reveals that the technology profile of adolescents and their parents often mirror each other, although the direction of the influence (parent to child or child to parent) is not clear. Consequently, it is reasonable to believe that adolescents may influence their parents' use of technology. They may be able to teach their parents new applications of technology and help them trouble shoot

when they encounter problems. As a result, it may be that factors beyond the control of policy-makers, such as whether or not a teacher has children or a teacher's age, have tangible influence on whether or not teachers integrate ICTs into their classrooms.

The current study examines various demographic and environmental characteristics of teachers in relation to the extent of their technology integration and their beliefs, including determining the extent to which having children may play a role. Understanding such factors may reveal important influences upon which professional development might build and it may lead to a better understanding of the factors beyond the pale of education policy and professional development, the latter of which is the topic of the final section of this review.

The Role of Professional Development in Integrating Technology into Literacy Teaching

Although the present study does not investigate extensively the role of professional development in the integration of technology into literacy instruction, it has the potential to inform professional development. For example, by understanding the barriers or perceived barriers that teachers face when considering the integration of technology into their literacy instruction, professional development might be tailored to addresses those barriers. Additionally, the current study investigates how teachers perceive the professional development that they have received on technology integration and directly addresses the question of how they believe professional development might be more effective, and in Chapter 5 I discuss the implications of findings for professional development.

Importance of Professional development

Recent studies have suggested that a lack of appropriate professional development is one of the prominent reasons that teachers do not integrate technology into their curriculum (Bauer & Kenton, 2005; Stolle, 2008). Professional Development regarding how to meaningfully integrate ICTs into the classroom is particularly important because many ICTs are new and unfamiliar to teachers. Not only must teachers learn ways of effectively incorporating ICTs into their existing curriculum, often they must also learn how to use new hardware or computer applications (Meier, 2005). Although ICTs are new to many teachers, appropriate professional development may encourage and support teachers' efforts to effectively integrate ICTs into their classrooms. For example, Penuel, Boscardin, Masyn, and Crawford (2007) found in their study of 498 educators that those who had received professional development in instructional strategies related to technology used ICTs more frequently and implemented the broadest array of strategies. Fatemi (1999) also found that teachers who were most likely to rely on digital content and search for Web sites for use in class had received professional development within the last year. Further, Becker (1999) reported that teachers who received professional development on using the Internet perceived the value of the Internet to be much higher and thus considered it an essential resource, making them more likely to use the Internet than other teachers. These findings are consistent with calls for more professional development as an avenue to increased use of ICTs in classrooms. For example, according to the National Commission on Writing (2006), high quality professional development is the best way to help teachers integrate ICTs into writing instruction. Clearly there is a belief that professional development plays a role in integrating digital

technologies into instruction and there is some evidence to support that belief. However, there are no national data concerning the role of professional development in promoting technology integrations among literacy teachers.

Professional Development on ICT integration

Nonetheless, a case can be made that, given the opportunities for professional development for using digital technologies in instruction, technologies are relatively underused in classrooms (Becker, 1999; U.S. Department of Education, 2000). Although a large research base has provided educators with useful information on the structure and delivery of effective professional development in general, it does not explain why teachers have been relatively slow to integrate ICTs into their classrooms, despite having ample access to professional development aimed at enhancing the use of digital technology in classrooms (NCES, 2003). This disconnect may be due to the circumstances, that although professional development is available, professional development that is focused, substantive, and extensive has been rare (Hughes, Kerr, & Ooms, 2005). After conducting a review of the literature on technology professional development, Lawless and Pellegrino (2007) declared that, "The paucity of empirical research examining the area of technology professional development for teachers is astonishing" (p. 584). Traditions of professional development used in many content areas do not suit the unique needs of professional development regarding ICT integration (Wells, 2007). For example, traditional professional development is often delivered in short-term workshops and focuses on teaching discrete skills and techniques (Little, 1994). Such an approach may not be conducive to integrating technology, which requires

not only conceptual knowledge and specific curricular goals, but more practically also requires support in basic operations as well as expertise to solve technical problems. Consequently, many researchers have called for increased and varied professional development on technology integration. For example, after examining the current status of technology use in the United States, the International Technology Education Association (ITEA; 2007) published a report indicating the need for more professional development related to technology use. Doering, Hughes, and Huffman (2003) argued that pre-service programs should spend less time focused on learning how to use tools, such as Power Point presentations, and more time on teaching how to integrate a learning-with-technology perspective into classrooms. A school district in Virginia also concluded that technology professional development requires more than simply instructing teachers on how to use technology tools (Jones, 2007). Their efforts suggest that teachers must be taught how to use ICTs to improve teaching, and that training needs to be driven by the skills needed to improve teaching rather than simply using the new technologies (Jones, 2007). These studies indicate the need for improved professional development regarding how to integrate ICTs into instruction. The current study aims to gather information that can inform such efforts.

Some models for professional development specifically aimed at enhancing teachers' capabilities to integrate technology into their instruction have been developed and implemented. These models include approaches that use students as technology trainers, on-site technology coordinators, summer institutes, district technology centers, university courses, training by hardware and software vendors, and online training (SRI

International, 2002). Many of the professional development models that have been successful have included design-based components where teachers were given the opportunity to design uses of ICTs in the context of their own classrooms and teaching goals (e.g. Beckett et al., 2003; Cole, Simkins & Penuel, 2002; Keller, Ehman & Bonk, 2004; Mitchum, Wells & Wells, 2003; Mulqueen, 2001; Seels, Campbell & Talsma, 2003). Another approach to technology professional development that is prominent in the literature and has been used with some success is the mentoring or coaching model (Cole et al., 2002; Holbein & Jackson, 1999; Kariuki, Franklin, & Duran, 2001; Mulqueen, 2001; Orrill, 2001). In this model, teachers have a mentor who provides assistance based on the teachers' personal needs. Mentors may include colleagues, graduate students, or even online mentors. A third approach that has appeared successfully in the literature is the train-the-trainers model (Gonzales, Oickett, Hupert, & Martin, 2002; Martin, Culp, Gersick, & Nudell, 2003). In this model, an initial group of teachers is trained, and they then assume responsibility for training their colleagues. However, no single model has been definitively established as the best way to conduct technology professional development. A perfectly effective model is not likely to exist given different circumstances. However, knowing the circumstances that most teachers face and the factors that are important to them in integrating technology into instruction, as provided by the current study, would be a useful starting point for considering effective professional development. Some researchers believe that more important than how technology professional development is conducted is the need to help teachers see the value of technology in the classroom. However, as Lawless and Pelegrino (2007)

have argued, there is a paucity of research that can guide the content and focus of professional development aimed at enhancing the integration of new technologies into instruction.

The Integrated Studies of Educational Technology (ISET; SRI International, 2001) survey of teachers added useful knowledge about factors, beyond a model of professional development, that contribute to teachers successfully integrating ICTs into their instruction. For example, they concluded that "The number of professional development activities experienced, the degree to which the activities were aligned with research-based features of high-quality professional development, and a focus on integrating technology into teaching appear to exert positive effects on whether or not teachers use technology during instruction [after professional development]" (p. 5). Another notable finding from that study was that the quality of technology professional development among teachers was inconsistent. Based on their findings, the researchers asserted that building in practice time for teachers, focusing on activities that help teachers develop skills in incorporating technology into teaching, providing building-level support, and offering incentives may all increase the effectiveness of professional development aimed at helping teachers integrate ICTs into instruction.

Despite a lack of empirically grounded knowledge about professional development on integrating technology into curricula, numerous professional development programs have been recently funded. According to Lawless and Pellegrino (2007), the U.S. Department of Education launched an initiative titled the Enhancing Education Through Technology (EETT) program, supplying more than $659 million each

year to provide professional development to teachers on integrating ICTs into their curricula. They pointed out that some researchers believe that such implementations are hasty and that more conclusive research should be the foundation of any such programs. After their comprehensive review of the literature, they concluded that empirically founded information regarding professional development on integrating technology is scarce, and they proposed a plan for better evaluating professional development opportunities. They call for a macro examination of the common constructs of technology professional development programs that lead to success, and the extent to which they address the indicators of quality professional development. Finally, they challenged researchers to follow their research plan so that capital resources can be allocated in ways that enhance technology use among teachers and students.

To summarize, the literature reveals the need for more understanding of how professional development can enhance teachers' integration of digital technologies into instruction in general and into literacy instruction in particular. Results from the present study will address that need.

Summary

From this review of literature, the following themes emerge in support for the rationale and questions for the present study:

1) The literacy skills needed to be considered fully literate are constantly changing in relation to new technologies and societal demands. Thus, it is important to document consistently over time the extent to which digital technologies are being integrated into literacy instruction.

2) Educators need to integrate technology into the curriculum in meaningful ways to ensure that students are fully literate in today's world. Thus, it is important to document the extent to which technology is being integrated into instruction in ways that go beyond simply using digital technology as opposed to using it in ways that will develop emerging skills and dispositions.
3) New skills are needed for reading comprehension to occur in an online environment and students need to be taught such skills. Thus there is a need to identify the extent to which teachers currently integrate those skills into literacy instruction.
4) Research indicates that there has not been widespread, authentic and meaningful integration of ICTs into teaching in ways that help students become more literate in online environments. Thus, more research is needed to determine how teachers nationwide are integrating ICTs.
5) There is evidence to suggest that a wide variety of factors hinder teachers from integrating ICTs into their classrooms in a way that moves students towards the goal of becoming digitally literate. There is a need to identify the factors that currently inhibit teachers so that those needs can be addressed.
6) More research is needed with larger and more diverse populations. Further, research that looks specifically at literacy environments is needed.
7) Little is known about how to best provide teachers with professional development that will facilitate the integration of ICTs into instruction. Thus, there is a need to

identify the potential content of professional development aimed at increasing the integration of ICTs that will be suitable for teachers' needs.

The literature reviewed explains the need to investigate the questions in this study. This review reveals that reading processes are fundamentally different in an online environment than they are in print-based environment and need to be taught to students. There is no existing evidence as to whether teachers are instructing students in how to read in online environments. It is also clear that there is a lack of sufficient professional development in the sustainable use of technology. Consequently, this study investigated teachers' uses and perceptions of technology in the classroom and barriers to integrating technologies into literacy instruction. It is necessary to understand if and how teachers are equipping students with the skills, strategies, and dispositions needed to be literate in online environments so that appropriate steps can be taken to ensure that students are receiving the instruction they need. Further, it is necessary to understand the barriers to ICT integration so that adequate professional development can be developed to help teachers integrate these tools in meaningful ways.

CHAPTER THREE

RESEARCH DESIGN AND PROCEDURES

Using survey methodology, the purposes of this study were as follows: (a) to investigate the extent to which literacy teachers nationwide integrate information and communication technologies (ICTs) into literacy instruction; (b) to investigate the extent to which ICTs are utilized in ways that promote the acquisition of literacy skills within digital environments; (c) to identify the perceived obstacles and challenges teachers face in their attempts to integrate ICTs into instruction; (d) to determine how literacy teachers define ICT integration and how they perceive the importance of ICT integration into reading instruction; and (e) to identify the distinguishing characteristics of teachers who report no or minimal integration of ICTs in their literacy instruction when compared to teachers who report extensive integration. A review of the literature in Chapter 2 revealed that new skills are required for reading in online environments and suggested that teachers are not integrating ICTs into their literacy instruction commensurate with ICTs' widespread use and in ways that facilitate the development of the new skills, strategies and dispositions required to use them effectively. The literature also suggested that there are a wide variety of obstacles that prevent the meaningful integration of ICTs into literacy instruction, but no one source covered all of the issues investigated in this study.

This chapter describes the methodology used in the present investigation including the following: an explanation and description of the sample, information about the development of the survey instrument, including efforts to establish its validity; a

description of a pilot study, including data collection procedures; and a description of the methods used to analyze data.

Participants

The sample for this survey was drawn mainly from teachers who are members of a state or local council of the International Reading Association (IRA). The IRA is an organization for professionals involved or interested in the teaching of reading and the language arts. Its members are mostly practicing teachers, and thus IRA is an organization primarily for practitioners, but it also includes administrators, policy makers, and researchers. IRA has approximately 95,000 members. IRA also has a network or councils and affiliates that extend their community to more than 300,000 reading professionals. Table 3.1 summarizes IRA's affiliates by country or area, and state or province.

Table 3.1

IRA Affiliates Worldwide

Country/Area	*Number of State/Provincial affiliates*	*local councils*
United States	50	Yes
Canada	6	Yes
Africa	4	Yes
Asia	9	Yes
Caribbean	7	Yes
Eurasia	2	No
Europe	29	Yes
Latin American	6	Yes
Oceania	2	Yes

IRA's mission as stated on its official website (www.reading.org) is as follows: "The mission of the International Reading Association is to promote reading by continuously advancing the quality of literacy instruction and research worldwide." IRA members who also maintain a membership in a state or local council are even more likely to be classroom teachers than the membership at large. In fact, some members of local or state councils are not members of the larger organization. The sample for this study was drawn mainly from the state and local councils because (a) members are mostly literacy educators, the target population of this study; (b) every state in the U.S. has a state affiliate comprised of local councils, thus representing the potential for a national sample, but with diversity in grade level and demographic profiles (e.g., teaching experience); and (c) many, but not all, of the state affiliates have email distribution lists, or they have other means available to disseminate information about an online survey, However, not all states are represented in the sample. In some states, leaders of the state IRA affiliate declined to invite their members to participate in the survey. In these cases, respondents were contacted through other organizations or list-servs. A description of how respondents were contacted is reported in the subsequent section outlining procedures. The number of participants from each state is listed in Table 3.3. Thirty-one states are represented in the survey from every region of the U.S. However, as noted in Table 3.3, the number of participants varied considerably by state.

Development and Validation of the Survey

The development and validation of the online survey followed procedures and recommendations in the literature on survey development (Dillman, 2007; Rea & Parker, 2005).

Initial development of content and items

The survey consisted of 69 items soliciting responses on a likert-scale, 11 multiple-choice items, and eight open-ended items. The survey development began by establishing the constructs that would be measured (Rea & Parker, 2005). Those constructs were as follows:

a) Use of ICTs: The purpose of this construct was to identify the varieties and uses of ICTs in literacy classrooms, and the extent to which ICTs are used to promote online reading skills.

b) Obstacles: The purpose of this construct was to identify the perceived obstacles teachers face in implementing ICTs into their literacy instruction.

c) Demographic Variables: The purpose of this construct was to identify the demographic variables of teachers in the sample. That information was used to make distinctions among teachers who do and do not successfully integrate ICTs into their literacy instruction.

d) Perceptions: The purpose of this construct was to identify teachers' perceptions about the importance and extent of technology integration in literacy instruction as well as perceptions about what it means to integrate ICTs into instruction.

After the survey constructs were established, the survey development continued with an extensive review of the literature pertaining to each construct. The research

questions, survey constructs, and findings from the review of the literature, were used to develop an initial pool of survey items.

Input from a focus group

After the initial pool of items was created, a focus group, consisting of three classroom teachers, was conducted to obtain feedback on the questions designed for classroom teachers (Rea & Parker, 2005). The teachers met for one hour at the school where they worked, and discussed their responses and reactions to each survey question among themselves. I observed and made notes while the teachers discussed the survey items. When the teachers completed their discussion of the survey items, I responded to teachers' reactions and asked additional questions based on their conversations. Interview questions were not prepared in advance because the questions were generated based on teachers' responses. The teachers who participated in the focus group were selected from a school in which the researcher had previously conducted research.

After the focus group meeting, the survey items were revised based on feedback from the teachers and ideas resulting from the meeting. For example, several additional examples of ICTs were noted during the focus-group meeting and additional questions were generated to inquire about those ICTs. Additionally, clarifications in terminology were made to they survey based on teachers' reactions to the terminology that was used during the focus-group meeting. After revision, the survey was converted to an online format using a survey tool called Survey Monkey, an application for developing online surveys. Survey Monkey was chosen as the platform for this survey because of its relative low cost and ease of use. Survey Monkey is a self-service survey platform

provider that allows researchers to enter survey questions into an online template and hosts live surveys on their server, automating much of the design and implementation of a survey. Additionally, Survey Monkey has 17 different question formats from which to choose and allows automatic skip patterns (i.e., when a response to an item makes subsequent items irrelevant), controls for required answers to essential questions and inclusion of a personal logo. Survey Monkey automatically records responses to the survey to an Excel spreadsheet file, which can later be downloaded and used for analysis. A disadvantage of Survey Monkey is that the Excel spreadsheets require a lot of reorganization before they are useable with statistical analysis software, such as Statistical Package for the Social Sciences (SPSS), which was used in the present analysis. Another disadvantage of Survey Monkey is that it does not check spelling. I wish to note that neither I nor my dissertation advisor have any financial interest in Survey Monkey.

Pilot Study

To enhance validity and to increase refinement of the survey, the initial was piloted in August, 2008. The pilot was conducted in order to test the reliability of the survey and to identify needed revisions based on reactions and responses from the participants in the piloting of the survey. The pilot survey consisted of 86 items developed around the research questions, survey constructs, relevant literature and focus-group results, and was distributed online using Survey Monkey.

A link to the survey and a request for participation was electronically mailed to100 kindergarten through high school teachers, although none of these teachers were

members of the International Reading Association. The teachers were acquaintances of the researcher, many of whom the researcher had worked with on previous occasions. Responses were solicited through an email in which each teacher could access a link to the survey. Teachers were encouraged to provide feedback on the survey to the researcher via email. Ninety-two completed surveys were received.

Item analyses were conducted on the items hypothesized to represent the constructs used to design the survey. For the Use of ICTs construct, item analyses were conducted on 19 items hypothesized to measure use of ICTs. Cronbach's alpha for Use of ICTs was .92. Therefore, all the items for this construct were retained in the final survey. Eight items in the Use of ICTs scale were hypothesized to specifically measure the use of ICTs to promote online reading skills, and were therefore treated as a subscale. Cronbach's alpha for the items hypothesized to measure online reading skills was .92. Therefore all the items were retained in the scale and final survey.

For the Obstacles construct, item analyses were conducted on 22 items included in the survey. The correlations ranged from .55 to .81. Cronbach's alpha for the Obstacles scale was .96. Therefore, all the items for this factor were retained in the final survey.

Based on survey responses, feedback, and problems that arose with the pilot survey, several changes were made to clarify items on the survey. No items were removed, but two items were added to avoid double-barreled questions (Dillman, 2007). A complete list of changes based on the pilot survey is in Table 3.2.

Table 3.2

Changes to the Final Survey Based on Pilot Survey Results

Item	*Changes made based on pilot survey results*
Please indicate the extent to which you believe the following are obstacles to integrating technology into your literacy/language arts instruction: High Stakes Testing	Clarified the meaning of "High Stakes Testing" by changing the option to "I don't think I have time to integrate technology because of the amount of time required to prepare students for high stakes testing."
Please list your First name/ Last name.	Provided the following explanation about why names were needed and ensured privacy before asking for the respondents' names: With permission, we may contact individuals for additional information. If you would be willing to talk with us, please provide your name and school in the blanks below. THE INFORMATION YOU HAVE PROVIDED IN THIS SURVEY WILL NOT BE LINKED TO YOUR NAME IN ANY WAY.

During the previous school year, about how often did you or your students use technology as part of literacy instruction? (e.g. the Internet, creating multimedia presentations, sending email, etc.)	Divided into two questions, specifying "you" in the first question, and "your students" in the second question.
Indicate the extent to which you present students in your typical reading or language arts class with online work that involved using computers or the Internet in the following ways: Using reference Websites such as Dictionary.com and Wikipedia	Removed Wikipedia as an example due to the controversial nature of the site's validity.
To what extent are you skilled at using digital technology in general?	Clarified the meaning of digital technology by adding the following examples at the end of the question: (computers, cell phones, iPods, etc.)
Text it too difficult for my students to read.	Clarified the type of text by changing it to Internet text.
In the last year, have you had any professional development related to technology use?	Changed "year" to "academic year."

Added additional question	Added "To what extent would you like to increase your integration of technology into your literacy or language arts instruction?" before asking what would help increase the integration of technology.
Added additional question	Added "Has *any* child every helped you learn how to use a new form of technology?" in addition to question asking if *your* child has helped with a new form of technology.
What grade do you teach?	Added answer choice option: combination class/multiple grade levels
All questions	Removed function that required an answer to all question on the survey.

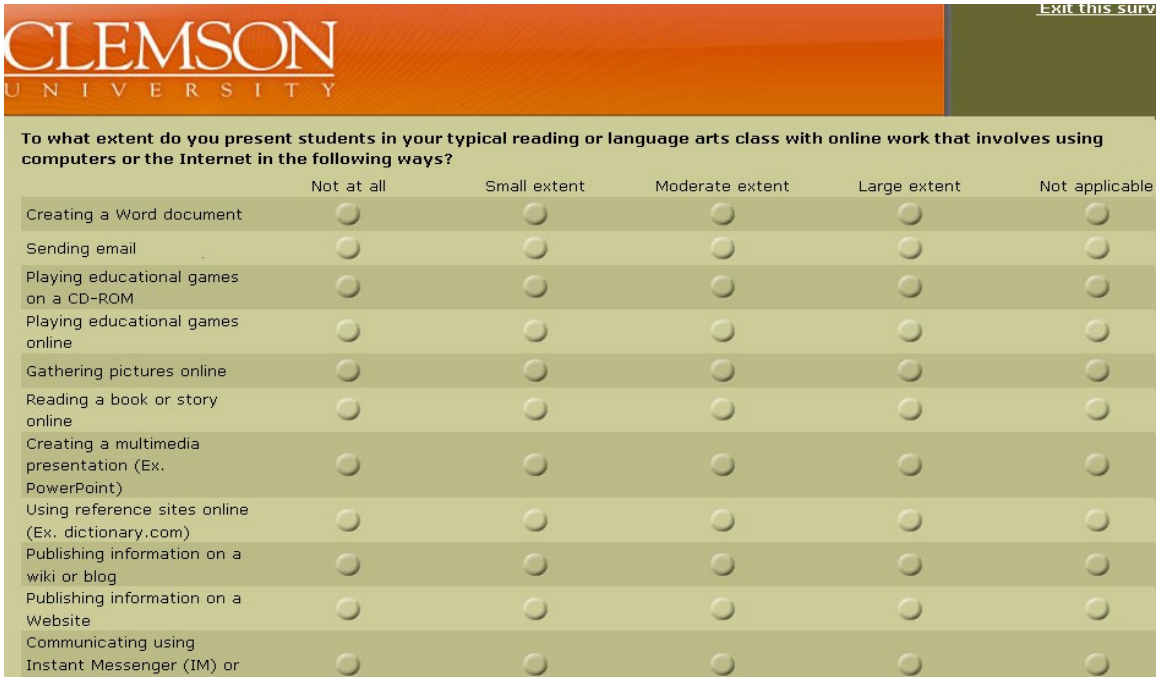
The Final Survey

The final survey was presented in an online format, and consisted of 69 items using a likert-scale, 11 multiple-choice items, and eight open-ended items. Figure 3.1 provides a screen shot of one of the pages of the online survey. The final survey can be

viewed online at

http://www.surveymonkey.com/s.aspx?sm=nZl9v9U_2bbTTFjIcVDFag_2bg_ 3d_3d. A list of the items on the final survey can be found in Appendix A.

Figure 3.1. Sample Page from the Final Survey


CLEMSON UNIVERSITY

Exit this surv

To what extent do you present students in your typical reading or language arts class with online work that involves using computers or the Internet in the following ways?

	Not at all	Small extent	Moderate extent	Large extent	Not applicable
Creating a Word document					
Sending email					
Playing educational games on a CD-ROM					
Playing educational games online					
Gathering pictures online					
Reading a book or story online					
Creating a multimedia presentation (Ex. PowerPoint)					
Using reference sites online (Ex. dictionary.com)					
Publishing information on a wiki or blog					
Publishing information on a Website					
Communicating using Instant Messenger (IM) or					

Procedures for Administering the Survey

Upon submission of the study procedures to Clemson University's Institutional Review Board (IRB), the present study was classified as exempt from continuing review and authorization was given for the study to begin (see Appendix B).

The survey was administered in several stages and through multiple contacts during a period of 3 months. Research suggests that multiple contacts effectively improve the response rates for surveys conducted by email (Schaefer and Dillman, 1998). The first contact consisted of sending a personal email to the presidents and membership chairs of all the state IRA councils to inform them of the study, to request their

cooperation in facilitating the study, and, if they consented, to make them aware that they would subsequently receive further instructions about how they could participate (see Appendix C for a copy of the email). The email also informed the state presidents that if at least 15% of their members completed the survey, they would receive a customized report of the survey findings for their state. A personal contact was used based on Heerwegh and Loosveldt's (2007) finding that personalized email contacts increased Web survey response rates. Five days after the first email, a second email contact was made with state presidents and membership chairs. The second email suggested several ways each state president could invite their state reading association members to complete the survey and it included a sample invitation email (see Appendix D for a copy of the email). The presidents were asked to send the invitation letter to their members through their email distribution list, or to inform the researcher if an email invitation was not a possibility. Based on Crawford, Couper, and Lamas' (2001) finding that a single reminder email doubled the number of their respondents, a reminder email was sent to presidents who had not replied approximately a week after the second contact was made.

Twenty three state presidents did not respond to either the first or second email. Four state presidents declined to participate because they did not have an email list or because of concerns about members' privacy. In these cases an email with other options for announcing the survey and distributing the survey link, including posting to the organization's Webpage and announcing the survey in their state newsletter was sent. After determining which state reading associations would not participate in the study, Professor Reinking, the dissertation advisor, emailed personal contacts in those states to

ask for suggestions about how to distribute the survey effectively to the appropriate population and who might be contacted to facilitate dissemination through email. These contacts led to participation in Connecticut, Utah, Nebraska, Missouri, and Rhode Island. In Connecticut, an email requesting participation in the survey was sent to the Connecticut Association for Reading Research list-serv. In Utah, an individual working in the area of language arts at the state department of education emailed the survey announcement to all literacy teachers in the state. In Nebraska, a link to the survey was posted on the State Department of Education's reading Webpage. In Missouri, an individual associated with eMINTS, a non-profit business of the University of Missouri that offers professional development for educators, emailed the survey link to literacy teachers involved with eMINTS. In Rhode Island, an individual who conducts professional development with literacy teachers throughout the state emailed the survey link to literacy teachers on her professional development email distribution list.

The survey was active online from September 15, 2008 until December 15, 2008. During that period, 1,441 respondents completed the entire survey. Table 3.3 describes which states participated, the number of participants in each state, and if the respondents were members of a state council of IRA of if they were contacted through another method.

Table 3.3

Survey Participation by State

State	*Number of participants*	*Participants/Method of Contact*
Arkansas	15	Arkansas Reading Association/ email link
Alabama	14	Alabama Reading Association/ link posted on Website
Arizona	27	Arizona Reading Association/ email link
California	20	Literacy teachers at a school whose principal is a member of the California Reading Association/ email link
Colorado	39	Colorado Council of the IRA/ link posted to listserv
Connecticut	13	Members of the Connecticut Association for Reading Research and their contacts/ email link
Delaware	41	Diamond State Reading Association/ email link
Florida	15	Florida Reading Association/ link in electronic newsletter
Georgia	20	Literacy teachers in Atlanta public schools/ email link
Iowa	22	Iowa Reading Association/ link posted on Website
Illinois	24	Illinois Reading Association/ link listed in newsletter
Kansas	195	Kansas Reading Association/ email link
Kentucky	25	Kentucky Reading Association/ email link
Minnesota	35	Minnesota Reading Association/ email link
Missouri	21	Teachers participating in eMINTS (Enhancing Missouri's Networked Teaching Strategies/ link in weekly email

		update
Nebraska	13	Literacy teachers state-wide/ link posted to state reading Webpage
New Jersey	14	New Jersey Reading Association/ email link
Nevada	16	Silver State Reading Association/ email link
Ohio	1	Ohio Council of the IRA/ email link
Oklahoma	8	Oklahoma Reading Association/ link posted to Webpage
Oregon	5	Oregon Reading Association/ email link
Pennsylvania	21	Keystone State Reading Association/ email link
Rhode Island	28	Literacy teacher state-wide/ email link
South Carolina	40	Literacy teachers in upstate SC/ email link
Tennessee	3	Tennessee Reading Association/ email link
Texas	3	Texas Council of Teachers of English/ link posted to Webpage
Utah	429	Literacy teachers state-wide/ email link
Virginia	184	Virginia Reading Association/ email link
Washington	119	Washington Reading Association/ email link
W. Virginia	8	West Virginia Reading Association/ email link
Wyoming	5	Wyoming Reading Association/ email link
TOTAL	1441	

Response Rates

Dillman (2000) suggested that a desirable response rate for Web-based surveys is approximately 80%, but also acknowledges that this rate is high and difficult to obtain. He asserts that researchers should follow a protocol to encourage higher response rates, which was followed in the present investigation. Specifically, Schaefer and Dillman (1998) suggest multiple, carefully timed, and personalized contacts, including pre-notice and reminder letters. However, due to primary and secondary methods of distribution this survey, the response rate cannot be determined. That is, there is no way to determine precisely who received an invitation to complete the survey. For example, the state affiliates were not asked to share their respective email lists, for the sake of privacy. In addition, in many cases, the survey link was posted to an organizational Website or in a newsletter. In these cases, there was no way to determine how many people read the survey announcement.

Data Analysis

For Research Questions One and Two, descriptive data were used to assess the extent to which teachers use ICTs in their classrooms. Descriptive data were also used to report the digital technologies that teachers use in their teaching. To assess the extent to which online literacy skills are a part of classroom instruction, teachers were assigned an *online reading skills score* based on the extent to which they integrating each skill into their instruction. One point was given for online reading skills that were reported being used to a small extent, two points were given for skills being used to a moderate extent, and three points were given for skills used to a large extent. These scores were added

together to create a composite *online reading skills score.* The total possible score was 32.

For the third research question, data from open-ended questions were used to assess how teachers define ICT integration. These data were first analyzed inductively using a Constant Comparative approach (Glaser & Strauss, 1967; Leech & Onwuegbuzie, 2007). First, the researcher read through the entire data set and then chunked the data into smaller, meaningful parts. Next, each chunk was labeled with a descriptive title or code (Miles & Huberman, 1994). Finally, the codes were grouped by similarity and a theme was identified for each grouping. After all of the data were coded, a classical content analysis approach (Leech & Onwuegbuzie, 2007) was followed and I counted the number of instances within each theme. The number of occurrences for each code was then reported as a percentage.

The purpose of the fourth research question was to determine the perceived obstacles and challenges to integrating ICTs into instruction. This question was assessed through closed- and open-ended questions. The quantitative data from the closed-ended questions were analyzed descriptively. The open-ended question was analyzed inductively using a Constant Comparative approach (Glaser & Strauss, 1967; Leech & Onwuegbuzie, 2007).

The purpose of the fifth research question was to assess teachers' perceptions about the importance of integrating ICTs into literacy instruction. These questions were analyzed descriptively.

The sixth research question was addressed using several statistical analyses. To assess teachers' levels of ICT integration, teachers were assigned a *total ICT use score* based on the variety and extent of ICT applications reported. Respondents were assigned one point for each activity that they reported integrating to a small extent, two points for activities integrated to a moderate extent, and three points for activities integrated to a large extent. Points for each activity were added together to create a composite *total ICT use score*, for a maximum possible score of 54.

To assess teachers' integration of ICTs in ways that promote the acquisition of skills for reading in an online environment, teachers were assigned an *online reading skills* score. The online reading skills that make up the *online reading skills score* are: a) communicating using IM or other chat tools, b) formulating questions to research online, c) locating information online, d) evaluating information online, e) synthesizing information online, f) searching for information online using specific search strategies, g) collaborating with students from other classes, and h) sending email. These skills were chosen as representative of the skills that promote literacy in digital environments based on the definition of new literacies by Leu et al. (2004). One point was assigned for online reading skills teachers reported integrating to a small extent, two points were assigned for skills integrated to a moderate extent, and three points were assigned for skills integrated to a large extent. These scores were added to create a composite *online reading skills score*, for a maximum possible score of 32.

Teachers were also assigned an *obstacles* score based on the extent to which they believed various potential obstacles affect their ICT integration. Multiple regression

procedures were used to assess the relationships of teacher perceptions and characteristics with the dependent factor, teachers' total ICT use (i.e., the *total ICT use score).*

CHAPTER FOUR

RESULTS

This chapter reports the results that address the research questions investigated in the present study. Results are presented separately for each research question.

What ICTs are being used in literacy classrooms?

Many teachers in this study reported frequently using ICTs as part of their literacy instruction. For example, thirty-seven percent of teachers reported using ICTs on a daily basis, and 22% reported using ICTs in instruction a few times each week. Three percent of teachers indicate that they do not use ICTs at all in their instruction. Teachers reported that their students use ICTs less frequently at school. Sixteen percent of teachers reported that their students use ICTs daily, with 21% reporting that their students use ICTs a few times each week. Seven percent of teachers reported that their students never use ICTs as a part of literacy instruction.

To assess the frequency and variety of their use of ICTs in literacy instruction, respondents were asked to indicate the extent to which they assign a variety of activities to the students in their reading or language arts class. Table 4.1 summarizes the frequency with which teachers reported incorporating each instructional activity.

Table 4.1

Relative Frequency of Using Information and Communication Technologies in Instructional Activities

Instructional activity using ICTs	*Not at all (%)*	*Small extent (%)*	*Moderate extent (%)*	*Large extent (%)*	*Not applicable (%)*
Communicating using Instant Messenger or other chat tools	**80.2**	6.7	1.7	2.3	9.1
Collaborating online with students from other classes	**75.5**	12.5	3.5	1.6	6.9
Publishing information on a wiki or blog	**75.0**	10.6	3.2	3.0	8.2
Publishing information on a Website	**70.4**	13.4	5.0	3.0	8.2
Sending email	**61.1**	15.5	6.1	6.6	9.9
Formulating questions to research online	**39.1**	**27.6**	18.8	8.6	5.9
Synthesizing information online	**38.2**	**25.8**	20.5	10.0	5.5
Evaluating information online	**34.7**	**27.0**	21.3	11.4	5.5
Playing educational games-CD-ROM	**34.7**	**27.5**	20.0	13.0	4.2
Creating a multimedia presentation	**32.9**	**26.1**	20.2	15.5	5.0
Using specific search strategies to search for information online	**29.3**	**26.2**	24.2	15.1	5.0
Reading a book or story online	**28.4**	**34.3**	21.6	12.6	2.7

Gathering pictures online	22.5	**33.5**	**26.6**	12.7	4.1
Creating a Word document	22.5	22.1	**23.0**	**27.0**	4.6
Playing educational games-Online	22.0	**29.8**	**26.6**	18.2	3.1
Using reference sites online	20.5	**26.4**	**26.5**	22.1	4.2
Searching for information online	17.0	**26.6**	26.0	**26.2**	4.2
Locating information online	16.2	**26.6**	**28.1**	24.9	4.2

Note. Bold values represent the one or two largest values in each category representing at least 50% of the responses.

There were five activities that more than half the teachers reported using "not at all." These included sending email, publishing information on a wiki or blog, publishing information on a Website, communicating using Instant Messenger or other chat tools, and collaborating online with students from other classes. On the other hand, there were three activities that more than half of the teachers reported using to a moderate or large extent. These included creating Word documents, locating information online, and searching for information online.

Availability of ICTs

Teachers responded to items indicating the variety of hardware and applications available to them for literacy instruction. Table 4.2 summarizes the results.

Table 4.2

Teachers' Access to Hardware and Applications for Literacy Instruction

Hardware or application	*Percent of Teachers Reporting Access*
Internet-connected computer(s) in the school (outside of classroom)	92.0
Internet-connected computer(s) in the classroom	86.1
Digital projector	66.7
Interactive whiteboard	43.1
Laptop computer at school for personal use	41.1
Digital video recording equipment	32.0
Document camera	15.3
Laptop computers for each student	12.3
Student email	11.4
Personal Data Assistant (PDA)	7.0
An iPod	5.8

These data indicate that the majority of teachers have access to Internet-connected computers in their school, but access to other equipment and applications is relatively limited. The high percentage of teachers reporting Internet access in their classrooms in this survey is consistent with, but somewhat less than, national statistics for all schools and classrooms. The data suggest that literacy teachers have somewhat less access to Internet connections than do all teachers. Teachers reported greater access to one-to-one

student laptops than to student email accounts. The least common ICTs in classrooms are Ipods and PDAs.

To what extent are ICTs being used to develop online reading?

To assess teachers' integration of ICTs aimed specifically at promoting the acquisition of literacy skills in digital environments, respondents were assigned an *online reading skills score* based on the extent to which they reported integrating online reading skills. The score was comprised of numerical values for the responses from the following items: a) communicating using IM or other chat tools, b) formulating questions to research online, c) locating information online, d) evaluating information online, e) synthesizing information online, f) searching for information online using specific search strategies, g) collaborating with students from other classes, and h) sending email. These activities were chosen as representative of the skills that promote literacy in digital environments based on Leu and his colleagues' (2004) definition of new literacies. One point was assigned for online reading skills teachers reported integrating to a small extent, two points were assigned for skills integrated to a moderate extent, and three points were assigned for skills integrated to a large extent. These individual values were added to create a composite *online reading skills score*, for a maximum possible score of 32. The mean *online reading skills score* for all respondents was 6.6 (SD = 5.53), indicating a relatively low usage of ICTs in ways that promote the acquisition of online reading skills.

How do teachers define ICT integration?

To address this question, respondents responded to the following open-ended question: "What do you think it looks like to integrate technology into literacy instruction? Give as many ideas as you can." Respondents were provided five open-ended text boxes in which to respond. These data were first analyzed inductively using a constant comparative approach (Glaser & Strauss, 1967; Leech & Onwuegbuzie, 2007). Initially, the entire data set was read and the data were chunked into smaller, meaningful parts. For example, all data related to the use of computers as presentation tools were grouped together. Next, each chunk was labeled with a descriptive title or code (Miles & Huberman, 1994). Throughout this process, earlier codes were checked to determine if a similar code already existed. If a similar code existed, the data was reevaluated to determine the appropriate code. Finally, the codes were grouped by similarity and a theme was identified for each grouping. After all of the data were coded, I employed a classical content analysis approach (Leech & Onwuegbuzie, 2007) and then counted the number of instances within each theme. Displaying information numerically can make patterns "emerge with greater clarity" (Dey, 1993, p. 198). Therefore, each theme was quantified (Creswell & Plano-Clark, 2007) to determine which themes appeared most often and thus represented the most prominent ideas about ICT integration for the respondents. Table 4.3 summarizes the themes that emerged from the data analysis and the percentage of teachers who reported answers related to each theme. Because the respondents were able to provide as many as five responses, the percentages listed in Table 4.3 do not equal 100%.

Table 4.3

Themes Emerging from the Analysis of Teacher Beliefs about What it Means to Integrate Technology into Instruction

Theme	*Description*	*Teachers Reporting Theme*
Presentation Tools	Describes use of ICTs by students and teachers for presenting information, including, but not limited to: a) the use of multimedia presentation software for lesson presentation and as demonstration of learning; b) the use of projectors for showing Websites and other information; c) the use of document cameras for demonstration, elaboration, and book sharing.	38%
Research	Describes use of ICTs by students for research on any topic.	23%
Supplement or replacement of existing activity	Describes the use of ICTs to replace activities that were already being conducted with pencil and paper, and the use of ICTs for activities that improve an existing activity and support instruction.	20%
Background information and information enhancement	Describes the use of ICTs for building background knowledge prior to reading instruction and for extending and enhancing reading instruction and reading topics.	16%
Computer as tutor	Describes the use of ICTs as student tutors. Includes the use of educational software, online tutorials, Websites, and games that reinforce reading skills.	15%
Publishing	Describes the use of ICTs for publishing student work both online and offline. Online publishing opportunities include blogs, Websites, wikis, Podcasts, Google docs and other collaborative publishing tools. Offline publishing includes using word processing tools	15%

	to type stories and assignments, create portfolios, reduce paper use, and to organize written work.	
Student Interaction	Describes the use of ICTs in ways that allow students to interact with the teacher during instruction, and allow for interactive work between students.	14%
Alternative Format Reading	Describes the use of ICTs for reading in formats other than traditional printed texts. Includes online texts, visual text, ebooks, text supplemented by audio reading, blogs, and books on Ipods.	13%
Environments	Describes the environments created by the integration of ICTs. Students are described as energetic, engaged, excited, interested, creative, comfortable, challenged, and inspired to learn.	12%
Writing	Describes use of ICTs by students and teachers for traditional writing, digital story writing, interactive writing, creating photo stories, editing and revising, learning the writing process, and as a tool for writing to real audiences.	12%
ICT availability	Describes the desire of teachers for reliable and accessible ICTs and for one-to-one laptops for students.	11%
Assessments	Describes the use of ICTs for assessing students' fluency, comprehension, and other knowledge and providing immediate feedback.	7%
Critical literacy	Describes the use of ICTs in ways that teach students to critically examine information as they question, locate, synthesize, communicate, and attempt to comprehend online.	5%
Differentiated instruction	Describes ICTs as tools that allow teachers to differentiate instruction for individual students.	5%
Interactive	Describes instances when teachers named	5%

whiteboards	interactive whiteboards as useful tools, but did not specify how they should be used.	
Student communication	Describes the use of ICTs in ways that allow student-to-student communication, student-to-teacher communication, and student-to-community communication.	5%
Telecollaboration	Describes the use of ICTs for connecting to people and students outside the classroom to collaborate on projects that are integrated into the curriculum. The use of ICTs enables activities that would not have been possible without ICTs.	5%
Independent work	Describes the use of ICTs as a means of providing students with independent work, such as work in a learning center.	4%
Projects	Describes the use of ICTs for culminating projects that demonstrate student learning.	4%
Teacher as facilitator	Describes the use of ICTs in ways that allow the teacher to work only as a facilitator while students explore and guide the content and pace of their learning.	4%
Teacher resource	Describes ICTs as a resource for teacher lesson plans, grade books, document collection, and other professional resources.	4%
Computer skills	Describes the use of ICTs for learning computer and keyboarding skills.	3%
Integral and seamless	Describes ICTs as being integral to everyday instruction and a seamless part of classroom activity.	3%
Teacher communication	Describes the use of ICTs in ways that allow teachers to communicate work and messages to students, parents, colleagues, and the community.	3%
Book discussion	Describes the use of ICTs as a tool for creating	2%

	discussion about books. Includes the use of wikis, blogs, online book groups, online discussion forums, and book review Websites.	
21st century preparation	Describes ICTs as an authentic means for preparing students for life as an adult in the 21st century.	2%
Global awareness	Describes the use of ICTs for global communication, and for understanding global cultures and points of view.	2%
Graphic organizers	Describes the use of ICTs as a tool for graphically organizing information and ideas.	2%
Learning styles	Describes the use of ICTs as a means of accommodating various learning styles.	2%
Word tools	Describes the use of ICTs for enhancing vocabulary instruction and using online dictionaries and thesauruses.	2%
Cross-curricular instruction	Describes the use of ICTs for integrating literacy into other content areas.	1%
Language support	Describes the use of ICTs to support English Language Learners.	1%
I don't know	Describes instances when teachers stated that they do not know what it means to integrate technology into instruction.	1%

What are the perceived obstacles and challenges to integrating ICTs?

Extent of Obstacles

Teachers were asked to identify the extent to which several potential obstacles and challenges interfered with integrating ICTs into literacy instruction by responding to

the following question: "Please indicate the extent to which you believe the following are obstacles to integrating technology into your literacy/language arts instruction."

Table 4.4 summarizes the responses.

Table 4.4

Perceived Obstacles to the Integration of ICTs into Literacy Instruction

Obstacle	*Not at all (%)*	*Small Extent (%)*	*Moderate extent (%)*	*Large extent (%)*	*Not applicable (%)*
I don't think technology is reliable	**43.7**	**37.9**	12.1	3.8	1.8
I don't know how to incorporate technology and still teach content standards	**39.3**	**34.1**	17.7	6.4	1.6
I don't know how to use technology	**51.6**	29.9	11.9	3.9	1.9
I don't understand how to integrate technology into my literacy instruction	**41.9**	**34.0**	17.8	4.9	1.3
I don't think technology fits my beliefs about learning	**75.7**	16.0	4.1	1.8	2.4
I don't think I have enough time to prepare for using technology	**21.7**	**30.0**	23.1	23.9	1.4
I don't think I have time to integrate technology because of the amount of time required to prepare students for high stakes testing	**29.1**	**26.4**	20.6	20.9	3.1
I don't believe technology integration is useful	**85.0**	9.6	1.9	1.3	2.2

I think Internet text is too difficult for students to read	**40.4**	**35.5**	15.9	6.8	1.5
I don't understand copyright issues	**51.5**	34.4	9.2	3.3	1.6
I have difficulty controlling what information students access online	**34.4**	**39.0**	16.5	6.9	3.2
I don't know how to evaluate or assess students when they work online	**34.2**	**38.9**	18.2	5.9	2.7
I don't have time to teach students the basic computer skills needed for more complex tasks	**24.3**	**30.8**	21.3	20.9	2.7
I have difficulty managing the classroom when students are working on computers	**56.9**	28.0	7.1	3.4	4.8
I don't know how skilled my students are at using technology	**39.2**	**39.7**	12.3	6.2	2.6
Lack of access to technology	17.7	**24.8**	22.2	**35.5**	0.0
Lack of incentives to use technology	**38.9**	**28.5**	20.1	10.9	1.5
Lack of time during a class period	12.3	23.1	**27.3**	**36.4**	0.9
Lack of technical support	19.5	**27.9**	25.0	**27.2**	0.5
Lack of professional development on how to integrate technology	17.9	**26.8**	26.7	**28.1**	0.5
Lack of funding	13.0	16.7	19.3	**50.0**	1.1
Lack of support from	**45.8**	**24.5**	16.3	11.6	1.9

administrators

Note. Bold values represent the one or two largest values in each category representing at least 50% of the responses.

Lack of time during a class period was reported the greatest obstacle to technology integration, followed by lack of access to technology and lack of funding. A majority of the teachers indicated that all of the other factors where not an obstacle at all or to a small extent.

Lack of Support as an Obstacle

Because lack of technical support for technology is sometimes cited as a reason that teachers do not integrate technology into general instruction (Zhao et al., 2002; Ertmer, 2000), teachers in this study were asked to identify the availability of technical and instructional support for integrating ICTs into instruction. Table 4.5 lists the variety of technical and instructional support available to teachers and the percentage of teachers reporting that each support was available.

Table 4.5

Support Available to Teachers for the Integration of ICTs

Type of Support	*Percentage of teachers with this support available*
District technology coordinator (for technical support)	73.8
Library/media specialist	70.5
Another teacher who assists with technology	48.0
In-school technology coordinator (for technical support)	47.4

Administrative support (for obtaining resources, PD, etc.)	46.7
District technology coordinator (for instructional support)	46.2
In-school technology coordinator (for instructional support)	31.9
No assistance is provided	1.6
Other	0.0

More than seven in 10 respondents reported that support is available from a library/media specialist and from a district technology coordinator when technical issues arise. Approximately four to five in 10 teachers reported access to an in-school technology coordinator for technical support, a district technology coordinator for instructional support, administrative support, and another teacher who assists with technology. More than three in 10 teachers reported access to an in-school technology coordinator for instructional support. These data indicate that technical support is more readily available to teachers than instructional support. Additionally, teachers are provided more support at the district level than at the school level.

Perceptions About Personal Technological Expertise

To assess the extent to which teachers perceptions about their own abilities may be obstacles to integration, teachers were also asked to evaluate how prepared they believe they are to teach students the skills they need for online reading, and how skilled they believe they are at using technology for instruction and in general. Fewer than four teachers in 100 reported that they believe they are not at all prepared to teach online reading skills. Many teachers (47.4%) believe that they are moderately prepared to teach

online reading skills. Twenty-three percent of teachers believe that they are prepared to a small extent, and 25.8% believe prepared to a large extent. Only one percent of respondents indicated that they are not at all skilled in using technology. Slightly more than half of the respondents believe that they are moderately skilled in general to use ICTs (51.1%), followed by 33.8% who believe they are skilled to a large extent, and 14% who believe they are skilled only to a small extent.

Despite confidence in their abilities to use technology, fewer teachers believe they are skilled at using technology for instruction. Five percent of teachers believe they are not at all prepared for using technology in instruction. Of those who do believe they are prepared, 24.7% believe they are prepared only to a small extent, 46.9% believe they are prepared to a moderate extent, and 23.6% believe they are prepared to a large extent.

Increasing Integration

Respondents in this study were asked the following open-ended question: "What do you feel would help you increase your integration of technology into your literacy/language arts instruction?" They could respond using five scrolling text boxes, although not every respondent completed all five boxes. The data were first analyzed inductively using a constant comparative approach (Glaser & Strauss, 1967; Leech & Onwuegbuzie, 2007). The first step in data analysis was to read the entire data set, which was then chunked the data into smaller parts. Next, each chunk was labeled with a descriptive title that served as a coding category (Miles & Huberman, 1994). Throughout this process, a new coding category was compared to previous categories to eliminate duplication. Finally, the codes were grouped into broader themes. After all of the data

were coded, a classical content analysis approach (Leech & Onwuegbuzie, 2007) was used to quantitize each theme (Creswell & Plano-Clark, 2007) to determine which codes appeared most often and thus represent the most important ideas about ICT integration for the respondents. Table 4.6 summarizes the themes that emerged from the data analysis and the percentage of teachers who reported answers related to each theme. Because the respondents were able to provide as many as five responses, the percentages listed in Table 4.6 do not equal 100%.

Table 4.6

Themes Emerging from the Analysis of Teacher Beliefs about How to Increase ICT Integration

Theme	*Description*	*Percent of teachers reporting theme*
Resources	Describes access to more hardware and software, better performing equipment, money for purchasing hardware and software, faster and more reliable Internet access, computers within classrooms instead of computer labs, equipment updates, and personnel to maintain the equipment as mechanisms for increasing ICT integration into instruction.	83%
Professional development	Describes the need for more and continued training on how to use various ICTs, more opportunities to practice what is learned in professional development sessions with guidance, and more training that would improve teachers' confidence in their abilities to use ICTs.	54%
Time	Describes the need for more time for teachers to learn, experiment and practice using ICTs, more time for planning lessons that integrate ICTs, and more time within a school day to incorporate ICTs.	30%

Examples and Ideas	Describes the need for improved access to ideas for lessons that integrate ICTs, more opportunity for teachers to see other teachers successfully integrating ICTs, and access to a technology mentor who would provide examples, ideas, and guidance.	16%
Curriculum requirements	Describes the need for a ready-made curriculum that integrates ICTs into instruction and the need for fewer district mandates on curricular and testing requirements. Also describes the need for a district-wide climate that facilitates ICT integration.	13%
Support	Describes the need for increased and timely technical support, administrative support of technology use in general, and instructional aide support to help with the practical issues of integrating ICTs into instruction.	11%
Student factors	Describes the need for smaller class sizes, an improvement in students' basic computer skills, better classroom management strategies, and older students in order to increase the integration of ICTs into instruction.	7%
Collaboration	Describes the need for time and opportunity for teachers to collaborate with colleagues and other schools to enhance their opportunities and abilities to integrate ICTs.	7%
Filters	Describes the need for fewer district-imposed filters that block student access to Websites, blogs, and wikis, and the need for a better understanding of Websites that are safe for students.	4%
One-to-one laptops	Describes the need for one-to-one laptops in the classroom.	3%
Research-proven methods	Describes the need for more research-proven methods for integrating ICTs into instruction.	1%

Increased resources, training, and time are the three most commonly reported ideas about what teachers believe would increase their integration of ICTs into reading instruction, as indicated with 83%, 54%, and 30% of the responses falling respectively into these categories.

What are teachers' perceptions about the importance of integrating ICTs?

Perceptions about Importance of ICT Applications

Table 4.7 summarizes teachers' perceptions about the relative importance of integrating various ICTs into literacy instruction. Respondents to this survey were asked how important they believe it would be to integrate each application of ICTs if it were available to them, regardless of how often they currently integrate ICTs into instruction. Specifically, they were asked the following question: "To what extent do you feel the following activities would be important to your literacy instruction, assuming they were available?"

Table 4.7

Teachers' Perceptions about the Importance of Integrating Various ICTs into Literacy Instruction

Instructional activity	*Not at all (%)*	*Small extent (%)*	*Moderate extent (%)*	*Large extent (%)*	*Not Sure (%)*
Creating a Word document	5.2	12.1	24.3	**57.8**	0.6
Sending email	**25.9**	**31.8**	21.7	17.7	3.0
Playing educational games-CD-ROM	11.6	**32.3**	**35.3**	19.6	1.2

Playing educational games-Online	8.6	**29.0**	**38.7**	22.6	1.1
Gathering pictures online	7.8	**28.9**	**37.5**	25.0	0.8
Reading a book or story online	4.9	17.8	**40.2**	**36.1**	1.0
Creating a multimedia presentation	10.0	14.4	**29.0**	**45.1**	1.4
Using reference sites online	6.6	10.2	28.9	**53.5**	0.9
Publishing information on a wiki or blog	**28.8**	**28.8**	22.3	14.9	5.1
Publishing information on a Website	25.0	**29.5**	**25.3**	16.2	4.0
Communicating using Instant Messenger or other chat tools	**45.0**	**29.3**	14.2	7.4	4.1
Formulating questions to research online	9.4	14.4	**29.9**	**44.7**	1.7
Locating information online	4.1	8.0	24.8	**62.6**	0.6
Evaluating information online	8.3	11.9	23.9	**54.7**	1.2
Synthesizing information online	9.7	12.0	**26.9**	**49.3**	2.0
Searching for information online	4.5	8.3	24.5	**62.0**	0.7
Using specific search strategies to search for information online	6.9	10.4	23.7	**57.9**	1.1
Collaborating online with students from other classes	15.8	**27.2**	**31.5**	24.3	1.1

Note. Bold values represent the one or two largest values in each category representing at least 50% of the responses, n = 1,442.

These data indicate that teachers believe communicating with chat tools such as IM or Yahoo Messenger, publishing information to a wiki or blog, and email are the least

important activities for literacy instruction. Teachers believe that the most important activities are searching for and locating information online, evaluating information online, and creating Word documents.

Perceptions about Increasing ICT Integration

Respondents were asked to report the extent to which they would like to increase their integration of ICTs into their literacy instruction. Ninety-eight percent of the teachers indicate that they would like to increase their integration, with the majority of teachers (55.8%) reporting that they would like to increase their integration to a large extent. Nine percent of teachers indicate that they would like to increase their integration to a small extent, and 32.9% would like to increase to a large extent.

Perceptions about the Role of ICTs in Literacy Instruction

Respondents were asked to choose a statement that described their view of technology as it relates to literacy instruction. Specifically, respondents were given the following options: (a) "Technology should not be used in instruction"; (b) "Technology is not important to instruction"; (c) "Technology is supplemental to instruction"; (d) "Technology is central to instruction"; and (d)" I don't know." The majority of teachers (67%) believe that technology is supplemental to instruction. Twenty-nine percent of respondents indicate that it is central to instruction. One percent of the respondents in this study believe that technology is not important to instruction. Fewer still (0.6%) believe that technology should not be used in instruction at all.

Perceptions about the Benefits of ICTs for Literacy Instruction

Respondents were asked to report the extent to which they perceive that students benefit from the integration of ICTs into the classroom. Respondents believed (46.6%) that students benefit to a large extent, whereas 40% believed that students benefit to a moderate extent, 9.4% believed that students benefit to a small extent, and 0.4% indicated that they do not believe students benefit at all.

What are the distinguishing characteristics of teachers with high or low ICT integration?

To assess teachers' levels of ICT integration, teachers were assigned a *total ICT use* score based on the variety and extent of ICT applications reported. The *total ICT use* score was a composite created by totaling the numerical values indicating the extent to which teachers reported integrating various ICTs into their literacy instruction. Teachers were asked to report how frequently they assign students work that uses technology in the following ways: a) creating a Word document, b) sending email, c) playing educational games on a CD-ROM, d) playing educational games online, e) gathering pictures online, f) using reference sites online, g) publishing information on a wiki or blog, h) publishing information on a website, i) reading a book or story online, j) creating a multimedia presentation, k) searching for information online, l) communicating using IM or other chat tools, m) formulating questions to research online, n) locating information online, o) evaluating information online, p) synthesizing information online, q) searching for information online using specific search strategies, and r) collaborating with students from other classes. Respondents were assigned one point for each activity that they reported integrating to a small extent, two points for activities integrated to a moderate extent, and three points for activities integrated to a large extent. The values for each of

these activities ranged from zero to three. The value for each activity was summed to create a composite *total ICT use* score. The maximum score was 54. The score was used to assess differences in the extent teachers integrated ICTs into their instruction when compared to various environmental factors and teachers' characteristics.

ICT Use and Teacher Characteristics

Several independent samples *t*-tests were conducted to test for differences between teachers' total ICT use in literacy instruction based on various teacher characteristics, including: whether a child has ever helped them learn to use a new form of technology, whether they have children of their own, and the extent to which they reported using ICTs in college. These comparisons were guided by the relevant literature reviewed in Chapter 2. For example, research from the Pew Internet and American Life project (2007) reveals that the technology profile of adolescents and their parents often mirror each other, although the direction of the influence (parent to child or child to parent) is not clear. Consequently, it is reasonable to believe that adolescents may influence their parents' use of technology. The independent samples *t*-tests revealed that (a) teachers who have received ICT-related help from a child ($M = 18.75$, $SD = 11.28$) , integrate technology into literacy instruction at statistically higher levels than teachers who have not ($M = 14.23$, $SD = 10.02$) had a child help them learn to use technology, $t(582) = 6.9$, $p<.01$; (b) there is no statistically significant difference in total ICT use among teachers based on whether they have children of their own; and (c) there is no statistically significant difference in teachers' total ICT use based on the extent to which teachers used technology while they were in college.

A one-way ANOVA was conducted to assess differences in total ICT use based on the extent to which teachers believe they are skilled at using technology in general. The independent variable, teachers' beliefs about their technology skill, included four levels: teachers who reported that they are not at all skilled, teachers who reported that they are skilled to a small extent, teachers who reported that they are skilled to a moderate extent, and teachers who reported that they are skilled to a large extent. The dependent variable was the *total ICT use* score. The ANOVA was significant $F(4, 1423) = 23.5$ $p<.01$, $\eta^2 = .06$.

Follow-up tests were conducted to evaluate pairwise differences among the means. Because the variances among the four groups ranged from 32.7 to 152.0, it was not assumed that the variances were homogenous and post hoc comparisons were conducted with the Dunnet's C test, a test that does not assume equal variances. Means and standard deviations for each skill group are reported in Table 4.8. The test revealed that teachers who believe they are not at all skilled at using ICTs, use ICTs in instruction at statistically significant levels that are less than teachers who believe they are skilled to a small, moderate, or large extent. Teachers who believe they are skilled to a small extent, use ICTs in instruction at statistically significant levels that are less than teachers who believe they are skilled to a moderate or large extent. Further, teachers who believe they are skilled to a moderate extent use ICTs in instruction at statistically significant levels that are less than teachers who believe they are skilled to a large extent.

Table 4.8

Means and Standard Deviations for ICT Use and Teacher Skill

	Mean ICT use score	*Standard Deviation*
Teacher Skill Group		
Not at all	6.67	5.72
Small extent	12.58	9.27
Moderate extent	17.26	10.20
Large extent	20.55	12.33

A one-way ANOVA was conducted to assess differences in total ICT use based on the extent to which teachers reported that they would like to increase their integration of ICTs into literacy instruction. The independent variable, the extent to which a teacher would like to increase his or her integration of ICTs into instruction, included four levels: not at all, to a small extent, to a moderate extent, and to a large extent. The dependent variable was the *total ICT use* score. The ANOVA was significant $F(4, 1420) = 40.4$, $p<.01$, $\eta^2 = .10$.

Follow-up tests were conducted to evaluate pairwise differences among the means. Because the variances among the four groups ranged from 85.0 to 126.34, it was not assumed that the variances were homogenous and post hoc comparisons were conducted with the Dunnet's C test, a test that does not assume equal variances. Means and standard deviations for each skill group are reported in Table 4.9. The test revealed that that teachers who would like to increase their integration of ICTs into literacy instruction to a large extent, already integrate ICTs at higher levels than teachers who

would like to increase their integration to a small or moderate extent or not at all. Teachers who would like to increase their integration of ICTs into literacy instruction to a moderate extent, already use ICTs in instruction at higher levels than teachers to wish to increase their integration to a small extent.

Table 4.9

Means and Standard Deviations for ICT Use and Extent of Integration

	Mean ICT use score	*Standard Deviation*
Extent of Integration Group		
Not at all	8.82	9.23
Small extent	10.31	9.70
Moderate extent	15.68	9.87
Large extent	20.42	11.24

ICT Use and Teaching Experience

A one-way ANOVA was conducted to test for differences in total ICT use based on years of teaching experience. The independent variable, years of teaching experience, included six levels: 1-5 years, 6-10 years, 11-15 years, 16-20 years, 21-25 years, and 26 or more years. The dependent variable was the *Total ICT use* score. The ANOVA was significant $F(6, 1427) = 5.51$, $p<.01$, $\eta^2 = .02$. Means and standard deviations are summarized in Table 4.10. Follow-up tests using the Dunnet's C test were conducted to evaluate pairwise differences among all means. The results of this analysis indicate that teachers who had 6-10 years of experience, 21-25 years of experience, and 26 or more

years of experience all integrated technology into their literacy instruction at statistically higher levels than teachers with one to five years of experience.

Table 4.10

Means and Standard Deviations for ICT Use and Teaching Experience

	Mean ICT use score	*Standard Deviation*
Years Teaching Experience		
1-5 years	14.72	9.82
6-10 years	18.32	11.44
11-15 years	17.32	11.29
16-20 years	17.16	10.63
21-25 years	18.63	10.80
26 or more years	19.65	11.93

A one-way ANOVA was conducted to test for differences in teachers' total ICT use based on the grade level they teach. The independent variable, grade level taught, included 14 levels, ranging from Kindergarten to twelfth grade and including a category for multiple grade levels and other teaching arrangements. The dependent variable was the *Total ICT use* score. The ANOVA was significant $F(14, 787) = 11.10$, $p<.01$, $\eta^2 = .17$. Follow-up tests were conducted to evaluate pairwise differences among all means. Because it could not be assumed that the variances were homogenous, post hoc comparisons were conducted with the Dunnet's C test. Means and standard deviations are summarized in Table 4.11. Fourth through ninth grade teachers, twelfth grade teachers,

and teachers in the "other" category all use ICTs in instruction at statistically higher levels than kindergarten and first grade teachers. Fifth and eighth grade teachers use ICTs in instruction at statistically higher levels than second and third grade teachers.

Table 4.11

Means and Standard Deviations for ICT Use and Grade Level

	Mean ICT use score	*Standard Deviation*
Grade level taught		
Kindergarten	9.21	7.71
1	10.16	7.80
2	14.94	10.71
3	13.98	8.61
4	18.81	9.42
5	22.63	10.18
6	21.48	9.01
7	19.11	10.58
8	26.35	13.29
9	22.17	8.98
10	23.00	16.70
11	18.50	9.58
12	25.86	9.21
Other (multiple grade levels, etc.)	18.75	11.58

ICT Use and Professional Development

T-tests were conducted to assess differences in teachers' Total ICT use based on whether teachers believe they have received adequate professional development on how to use technology, whether a teacher has received professional development on the integration of technology into instruction within the last year, and how prepared teachers believe they are to teach online reading skills. The independent samples *t*-tests revealed: (a) teachers who believe they have received adequate professional development on how to integrate ICTs into their literacy instruction ($M = 21.26$, $SD = 12.3$), use ICTs at statistically higher levels than teachers who believe they have not($M = 16.86$, $SD = 10.71$), $t(1,212) = 2.83$, $p<.01$; (b) teachers who have received professional development on the integration of technology into instruction within the previous year integrate ICTs at statistically significant levels ($M = 18.34$, $SD = 11.26$) that are higher than teachers who have not ($M = 15.68$, $SD = 10.73$), $t(1,408) = 3.87$, $p<.01$; (c) Teachers who believe they are well prepared to teach online reading skills have a statistically significant total ICT use score ($M = 21.59$, $SD = 11.20$) that is higher than the total ICT use score for teachers who do not believe they are well prepared to teach online reading skills ($M = 13.77$, $SD = 9.60$), $t(1,408) = 14.13$, $p<.01$; and (d) there was no statistically significant difference in total ICT use among teachers who received professional development focused only on how to use technology within the last year ($M = 18.54$, $SD = 11.34$) compared to those who did not receive professional development focused on how to use technology ($M = 15.94$, $SD = 9.18$), $t(1,044) = 1.86$, $p = 0.63$.

ICT use and Obstacles

Teachers were assigned an *obstacles* score based on the extent to which they perceive their ICT integration is affected by the physical and environmental factors listed on the survey. To create this score, respondents were assigned one point for each factor they reported as a small obstacle, two points for each factor that was an obstacle to a moderate extent, and three points for each factor that was an obstacle to a large extent. The maximum number of points was 66. That score was employed to discern differences in teachers' uses of ICTs based on the degree to which they face obstacles to ICT integration.

A linear regression analysis was conducted to evaluate the prediction of the *total ICT use* score from the *obstacles* score. The scatterplot for the two variables indicated that the two variables are linearly related ($F = 93.53$, $p<.01$) such that as total ICT use increases, the *obstacles* score decreases. The regression equation for predicting Total ICT use is: Predicted Total ICT use = (-.243) *Obstacles* score + 23.25. The 95% confidence interval for the slope, -.29 to -.19, does not contain the value of zero, and therefore total ICT use is significantly related to the *obstacles* score. Accuracy in predicting *Total ICT use* was moderate. The correlation between the *Total ICT use* score and the *Obstacles* score was -.247. Approximately 6% of the variance of the *Total ICT use* score was accounted for by its linear relationship with the *obstacles* score. This analysis indicates that for every one point increase in the *obstacles* score, there is a .25 point decrease in the total ICT use.

. *ICT Use and Personal Stance*

Teachers were asked to rate their stance toward technology in the classroom on a scale of one to five ranging from "I prefer to live without it" to "I can't live without it." A one-way ANOVA was conducted to assess differences in teachers' integration of ICTs in their own classroom (Total ICT use score) based on their personal stance toward technology in the classroom. The independent variable, stance toward technology, included five levels: a self-rating of "I prefer to live without technology" (1), a self-rating of 2, 3, or 4, and a self-rating of "I can't live without technology" (5). The dependent variable was the *Total ICT Use* score. The ANOVA was significant $F(2, 1380) = 95.08$, $p = <.01$.

Follow-up tests were conducted to evaluate pairwise differences among all means. Because it could not be assumed that the variances were homogenous, post hoc comparisons were conducted with the Dunnet's C test. Means and standard deviations are summarized in Table 4.12. The follow-up test revealed that respondents who indicated they cannot live without technology, integrate technology at statistically higher levels than respondents who rated their stance toward technology as one through four. Respondents who rated their stance toward technology as a four, integrate technology at statistically higher levels than respondents who rated their stance toward technology as two or three. Respondents who rated their stance toward technology a three, integrate technology at statistically higher levels than respondents who indicated a rating of two.

Table 4.12

Means and Standard Deviations for ICT Use and Stance toward Technology

	Mean ICT use score	*Standard Deviation*
Stance toward technology		
1- I prefer to live without it	4.75	4.99
2	8.37	7.73
3	12.64	9.13
4	17.20	10.16
5- I cannot live without it	22.67	11.21

Teachers were also asked to report the extent to which they believe students benefit from the integration of ICTs into literacy instruction. A one-way ANOVA was conducted to assess differences in teachers' total ICT use based on how much they believe students benefit from the integration of ICTs into instruction. The independent variable, the extent to which teachers believe students benefit from the integration of technology, included five levels: not at all, small extent, moderate extent, and large extent. The dependent variable was the *Total ICT use* score. The ANOVA was significant $F(4, 1{,}412) = 83.95$, $p<.01$, $\eta^2 = .19$. Follow-up tests were conducted to evaluate pairwise differences among all means. Because it could not be assumed that the variances were homogenous, post hoc comparisons were conducted with the Dunnet's C test. Means and standard deviations are summarized in Table 4.13. The post hoc comparisons revealed that teachers who believe students benefit from ICT integration to a

large extent, use ICTs at statistically significant levels that are higher than the levels of teachers who believe that students benefit to a moderate or small extent or not at all. Teachers who believe that students benefit from ICT integration to a moderate extent, use ICTs at statistically significant levels that are higher than the levels of teachers who believe that students benefit to a small extent.

Table 4.13

Means and Standard Deviations for ICT Use and Extent of Student Benefit

	Mean ICT use score	*Standard Deviation*
Extent to which student benefit		
Not at all	7.64	7.20
Small extent	8.69	6.18
Moderate extent	15.23	9.63
Large extent	22.30	11.22

ICT Integration and Instructional and Technical Support

A one-way ANOVA was conducted to test for differences between how prepared teachers believe they are to teach online reading skills and their level of instructional and technical support for integrating technology into instruction. The independent variable, available technical support, was an index of the varieties of instructional and technical support available to teachers. The maximum index score was seven. The dependent variable was the rating of how prepared teachers believe they are to teach online reading skills. The ANOVA was significant $F(7, 1406) = 4.42$, $p<.01$, $\eta^2 = .02$. Means and

Standard Deviations are summarized in Table 4.14. Follow-up tests using the Dunnet's C test were conducted to evaluate pairwise differences among all means and revealed that teachers with six or seven varieties of support believe they are more prepared to teach online reading skills than teachers with one, two, or three varieties of support.

Table 4.14

Means and Standard Deviations for Instructional and Technical Support and Preparedness to Teach Online Reading

	Mean ICT use score	*Standard Deviation*
Varieties of instructional/technical support		
0	1.33	.70
1	1.39	.91
2	1.41	.83
3	1.43	.80
4	1.49	.82
5	1.59	.84
6	1.75	.79
7	1.82	.86

A one-way ANOVA was also conducted to test for differences in teachers' total ICT use based on their available instructional and technical support. The independent variable, available technical support, was an index of the varieties of instructional and technical support available to teachers. The maximum index score was seven. The

dependent variable was the *Total ICT use* score. The ANOVA was significant $F(7, 1426) = 3.47$, $p<.01$, $\eta^2 = .02$. Means and standard deviations are summarized in Table 4.15. Follow-up tests using the Dunnet's C test were conducted to evaluate pairwise differences among all means and revealed that teachers' with six or seven varieties of technical and instructional support integrate ICTs at statistically higher levels than teachers with one or two varieties of technical and instructional support.

Table 4.15

Means and Standard Deviations for Instructional and Technical Support and ICT Use

	Mean ICT use score	*Standard Deviation*
Varieties of instructional/technical support		
0	17.90	10.87
1	15.41	10.58
2	16.01	11.37
3	17.83	10.10
4	17.18	11.05
5	18.23	10.49
6	20.24	11.31
7	20.36	14.60

Differences in ICT Use for Online Reading Skills

A one-way ANOVA was conducted to test for differences in teachers' *online reading skill* scores based on the extent to which teachers indicate they believe they are prepared to teach skills for reading in online environments. The independent variable,

the extent to which teachers indicate they believe they are prepared to teach skills for reading in online environments, included four levels: not at all, small extent, moderate extent, and large extent. The dependent variable was the *online reading skills* score. The ANOVA was significant. $F(3, 1411) = 81.0$, $p = <.01$, $\eta^2 = .15$. Follow-up tests using the Dunnet's C test were conducted to evaluate pairwise differences among all means. Means and standard deviations are reported in Table 4.16. Teachers who believe they are prepared to a large extent have statistically significant online reading skill scores that are higher than the scores of all other groups (moderate extent, small extent, not at all, not sure). Teachers who believe they are prepared to a moderate extent have statistically significant online reading scores that are higher than the scores of teachers who believe they are prepared to a small extent, not at all prepared, or who were not sure about their preparation.

Table 4.16

Means and Standard Deviations for Online Reading Skill Score and Preparedness to Teach Skills for Reading in Online Environments

	Mean ICT use score	*Standard Deviation*
Extent prepared to teach skills for reading in online environments		
Not at all	3.55	4.01
Small extent	5.13	4.81
Moderate extent	7.47	5.31
Large extent	11.01	6.09

A one-way ANOVA was also conducted to test for differences in teachers' *online reading skills* score based on years of teaching experience. The independent variable, years of teaching experience, included six levels: 1-5 years, 6-10 years, 11-15 years, 16-20 years, 21-25 years, and 26 or more years. The dependent variable was the *online reading skills* score. The ANOVA was significant $F(10, 1423) = 7.32$, $p<.01$, $\eta^2 = .02$. Follow-up tests using the Dunnet's C test were conducted to evaluate pairwise differences among all means. Means and standard deviations are reported in Table 4.17. Teachers who fell into the categories of 6 or more years of experience (with the exception of the 16-20 years category) integrated technology in ways that promoted online reading skills at statistically higher levels than teachers with only one to five years of experience.

Table 4.17

Means and Standard Deviations for Online Reading Skill Score and Years Teaching Experience

	Mean ICT use score	*Standard Deviation*
Years teaching experience		
0-5 years	5.00	4.83
6-10 years	6.83	5.55
11-15 years	6.57	5.55
16-20 years	6.26	5.46
21-25 years	7.06	5.49
26 or more years	7.61	5.84

A one-way ANOVA was conducted to assess differences in teachers' integration of ICTs in ways that promote online reading skills based on whether they held a negative, moderate, or positive stance toward technology in the classroom. The ANOVA was significant $F(2, 1380) = 70.69$, $p = <.01$, $\eta^2 = .09$. Follow-up tests using the Dunnet's C test were conducted to evaluate pairwise differences among all means. Means and standard deviations are summarized in Table 4.18. The follow-up test indicated that teachers who have a positive stance toward technology in the classroom integrate technology in ways that promote the acquisition of online reading skills at statistically higher levels than teachers who have a moderate or negative stance. Teachers who have a moderate stance have statistically higher *online reading skill* scores than teachers who have a negative stance.

Table 4.18

Means and Standard Deviations for Online Reading Skill Score and Stance toward Technology

	Mean ICT use score	*Standard Deviation*
Stance toward technology		
Negative stance	2.15	3.00
Moderate stance	4.42	4.61
Positive stance	7.63	5.60

Predicting ICT Integration

A multiple regression analysis was conducted to evaluate how well measures of teachers' professional development, their skill, their views about the integration of technology into instruction, and their perceived obstacles to technology integration predicted ICT use. The regression analysis used the Total ICT use score as the criterion variable and the following 11 predictor variables:

Demographic variable:

1) Years teaching experience

Professional Development variables:

2) Beliefs about adequate professional development on technology integration
3) Professional development (PD) focus on integration

Skill variables:

4) Beliefs about preparation for teaching online reading
5) Beliefs about technology skill
6) Beliefs about ability to integrate technology

Beliefs about technology variables:

7) Technology stance (positive or negative)
8) Beliefs about extent of integration benefits

Obstacle variables:

9) Access to technology
10) Amount of technology support
11) Extent of obstacles

Using the Statistical Package for the Social Sciences (SPSS), all variables except for years of teaching experience were first recoded into a dummy variables (using "0's" and "1's), a methodology commonly used in social science regression equations (O'Sullivan, Rassel, & Berner, 2003). Variables were individually entered into the model beginning with the variables most personal to the respondent, such as years teaching experience, that seemed most likely to affect total ICT use. These variables seemed likely to predict ICT use based on the existing literature. The demographic variable was entered first, followed by the professional development variables, skill variables, beliefs about technology variables, and finally obstacle variables. Assumptions were tested by examining normal probability plots of residuals and scatter diagrams of residuals versus predicted residuals. No violations of normality or linearity were detected. Regression analysis revealed that the model significantly predicted Total ICT use by teachers, $F(11, 983) = 37.40$, $p < .001$. R^2 for the model was 0.295, and adjusted R^2 was 0.287. The results of the analysis are summarized in Table 4.13.

Table 4.19

Results of the regression analysis predicting total ICT use

Predictor	R^2	ΔR^2	*B*	*p*
Years teaching experience	.016	.016	.136	<.001
Adequate PD on technology integration	.037	.021	-.007	.752
PD focus	.055	.018	.042	.155
Preparation for	.143	.088	.142	<.001

teaching online reading				
Tech. skill	.159	.016	.063	.033
Ability to integrate tech.	.177	.018	.081	.011
Tech. stance	.211	.034	.116	<.001
Integration benefit	.264	.053	.254	<.001
Tech. access	.282	.018	.151	<.001
Tech. support	.286	.004	-.076	.007
Obstacle total	.287	.001	-.044	.129

For individual relations between the predictor variables and total ICT use, years teaching experience ($t = 4.94$, $p < .001$), preparation for teaching online reading ($t = 4.37$, $p < .001$), technology skill ($t = 2.11$, $p = .03$), ability to integrate technology ($t = 2.55$, $p = .01$), technology stance ($t = 3.73$, $p < .001$), integration benefit ($t = 8.53$, $p < .001$), technology access ($t = 5.34$, $p < .001$), and technology support ($t = -.270$, $p = .007$) each significantly predicted total ICT use.

The R^2 for the model increased with each predictor variable that was entered, but adequate professional development on technology integration, professional development focused on integration, and the obstacle total did not individually predict the total ICT use. The multiple regression suggests that demographics, professional development, technology skill, beliefs about technology, and obstacle variables accounted for 29% of the variability in the total ICT use score may predict the extent to which teachers integrate ICTs into their literacy instruction.

CHAPTER FIVE

DISCUSSION

The purpose of this dissertation study was to investigate literacy teachers' uses of ICTs and their perceptions about the importance and challenges of integrating them into instruction. Specifically this investigation addressed the following research questions:

5) To what extent are teachers across the U.S. integrating Information and Communication Technologies (ICTs) into literacy instruction?
6) To what extent are they utilizing ICTs in ways that promote the acquisition of literacy skills for online environments?
7) How do they define ICT integration?
8) What are the perceived obstacles and challenges to integrating ICTs into literacy instruction?
5) What are teachers' perceptions about the importance of integrating ICTs into literacy instruction?
6) Are there distinguishing characteristics between teachers who report no or minimal integration of ICTs into their literacy instruction and teachers who report extensive integration?

The purpose of this chapter is to summarize findings and to discuss implications for practice and for professional development. In this chapter, I discuss the findings separately for each of the research questions. I also interpret findings in light of the literature reviewed in Chapter 2, identify limitations of the present study, and suggest directions for future research.

What ICTs are being used in literacy classrooms?

The first research question investigated the extent to which teachers integrate ICTs into literacy instruction. To address that question, teachers were asked to report about how often they and their students use ICTs, and the extent to which they assign students work involving specific applications of ICTs. Teachers reported that they use ICTs for planning and delivering instruction more often than they assign their students to use ICTs. Seventy-one percent of teachers reported using ICTs as part of their literacy instruction once a week or more, whereas only 55% of teachers reported having their students use ICTs as part of literacy instruction once a week or more. In addition, only 3% of teachers reported that they never use ICTs as part of literacy instruction, whereas 7% of teachers reported that their students never use ICTs as part of literacy instruction.

The results suggest that several applications of ICTs are not frequently integrated into literacy and language arts classrooms. For example, more than 60% of teachers in this study reported that they never assign work that involves sending email (61%), publishing information on a Website (70%), publishing information on a wiki or blog (75%), collaborating online with students from other classes (76%), or communicating using Instant Messenger or other chat tools (80%). Becker (1999) inquired about the use of email in his study of teachers' uses of ICTs, and found that only 7% of teachers reported asking their students to use email. The current study indicates that there has been growth in the use of email, but perhaps not as much as might be expected during a period of ten years. Only four of the eighteen activities were reported as being used to a large extent by more than 20% of teachers: creating a Word document, searching for

information online, locating information online, and using reference sites online. Although many teachers reported that their students use ICTs to locate information, which might be considered a 21st century literacies skill, there is no evidence that they see this activity as an important component of digital literacy, nor is there evidence that they are teaching students how to access information. For example, the majority of teachers reported that their students do not use specific search strategies to search for information online or that they do so only to a small extent.

When compared to earlier investigations of how teachers use ICTs, the present study suggests that overall, literacy teachers use ICTs more frequently and diversely than all teachers did ten years ago. For example, Becker (1999) reported that the most common use of ICTs was Word processing (50%), followed by CD-ROM reference materials, such as encyclopedias (36%), and the World Wide Web (29%). In the current study, the most common applications of ICTs were for student work involving the Internet to locate information, to use online reference sites, and to play online games, with more than 75% of teachers reporting each use. Although the use of ICTs seems to have increased throughout the previous ten years, there is no evidence to suggest that ICTs are used in ways consistent with definitions associated with 21st century literacy, particularly those alluded to in the with the mission statements of NCTE or IRA.

The classroom uses of ICTs that remain at a relatively low level, although they are on an upward trend when compared to Becker's (1999) study, are email usage (28% compared to 7%) and cross-classroom collaboration (17% compared to 6%). ICTs provide powerful tools for authentic communication (Leu et al., 2004); yet the results of

the present study provide little evidence that teachers are employing ICTs for communication purposes.

The use of computers for creating multimedia presentations has increased substantially from 9% to 62% since Becker's (1999) study. However, creating multimedia presentations alone does not necessarily help students acquire skills that will make them more successful at navigating and reading in online environments. In fact, results from the present survey suggest that teachers consider the creation of multimedia presentations as important to their concepts of integration, but without any connection to 21st century literacy skills.

Overall, these data suggest that although ICT usage has increased since 1999, teachers still are not regularly integrating many current applications of ICTs into literacy instruction. These data confirm the findings of several other recent studies. For example, in a recent research study of a laptop program, Leander (2007) found that teachers continued with their existing practices after the introduction of laptops. Instead of using the laptops to transform learning, most teachers merely replaced their existing print-based activities with digital versions of those activities. The laptops were viewed as an add-on to the existing curriculum, and not seamlessly integrated in ways that promoted literacy within digital environments. Cuban (2001) found a similar pattern in his study of schools in Silicon Valley, California, leading him to declare that "When it comes to higher teacher and student productivity and a transformation in teaching and learning…there is little ambiguity. Both must be tagged as failures. Computers have been oversold and underused, at least for now" (p.179).

The results from the current study seem to indicate that not much has changed. ICTs are still used most often to replace existing print-based activities with digital activities instead of as a vehicle for transforming learning or as a means of teaching students literacy within digital environments. For example, 72% of the teachers in this study reported that their students create Word documents as part of literacy instruction, but only 18% reported that their students collaborate online with students from other classes. Considine, Horton, and Moorman (2009) argued strongly for teaching media literacy, aptly stating that children who have grown up using the World Wide Web and other ICTs are ". . . self-taught but not well-taught" (p.475). The apparent lack of use and systematic instruction related to many ICTs suggests that teacher educators and policy makers may need to strive for changes in teacher education programs and teacher professional development that lead to fundamental shifts in teaching practices (Kist, 2000; New London Group, 2000). Similarly, literacy educators may need to make space in their teaching not only for new technologies, but for new ways of learning and teaching, and using ICTs.

Teachers in the current study reported their access to various hardware and software applications. Results suggest that teachers have sufficient access to computers, with 92% of all teachers connected to the Internet in their classroom or elsewhere in their school. That level of access is consistent with previous reports that virtually all teachers have access to computers connected to the Internet (Wells & Lewis, 2006). Two out of three teachers also reported access to a digital projector. On the other hand, only around 30-40% of teachers reported access to interactive whiteboards, a laptop computer for

personal use, and digital video recording equipment. Only 12% of teachers reported access to laptop computers for each student, and even fewer reported access to student email, PDAs and mp3 players. Because many teachers have a classroom computer, which is often connected to the Internet and a digital projector for sharing with the class, teachers may have sufficient access to ICTs for demonstrating the use of ICT. However, apparently few teachers can engage students individually with ICTs during teaching activities, which would require each students to have a computer connected, preferably connected to the Internet.

To what extent are ICTs being used to develop online reading?

To address this question, respondents were assigned a score representing the extent to which they reported using ICTs in their instruction. The score was derived from the sum of the numerical values representing the extent to which respondents reported using ICTs in ways that promote the acquisition of skills for reading in online environments. The activities comprising the score were derived from the literature (Leu et al., 2005) and were discussed in more detail in Chapter Four. The mean of 6.6 (*SD* = 5.53) of a possible score of 32 is relatively low, suggesting that teachers do not regularly use ICTs for purposes that promote literacy in digital environments. Rather, they often use ICTs in ways that correspond to their existing print-based practices or make those practices more efficient. For example, a majority of teachers use ICTs to create Word documents (72%) and for accessing information online at reference sites (75%), but only 28% of teachers ask students to use ICTs to communicate through email. This low level of email use may be explained in part by teachers' concerns about Internet safety and the

filters that schools often use to prevent students from accessing inappropriate information. That interpretation is supported by the finding that 4% of teachers reported that fewer district-imposed filters and a better understanding of Internet safety would increase their integration. Other potential explanations for this relatively low usage may be related to teachers' perceived obstacles to integration, which are discussed in a subsequent section. The finding that teachers often use ICTs in ways that correspond to their existing practices is consistent with the findings of Stolle's (2008) qualitative study in which she stated that:

> The teachers simply find ways to use ICTs to complete tasks they previously did without ICTs. This lack of transformation limits the teachers' ability to put their conceptualizations into practice, and thus impact student literacy learning in new and inventive ways (p.66).

How do teachers define integration of ICTs?

To investigate this question, the survey included the following open-ended question: "What do you think it looks like to integrate technology into literacy instruction? Give as many ideas as you can." After qualitative analysis, which is detailed in Chapter Four, the teachers' responses revealed thirty-three themes. Three themes predominated, representing cumulatively 30% of all the responses: (a) using presentation tools (38%); (2) conducting research on topics (23%); and (3) supplementing or replacing existing activities (20%). These results suggest that the majority of teachers do not integrate ICTs into their literacy classrooms in ways that are consistent with the position statements of the International Reading Association (2002) and the National

Council for Teachers of English (2008), or the relevant literature (Coiro et al., 2008; Leu et al., 2004; New London Group, 2000). For example, only 5% of the teachers in this study reported that they believe integration means teaching students critical literacy skills, and an even smaller percentage (2%) defined integration as something that prepares students for new and different reading and writing skills in the 21st century. Such uses are typically included in the definitions of new literacies (Coiro, Knobel, Lankshear, & Leu, 2008) that have been argued to be the skills students need to internalize to become fully literate in online environments for reading and writing. It appears that teachers may have incomplete or narrow understandings of what it means to integrate ICTs into instruction in meaningful ways that will prepare students for these new literacies. Therefore, the first step for teacher educators and those conducting professional development activities may be to make transparent the dominant meanings of integrating ICTs into instruction focusing on expanding teachers' awareness of what skills, strategies, and dispositions are needed for reading and writing in online environments.

What are the perceived obstacles and challenges to integrating ICTs?

To address this question, teachers were asked to identify the extent to which several potential obstacles and challenges interfered with integrating ICTs into literacy instruction by responding to the following question: "Please indicate the extent to which you believe the following are obstacles to integrating technology into your literacy/language arts instruction." In addition, teachers were asked about the technical and instructional support they receive related to ICTs and their perceptions about their

own preparedness to use and integrate ICTs. The results of the present investigation suggest that teachers perceive time to be an prominent obstacle to increased integration. For example, teachers reported that their greatest barrier to integration is lack of time during a class period (87%). Seventy-seven percent of teachers also reported that a lack of time to prepare for using technology is a barrier. Sixty-eight percent of teachers reported that they do not have time to integrate technology because of the amount of time required to prepare students for high stakes testing, and 73% reported that they do not have time to teach students the basic computer skills needed for more complex tasks. These findings support Bauer and Kenton's (2005) finding that teachers lack time within a class period to integrate ICTs and Ertmer et al.'s (1999) finding that teachers lack time to plan for ICT integration. Lack of time is an obstacle is also supported by findings reported in a subsequent section about what teachers perceive would increase their integration of ICTs into instruction. For example, thirty percent of teachers reported that more time to learn, experiment and practice using ICTs, more time for planning lessons that integrate ICTs, and more time within a school day to incorporate ICTs would increase their integration of ICTs into their literacy instruction.

Eighty-three percent of teachers in the current study reported lack of access to ICTs as a barrier. That finding is consistent with Bauer and Kenton (2005), Ertmer et al. (1999) and Stolle (2008), who all reported that a lack of equipment for the desired task impeded teachers' integration of ICTs. However, these findings may be inconsistent with the 2006 U.S. Department of Education report that 94% of public school instructional rooms had Internet access and an average ratio of 3.8 students per computer in 2005.

They may also be inconsistent with the finding from the current study that 86% of teachers have Internet-connected computers in their own classrooms. However, the finding that so many teachers identified access as a barrier is less surprising when considering that only 12% of the teachers in this study reported having laptop computers for every student and that 86% of the teachers in this study reported lack of funding as a barrier to integration. Further, 3% of teachers reported a need for individual student laptop computers when asked an open-ended question about what would increase their integration. These findings lead to speculation that providing laptops to individual students may be the resources teachers believe they need to increase their integration of ICTs into instruction.

Many teachers indicated that the lack of various supports is a barrier to their integration. For example, teachers reported the following as obstacles to their integration: (a) lack of professional development on how to integrate ICTs (82%); (b) lack of technical support (80%); (c) lack of incentives to use ICTs (60%); and (d) lack of support from administrators (52%). These findings are similar to those of several previous studies. For example, Ertmer et al. (1999) reported that teachers' lack of technological skill, which may be the result of a lack of appropriate professional development, inhibited their integration In addition, Zhao et al. (2002) and Ertmer et al. (1999) found that lack of technical support was an obstacle to teachers' ICT integration.

Also noteworthy was what teachers did not identify as an obstacle. For example, more than half of all teachers reported that the following were not obstacles to their integration of ICTs into instruction: (a) the usefulness of ICT integration (85%); (b) the

fit of ICTs with teachers' beliefs about learning (76%); (c) difficulty managing the classroom when students are working on computers (57%); (d) not knowing how to use ICTs (52%); and (e) copyright issues (52%). These findings contradict the results of several previous studies. For example, Ertmer and her colleagues (1999) found that difficulties with classroom management impeded ICT integration, but 57% of the teachers in the current study reported that classroom management issues are not obstacles to integration. Stolle (2008) found that teachers do not integrate because they are unsure of the benefits of ICTs, yet 85% of teachers in the current study indicated that their integration was not impeded by doubts about the usefulness of ICTs. Zhao et al. (2002) found that a mismatch of teacher beliefs about learning with ICTs acted as a barrier to integration, yet more than three out of four teachers in the current study reported that their beliefs about learning were not a barrier to integration. Rather, it seems that teachers lack the time, support, professional development, and materials to integrate. It is difficult to speculate why there are discrepancies between the current study and previous studies. The discrepancies may be due to the fact that Ertmer et al., Stolle, and Zhao et al. used qualitative data collection methods, whereas the current study consists only of self-report data. On the other hand, the discrepancies may represent a change over time. The professional development teachers have received, although seemingly ineffective in some ways, may have been effective for informing teachers about the usefulness of ICTs and how to manage ICT integration.

Not only do teacher beliefs not seem to be an obstacle, but teachers seem confident about their own abilities to use and teach about ICTs. For example, 73% of

teachers believe they are prepared to either a moderate or large extent to teach students the skills they need for online reading. Ninety-nine percent of teachers in the current study indicated that they are at least somewhat skilled at using ICTs, with the majority indicating that they are moderately skilled at using ICTs. These data seem to contradict the finding of Ertmer et al. (1999) that teachers do not integrate due to a lack of confidence in their abilities to use ICTs. Teachers in the current study seem to be confident in their abilities to integrate ICTs. Nonetheless, they still do not integrate ICTs into instruction with much variety or frequency, indicating that explanations are more complex or nuanced. This contradiction of findings may suggest that teacher confidence with ICTs has increased since Ertmer's 1999 study simply due to the increased presence of ICTs in classrooms. Further, this increase may actually represent a negative change if it is a false confidence based on narrow or incomplete understandings of what integration of ICTs entails. For example, the use of ICTs as presentation tools was the most popular response when teachers were asked what it means to integrate ICTs into instruction, indicating that teachers may have a shallow view of integrating ICTs into instruction that does not include developing 21st century skills, strategies, and dispositions. Instead, they may be focusing more on products than process (Honan, 2008). It seems that teachers define integration narrowly, which may account for why they believe they are well prepared to integrate ICTs. That interpretation has important implications for professional development. For example, increasing teacher confidence with ICTs may not be a necessary or useful goal. Rather, those providing professional development should be aware that although teachers feel prepared to integrate ICTs, they are not

prepared to do so in ways consistent with the goals of developing 21st century literacy as outlined by IRA (2002), NCTE (2008), and proponents of new literacies (Coiro et al., 2008; Leu et al., 2004; New London Group, 2000).

In addition to the obstacles they face, teachers were also asked to report the varieties of support that are available to them. Seventy-four percent of teachers reported that have a district technology coordinator available for technical support, but only 57% reported access to an in-school technology coordinator for technical support. Fewer still reported access to a district-level or in-school technology coordinator for instructional support (46% and 32% respectively). It seems that the technical support teachers are receiving in their districts and schools in their view is not sufficient. Thus, the findings from the present survey in the area of technical support for teachers are consistent with the finding reported in a previous section in which 80% of teachers reported lack of technical support as an obstacle.

What are teachers' perceptions about the importance of integrating ICTs into literacy instruction and how to increase ICT integration?

To investigate this question, teachers were asked to report what they believed would increase their integration of ICTs. The results indicated that the percentage of teachers who believe each application of ICTs is important is always higher than the percentage of teachers who reported integrating each application into their classroom. For example, 73% of teachers reported integrating Word documents into their literacy instruction, but 95% report that they believe this application is important to literacy instruction. The largest gaps between importance (reported in Table 4.7) and practice

(reported in Table 4.1) occur between email, publishing information to a wiki or blog, publishing to Websites, and collaborating with students from other classes. Table 5.1 reports the gaps observed between importance and practice for activities in which there was more than a 30% discrepancy. These gaps may be due to the obstacles teachers encounter in attempting to integrate ICTs. The smallest gaps exist with playing educational games online, gathering pictures online, using reference sites online, and searching and locating information online.

Table 5.1

Reported Practice and Importance of ICT Integration

Instructional Activity	Reported Use	Reported Importance
Collaborating online with students from other classes	18%	83%
Publishing information to Websites	21%	71%
Publishing information to wikis or blogs	17%	66%
Sending email	28%	71%
Formulating questions to research online	55%	89%
Synthesizing information online	56%	88%
Evaluating information online	60%	91%

Teachers also provided open-ended responses to what they believed would help increase their integration of ICTs in their teaching. Ninety-eight percent of teachers reported that they would like to increase their integration of ICTs into literacy instruction.

A qualitative analysis revealed 11 factors that reflected their beliefs about what would increase ICT integration (see Chapter Four). Eighty-three percent of teachers reported that an increase in technological resources would increase their integration. This finding is consistent with teachers' reports that lack of access to ICTs is an obstacle and with the findings of several other studies that examined classrooms across many content areas (Stolle, 2008; Bauer & Keaton, 2005; Ertmer et al., 1999) and with Honan's (2008) study, conducted with literacy teachers, that appropriate ICTs for desired tasks may increase teachers' integration of ICTs. At least 92% of teachers have computers connected to the Internet in their classrooms or elsewhere in the school, but this access alone clearly is not enough in the teachers' views. A single computer in a classroom is likely to limit teachers' capabilities to integrate ICTs. That interpretation is supported by data in the current study. Even computer labs, where there is typically a computer for every student, may not be sufficient because of the difficulty teachers face in scheduling time in those labs (Honan, 2008).

Another frequently reported response about what would increase integration is professional development. In 2005, IES reported that 83% of schools nationwide offered professional development within their school or district on how to integrate technology into literacy curriculum. Yet, 54% of the teachers in this study reported that receiving professional development on how to use and integrate ICTs into literacy would increase their integration, and 82 % of teachers reported that a lack of professional development on how to integrate technology is an obstacle to their integration. These data suggest that the professional development teachers are receiving may not address their needs and

suggests some commitment to participate in professional development activities. However, if professional development is provided without any additional time or support to plan for integration, or if the professional development is aimed at how to use technology rather than helping teachers develop skills in incorporating technology into teaching, it may not be effective (SRI International, 2001).

Regarding what teachers believe would increase their integration of ICTs, another common response, in both this section of the survey focusing on the present question and in a previous section of the survey, is time. That response includes both time for planning integration and time within a class period to integrate. Eighty-seven percent of the teachers in the current study also reported in a different part of the survey that the limited amount of time during a single class period serves as an obstacle to their integration. These findings are consistent with Bauer and Keaton's (2005) finding that limited time within a class period was a barrier to integration, and Ertmer, Addison, Lane, Ross, and Woods' (1999) finding that time to plan for integration was a barrier. Teachers have indicated that they need more time to integrate ICTs into their instruction, which may create a dilemma for administrators. Administrators may need to change traditional scheduling to make space for new ways or reading and writing in the classroom. If teachers are expected to prepare students for these new literacies, they will either need more time and space to do so, or they will need support and strategies to manage the integration of ICTs within current time frames.

Teachers were also asked to describe their view of technology as it relates to literacy and language arts instruction. Two out of three teachers indicated that they view

ICTs as supplemental to instruction, rather than as central or unimportant to instruction. That finding indicates the need for a change in how teachers perceive ICTs in relation to instruction. It will be difficult for teachers to integrate ICTs into instruction and to broaden their views of what integration means if many of them see it as only supplemental.

What are the distinguishing characteristics of teachers with high or low ICT integration?

To address this question, data from several parts of the survey were analyzed using ANOVAs, t-tests and regression analysis. For example, data in this section pertain to teachers' professional development and teaching experiences, teachers' perceptions of their skill at using ICTs and integrating ICTs into instruction, teachers' beliefs about ICTs in the classroom, and teachers' perceptions about obstacles to integration. This analysis suggests that teachers who believe they have received adequate professional development on the integration of ICTs, and those who have received such professional development within the last year, integrate ICTs at higher rates than other teachers. Further, teachers' ICT use increased with their perceptions of their preparedness to teach online reading skills. Taking these findings in isolation suggests that receiving professional development is related to successful integration, although survey data cannot establish a causal link. However, other aspects of the survey data suggest a more complex picture. For example, 75% of teachers in this study reported receiving professional development related to technology use within the last year, yet 82% of them reported that a lack of professional development on the integration of ICTs into instruction is a barrier to their integration. That finding suggests that the variety and

quality of professional development received is an important aspect of whether or not teachers will integrate ICTs into instruction.

Teachers' years of teaching experience and the grade level they taught also predicted ICT integration in the current study. Surprisingly, teachers in this study with one to five years of teaching experience integrate ICTs less often than teachers with more experience. This discredits the belief some educators may hold about younger teachers being more savvy about using digital technologies and therefore being better able to integrate ICTs. It is difficult to speculate why less teaching experience is associated with less integration, but it may be reasonable to suggest that it is due to the difficulty new teachers face in balancing their efforts to address curriculum standards with research-based and effective methods of teaching. This seemingly anomalous finding may also indicate that integrating technology requires going beyond a language arts curriculum that gives little attention to digital literacy (e.g., Leu et al., 2005) and requires addressing sometimes complex logistical and technical issues. These issues could be problematic enough to discourage integration in light of the finding that less than half of the teachers in this study reported having an in-school technology coordinator for technical support. That finding might also suggest that teachers with less experience may need different emphases in professional development than more experienced teachers.

Other factors related to higher ICT use were teachers' levels of support for integration and the extent to which teachers faced obstacles to integration. More support and fewer obstacles both lead to higher integration. These findings seem intuitive, but the data provided in this study provide additional support for the idea that teachers need

better support systems within their classrooms, schools, and districts toward integrating ICTs into literacy instruction.

Several factors that were predictive of teachers' ICT integration seem to be more related to teacher attitudes than to support and training. For example, teachers who reported that they have received help from a child on the use of ICTs, integrated ICTs into their instruction at statistically higher levels that teachers who have not. There was no statistically significant difference in the extent to which teachers use ICTs based on whether or not they have children of their own or how frequently they used ICTs in college. These findings may indicate that a willingness to learn and seek assistance may be more important than one's background with ICTs. This idea seems plausible when considering the speed at which ICTs and their manifestations change. Teachers who have had ubiquitous access to ICTs most of their adult lives may not necessarily be at an advantage when it comes to ICT integration. That possibility is supported by the finding that first-through-fifth year teachers in this study integrated ICTs less frequently than many teachers with more experience. It may be the case that teacher educators need to instill in pre-service and in-service teachers a willingness to continually learn rapidly changing ICTs. On the other hand, teacher educators may also need to give pre-service teachers a realistic awareness of the challenges they may face in integrating ICTs and encourage them to seek out a more experienced teacher who has had some success at integrating.

In addition to a willingness to learn, it would appear that teachers' perceptions are also important regarding ICT integration. That conclusion is supported by the finding

that teachers who perceive themselves to be more skilled are also those who are more likely to use ICTs in literacy instruction. In addition, teachers' ICT use appears to increase with their desire to increase their integration of ICTs into instruction, indicating that a desire to integrate is important. Further, ICT use also appears to increase with teachers' perceptions about the extent to which students benefit from ICT integration. Finally, teachers' total ICT use was related positively to their stances toward technology in the classroom. The more positive teachers' stances were, the more they integrated. These attitudinal and belief factors may be important to teachers' integration of ICTs into their literacy instruction. These findings seem to indicate that an important part of teacher educators' roles may be fostering attitudes that are favorable toward ICTs, in addition to teaching ICT-related skills.

Limitations

A potential limitation of this study is that it was conducted largely with teachers who are members of the IRA or of a state or local affiliate of the IRA. Because the IRA has issued a position statement about the importance of integrating literacy and technology in the curriculum, teachers who are members of this organization may be more likely to integrate technology than teachers who are not IRA members. Thus, this sample may not be reflective of all literacy teachers. In addition, because the survey was Web-based, a certain level of computer competence was required to complete it.

Implications for Practice

The findings from the current study suggest several implications for practice and professional development. At the administrative level, this study indicates that teachers

may need more technological resources to increase the degree to which they integrate ICTs and digital literacy into their instruction. A substantial majority of teachers do not have access to individual laptop computers for their students, perhaps limiting their capabilities to integrate ICTs into their instruction in ways supported by the mission statements of NCTE and IRA. At minimum, this finding suggests that teachers perceptions about the need for more support need to be addressed. There may also exist a need for a structural reorganization that makes space for new ways of reading and writing. In other words, curriculum may need to be reconceptualized and class periods may need to be lengthened to accommodate the integration of ICTs into instruction. Such reorganization may begin at the policy level or with individual administrators within their own school.

At the policy, administrative, and teacher levels there seems to be a need for a clearer understanding of what it means to integrate ICTs into instruction and the goals associated with ICT integration. Districts, or perhaps schools, may need to articulate clear goals regarding ICT integration. For example, districts may choose to adopt the definition of 21st century literacies that NCTE has provided (2008) or the mission statement of IRA or another professional organization to make clear the expectations for ICT integration. With clearly articulated goals and definitions, teachers, administrators, and policy-makers should be able to work synergistically to select the most appropriate technology, curriculum, and instructional techniques for integrating ICTs into literacy instruction. Further, such goals would help teachers address the need revealed in the

current study for more focused and intentional uses of ICTs connected to 21st century skills in literacy classrooms.

There may also be a need for a transformation of traditional teacher roles, traditional ways of learning literacy, and thought about what it means to be literate. For example, implementing individual laptop computers for students may require teachers to change the way they deliver instruction and assess students' learning. Administrators and policy-makers can facilitate such a change through the standards and guidelines they set for teachers.

Implications for Professional Development

The current study suggests that the professional development teachers are currently receiving does not fully address their needs, indicating a need for a new variety of professional development related to ICTs. ICT professional development has often focused on how to use ICTs, but data from this study suggest that teachers assess themselves to be decidedly confident in using ICTs and believe that integrating ICTs is beneficial to their students. However, it seems that the majority of teachers do not integrate ICTs in ways that connect to any definition of new literacies or to any literature-based conceptualizations of meaningful ICT integration. Thus, there is a need for professional development that focuses on ways to better connect ICTs to existing curriculum standards and definitions of 21st century skills. Further, teachers in the current study reported a need for increased time to plan for integration after professional development sessions. Providing professional development that focuses on helping teachers manage the time for planning and implementing ICTs in their teaching may help

reduce the existing gaps between teachers' integration of ICTs and their perceptions about the importance of integration.

This study also suggests that favorable attitudes about ICTs and a willingness to seek assistance are related to increased levels of ICT integration. Thus, professional development may need to be focused on informing teachers about where they can seek assistance within their schools and districts and on discussing their attitudes towards ICTs.

Professional development may also need to be specific to teachers' experience levels. Newer teachers may need professional development that focuses on how integrating ICTs into instruction interfaces with curriculum standards and addresses similar issues related to the unique challenges they may face. Developing such an awareness may prevent teachers from becoming quickly frustrated and avoiding ICT integration. Further, making newer teachers aware of where they can seek help when they encounter technical issues may help them avoid unnecessary frustration.

Implications for Research

This study also suggests implications for research. The findings suggest that teachers may require different professional development on integrating ICTs into literacy instruction than they have previously received. Yet, there is little research evidence about what makes professional development effective in regards to ICT integration. After conducting a review of the literature on technology PD, Lawless and Pellegrino (2007) declared that "The paucity of empirical research examining the area of technology professional development for teachers is astonishing" (p. 584). However, the results of

the present study inform if not prescribe the potential content of professional development aimed at increasing the integration of digital literacy into the curriculum. Because traditions of professional development used in many content areas may not suit the unique needs of professional development regarding ICT integration, future research should focus on effective ways of providing professional development related to ICT integration, perhaps using the current study as a guideline.

There also exists a need for specific guidelines for teachers about what it means to effectively integrate ICTs into literacy instruction. Some studies are emerging about the effective uses of ICTs for reading and writing, but there are few research-based guidelines that clearly state what is not effective, or what effective integration should look like.

Finally, many districts, and some states, have implemented one-to-one laptop programs for students. However, there is limited research about the effective implementation of laptops programs in classrooms. Further research should examine the logistical challenges of laptop programs, as well as ways to connect the use of laptops to curriculum standards.

APPENDICES

Appendix A

Survey Questions

Item:
During the previous school year, about how often did you use technology as part of literacy instruction? (e.g. the Internet, creating multimedia presentations, sending email, etc.)
Response Options:
Not at all
A few times during the year
About once a month
Two to three times a month
About once a week
A few times each week
Daily

Item:
During the previous school year, about how often did your students use technology as part of literacy instruction? (e.g. the Internet, creating multimedia presentations, sending email, etc.)
Response Options:
Not at all
A few times during the year
About once a month
Two to three times a month
About once a week
A few times each week
Daily

Item:
Indicate the extent to which you present students in your typical reading or language arts class with online work that involved using computers or the Internet in the following ways?

	Not at all	Small extent	Moderate extent	Large extent	Not applicable
Creating a Word document					
Sending email					
Playing educational games on a CD-ROM					

Playing educational games online					
Gathering pictures online					
Reading a book or story online					
Creating a multimedia presentation (ex. PowerPoint)					
Using reference sites online (Ex. dictionary.com)					
Publishing information on a wiki or blog					
Publishing information on a Website					
Communicating using Instant Messenger (IM) or other chat tools					
Formulating questions to research online					
Locating information online					
Evaluating information online					
Synthesizing information online					
Searching for information online					

Using specific search strategies to search for information online					
Collaborating online with students from other classes					

Item:

To what extent do you feel the following activities would be IMPORTANT to your literacy instruction, assuming they were available?

	Not at all	Small extent	Moderate extent	Large extent	Not applicable
Creating a Word document					
Sending email					
Playing educational games on a CD-ROM					
Playing educational games online					
Gathering pictures online					
Reading a book or story online					
Creating a multimedia presentation (ex. PowerPoint)					
Using reference sites online (Ex. dictionary.com)					
Publishing information on a wiki or blog					
Publishing					

information on a Website					
Communicating using Instant Messenger (IM) or other chat tools					
Formulating questions to research online					
Locating information online					
Evaluating information online					
Synthesizing information online					
Searching for information online					
Using specific search strategies to search for information online					
Collaborating online with students from other classes					

Item:
To what extent do you feel prepared to teach students the skills they need for online reading?
Response options:
Not at all
Small extent
Moderate extent
Large extent
NA

Item:
To what extent are you skilled at using digital technology for instruction?
Response options:
Not at all
Small extent
Moderate extent
Large extent
NA

Item:
To what extent are you skilled at using technology in general (computers, cell phones, Ipods, etc.)?
Response options:
Not at all
Small extent
Moderate extent
Large extent
NA

Item:
To what extent would you like to increase your integration of technology into your literacy or language arts instruction?
Response options:
Not at all
Small extent
Moderate extent
Large extent
NA

Item:
What do you feel would help you increase your integration of technology into your literacy/language arts instruction?
Response options:
Five open-ended text boxes

Item:
Please indicate the extent to which you believe the following are OBSTACLES to integrating technology into your literacy/language arts instruction:

	Not at all	Small extent	Moderate extent	Large extent	NA
Technology is					

unreliable					
I don't know how to incorporate technology and still teach content standards					
I don’t know how to use technology					
I don’t understand how to integrate technology into my literacy instruction					
I don't think technology fits my beliefs about student learning					
I don't think I have enough time to prepare for using technology					
I don't think I have time to integrate technology because of the amount of time required to prepare students for high stakes testing					
I don't believe technology integration is useful					
I think Internet text is too difficult for students to read					
I don't					

understand copyright issues					
I have difficulty controlling what information students access online					
I don’t know how to evaluate or assess students when the work online					
I don't have time to teach students the basic computer skills needed for more complex tasks					
I have difficulty managing the classroom when students are working on computers					
I don’t know how skilled my students are at using technology					
Lack of access to technology					
Lack of incentives to use technology					
Lack of time during a class period					
Lack of technical support					
Lack of professional development on how to integrate technology					

Lack of funding					
Lack of support from administrators					

Item:
What types of technology are available to you at school? (Click all that apply.)
Response options:

Internet-connected computer(s) in my classroom
Internet-connected computer(s) elsewhere in the school
A laptop computer for personal use
Laptop computers for each student
A digital projector
An interactive whiteboard
Student email
A document camera
Digital video recording equipment
Digital camera
An iPod
PDA (personal digital assistant)

Item:
Please list any additional technology that is available to you.
Response options:
Open-ended text box

Item:
What kind of technology support is available to you? (Click all that apply.)
Response options:

in-school technology coordinator (for instructional support)
in-school technology coordinator (for technical support)
district technology coordinator (for instructional support)
district technology coordinator (for technical support)
administrative support (ex.- for obtaining resources, professional development, etc.)
library/media specialist

Another teacher who assists with technology
No assistance is provided

Item:
Choose the statement below that best describes how you view technology as it relates to language arts instruction.
Response Options:
Technology is supplemental to instruction.
Technology is central to instruction.
Technology is not important to instruction.
Technology should not be used in instruction.
I don't know.

Item:
To what extent do you feel that students benefit when they use digital technologies such as the Internet to learn in your classroom?
Response options:
Not al all
Small extent
Moderate extent
Large extent
Not sure

Item:
What do you think it looks like to integrate technology into literacy instruction? Give as many ideas as you can.
Response options:
Five open-ended text boxes

Item:
How many years have you been a teacher?
Response options:
Open-ended text box

Item:
What grade do you teacher?
Response options:
K, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, other (multiple grade levels, resource, coach, etc.)

Item:
What is your age?
Response options:

Open-ended text box

Item:
What is the two-letter postal code for your state?
Response options:
Open-ended text box

Item:
Do you have children?
Response options:
Yes
No

Item:
How old are your children?
Response options:
Open-ended text box

Item:
Has your child ever helped you use a new form of technology?
Response options:
Yes
No

Item:
Has any child ever helped you use a new form of technology?
Response options:
Yes
No

Item:
Do you feel that you have received adequate professional development on how to use technology?
Response options:
Yes
No

Item:
Do you feel that you have received adequate professional development on the integration of technology into your reading curriculum?
Response options:
Yes
No

Item:
To what extent do you feel prepared to teach skills for reading in online environments?
Response options:
Not at all
Small extent
Moderate extent
Large extent
Not sure

Item:
In the last academic year, have you had any professional development related to technology use?
Response options:
Yes
No

Item:
Think about the professional development you have received to answer the following statements:
The professional development focused on how to use technology
The professional development focused on how to integrate technology into instruction
Response options:
Yes
No
Not sure

Item:
What would make the professional development you received more effective?
Response options:
Open-ended text box

Item:
Rate the following:
What is your stance towards technology in the classroom?
Response options:
1- I prefer to live without it
2
3
4
5- I can't live without it

Item:
To what extent did you use technology while you were in college?
Response options:

Not at all
Small extent
Moderate extent
Large extent
Not sure

Item:
With permission, we may contact individuals for additional information. If you would be willing to talk with us, please provide your name and school in the blanks below.

THE INFORMATION YOU HAVE PROVIDED IN THIS SURVEY WILL NOT BE LINKED TO YOUR NAME IN ANY WAY.
Response options:
First Name:
Last Name:

Appendix B

Institutional Review Board Authorization

Subject: Your IRB protocol # IRB2008-232, entitled "A National Survey of Teachers' Perceptions, Challenges, and Uses of Information and Communication Technology"
From: "Rebecca Alley" <RALLEY@exchange.clemson.edu>
Date: Wed, August 13, 2008 2:06 pm
To: reinkin@CLEMSON.EDU
Cc: arcarte@CLEMSON.EDU
Priority: Normal

Dear Dr. Reinking:
The Chair of the Clemson University Institutional Review Board (IRB) validated the protocol identified above using Exempt review procedures and a determination was made on August 13, 2008, that the proposed activities involving human participants qualify as Exempt from continuing review under Category B2, based on the Federal Regulations(45 CFR 46). You may begin this study.

Please remember that no change in this research protocol can be initiated without prior review by the IRB. Any unanticipated problems involving risks to subjects, complications, and/or any adverse events must be reported to the Office of Research Compliance (ORC) immediately.You are requested to notify the ORC when your study is completed or terminated.

Attached are documents developed by Clemson University regarding the responsibilities of Principal Investigators and Research Team Members. Please be sure these are distributed to all appropriate parties.

Good luck with your study and please feel free to contact us if you have any questions. Please use the IRB number and title in all communications regarding this study.

Sincerely,

Becca
Rebecca L. Alley, J.D.
IRB Coordinator
Office of Research Compliance
Clemson University
223 Brackett Hall
Clemson, SC 29634-5704
ralley@clemson.edu
Office Phone: 864-656-0636

Appendix C

First Letter to State IRA Councils

TO: [membership coordinator]
CC: [president]
SUBJ: Assistance with a national literacy study

Would you like to know how reading teachers in [insert state] use technology in their classrooms? What skills do they think are important to develop literacy online? What obstacles do they face in integrating technology into their instruction? These questions relate to important goals identified in IRA's 2002 position statement on integrating technology into language arts instruction.

I am supervising a national online survey that addresses these questions, and I am seeking your assistance in disseminating and promoting the survey to the members of the [insert NAME of the state affiliate (e.g., Indiana State Reading Association)]. Your assistance will require nothing more than helping us determine the best way to inform your members about the survey through email. For example, some states regularly send emails to all of its members using a distribution list. Others may send out emails through local councils or through some other means.

In the next week, Ms. Amy Hutchison, my research assistant, will email you to verify your participation and to determine the most efficient way to email your members about the survey. She will explain how members receiving the email will be able to access it by simply clicking on an Internet address. The survey requires approximately 15 minutes to complete. You may examine the survey, and perhaps complete it yourself, by clicking on the following address:
http://www.surveymonkey.com/s.aspx?sm=oXoLUlAjxri9X6xap3ztKw_3d_3d

For assisting in this project, you will receive a summary of the national results when it is available early next year. Further, if at least 15% of your membership completes the survey before October 17, you will receive a customized report of findings and recommendations for your state.

Feel free to contact me if you have any questions or concerns, or if you would like more details beyond those that will be sent shortly. Thank you for your time, consideration, and all the work that you do to support literacy.

Sincerely,

David Reinking
Former co-editor of *Reading Research Quarterly*
Member, Reading Hall of Fame

Appendix D

Second Letter to State IRA Councils

Email subject heading: Follow up to national literacy study participation request
****
TO:

SUBJECT: Next steps for participation in the national literacy study

You should have recently received an email from Dr. David Reinking regarding your state reading council's participation in a national survey on literacy and technology. Thank you for your consideration, and we hope that you will agree to help us.

We imagine that you **have a state email list that you can use to send the survey request to all of your members.** If this is the case, we have attached a document called "state request" that we think you will find useful. It is a boiler plate letter that you can copy and paste into an email and send to your members just as it is, or you can alter it however you see fit. The letter explains the study and requests the recipients' participation. In consideration of your members' privacy, we do not need access to email addresses. We ask that you send the survey link directly.

We also realize that you may not yet have an email distribution list. If this is the case, please contact us to discuss an alternate suggestion, and we will work with you to find a suitable solution.

Please reply to this email indicating your agreement to participate in this study and informing us about how we can assist you.

Remember that for assisting in this project, you will receive a summary of the national results when it is available early next year. Further, if at least 15% of your membership completes the survey before October 17, you will receive a customized report of findings and recommendations for your state.

Feel free to contact me if you have any questions or concerns. Thank you for your time, consideration, and all the work that you do to support literacy.

Sincerely,

Amy Hutchison
Assistant to Dr. David Reinking

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