# TEACHERS' BELIEFS AND PRACTICES REGARDING THE ROLE OF TECHNOLOGY IN LITERACY INSTRUCTION: A MIXED METHODS STUDY

by

Beverly Kesler McIntyre

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Approved by:

_____
Dr. Bruce Taylor

_____
Dr. Jae Hoon Lim

_____
Dr. Adriana L. Medina

_____
Dr. Robert J. Rickleman

_____
Dr. Christine S. Davis

# ABSTRACT

BEVERLY KESLER MCINTYRE. Teachers' beliefs and practices regarding the of technology in literacy instruction: A mixed methods study. (Under the direction of DR. BRUCE TAYLOR)

The purpose of this study was to gain a deeper understanding of teachers' beliefs about the role of technology in their literacy instruction in the context of one elementary school with a technology-rich environment by investigating those beliefs about instructional technology and the degree to which they were reflected in actual practice. Survey data were used to establish overall patterns of the teachers' beliefs about and their use of technology in instruction. The survey data informed the qualitative data gathered through open-ended questions and the case studies of three literacy teachers. Within-case and cross-case analysis yielded in-depth details about the beliefs of three teachers regarding the role of technology in their literacy instruction and the degree to which those beliefs were evidenced in their actual instruction. Findings revealed that the case study participants believed that technology played several roles in their literacy instruction. Technology enabled teachers to enact their pre-existing pedagogical beliefs. Technology served as a manager of classroom behavior and as a tool to make classroom instruction more efficient. Teachers also used technology to make their literacy instruction more effective. Findings led to the conclusion that technology use in the teachers' literacy instruction was influenced by such factors as their pedagogical beliefs, perceived administrative support, the amount and type of professional development teachers received, the ease of access to technology, perceived barriers to technology integration, and teachers' attitudes toward technology integration.

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# CHAPTER I: INTRODUCTION

For thousands of years, individuals have been reading and writing texts (Myers, 1996; Resnick & Resnick, 1977; Smith, 2002). Technological changes which impacted literacy during this time were limited to innovations in writing implements and methods of printing texts. The quantity and the speed of production of literacy materials changed, but the literacy skills themselves changed little (Leu, 2008; Miners & Pascopella, 2007; Myers, 1996; Smith, 2002). Traditional literacy skills centered on the ability to read and write printed text (Smith, 2002). However, during the last half of the twentieth century, technological innovations were introduced that enabled unique literacy practices. By the beginning of the new millennium, the rapid introduction of new technological tools began to change the very nature of what it means to be literate (Leu, 2008).

The introduction of email and the World Wide Web to the general public during the last two decades of the twentieth century sparked a revolution in communication and human collaboration (Friedman, 2005). More recently, increasing globalization and technological advances are creating such drastic changes in people's social, cultural, and working worlds that these are often referred to as "New Times" (Elkins & Luke, 2000, p. 1). The technological advances include hardware, software and applications, such as computers, the Internet, iPods, cell phones, and wikis (Miners & Pascopella, 2007), that enable people to create and communicate with digital texts (Friedman, 2005). According

to Friedman, the Internet and other information and communication technologies (ICTs) are leveling the world in terms of access, opportunity, and collaboration. Consequently, our notion of literacy is evolving (Myers, 1996). Many contend that literacy now encompasses much more than reading and writing printed text, but requires additional skills such as the ability to interact with different text types or navigate hyperlinks (Anstey & Bull; Iyer, 2007; Leu, Kinzer, Coiro, & Cammack, 2004; The New London Group, 1996). If it is true that our idea of what it means to be literate is changing, then it stands to reason that instructional practices in the classroom must also change in order to satisfy the evolving demands of society.

## Background to the Problem

Digital technology has changed the way people communicate and collaborate, eliminating linguistic, cultural, and geographical barriers and creating a global society. Changing worlds of society, work, and citizenship demand a change in educational practices (Kalantzis, Cope, & Harvey, 2003; Leu et al., 2004). Educators bear the responsibility for providing students with opportunities to practice multiple modes of literacy. Teaching that favors the use of traditional methods, such as reading from printed textbooks and filling in worksheets, is no longer enough to prepare students for success in an ever-changing global society (North Carolina Department of Public Instruction [NCDPI], 2007). Being literate in the twenty-first century must include the ability to collaborate, use higher order thinking skills, assume a critical stance, and communicate in print, oral, and digital forms (Anstey & Bull, 2006; Brown & Lockyer, 2006; NCDPI, 2004). These skills, now referred to as “the new basics” (Kalantzis et al., 2003, p. 16),

comprise the new literacies (Leu, 2008; Miners & Pascopella, 2007) required for success in the twenty-first century.

The current generation is now referred to as *digital natives* because they are born into the digital age (Miners & Pascopella, 2007), live in a technology-rich environment, and many of them use digital technology on a regular basis, often for the purposes of social interaction (Cavanaugh, 2009). When digital technology is used primarily for the purposes of socially sharing and discussing information, it is referred to as social media (Cavanaugh, 2009). Lenhart, Madden, Macgill, and Smith (2007) reveal startling statistics on teens' use of social media. Of teens aged 12 – 17, 93% use the Internet daily, 55% maintain profiles on social networking sites such as Facebook or MySpace, and 89% report holding virtual conversations which stem from online posts of photos. Of the 55% who use social networking sites, 42% of them also maintain blogs, 70% read others' blogs, and 76% post comments on either the blogs or social networking sites of their friends. Teen usage of the Internet is growing rapidly. Just two years prior, only 90% of the same aged teens were Internet users and seven years prior only 76% of those teens used the Internet (Lenhart, Madden, & Hitlin, 2005). Teens also report using the Internet to communicate, send photos, documents, and music and video files (Lenhart et al., 2007). Eighty-one percent of the teens who use the Internet also report playing games on the Internet (Lenhart et al., 2005).

Williams (2005) states that students have two sets of literacy practices; one set used outside of school and one set of practices, which are almost entirely traditional, used inside the school. Hitlin and Rainie (2005) report that of the teens who use the Internet outside of school, only 68% say they use the Internet in school. Thirty-two percent of

those report that they do not get online at school regularly. Students spend an average of 27 hours per week on the Internet at home compared to an average of only 15 minutes per week at school (Levin, Arafeh, Lenhart, & Rainie, 2008). This is in spite of the fact that 100% of public schools reportedly have Internet access (Wells & Lewis, 2006).

Federal legislation under the No Child Left Behind Act (NCLB) of 2001 (United States Department of Education [USDE]) mandates that every student become technologically literate by the time they complete eighth grade. However, in spite of the changing demands of society and the business world and in spite of federal mandates, schools are slow to incorporate new technologies into their standard practices (Cuban, 2001, 2007). Researchers (Peck, Cuban, & Kirkpatrick, 2002) find that even in classrooms with Internet connections and other technological hardware, there is evidence that the presence of technology rarely results in instructional changes. Even though technological innovations have the potential to foster student-centered learning, critical thinking, and collaboration among students (USDE, 1996), the technology is not often integrated into curricula, but rather, used most often for low-level tasks such as word processing or information searches (Barron, Kemker, Harmes, & Kalaydjian, 2003; National Center for Education Statistics, 2005; USDE, 1996), or used in non-curricular ways, such as record-keeping (Palak & Walls, 2009; Peck et al., 2002).

Research reveals that many factors, both external (Teo, Chai, Hung, & Lee, 2008; Zhao, Pugh, Sheldon, & Byers, 2002) and internal (Cuban, 1986; Ertmer & Hruskocy, 1999; Hutchison, 2009; Marcinkiewicz, 1994, Veen, 1993), influence teachers' use of technology. Ironically, one of the reasons that new literacies have not found its way into schools' curricula is the federal legislation that mandates its

inclusion, NCLB. Technological literacy is an unfunded mandate under NCLB (Leu et al., 2007; USDE, 2001), and this impedes the integration of new literacies into the curriculum. Inadequate funding means that schools have little or no money to spend on hardware and software. It also sends the message that technology is a low priority for the federal government; therefore, there is little incentive for schools to use available staff development funds for technology training. Leu (2000) estimates that the average school district spends only 20% of its technology funds on staff development for teachers.

The lack of technology training for teachers creates a paradox for new literacies instruction. Peck and his colleagues (2002) find that one of the top reasons teachers report not using technology in instruction is that they do not feel competent to do so because of inadequate training. However, some literacy experts (Leu, 2000) believe that for literacy instruction to undergo transformation and include new literacies instruction, it must begin at the classroom level.

## Statement of the Problem

Technology has brought about vast changes in society, connecting diverse groups of people despite geographic, cultural, and linguistic barriers (Friedman, 2005), with the exception of one area: education (Cuban, 2001, 2007). Some experts believe literacy instruction must respond to changes in society by changing the nature of literacy instruction (The New London Group, 1996; Elkins & Luke; 2000; Leu, 2008). Research reveals, however, that current instructional practices remain, for the most part, bound in traditional print activities (Cuban, 2001, 2007; Yeo, 2007). It may well be the case that some teachers lack awareness of the changing nature of literacy and literacy

instruction, while others, still bound in traditional pedagogy, reject the notion that technological literacy deserves a place in literacy curricula (Yeo, 2007). Others fear the new emphasis on information and communication will result in the abandonment of classical literature (Lynch, 2009). There are those who believe that change must be affected from the bottom up; classroom teachers must become the agents of change that open the door to new literacies for students (Leu, 2000). All stakeholders must look to the teachers who are already integrating new literacies in their curricula. The problem, then, becomes one of identifying those teachers who are proficiently integrating technology and uncovering the reasons why they choose to do so in spite of the same commonly identified barriers that inhibit other classroom teachers from using technology (Lee, 2006).

Teachers have a great deal of authority in making decisions regarding the planning of day-to-day instruction (Judson, 2006), and there is substantial evidence that those decisions are influenced by their beliefs (Clark & Peterson, 1986; Deemer, 2004; Fang, 1996; Farrell & Lim, 2005; Lam & Kember, 2006). This includes teachers' decisions about the use of technology in instruction (Cuban, 1986; Ertmer & Hruskocy, 1999; Hutchison, 2009; Marcinkiewicz, 1994, Veen, 1993). Ertmer, Addison, Lane, Ross, and Woods (1999) posit that teachers must first value technology before they will successfully integrate it into their pedagogy. Furthermore, teachers who believe that technology can influence instruction in a significantly positive way are more apt to place a higher value on technology than those whose attitudes towards technology are more moderate (Becker, 2000, 2001; Cuban, 2001; Zhao et al., 2002). According to Fulkerth (1992), "The most important component in a change process is not the

innovation itself, but the beliefs and practices of the people who are affected by it" (p. 1). Consequently, it is imperative that all stakeholders in the education process understand the relationship between teachers' beliefs and their inclination or failure to use technology in instruction. Such understanding may be vital in affecting changes in literacy instruction that would bring about alignment between literacy practices inside and outside schools.

## Purpose of the Study

Mastery of multiple modes of literacy and multiple types of texts will prepare students for success in the twenty-first century, but teachers must possess the knowledge, skills, attitudes, and beliefs to foster the new literacies in students. For this to happen, teachers must acknowledge that technological literacy is an essential component of overall literacy and reading comprehension and integrate new literacies into literacy curricula at all levels of education (Ertmer et al., 1999). Teachers must believe that technology fulfills a role in literacy instruction. There is little evidence that new literacies are being integrated into curricula despite high levels of classroom connectivity (Cuban, 2001, 2007; Hutchison, 2009; Yeo, 2007). Research identifies many obstacles that teachers face when attempting to implement technology; however, a possible explanation for this lack of change is that teachers' beliefs about instructional practices and the role of technology in instruction are either at odds with or simply fail to support the instructional demands of the new global society. Research highlights instances where teachers' practices, for one reason or another, are incongruent with their beliefs (Calderhead, 1996; Ertmer, Gopalakrishnan, & Ross, 2001; Fang, 1996; Judson, 2006; Palak & Walls, 2009; Simmons et al., 1999). Therefore, the purpose of this study was to gain a deeper

understanding of teachers' beliefs about the role of technology in their literacy instruction in the context of one elementary school with a technology-rich environment by investigating those beliefs about instructional technology and the degree to which they were reflected in actual practice.

## Significance of the Study

The technological innovations that brought about changes in people's social and working worlds have not found their way into the students' instructional worlds (Cuban, 2001, 2007; Yeo, 2007). Current research identifies common impediments to technology use (Cuban, 2001); however, despite a federal mandate in NCLB for research to be conducted which will facilitate teachers' ability to integrate technology (USDE, 2001), there is a gap in the existing empirical evidence (Leu, 2008). It does not shed light on teachers' beliefs regarding technology use and its role in literacy instruction. Yet, Lim and Chan (2007) argue that understanding teachers' beliefs about teaching and learning is vital for understanding their perceptions of the role of technology in instruction. Richardson (1996) stresses the need for research that links teachers' beliefs with practice, and Pajares (1992) adds that investigating teachers' beliefs would add new and valuable understanding of educational practices.

The integration of technology into instruction allows for the curriculum to be motivating and engaging (Chandler-Olcott & Mahar, 2003; Miners & Pascopella; Luce-Kapler, 2007; Williams, 2005), especially for students who struggle with traditional reading skills (Leu, 2008; Leu et al., 2007; Miners & Pascopella, 2007). However, research reveals that teachers often have limited or no knowledge of what technology integration looks like (Hutchison, 2009; Yeo, 2007). When technology is utilized in

literacy instruction, it may be implemented with no clear curricular objective or connection (Balajthy, Reuber, & Robinson, 2001). It is important to gain a clear and detailed picture of what literacy teachers' beliefs are regarding the role of technology in literacy instruction and exactly how those teachers are using digital technology in their instruction in order to better meet their instructional needs and guide administrative decisions. Gaining insight into how and to what degree those beliefs are reflected in instruction will assist administrators in supporting those teachers who under use technology in instruction. Additionally, understanding teachers' beliefs about technology and its role in literacy instruction would serve as a guide for planning the type of training both pre-service and in-service teachers need to be able to engage students in meaningful instruction and prepare students for twenty-first century literacy tasks.

## Research Questions

The purpose of this research was to gain a deeper understanding of teachers' beliefs about the role of technology in their literacy instruction in the context of one elementary school with a technology-rich environment. Furthermore, this study explored the degree to which those teachers' beliefs regarding the use of technology in literacy instruction were reflected in their actual literacy instruction. In seeking to better understand teachers' beliefs and practices regarding instructional technology in one elementary school with a technology-rich environment, the following questions guided this study:

1. What are teachers' beliefs across grade levels regarding the role of technology in literacy instruction as measured by the *Technology Integration in the Classroom* survey?
2. How are teachers across grade levels using technology in literacy instruction?
3. How are the beliefs of three teachers of varying levels of technology integration reflected or not reflected in their practice as evidenced by interviews, observations, and the *Technology Integration in the Classroom* survey?

## Assumptions

This study was designed to collect data through survey research, interviews and classroom observations in one elementary school located in a small town of a southeastern state. It was assumed by the researcher that the participants would answer all questions truthfully and accurately.

It was assumed that although curriculum and professional teaching standards call for technology integration across all grade levels, there would be variability in the ways technology was integrated across grade levels due to cognitive, physical, and social developmental factors. Furthermore, it was assumed by the researcher that there would be high and moderate frequency users of technology as well as teachers who used technology little or not at all. This assumption was necessary for choosing three cases of varying levels of use to study.

## Limitations

This was primarily a qualitative study of a single elementary school. Data was collected over a period of 16 weeks. While results will enhance the understanding of how teachers' beliefs regarding the use of technology influence their use of technology

in instruction, results are not generalizable on a larger scale. Other schools, even those with similar demographics, may not have the same level of access to technology, technology support, or level of commitment to technology integration.

Furthermore, the researcher's past connection with the research site and familiarity with some participants potentially constitute a source of bias. Prior to the inception of this study, the researcher taught at the research site for 31 years. However, member checks and multiple data sources for triangulation were utilized to minimize potential bias.

## Delimitations

The research site was purposefully selected because of its low socio-economic status. Schools with a high percentage of students from low income families who qualify for free or reduced meals are designated as Title I schools (USDE, 2001). The research site qualifies for a school wide Title I program under NCLB (USDE, 2008) with low income students comprising more than 50% of the total school population. Relevant literature (Belfield, 2008; Leu et al., 2007; Miners & Pascopella, 2007; Rebell, 2005) suggests that low socioeconomic schools may struggle to integrate technology due to lack of funding and pressures to devote instructional time to improving standardized test scores. Yet, the research site for this investigation is technology-rich despite its low socioeconomic status. An investigation into literacy teachers' beliefs about and use of technology in this environment could yield useful insights in understanding teachers' beliefs regarding the role of technology in literacy instruction and to what degree those beliefs may be reflected in actual practice.

Participants for the case studies were chosen purposefully in order to gain an understanding of why some teachers use technology to varying degrees in their instruction and how their beliefs about technology were reflected in their practice. Another factor in the selection of the research site was the researcher's familiarity with the principal and participants. It was thought that this familiarity may improve response rates, site access, and cooperation.

# CHAPTER II: REVIEW OF THE LITERATURE

The purpose of the current study was to examine teachers' beliefs across grade levels in one technology-rich elementary school regarding the role of technology in their literacy instruction and their actual use of technology in literacy instruction. Although a complete list of terms pertinent to the study are defined in Appendix A, several terms deserve a more detailed treatment to set the stage for the review of literature. Therefore, after outlining the search process, this chapter introduces a definition of technology, technology integration, and a technology-rich environment as it applies to education. From there, a review of the relevant literature on personal beliefs and teachers' educational beliefs follows. A theoretical perspective is then introduced which serves as a lens for interpreting the relationship between teachers' beliefs and their decisions regarding the instructional use of technology. The review of related literature on new literacies is divided into sections which are summarized. The review of literature on new literacies begins with the historical and social context surrounding the introduction of technology in the educational setting and the resulting calls for an updated definition of literacy. Next, the skills needed for literacy in a global society are discussed in terms of new skills that are needed and their relationship to traditional literacy skills. From there, the literature surrounding the lack of technology use in classroom pedagogy is addressed. This section focuses on the institutional and social challenges and consequences that

result from the failure to integrate technology in classroom instruction. Finally, the section concludes with an examination of the literature on the future directions that are possible for new literacies and concludes with a summary of the literature on new literacies

## The Search Process

Investigations into the changing nature of literacy and text types are relatively new, most being done over the last two decades, following the widespread use of the Internet and the explosion of new information and communication technologies (ICTs). Much of the research on digital literacies is situated within one of several relational frameworks: its relationship to traditional literacy skills and pedagogy, public policy regarding curriculum, global economics, or social practices outside the context of school (Hudgins, 2008).

While much research focuses on the type and amount of youngsters' use of digital media outside of school, there is less data on its use inside the classroom (Hudgins, 2008). In particular there seems to be a paucity of research regarding the ways in which the use of digital texts changes literacy instruction or even the notion of what it means to be literate in the twenty-first century (Castek et al., 2006). Therefore, this review of literature on new digital literacies focuses on defining what constitutes digital literacies and how digital literacies fit into literacy instruction in classrooms. These criteria lead to the establishment of some broad guidelines for the inclusion of literature into the review. Articles regarding educational policy and legislative mandates on technology instruction, as well as articles that set the historical and social context, are included in the review. As far as empirical research, the review is limited to studies which examine technology use

in classrooms in which literacy activities (reading and writing) constitute a major part of instruction or class activities. Although, I chose to exclude studies that examine the use of technology in mathematics and science instruction, I did include several pertinent studies that look at technology integration in social studies. Social studies is heavily dependent upon reading to gain meaning from printed texts; therefore, social studies and literacy instruction are well-suited for integration (Kinniburgh & Busby, 2008). Furthermore, technology is often integrated with social studies instruction (Heafner & Friedman, 2008).

Once the guidelines for inclusion were established, I began the review of the literature. The method employed in reviewing the literature was to search and review books and hard copies of journals for articles and studies that focus on the use of new digital literacy skills in pedagogy and emerging definitions of literacy, as well as electronic databases, such as Education Research Complete, ERIC, and those containing full texts of dissertations. I decided to include dissertations in the review of literature due to the fact that the field of new literacies is relatively young and much of the research is found in dissertation research only a few years old.

## Technology

### Technology Defined

The term *technology* is very broad and can be used to designate a vast array of tools from computers to iPods to pencils. The International Technology Education Association (2000) defines educational technology as multimedia technologies or audiovisual aids which are used as tools for enhancing the teaching and learning process. For the purposes of this study, technology refers to a wide variety of hardware

and software, including, but not limited to, computers and computer applications, iPods, scanners, cell phones, digital cameras and video recorders, presentation and editing software, databases, spreadsheets, and word processors that may potentially be used in an educational setting for teaching and learning.

## Technology Integration

Technology can be used for a variety of purposes that have a wide range of impact on student learning depending upon the way it is used. Some of the uses of technology include record keeping, storing and retrieving information, word processing, threaded discussions, blogging, instant messaging, texting, e-mailing, and the making of videos. According to The International Society for Technology in Education ([ISTE], 2009) “Proper integration of modern digital tools and content into the learning environment by trained administrators and teachers will lead to high achieving citizens equipped to succeed in our evolving global society” (p. 1).

The integration of technology into classroom practices is a topic that appears in numerous educational journals (Roblyer, 2005); however, there is no clear definition of what exactly constitutes technology integration (Hudgins, 2008). According to ISTE (2000):

> Curriculum integration with the use of technology involves the infusion of technology as a tool to enhance the learning in a content area on multidisciplinary setting. Technology enables students to learn in ways not previously possible. Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and present it

> professionally. The technology should become an integral part of how the classroom functions – as accessible as all other classroom tools. (p. 6).

For the current study, technology integration is defined as "the use of various technological tools that support and enhance teacher instruction and practice… and that provide access to resources that augment learning activities in classroom practices" (Hudgins, 2008, p. 7).

Technology can be integrated to a variety of curricula and at any grade level (ISTE, 2000) as evidenced by the fact that several content area organizations include a technology component in their standards (National Council for the Social Studies, 1994; National Council of Teachers of English, 1996; National Council of Teachers of Mathematics, 2000). Consequently, to assist in preparing future teachers for all levels and content areas, the National Council for the Accreditation of Teacher Education (2001) standards for pre-service teachers include the knowledge of technology for professional use, assessment, and curriculum integration. Although curriculum and professional teaching standards call for technology integration across all grade levels, it is acknowledged that the technological tools and degree of integration must vary across grade levels due to cognitive, physical, and social developmental factors. For this reason, this study will investigate teachers across grade levels (kindergarten through fifth grade) in one elementary school and their beliefs regarding the use of technology in literacy instruction.

## Technology-rich Environments

In a mixed methods study, Aldridge (2004) documented the process through which an intermediate school consisting of fourth and fifth grades implemented a technology-rich learning environment. To obtain qualitative data, Aldridge interviewed and observed eleven of the school's teachers. During the process, the teachers were asked to define a technology-rich learning environment. According to Aldridge:

> All respondents agreed that a technology-rich learning environment would provide access to both teachers and students. There would be an array of software and application programs, and students and teachers would be using technology as part of the learning environment, not as a stand-alone piece where a class goes to the computer lab and creates an isolated project. Technology integration requires that students are actively engaged in the learning process through technology tools in varied ways (2004, p. 118).

This conception of a technology-rich environment is consistent with a definition used by Tiene and Luft (2002) which states that such an environment is one where technology-based activities are integrated into the curriculum. The current study is aimed at investigating teachers' beliefs regarding the role of technology in literacy instruction in a technology-rich environment. Therefore, for the purposes of this study, a technology-rich environment is defined as an environment in which a variety of technology hardware and software is easily and readily accessible to all teachers and students for immediate integration into the curriculum and is integrated into instruction in multiple ways.

## Beliefs

Anthropologists, social psychologists, and philosophers concur that beliefs are ideas and conceptions that a person either consciously or unconsciously perceives to be

true (Richardson, 1996). Rokeach (1968) identifies five types of beliefs based on their source: primitive beliefs with 100% consensus, primitive beliefs with 0% consensus, authority beliefs, derived beliefs, and inconsequential beliefs. Primitive beliefs with 100% consensus are beliefs one has in common with close friends and colleagues. These are core beliefs which are seldom discussed and remain entrenched unless specific events compel an individual to confront them. Primitive beliefs with 0% consensus evolve from personal experiences and may or may not be shared with other close acquaintances. Authority and derived beliefs have their sources in the beliefs held by authority figures and influential groups with which an individual associates. Inconsequential beliefs, Rokeach explains, are more akin to personal preferences.

Pajares (1992) posits that beliefs are intangible; they are evident only through one's actions and words. According to Richardson (1996), the relationship between beliefs and actions is exceedingly convoluted. She explains that the "perceived relationship between beliefs and actions is interactive. Beliefs are thought to drive actions; however, experiences and reflection on action may lead to changes in or additions to beliefs" (p. 104).

According to Pajares (1992), beliefs change through a process which results when a person questions existing beliefs or perceives new truths to be incompatible with preconceived ideas. Beliefs may change, but the ease with which they are altered is thought to be dependent upon the type of belief under question. Core beliefs are deeply rooted in the psyche and highly resistant to change (Pajares, 1992; Rokeach, 1968). Rokeach explains that these strong beliefs are closely tied to one's sense of identity because they arise from experiences early in life and are used when evaluating

later experiences (Pajares, 1992). Pajares' synthesis of empirical studies on beliefs leads to the supposition that core beliefs rarely change in adults. However, according to Rokeach (1968), authority and derived beliefs may change if the source of the belief loses credibility.

According to Rokeach (1968), a group of related beliefs gives rise to attitudes and values, which, together with the beliefs, form a belief system. He compares a belief system to the structure of an atom. Anchoring the belief system, like the nucleus of an atom, is the set of strongly entrenched core beliefs, while on the periphery are the more easily changed beliefs (primitive beliefs with 0% consensus, authority beliefs, derived beliefs, and inconsequential beliefs). While Rokeach does not speak explicitly about teacher beliefs, Pajares (1992) reviewed 35 empirical studies on teachers' beliefs and concludes that "individuals develop a belief system which houses all the beliefs acquired through the process of cultural transmission" (p. 325). Pajares also adds that belief systems are formed early and reinforced by subsequent experiences. They are ranked according to their affiliation with other beliefs, and belief systems influence perceptions, behavior, and decisions. Furthermore, according to Kagan (1992), core beliefs about teaching affect the processing of new information about teaching.

## Teachers' Beliefs

### Definition of Teacher Beliefs

Pajares (1992) notes that the construct of teacher beliefs is plagued with "…definitional problems, poor conceptualizations, and differing understandings of beliefs and belief structures" (p. 307). However, Pajares concludes that because all people have beliefs regarding all things about which they have knowledge, teachers

have beliefs regarding elements of their profession such as pedagogy, student learning, and teacher roles and responsibilities. Furthermore, Pajares posits that these beliefs occupy a compartment in a teacher's belief system. Elen and Lowyck (1999) describe teachers' beliefs as suppositions about educational issues such as teaching, learning, and curricula. In a study of junior high school teachers' beliefs regarding the integration of technology into pedagogy and classroom practice, Hudgins (2008) defines teachers' beliefs as those "…beliefs about teaching and learning (referred to as pedagogical beliefs) and the beliefs they have about how technology enables them to translate those beliefs into classroom practice" (p. 19). For the purpose of the current study, the definition of teachers' beliefs draws from the definition proposed by Elen and Lowyk (1999) and Hudgins (2008). Teachers' beliefs are defined as beliefs teachers hold about teaching, learning, and curricula and beliefs they hold about the role of technology in literacy instruction.

## Teachers' Beliefs and Instructional Practice

Teacher beliefs seem to have their foundation early in life. Research reveals that personal, cultural, and professional experiences shape teachers' beliefs, classroom knowledge and practice (Butt, Raymond, McCue, & Yamagishi, 1992; Richardson, 1996); however, personal experiences with family and school seem to have the greatest impact on teachers' beliefs and instructional practice (Knowles, 1992; Lortie, 1975). Studies by both Knowles and Lortie reveal that teachers have a well-entrenched conceptualization of the role of a teacher long before entering formal teacher training. A synthesis of studies on teachers' beliefs leads Pajares (1992) to conclude that students enter college with their belief systems firmly in place. Furthermore, beliefs

that form earlier in life tend to be the most ingrained and unshakable (Pajares, 1992; Richardson, 1996).

While some research does point to the inability of teacher training programs to impact instructional practice which is closely related to personal beliefs about education (Tillema & Knol, 1997), Russell, Munby, Spafford, and Johnston (1988) show that novice teachers do depend on theory from teacher training when planning instruction. However, they also reveal that experienced teachers formulate personal theories in response to their classroom experiences, indicating that teachers' beliefs may change over time.

Teachers' beliefs greatly influence their instructional practice (Clark & Peterson, 1986; Deemer, 2004; Fang, 1996; Farrell & Lim, 2005; Honey & Moeller, 1990; Lam & Kember, 2006), impacting both how and why they embrace new teaching methods (Golombek, 1998). In fact, some research shows that it is a teacher's belief system that has the greatest impact on instructional practice (Deemer, 2004; Fang, 1996; Lam & Kember, 2006). Whether or not a teacher will incorporate new teaching strategies and innovations or support educational reforms largely depends on his or her beliefs (Clark & Peterson, 1986; Cuban, 1990; Fang, 1996; Golombek, 1998; Munby, 1984). The further the principles underlying the new strategy, innovation, or reform are from the teacher's beliefs, the more reluctant he or she is to change (Clark & Peterson, 1986; Fang, 1996; Richardson, 1996; Yocum, 1996). Therefore, teachers' beliefs can either support or impede change (Prawat, 1992).

While a substantial amount of research shows the influence of teachers' beliefs on the instructional decisions they make (Clark & Peterson, 1986; Deemer, 2004; Fang,

1996; Farrell & Lim, 2005; Lam & Kember, 2006), there is also research that reveals teachers' classroom practices do not always match their beliefs (Calderhead, 1996; Ertmer, Gopalakrishnan, & Ross, 2001; Fang, 1996; Judson, 2006; Simmons et al., 1999). Fang finds that, often, contextual factors interfere when teachers attempt to align instructional practice with their educational beliefs. In studying the alignment of teachers' use of technology in instruction and their educational beliefs, Ertmer (2001) reports that factors relating to context and pressure from parents, peers and administrators account for the mismatch between instruction and beliefs.

## Teachers' Beliefs and Technology Use

Studies show teachers' beliefs also affect the use of technology, such as computers and other ICTs, in the classroom (Cuban, 1986; Ertmer & Hruskocy, 1999; Hudgins, 2008; Marcinkiewicz, 1994, Veen, 1993). Beliefs about the role of technology in instruction are intimately connected to the way technology is used (Ertmer et al., 1999) and can significantly foster or impede its integration into classroom instruction (Ertmer & Hruskocy, 1999). Veen (1993) reports that teachers are more apt to incorporate technology into their instruction when it complements their pre-existing belief system.

Teachers' epistemological beliefs appear to be directly linked to the way technology is used in the classroom (Gobbo & Girardi, 2002; Maor & Taylor, 1995; Teo et al., 2008) as well as teachers' willingness to integrate technology into instruction (Gobbo & Girardi, 2002; Maor & Taylor, 1995). Teachers with more traditional pedagogical beliefs must make more changes in their instruction in order to integrate technology (Judson, 2006; Totter et al., 2006), and this may result in their reluctance to

use technology (Ertmer & Hruskocy, 1999). Traditional pedagogy is generally described as being teacher driven and textbook-centered, with much direct instruction by the teacher and individual learning (Teo et al., 2008). When teachers who are oriented toward traditional teaching methods use technology, they are likely to use technology in traditional ways (Teo et al. 2008). Conversely, teachers who use a more student-centered, collaborative, constructivist approach to teaching are more likely to integrate computers and other ICTs into their curricula (Judson, 2006; Totter et al., 2008), use them more often (Becker & Ravitz, 2001) and more successfully (Judson, 2006; Totter et al., 2008). In addition, teachers who adhere to more constructivist principles use technology in both constructivist and traditional ways (Teo et al., 2008).

Lee's (2006) mixed methods study examined the role teachers' beliefs play in the frequency with which they integrate technology into instruction. Lee gathered data from 106 third through fifth grade teachers in schools located in a district known for its dedication to using technology to enhance student learning. Additionally, 22 of the participants were then interviewed to gain insight into their thought processes when making decisions on whether or how to integrate technology in instruction. Findings show that perceived barriers to technology integration are similar for those who choose to integrate and those who do not. Also revealed is that there are significant differences between those teachers who choose to integrate technology and those who do not, particularly in their positive beliefs related to the value to students of technology integration and their daily time management that enables them to utilize technology. Teachers who were the most frequent users of technology in instruction reported having a vision of technology integration based upon their perception of a classroom with an

ideal technology setup. Teachers who reported little use of technology did not indicate that they had such a vision.

Hudgins (2008) conducted a quantitative study in order to investigate the nature of junior high school teachers' beliefs regarding the use of technology in their pedagogy and classroom practice, whether intrinsic or extrinsic barriers hindered their use of technology, the ways they use technology, and the relationship between their beliefs and use of technology. Hudgins administered a survey developed specifically for her study of 201 seventh through ninth grade teachers and then analyzed the data using correlational and descriptive statistics. She found that the teachers surveyed overwhelmingly believed in the importance of integrating technology into the curriculum. They believed that technology has the potential to change the way content material is taught, amplify student learning, and enable students to undertake a variety of activities. Furthermore, those who chose to integrate technology did so in spite of identified intrinsic and extrinsic barriers. Hudgins (2008) concluded that the teachers' beliefs about the importance and benefits of integrated technology enable them to overcome identified barriers to its use. Strengths of this study include its large sample size and the fact that it supports the growing body of literature that links teachers' beliefs to their decisions on the instructional use of technology. However, due to the fact that previous studies investigating teachers' beliefs and the instructional use of technology utilize surveys, Hudgins' study would benefit from the inclusion of qualitative measures, such as in-depth interviews and observations, to gain new insight into how and why the teachers came to hold such positive and firm beliefs about technology, as well as how 100% of them are able to overcome all barriers to

technology use when these same barriers prevent other teachers from integrating technology. Furthermore, conducting classroom observations with a few cases, purposefully identified and selected from the survey data, would provide illustrative detail and verification of the ways teachers use technology. Judson (2006) points to the incongruences between teachers' self-reported and actual observed practices.

While the current study will not address if and how teachers overcome barriers to technology use, it, like Hudgins' study, is aimed at investigating teachers' beliefs regarding technology use, the ways technology is being used, and the possible relationship between teachers' beliefs and their use of technology. However, this study will couple qualitative data with survey data. In addition to data gained from in-depth interviews, classroom observation data will provide additional detail and triangulation of survey data.

While there is a substantial amount of evidence positively linking teachers' beliefs to their integration of technology, it is important to note that Judson (2006) failed to find a link between the two variables. In his discussion of why his finding may be contradictory to a large body of research showing such a connection, he noted that previous studies did not incorporate classroom observations, instead, relying on self-report data which may lack accuracy.

The relationship between teachers' pedagogical beliefs and the instructional use of technology is reciprocal. Not only do educational beliefs affect the use of technology in the classroom, but the utilization of technology, in turn, influences teachers' beliefs regarding education. In fact, Burton (2003) reveals that teachers' beliefs can be steered towards a more student-centered pedagogy after merely receiving staff development

involving the use of technology. However, the amount of staff development referred to is unclear, and Burton's findings have little support in the cache of research on technology and teachers' beliefs.

The Apple Classrooms of Tomorrow (Baker, 1993) project placed laptop computers in students' classrooms and homes for a period of three years. The evaluation of the project found that those classrooms involved moved from curriculum-centered teaching to student-centered teaching, from passive learning to active learning, and featured more collaborative, rather than individual, activities (Baker 1993; Sandholtz, Ringstaff, & Dwyer, 1997). According to Bruenjes (2002), such a move from a traditional classroom which is teacher-centered and textbook driven to a classroom where teachers are facilitators and technology is integrated into instruction constitutes a transformation in epistemology as well as pedagogy.

Knapp and Glenn (1996) revealed that when teachers use technology in their classrooms, they exhibit a greater willingness to incorporate new and innovative approaches in their instruction. According to Knapp and Glenn, the instructional use of technology encourages student-centered learning and teaching as well as the application of diverse problem-solving techniques in the classroom.

Levin and Wadmany (2006) conducted a three-year exploratory study using both quantitative and qualitative methods to examine whether or not teachers' beliefs change after implementing technology-based, information-rich tasks with fourth through sixth graders. Findings indicated that the teachers' beliefs did slowly evolve to include multiple perspectives which changed their classroom practices. Specifically, Levin and Wadmany concluded that changes in teachers' beliefs are possible, and

alterations in practices may precede changes in their beliefs. However, the study was conducted at a single school and, therefore, the findings cannot be generalized to other settings.

Summary of Beliefs

Personal beliefs must be inferred from an individual's words and actions (Pajares, 1992). Formed early in life and reinforced by subsequent experiences, beliefs are intangible ideas and conceptions thought to be true (Richardson, 1996; Rokeach, 1986). Together with the attitudes they foster, they form belief systems with a nucleus of core beliefs (Rokeach, 1986). Belief systems are the driving force behind personal decisions and actions.

Personal beliefs are firmly entrenched by the time a person reaches adulthood and do not easily change (Pajares, 1992; Rokeach, 1968). Although beliefs may be altered when newly acquired knowledge challenges what is believed to be true, long-held core beliefs which are linked to personal experiences rarely change (Pajares, 1992).

Teachers' educational beliefs are thought to be intertwined with their personal beliefs (Pajares, 1992). Teachers' beliefs have great influence over the instructional decisions they make in the classroom (Clark & Peterson, 1986; Deemer, 2004; Fang, 1996; Farrell & Lim, 2005; Lam & Kember, 2006), including decisions about the use of technology in instruction (Cuban, 1986; Ertmer & Hruskocy, 1999; Marcinkiewicz, 1994; Veen, 1993). While, educational beliefs have the ability to foster or impede teachers' acceptance of innovations such as technology (Ertmer & Hruskocy, 1999; Judson, 2006; Totter et al., 2006), those beliefs are not entirely immutable (Baker,

1993; Knapp & Glenn, 1996; Sandholtz et al., 1997). According to Richardson (1996), it is imperative that teachers' beliefs are taken into account when examining how they utilize technology in instruction.

## Theoretical Perspective

Specifically, the purpose of this study is to investigate teachers' beliefs across grade levels regarding the role of technology in literacy instruction and the degree to which those beliefs are reflected in their actual practice. According to Bigge and Shermis (1999), all teachers believe in the tenets of some educational learning theory and use those tenets to guide them in planning instructional strategies, including the way technology is used in instruction. Furthermore, there is a considerable amount of empirical evidence that highlights the influence that teachers' beliefs have over the way they choose to integrate technology in their instruction (Gobbo & Girardi, 2002; Maor & Taylor, 1995; Teo, Chai, Hung, & Lee, 2008). I use sociocultural theory as a lens to view this research topic and draw from the work of Vygotsky (1986). Vygotsky is often linked with social constructivism (Lantolf, 2000) and constructivist teaching has been linked with a greater likelihood of integrating technology into instruction (Judson, 2006; Totter, Stutz, & Grote, 2006); therefore, I will begin with a discussion of constructivism, move to sociocultural theory, and then discuss the sociocultural perspective as it applies to teachers' beliefs and technology integration.

### Constructivism

According to Bigge and Shermis (1999), educational psychologists offer several theories of learning, and "…each learning theory implies a set of related classroom procedures. The ways in which an educator develops instructional techniques depends

on how that educator defines the learning process" (p. xiii). Bigge and Shermis define a learning theory as "a systematic integrated outlook in regard to the nature of the process whereby people relate to their environments in such a way as to enhance their abilities to employ both themselves and their environments effectively" (p. xiii). As an educator and researcher, I view teaching and learning with a constructivist perspective.

Constructivism is a theory of learning which posits that individuals actively construct knowledge as they experience the world (Bransford, Brown, & Cocking, 2004; Fosnot & Perry, 2005; Kottalil, 2009). It is based on the theoretical work of such experts as Dewey, Montessori, Piaget, Bruner, Vygotsky, Wertsch, and von Glasersfeld (Kottalil, 2009). Prior knowledge plays a critical role in learning, according to constructivists. New knowledge is based upon old knowledge as the individual reflects upon new information and decides whether or not to assimilate it (Miranda, 2009). Cambourne (2002) proposes three simplified principles of constructivism. Learning "…cannot be separated from the context in which it is learned. The purposes or goals that the learner brings to the learning situation are central to what is learned" and "knowledge and meaning are socially constructed through the processes of negotiation, evaluation, and transformation" (p. 26). These principles imply that students' literacy experiences and their contextual factors are crucial to the students' meaning making.

Constructivism and the Instructional Use of Technology

Many literacy experts and researchers view the blending of technology and constructivism to be compatible and beneficial for classroom pedagogy (Cambourne, 2002; Esmaiel, 2006; Larson, 2007; Ravitz et al., 2000; Shamir & Korat, 2006). Furthermore, the theory of constructivism offers an appropriate framework for students'

literacy experiences with technology as they endeavor to make meaning through social interactions and tools from their environment (Jonassen, 1994; Jonassen, Peck, & Wilson, 1999; Shamir & Korat, 2006).

The principles of new literacies (Leu et al., 2004) mesh well with the tenets of social constructivism. The Internet and other ICTs are specific tools created by a global culture in a specific historical context. These tools mediate and are mediated by individuals in that global society. They require unique literacy practices dictated by the particular tool and context (Leu et al., 2005). When technological tools are used in novel ways, additional new literacies are required for their effective use (Leu et al., 2004). However literacy practices can also transform the technology itself; as technology is used in new ways, it is transformed and creates additional new literacies. Whereas traditional texts consist of two-dimensional graphic symbols, digital texts consist of a wide array of symbols which can be arranged and rearranged in multiple ways to construct a variety of meanings. In other words the tools and symbols are highly contextual and socially situated (Leu et al., 2004).

## Social Constructivism and Sociocultural Theory

Social constructivism argues that any inclusive learning theory must take into consideration external influences such as society, historical context, and culture. I believe that teaching and learning occur within such specific social, historical, and cultural contexts. My perspective aligns closely with that of sociocultural theorists in that I believe individual learning cannot be separated from these contexts.

Sociocultural theory has its roots in the writings of the Russian psychologist, Lev Vygotsky, although his ideas have been elaborated on over the years by scholars such as

James Werstch and Jerome Bruner (Lantolf, 2000). Vygotsky (1986) concluded that learning is constructed by the individual; however, he extended constructivism by arguing that individual learning cannot be separated from its social context (Lantolf, 2000). Specifically, Vygotsky (1986) situates an individual's social, cultural, and cognitive development within the interactions that occur at the intersection of that individual's cultural, institutional, and historical environment. The relationships and interactions between the individual and the cultural, institutional, and historical contexts are reciprocal. Sociocultural theory outlines how the institutional, cultural, and historical environments shape an individual, and how the individual, in turn, shapes them.

A Sociocultural Perspective on Teachers' Beliefs and Technology Use

According to Vygotsky (1986), the learning process is mediated by cultural tools and artifacts which may include language (written and oral), symbols or other signs, or tangible tools such as computers. Cultural tools influence activity, behavior, and language, but individuals also shape the tools as well, fashioning them to affect change or meet cultural or societal needs. Tools are such an integral, vital part of the entire relationship that it could be described as a fluid, dynamic, reciprocal three-way relationship: tools – individual – society / culture, with constant movement back and forth along a triangular route. Adults share tools with children by modeling how to use them and by directly instructing children. The use of tools is also learned when individuals collaborate with one another, jointly discovering or elaborating on a tool's use. Since the tools of any one given culture vary, the influence that the tools have will vary from culture to culture and the way those in that culture shape their tools will also vary. Sociocultural theory takes into account historical contexts surrounding the triadic

relationship that shapes human development and learning. At any given point in historical time, cultural beliefs, customs, and behaviors are different. The cultural tools differ, the institutions differ. Therefore, the institutional and historical contexts surrounding a given individual help to shape that individual and their culture.

I developed the model depicted in figure1 to illustrate how sociocultural theory can be used to provide a suitable lens for interpreting and blending the precepts of teachers' beliefs and the decisions teachers make regarding the use of technology. Within a historical context, a teacher is also situated within various institutional contexts. In this case, the institution involved is school; however, multiple institutional contexts could influence a teacher's beliefs and curricular decisions. The cultural tools this study is concerned with are the technological tools, such as computers and other ICTs. These tools are created to serve numerous purposes such as communication, and producing and consuming information. At the same time, they impact the society, changing the ways people communicate, produce and consume information. Additionally, these behaviors impact the culture and as the tools are adopted into the culture, the culture impacts the individual, potentially influencing the teacher's personal and educational beliefs.

A Summary of Sociocultural Theory

Constructivism is a theory of learning that details how individuals construct new knowledge by filtering new ideas and experiences through their prior knowledge (Bigge & Shermis, 1999). The sociocultural perspective extends constructivism by placing great value on the social influences on learning. Vygotsky (1986) adds that culture, society, and history interact to influence learning. Within the cultural, societal, and

historical contexts, tools are created which are used to mediate relationships and transmit culture. Sociocultural theory provides an appropriate framework for this investigation by providing a lens through which to understand the role teachers' beliefs play in their decisions about if, when, and how they use technology in instruction.

## The Historical and Social Context for Technology Integration

General access to the World Wide Web brought sweeping changes in communication and collaboration during the closing decades of the twentieth century (Friedman, 2005). Geography, physical space, and cultural differences were once barriers to human collaboration and communication; however, the Internet broke down those barriers. Today the Internet makes communication and collaboration across the globe not only possible, but easy and instantaneous, creating a flat world (Friedman 2005). According to Friedman, the Internet and other information and communication technologies (ICTs) allow such widespread collaboration and communication opportunities that the effect is that of a flattened world, free of the barriers that once hindered such collaboration and communication.

### Changing Social Worlds

Technology is rapidly infiltrating all arenas of life, making an especially profound impact on people's social worlds (Anstey & Bull, 2006), particularly those of young people. Nearly half of all teens report having cell phones (Lenhart et al., 2005). One in four of those phones are connected to the Internet, and 33% are used to send text messages. Two-thirds of all teens send instant messages (IMs), 32% of them use IM on a daily basis. The use of IM is not restricted to simple communication, 45% use IM to send photos or documents and 31% use IM to send music or video files. Social networking

sites, such as MySpace and Facebook, are used by 55% of all online teens aged 12-17 (Lenhart & Madden, 2007). Teens use these sites for making new friendships and managing existing ones through blogging, posting images, and direct communication. Almost half of those teens visit the sites daily; 22% of them engage in networking multiple times per day.

## Changing Working Worlds

Technology is, likewise, revolutionizing people's working worlds (Anstey & Bull, 2006). In the corporate world, electronic communication is necessary for global networking (Johnson & Kress, 2003). Without it, capital could not be transferred instantaneously around the globe. Gee (2004) refers to the business world today as "new capitalism" (p. 283) and explains that workers are now asked to take on responsibilities once reserved for members of middle management. Teamwork and collaboration, both locally and globally, are valued, technological innovation is common, and knowledge is constantly being updated. Furthermore, the global economic competition between corporations, enabled by the Internet and other ICTs, requires workers to possess the ability to problem solve (Friedman, 2005; Leu, 2000).

Gee (2004) reminds us that there exists a vast array of literacies based on a multitude of socioculturally unique practices involving language. Gee describes, for example, the "academic language" (p. 280) of schools, bureaucracies, professions, and institutions and the social languages of everyday "lifeworlds" (p. 280). Acquisition of academic language is vital for success in school and access to positions of power in traditional workplace hierarchies with top-down knowledge and power systems. Gee refers to these traditional work worlds as "old capitalism" (p. 279). However, in new

capitalism, academic language is not enough. The project-based work of new capitalism requires skills in collaborating, shifting knowledge from one fund to another, networking, and digital literacies. These Discourses (Gee, 2001) are essential for success in the twenty-first century job market.

## Changing Texts

Change is not only a motto for the twenty-first century, it is deeply embedded in the act of reading. The New London Group (1996), an international group of literacy educators, suggests that literacy is an ever-changing, ongoing process that evolves in response to readers and contexts. Leu (2001) reminds us that each time we read we come away changed in some way. Texts are imbued with the voices of others; no text is neutral or void of expression (Bakhtin, 1986). Therefore, the readers cannot help but be affected. Different types of texts affect readers in various ways. For example, a persuasive text may succeed in changing the opinions of the readers. Until the last decades of the twentieth century, "text types" most likely meant genres of text or styles of writing (Leu, 2001). However, with the intrusion of technological tools into daily life the idea of what constitutes a text changes.

The New London Group (1996) argues that since language is comprised of symbols, or semiotic systems, texts are also semiotic. They describe many types of texts which receive meaning through the interpretation of these semiotic systems, which include linguistics (oral and written language). Linguistic systems encompass traditional printed texts as well as oral texts such as spoken stories or speeches. Additional semiotic systems described by the New London Group include visual (still or moving images),

auditory (sound or elements of sound), gestural (body language), and spatial (the arrangement of objects in space) systems.

Anstey and Bull (2006) state that, in addition to traditional printed texts, there are digital and live texts. Digital texts include text messages sent through mobile phones and email messages. The Internet is a digital text which requires students to navigate the World Wide Web to retrieve information and comprehend layers of embedded text (Miners & Pascopella, 2007). Live texts include music, art, and face-to-face encounters such as drama (Anstey & Bull, 2006). Both digital and live texts can be interactive and collaborative between author and reader(s).

New technologies, new types of texts, and new types of literacies are creating challenges for the field of education. These challenges extend from the research and theoretical end of education to the education policy-makers to administrators and, finally, down to the pedagogical practices in the classroom. At the heart of the challenges caused by new technologies and text types are conflicting views of the very meaning of literacy itself.

## Changing Definitions of Literacy

As the notion of what constitutes a text changes, then so does the notion of what it means to be literate. Literacy is now seen by many researchers as encompassing much more than reading and writing printed text (Anstey & Bull, 2006, Iyer, 2007; Leu et al., 2004, The New London Group, 1996), and many researchers advocate a formal reconceptualization of the definition of literacy (Anstey & Bull, 2006; Johnson & Kress, 2003; Rhodes & Robnolt, 2008). Anstey and Bull stress the need for a more comprehensive definition of literacy in light of the global changes taking place and the

rapid introduction of new text types. Luke and Freebody (2000, as cited in Anstey & Bull, 2006, p. 9) offer the following definition, “Literacy is the flexible and sustainable mastery of a repertoire of practices with the texts of traditional and new communications technologies via spoken, print, and multimedia”. Consequently, a reader must be a master of multiple modes of literacy and multiple types of texts. The texts may include, but are not limited to, digital texts such as the Internet, wikis, blogs, podcasts, instant messages, live texts, auditory texts, gestural texts, and traditional print texts (Miners & Pascopella, 2007).

From a sociocultural perspective, the relationship between the author and reader of a printed text is transactional (Rosenblatt, 1978)**,** influenced by larger historical and cultural forces (Vygotsky, 1986). Therefore, a single reader engaging in an isolated reading event is also engaging in a social act. This is especially true when readers engage with new text types. Many of the new text types described are highly interactive and collaborative between the author and reader. According to Gee (1996), the collaborative creation, sharing, and communication of these texts bestow a social dimension to these literate practices. Furthermore, these new literacy practices mediate and are mediated by the social contexts and discourses in which readers engage (Gee, 1996). They are social practices in that the multimodal texts created by digital technologies are sometimes created collaboratively and meaning is often made collaboratively. Consequently, our notion of what constitutes a literacy practice is changing.

Digital texts, such as the Internet and other ICTs pose challenges for educators. Digital technologies such as web logs (blogs), iPods, and avatars appeared in social and business worlds and embedded themselves as cultural icons and necessities in a very

short period of time (Friedman, 2005). The introduction of digital texts occurred too rapidly for educators and researchers to keep pace or sort out what the new text types and new literacy practices mean for literacy instruction in schools. While many researchers agree that literacy instruction in the twenty-first century should include the new literacy practices, there are many interpretations of exactly what comprises the new literacy practices (Castek et al., 2006).

Terminology for the new literacies is a source of contention among educators. The new literacy practices are referred to by some researchers as new literacies (Castek et al., 2006; Leu et al., 2004; Street, 2003), while educators and policy makers refer to them as 21st Century skills or technology skills or digital literacies (Miners & Pascopella, 2007). Gee (2001) sees new literacy practices as new "Discourses" (p. 714), or new semiotic contexts arising from new technologies.

The New London Group (1996) first brought attention to the new literacy skills of the global age when they used the term multiliteracies to refer to new literacy practices. However, multiliteracies is a very broad term encompassing the skills needed for a variety of new texts, including but not limited to digital texts. The New London Group focuses on multimodal and multicultural contexts in which individuals practice critical evaluation, communication, and collaboration. Being multiliterate includes recognizing that there are multiple types of literate practices and having the ability to select a literate practice to match a particular context. Any given context may require one to evaluate, synthesize, and communicate new information in multiple ways (Miners & Pascopella, 2007; The New London Group, 1996).

Leu and his colleagues (2004) believe the core of new literacies is the Internet and other ICTs because of their prominence in the social, cultural, and economic worlds outside school and because of their importance in using and acquiring information. Johnson and Kress (2003) express a similar view concerning the importance of electronic technology, stating that there has been evolution in the ways in which people make and represent meaning. People in public, private, and working worlds increasingly use electronic texts to represent meaning rather than traditional printed texts. However, Leu (2008) warns that due to the rapidly changing nature of such technologies, an exact understanding of or definition of new literacies may never be formulated.

The lack of an exact understanding or definition of new literacies poses another problem for education in that the lack of clarity is impeding the development of research and theory surrounding new literacies (Coiro & Dobler, 2007; Leu et al., 2004; Street, 2003). Also contributing to the lack of research is the fact that new technologies rose to prominence so quickly; yet, research takes much time from the conception of a question for investigation to publication. To compound this problem, some believe that by the time lengthy studies are produced, new technology will have replaced that which was the focus of the study (Leu, 2000; Leu et al., 2004). The lack of research and theory surrounding new literacies, in turn, inhibits public education policy and the integration of new literacies into school curricula (Leu, 2008; Leu et al., 2005). Consequently, Leu and his colleagues (2004) see the need for a theoretical framework to be developed for new literacies that is grounded in the technologies of the Internet and other ICTs. The deictic nature of these technologies is such that they "… require their own theoretical framework

in order to adequately understand them and the role they should play in a literacy curriculum" (p. 1588).

### Summary of the Historical and Social Context for Technology Integration

Technological innovations during the late twentieth century which facilitate networking, collaboration, and communication made new social and business practices possible. People can now connect with one another across barriers that once impeded such interaction. The Internet and other ICTs allow for the creation of new types of texts which feature many characteristics not found in traditional print texts. The new texts may be digital, contextual, interactive, and collaborative, therefore, providing readers with new ways to engage in literate practices. Consequently, some literacy experts are calling for a new definition of literacy that will include the ways that readers interact with both traditional and new text types (Anstey & Bull, 2006; Johnson & Kress, 2003; Rhodes & Robnolt, 2008).

As new text types began to change the literacy practices in people's social and working worlds, some literacy experts began to call for the integration of the new technology and literacies into the world of education. However, the innovations have created somewhat of a paradox for education. Research which would illuminate the nature of the new literate practices is much slower to arrive on the scene than new technology. As a result, new theory, definitions of literacy, and terminology have not evolved to guide educators in planning their curricula so that literacy practices inside schools can prepare students for the types of practices they will engage in outside school.

## New Skills for New Literacies

While there is much ambiguity regarding the new literacy practices, there are points on which researchers agree. Researchers agree that digital literacies build upon a foundation of traditional literacy skills, but also require additional, more complex, skills beside those used in reading and writing printed texts (Anstey & Bull, 2006; Brown & Lockyer, 2006; Castek et al., 2006; Chandler-Olcott & Mahar, 2003; Coiro, 2003; Coiro & Dobler, 2007; Friedman, 2005; Johnson & Kress, 2003; Leu et al., 2004; Leu, Mallette, Karchmer, & Kara-Soteriou, 2005; Leu et al., 2007; Miners & Pascopella, 2007; The New London Group, 1996). Additionally, each unique ICT, as well as each new update of that ICT, demands its own special set of literacies in order to be used effectively (Leu et al., 2005).

Research indicates that additional and more complex skills are required in Internet reading compared to reading traditional texts due to its multi-layered nature (Coiro, 2003; Coiro & Dobler, 2007; Leu et al., 2004; Leu at al., 2005). The skills required for the Internet and other ICTs are multiple and deictic, changing as quickly as new technologies appear (Castek et al., 2006). Therefore, the skills needed to be literate with the technologies constantly change as well. Leu and his colleagues (2004) state:

> The new literacies of the Internet and other ICT include the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives. These new literacies allow us to use the Internet and other ICT to identify important questions, locate information, analyze the usefulness of that information, synthesize information to answer those questions, and

then communicate the answers to others (p. 1570).

Consequently, Leu and his fellow researchers (2007) believe traditional models of reading comprehension are inadequate for new literacies. In the past, models of reading comprehension have centered on the reader's internal processes such as metalinguistics or decoding (Leu et al., 2007), rather than situating reading in social practices and contexts (Coiro, 2003). Because Internet reading is done for the purpose of seeking information, Leu and his colleagues suggest a model of online reading comprehension based on question identification, and locating, analyzing, synthesizing, and communicating information.

Leu et al. (2007) cite a quantitative study previously conducted by Leu and other researchers to compare the online and offline reading comprehension of 89 seventh graders as further evidence of the differences between online and offline reading comprehension. In this study (Leu et al., 2005, as cited in Leu et al., 2007), the results of traditional measures of offline reading comprehension and online reading comprehension as measured by the ORCA-Blog, a reliable and valid measure of online reading comprehension (see Leu et al., 2005) were compared. Their findings show no significant correlation between students' measures of online and offline reading comprehension and lead them to conclude that online reading requires new and additional skills and strategies.

Leu and his colleagues (2007) conducted a qualitative study to investigate the nature of adolescents' online reading comprehension. Specifically, they wished to determine whether or not online and offline reading comprehension is isomorphic. They compared the observations, think-alouds, and interviews of three seventh grade students

of diverse reading abilities who were asked to complete three Internet tasks. The tasks included reading three blogs and completing subsequent activities that required the students to identify important questions and locate, analyze, synthesize, and evaluate information. Their study revealed that some students with poor reading comprehension skills on traditional standardized tests excelled in online reading comprehension as measured by the ORCA-Blog. Conversely, some students who performed well on traditional standardized reading tests experienced difficulty with the measures of online reading. These findings, according to Leu et al., are evidence of the nonisomorphic nature of online and offline reading comprehension, and lead Leu and his colleagues to conclude that online and offline reading are not the same; but, rather, online reading requires additional, new skill sets.

### Overlapping Skills

Research also reveals that there is some overlap in the skills required for online reading comprehension and traditional reading comprehension (Chandler-Olcott & Mahar, 2003; Coiro, 2003; Coiro & Dobler, 2007; Leu et al., 2004; Leu at al., 2005). For example, Internet reading requires such skills as the ability to collaborate, use higher order thinking skills, assume a critical stance, and communicate in print, oral, and digital forms. Most of these skills are similar to those necessary for traditional literacies (Anstey & Bull, 2006; Brown & Lockyer, 2006). Furthermore, Leu and his fellow researchers (2005) specify the need for certain unique skills which build upon traditional literacy skills. Those distinctive skills include strategies for manipulating, evaluating, and comprehending information on the Internet and effectively using search engines, email, and word processors.

Coiro (2007) reports a sequential mixed methods study designed to investigate both the online and offline reading comprehension of three adolescents of diverse reading abilities and the extent to which new skills may be required to comprehend reading on the Internet. Initially, 109 seventh graders were given the ORCA – Scenario I to measure their online reading comprehension ability. Students' standardized reading scores were also gathered. Sixteen weeks later, the students were given the ORCA – Scenario II, another parallel measure of online reading comprehension, and a survey to determine their content specific prior knowledge. Findings revealed that one measure of online reading comprehension contributed a significant amount of variance in the second measure of online reading comprehension. This was in addition to the significant amount of variance that offline reading comprehension and prior knowledge accounted for. Furthermore, strong online reading comprehension ability seemed to compensate for weak content specific prior knowledge. Analysis of the qualitative data gave evidence of a developmental progression of online reading skills and strategies among the three participants. The findings led Coiro to conclude that while online and offline reading comprehension share some skills and strategies, online reading comprehension requires certain unique skills and strategies.

Coiro and Dobler (2007) studied the online reading comprehension strategies used by eleven skilled sixth grade readers in locating information on the Internet in order to determine the nature of online reading comprehension of adolescents where students were required to search for and read information in multi-layered websites. Coiro and Dobler conclude that like traditional reading comprehension, online reading comprehension requires the use of prior knowledge, making inferences, and self-

regulation. However, they also find that online reading comprehension requires the reader to move through a process of self-directed text construction. In other words, the reader is faced with choosing from a variety of hyperlinks in the process of navigating through a particular website. The decisions the reader makes result in the construction of a unique text. Coiro and Dobler conclude that such a process of text construction adds an additional dimension of complexity to the reading task.

## The Relationship between Old and New Literacies

Due to the lack of research there is confusion about the relationship between old and new literacies in the classroom. Debate topics include whether or not the two can coexist or whether new literacies will replace traditional literacies. Traditional literacies, some researchers argue, will not be forsaken or replaced by digital literacies. In fact, Leu and his colleagues (2004) emphasize that a foundation of traditional literacies is vitally important in a digital age because old fashioned reading and writing are so important in garnering and conveying information. Leu (2008) sees digital literacies as simply extending traditional literacies into new contexts with new text types and tools.

A study by Wilder (2007) sheds some light on the relationship between old and new literacies. Wilder's qualitative study was designed for the purpose of investigating why some students are adept at searching the Internet for information while others struggle with the task. He concluded that adolescents' traditional print-based literacies have a distinct impact on their ability to locate and comprehend information on the Internet.

There is not always continuity or agreement between researchers whose studies shape theory and those directly responsible for pedagogical practices in classrooms.

While most researchers (Coiro, 2003; Coiro & Dobler, 2007; Leu et al., 2004; Leu at al., 2005) are in agreement that new literacies require additional skills and texts beyond the traditional reading and writing of printed texts, many educators and administrators in local school systems do not. Instead, many administrators and teachers believe that no new skills are needed to navigate new technology (Frataccia, 2007; Miners & Pascopella, 2007). Rather, they believe that new technologies are simply new tools and new pathways to practice traditional literacies. Furthermore, while researchers call for the integration of technology into school curricula, it remains, for the most part, absent (Cuban, 2001, 2007; Yeo, 2007). The disconnect between the beliefs of researchers and beliefs and practices of teachers and administrators is a source of contention among educators.

### Summary of New Skills for New Literacies

Early research into new literacies leads some researchers to conclude that the new literacy practices require new skills beyond those used in reading traditional printed texts (Coiro, 2003; Coiro & Dobler, 2007; Leu et al., 2004; Leu at al., 2005). The social, interactive, and changing nature of digital texts may require new models of reading comprehension (Leu, 2007). However, researchers caution that new literacies will not replace traditional literacies. Evidence indicates that there is not only some overlap in the skills needed for online and offline reading comprehension, but that a solid foundation of traditional literacy skills may be vital for new literacy skills (Leu et al., 2004; Wilder, 2007).

## The Lack of Technology Use in the Classroom

If the skills required for being literate change, then it follows that instructional practices in the classroom must also change. Researchers agree that the skills needed to be literate with the Internet and other ICTs are critically important to civic, economic, and personal success in a global society (Anstey & Bull, 2006; Brown & Lockyer, 2006; Castek et al., 2006; Coiro, 2003; Coiro & Dobler, 2007; Friedman, 2005; Leu et al., 2004; Leu et al., 2005; Miners & Pascopella, 2007; The New London Group, 1996). The ultimate goal of education is to produce citizens who possess the ability to use multiple forms of literacy to collaborate and solve complex problems (Friedman, 2005). Consequently, opportunities to practice collaborative problem-solving and use multiple types of texts and literate practices must be afforded to students (Anstey & Bull, 2006; Brown & Lockyer, 2006; Leu, 2008). To this end, the International Reading Association ([IRA], 2009) issued a position statement regarding new literacies and twenty-first century technologies which calls for all stakeholders to be fully committed to student proficiency in the new literacies of twenty-first century technology. The IRA also pushes for new standards and assessments that will provide students with a literacy curriculum that affords opportunity for worldwide collaboration and equal access to ICTs. Furthermore, the New London Group (1996) argues that "creating access to the evolving language of work, power, and community, and fostering the critical engagement necessary for them [students] to design their social futures and achieve success through fulfilling employment" (p. 1) is vital.

## The Digital Gap

The mere mention of the word *gap* causes a sense of despair among educators. For years the well documented achievement gap between urban and suburban students

has caused the educational community much concern as it scrambles, with little success, to find ways to close the gap (Miller, 2003; Williams, 1996). Now a new kind of gap, known as the digital gap, looms large in American classrooms, threatening to widen the existing achievement gap. The digital gap involves the growing disparity between students' use of technology in the home or other outside arenas and their use of technology at school (Leu, 2008; Leu et al., 2004; Leu et al., 2005; Leu et al., 2007; Miners & Pascopella, 2007). At one time school was the place where children learned basic literacy skills, but some say that, too, is changing (Leu et al., 2007).

Research reveals that technology, such as the Internet and other ICTs, is generally not finding its way into classroom instruction (Cuban, 2001, 2007; Hitlin & Rainie, 2005; Peck, Cuban, & Kirkpatrick, 2002; Yeo, 2007), even in technology rich environments where access is not an issue (Cuban, 2001; Palak & Walls, 2009). Print based texts form the core of most instruction and literacy activities in classrooms (Gambrell, 2005; Yeo). Research (Cuban, 2001, 2007; Hutchison, 2009; Peck et al., 2002; Yeo, 2007) reveals that even in classrooms with Internet connections and other technological hardware, there is evidence that the presence of technology does not result in instructional changes that include new literacies instruction. According to Larry Cuban (2001):

> Teachers have been infrequent and limited users of the new technologies for classroom instruction. If anything, in the midst of the swift spread of computers and the Internet to all facets of American life, "e-learning" in public schools has turned out to be word processing and Internet searches. As important supplements as these have become to many teachers' repertoires, they are far from the project-based teaching and learning that some technology promoters have sought.

> Teachers at all levels of schooling have used the new technology basically to continue what they have always done: communicate with parents and administrators, prepare syllabi and lectures, record grades, [and] assign research papers (p. 178).

Cuban's statements were made in 2001; yet, subsequent research has yielded similar findings. Yeo (2007) explored language arts teachers' conceptualizations of reading and writing instruction. She was particularly interested in their perceptions of new literacies. Yeo analyzed recorded interviews and group conversations with teachers representing the various grade levels at a specific elementary school. Her findings reveal that the teachers' views of literacy are traditional and their practices are tied to traditional print-based texts. Additionally, the findings show that the teachers who participated in the study have little or no interest in or awareness of digital or new literacies. Hutchison (2009) reports similar findings from a national survey of literacy teachers. Teachers reported less access to ICTs such as iPods than to the Internet and those ICTs receive minimal use and with limited variability in the ways they are used. Furthermore, technology is not being used in ways that foster skills for online reading (Hutchison, 2009).

When the Internet is used inside school for instruction, there is a mismatch in the ways in which it is used at home and at school. When students do use the Internet for instructional purposes at school, it is more often used outside the school for homework or outside projects (Levin et al., 2008).A study by the National School Boards Association (n.d.) reveals that 96% of students who have access to the Internet outside school use it for social networking activities such as blogging, music sharing, podcasting, creating and

sharing videos, and instant messaging. Handsfield, Dean, and Cielocha (2009) distinguish between types of online tools, referencing Web 1.0 and Web 2.0 tools. Web 1.0 tools only permit website owners to collaborate or exercise control over the content; however Web 2.0 tools, such as blogs and wikis, allow consumers to create, edit, interact with, and collaborate online. Web 2.0 features social software that transforms consumers to producers (Hedberg & Brudvik, as cited in Handsfield et al., 2009). "Thus, unlike Web 1.0 tools, Web 2.0 tools 'belong' to the collective, or to all collaborators" (Handsfield et al., 2009, p. 40). Web 2.0 are thought to have the ability to offer students opportunities to be critical consumers and producers of text, something considered "an essential component of 21st-century literacies" (Handsfield et al., 2009, p. 49). Yet, students report that at school the Internet most often serves as a virtual guidance counselor, tutor, or study group. It may, additionally, be used for retrieving and storing information (Levin et al., 2008).

A 2009 study by Hutchison sheds further light on classroom computer use. The study aimed to ascertain literacy teachers' conceptualizations of ICT integration and their perceptions of the importance of ICT integration into the literacy curriculum as well as the degree to which the integration of ICTs foster the attainment of literacy skills in a digital environment. An online survey was given to 1,442 literacy teachers across the nation. Findings indicate that literacy teachers use ICTs very minimally in instruction, with little diversity in the ways they are used, and usually not in ways that support the acquisition of online reading skills. Teachers' beliefs about technology are a significant predictor of their ICT integration. Furthermore, findings reveal that literacy teachers have a vague or restricted idea of what is meant by ICT integration. Two thirds of the

participants reported perceiving ICT integration as supplemental to instruction. Strengths of this study include the large sample size taken across the nation; however, according to Judson (2006) a weakness of the survey method is that, in actuality, teachers' practices do not always match their self-reported practices. Following the survey data with purposively selected participant interviews and classroom observations would serve to corroborate and provide rich detail to the survey data. Furthermore, the researcher identified limitations which may have affected findings. The survey participants were all members of the IRA or a state or local affiliate of the IRA. Since the IRA issued a position statement on the importance of integrating technology in instruction, the Hutchison feels that IRA members may be more likely to integrate technology than other teachers. In addition, the web-based survey inherently required a certain level of familiarity with technology to complete. Therefore, the results may not accurately represent literacy teachers. Still, the survey yielded important findings which led Hutchison to conclude that literacy teachers need administrative support and staff development aimed at broadening their understanding of what constitutes ICT integration and their perceptions of ICTs as they relate to instruction.

Palak and Walls (2009) conducted a mixed methods study to investigate the relationship between teachers' beliefs and their uses of technology in technology-rich schools. They found that even in technology-rich schools teachers primarily use technology to prepare for lessons and for management and administrative purposes rather than for student-centered practices. Furthermore, they found that teachers' use of technology to support student-centered learning is rare even among teachers who hold student-centered beliefs.

## Causes of the Digital Gap

Research identifies various barriers that impede teachers' instructional use of technology. One of the purposes of Hutchison's (2009) national survey of teachers was to uncover the things that teachers currently perceive as barriers to integrating technology. Time was identified as a major impediment to using technology. Specifically, 87% of the respondents reported that a lack of time in class periods affected their technology integration, while 68% reported that pressures to meet standardized testing requirements left little time for using technology. A lack of staff development on ways to integrate technology was seen as a barrier by 82% of the teachers surveyed. Additionally, 83% identified access to technology as a barrier to its use and 86% blamed funding issues for the lack of access and subsequent lack of technology integration. Furthermore, 83% of responding teachers reported that additional resources would increase their level of technology integration.

According to Hutchison (2009), one previously identified barrier to technology use may be disappearing. Earlier research revealed teachers' unfamiliarity with digital technology to be an impediment to its integration (Leu et. al., 2004). One reason for the lack of Internet use in classrooms and the poor quality of Internet assignments is that, unlike their students, teachers are not so familiar with digital technology, its uses, or potential for instruction (Leu et al., 2004). At one time as many as 80% of American teachers reported feeling unprepared to integrate the Internet into the curriculum (USDE, 1999). However, Hutchison reveals that 99% of teachers responded to her national survey reported being somewhat skilled with ICTs, with the majority of teachers reporting a moderate skill level. However, familiarity with technological tools does not guarantee

integration for, as previously stated, Hutchison's findings reveal that ICT integration is minimal and superficial.

Even though teachers are reporting familiarity with technological tools, their students are also tech-savvy. For the first time, many teachers are faced with an aspect of the curriculum in which their students are more knowledgeable than they are. This is very unsettling for many teachers and, consequently, many choose not to include technology in instruction (Miners & Pascopella, 2007). Levin et al. (2008) state that "many schools and teachers have not yet recognized—much less responded to—the new ways students communicate and access information over the Internet" (p.1). In a survey for the Pew Internet and American Life Project, Levin et al. (2008) report that students perceive the restrictive Internet use policies of teachers and administrators as a major cause of the lack of Internet use at school.

As previously stated, because there is no clearly defined theoretical framework surrounding the new literacies of digital technology, teachers lack clarity on how and why to use them. According to Labbo (2006), computer technologies are often not implemented in classroom literacy instruction because there is no clear goal for doing so. The uncertainty centers on the role that technology should play in literacy instruction. Teachers become confused on whether technology should be used to enhance print-based literacy, to support standardized testing, or be used to develop new sets of literacy skills. Compounding this problem is a lack of understanding of exactly what technology integration looks like (Hutchison, 2009, Yeo, 2007).

According to Hutchison (2009), teachers have a narrow, incomplete conceptualization of technology integration. Only 5% of the teachers who participated in

this national survey believe technology integration involves teaching critical literacy, while only 2% view technology integration as a means to teach students the unique literacy skills typically identified as new literacies skills (Leu et al., 2004).

One explanation for the failure to integrate technology, as well teachers' vague understanding of technology integration, may be tied to the interaction between teachers' conceptualizations of technologies and their pedagogical content knowledge (Koehler & Mishra, 2008 as cited in Niess et al., 2009). Pedagogical content knowledge is described as

> The most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations…including an understanding of what makes the learning of specific concepts easy or difficult: the concepts and preconceptions that students of different ages and backgrounds bring with them to the learning (Shulman, 1986, p. 9).

Additionally, several researchers contributed to the concept of technological pedagogical content knowledge by pointing to the knowledge prerequisite for teachers to successfully teach with technology (Margerum-Leys & Marx, 2002, Niess, 2005, Pierson, 2001 as cited in Niess et al., 2009; Mishra & Koehler, 2006). Technological pedagogical content knowledge evolved into Technology, Pedagogy, and Content Knowledge (TPACK) which describes how a teacher's knowledge of technology, pedagogy, and subject content must interact before technology can be successfully integrated (Mishra & Koehler, 2006, Niess, 2008, Thompson & Mishra, 2007 as cited in Niess et al., 2009). The TPACK framework outlines how teachers advance through five stages of growth toward the

successful integration of technology into pedagogy. These stages grew from an earlier model designed to describe how individuals make decisions regarding the adoption or rejection of innovations (Niess, Sadri, & Lee, 2007 as cited in Niess et al., 2009). According to Ronau et al. (in press) the only teachers who will meaningfully integrate technology into their pedagogy are those who have progressed through the final stage of growth in which teachers make revisions in their curriculum as a result of their technology capabilities and evaluate the results of the decision to integrate teaching and learning subject matter content with an appropriate technology.

Yet another cause of the digital gap in the use of the Internet and ICTs inside and outside school lies with the federal policies that govern literacy instruction. Every facet of public school education is shaped by federal policy decisions (Shannon, 2005), including literacy instruction. The lack of technology integration occurs in spite of federal legislation (USDE, 2001) which mandates that every child become technologically literate by the eighth grade and the fact that researchers urgently call for its inclusion in order to prepare students to compete in a global society (Anstey & Bull, 2006; Brown & Lockyer, 2006; Castek et al., 2006; Coiro, 2003; Coiro & Dobler, 2007; Friedman, 2005; Leu et al., 2004; Leu et al., 2005; Miners & Pascopella, 2007; The New London Group, 1996). Experts (Leu, 2008; Williams, 2005) see this as a problem for schools. They explain that schools are getting left behind, and a gap is forming between literate practices outside schools and literate practices inside schools. Schools base their literacy instruction on old-fashioned literacy with printed texts; yet, students engage in new literacy practices with digital texts outside school. This digital gap, which is rooted

in the history of school reform in the United States, has serious implications for American education, according to Leu (2008).

## The Digital Gap: School Reform and New Literacies

School reform in the post-Sputnik decades aimed at improving the quality of American schools by setting minimum graduation standards for the traditional basics of reading and mathematics (Nichols & Berliner, 2007). The Elementary and Secondary Education Act of 1965 led to the implementation of standardized testing to assess whether or not students met those competencies. Yet, there was continued criticism of public schools regarding its requirement that only minimum standards be met. There was concern that American schools did not measure up to schools of other countries and that there was a growing achievement gap between White middle class students and students of poverty or of other races and ethnicities. The criticism coincided with the 1983 release of *A Nation at Risk* (National Commission on Educational Excellence), which linked a failure to improve the academic achievement of students to a threat to the economic stability of the country. A call for equity and excellence in the public schools of America followed this publication (Nichols & Berliner, 2007).

The call for equity and excellence in public schools resulted in the application of market principles to education and the subsequent federal legislation, NCLB (USDE, 2001). One component of this market reform was the setting of high standards for all students in the areas of math, science, and literacy. Additionally, a system of accountability was included to ensure that students meet certain of these standards. The accountability system of NCLB is designed around a corporate model of increased

productivity without increased costs, and standardized tests are the method of measuring productivity (Nichols & Berliner, 2007).

The literacy standards of NCLB include traditional reading comprehension and technological literacy. By mandating that students become technologically literate by the end of the eighth grade (USDE, 2001), federal education policy-makers recognize that new literacies are important to students' success in a global society and economy. However, the mandate is unfunded.

The failure to fund the technology mandate in NCLB impedes the integration of new literacies into the curriculum. Inadequate funding means that schools have little or no money to spend on hardware and software. A study by Wells and Lewis (2006) estimates that 100% of public schools are connected to the Internet. However, a closer look at this study reveals that the operational definition of an instructional classroom includes computer labs, libraries, media rooms, or any other room which is used for instruction at any time. The fact is that many of these locations are not primary sites of instruction for students. If a teacher must transition a class to a computer lab to gain access to a computer for each student, then scheduling becomes a barrier (Honan, 2008). Even if there is connectivity in the instructional classroom, one computer does little to facilitate integration (Hutchison, 2009). The root of this problem may ultimately be found in the fact that schools cannot afford computers which are wired for the Internet in classrooms where most instruction takes place. Eighty-six percent of the teachers across the nation report funding to be a significant barrier to technology integration (Hutchison, 2009).

The lack of funds for technology creates even greater problems for new literacies in lower socioeconomic school districts where the pressure to improve reading test scores is greater (Gee, 2000; Leu, 2008; Leu et al., 2007; Miners & Pascopella, 2007). Students in lower socioeconomic districts are less likely to achieve proficiency on standardized measures of reading (Miller, 2003; Williams, 1996). Low socioeconomic districts, often more strapped for funds in the first place than districts located in higher socioeconomic communities, feel the need to commit those funds to improving test scores (Leu et al., 2007; Miners & Pascopella, 2007). This leaves no money to purchase technology for classrooms and technology labs. Without the technological tools, new literacies cannot be adopted into the curriculum.

Schools in higher socioeconomic districts tend to have more funds at their disposal than their counterparts in lower socioeconomic districts (Belfield, 2008; Leu et al., 2007; Miners & Pascopella, 2007; Rebell, 2005). In addition, standardized test scores in higher socioeconomic school districts are generally higher (Williams, 1996), and with less pressure to increase student performance on tests, these districts feel free to allocate funds for technology (Leu et al., 2007; Miners & Pascopella). With less pressure to perform, the parents, teachers, and administrators of higher socioeconomic schools are more likely to push for the inclusion of the Internet and other ICTs into the curriculum.

The effects of socioeconomic status on new literacies instruction are compounded when the students' home socioeconomic levels are considered. The most common place for students to connect to the Internet is the home (Hitlin & Rainie, 2005); yet, lower socioeconomic students are less likely than their peers from families with a higher socioeconomic status to have home access to the Internet or other ICTs. Low income

students who are not exposed to technology at home are likely to attend low socioeconomic schools where there is little or no technology (Leu, 2008; Steinberg & Kincheloe, 2004). Therefore, students from lower socioeconomic families lag behind those from a higher socioeconomic status in developing digital literacy skills. This disparity across socioeconomic levels is sometimes referred to as the "digital divide" (Steinberg & Kincheloe, 2004, p. 210).

Leu (2008) believes that public education policy regarding new literacies compounds the achievement gap by not assessing online reading comprehension. Leu and other researchers (Coiro & Dobbler, 2007; Leu et al., 2004; Leu et al., 2007) warn that the digital divide will widen the achievement gap that exists across socioeconomic levels, especially given the combined effects of the low socioeconomic levels of home and school. Reducing the achievement gap and providing an equitable and excellent education are goals of NCLB; yet it inherently reduces the chances those goals will be met by failing to allocate appropriate funds.

Over the course of the last decade, the federal government attempted to address the digital divide by subsidizing a two billion dollar program designed to provide schools with high numbers of poor children with computers, Internet service, and wiring at a discount of up to 90% (Steinberg & Kincheloe, 2004). However, the program failed to include financial supplements for technical support services or staff development. Technical failures and lack of staff development are identified as factors contributing to the lack of technology integration in the curriculum (Peck et al., 2002). The provision of equipment and wiring simply are not enough to guarantee students receive instruction in new literacies (Steinberg & Kincheloe, 2004).

The failure to provide funding for the implementation of technology signals to educators that technology is a low priority for the federal government. Consequently, schools spend a small portion of staff development funds for technology training (Leu, 2000). Leu (2000) estimates that the average school district spends only 20% of its technology funds on staff development for teachers. In turn, teachers report that a major reason for not incorporating technology into the curriculum is the lack of training (Hutchison, 2009; Peck et al., 2002).

Assessment and New Literacies

Assessment creates a major roadblock for the inclusion of new literacies into the curriculum. There is ambiguity regarding the best method of assessing new literacies, especially when there is no consensus on a formal definition or its composite skills. Johnson and Kress (2003) posit that traditional forms of assessment based only on printed texts, such as those required by NCLB to assess literacy, are inappropriate in an age where texts are multimodal. Researchers (Johnson & Kress; Kalantzis et al., 2003; Leu, 2008) argue that traditional assessment techniques are incompatible with new literacies because the new literacies require students to be problem solvers, producers, and collaborators. Traditional standardized tests assess individual knowledge and application. In the twenty-first century, it is often the case that information rests within the minds of a group rather than an individual (Kalantzis et al., 2003). Kalantzis and colleagues caution educators to rethink what is "…meant by terms such as competence, ability, capacity, and intelligence" (2003, p. 24).

In 2004 Friedman and Heafner conducted a two part study to investigate the impact of technology on student achievement. The first part of the study used a quasi-

experimental design in which two classes of eleventh grade United States history classes participated. The control group received instruction with the traditional pedagogy the instructor normally uses. In the test group, the same instructor served as a facilitator as students learned the content through the completion of open-ended guided questions and the development of a website in which they described and interpreted the content. Students in the test group successfully completed the technology-based learning inquiry, and the majority received a grade of A or B on the task. However, results of the study revealed that the use of technology did not significantly or positively impact student achievement, as measured by a traditional "multiple-choice, fact-recall" (p. 202) end-of-unit assessment. Friedman and Heafner (2004) followed up by using a mix of quantitative methods and grounded theory to investigate student engagement in the previously described scenario and found that task-specific success did not transfer to success on the final assessment. The results led to the conclusion that the students in the test group were not only unfamiliar with the more student-centered pedagogy employed in the study, but the final traditional assessment was incongruent with the learning task. This conclusion becomes important in the conversation about the role of new literacies instruction in classrooms where the predominant or only assessment techniques are traditional.

Leu (2008) cautions that if Internet reading comprehension is nonisomorphic with traditional print comprehension, then traditional standardized assessments of reading comprehension are not sufficient, and failure to develop appropriate assessments threatens the nation's literate future (Leu et al., 2007). Yet it is the

traditional standardized testing required by NCLB (USDE, 2001) that drives educational decisions at the present time (Nichols & Berliner, 2007).

Not only is there a failure to assess new literacies skills or online reading comprehension, there is little effort to even use technology to assess traditional literacy skills. Currently, no state assesses online reading comprehension. Prior to 2007 no state writing assessments allowed the use of word processors (Leu et al., 2005; Russell, Higgins, & Hoffmann, 2004). Few states currently allow word processors to be used on the state writing assessment (Leu, 2008); in spite of the fact that students' writing scores improve when computers are used for composition (Cochran-Smith, 1991; Leu, 2008; Russell & Plati, 2000).

Russell and Plati (2000) reveal that when writing is composed on word processors, assessment scores are significantly better than when composed on paper. In fact, 20% more students pass writing assessments when word processors are used for composition. Furthermore, according to Russell and Plati, composition done on word processors also benefits special needs students even more than their regular education peers.

Russell, Higgins, and Hoffmann (2004b) conducted a quantitative study designed to replicate previous investigations, such as that carried out by Russell and Plati (2000), into the effects of word processor use on writing on a larger, more generalizable sample that was geographically, academically, and racially diverse. Eighth grade students were assessed for computer skills and literacy before administering the writing test. Findings from the 2004 study generally supported those of previous studies, but with several important exceptions. The study carried out by Russell and Plati (2000) found that the

performance of students with little experience in using computers for composition suffered when their writing was assessed using a word processor. However, the 2004 study conducted by Russell and his colleagues found that the mode of administration did not negatively affect students whose computer skills and literacy were less proficient. This finding was attributed to the fact that even the students who were less proficient with word processors at the time of the study were more proficient than comparable participants in prior studies. The 2004 participants' computer skills were compared to the skills of participants in a 1999 study by Russell using the same assessment methods. Findings led Russell and his colleagues (2004b) to conclude that current students are proficient enough with computers that using word processors for responding to state writing assessments is either beneficial to students, or at least, does no harm. Furthermore, they conclude that it is appropriate for states to begin making the transition from paper-pencil based writing assessments to computer-based assessments.

There is evidence that computer-based formats are compatible with assessments of traditional reading comprehension as well. Russell, Higgins, and Hoffman (2004a) conducted a study to explore the differences in the performance of fourth graders when two different computer-based test formats and a traditional paper-and-pencil format were used to assess reading comprehension. Of the two computer-based formats, one featured scrolling, while the other showed complete subsections of a reading passage in a whole page view. The participants were 219 economically, linguistically, and ethnically diverse students from Vermont. The participants were assessed in computer literacy and completed a computer use survey before completing the reading comprehension assessment with identical laptop computers. Their findings showed no statistically

significant differences in the reading comprehension scores across the three testing modes and no statistically significant differences in reading comprehension scores based on students' computer fluidity and literacy. Despite the fact that the study examined a computer-based format for assessing traditional print-based reading comprehension rather than digital reading comprehension, it never-the-less serves to advance new literacies. The use of a computer-based format for assessing traditional reading comprehension is at least a step towards integrating new literacies into the curriculum.

## The Consequences of High-Stakes Testing for New Literacies

Each year the standardized tests required by NCLB yield scores that are used to make high-stakes decisions. Students must be on grade level in tested subjects in order to be promoted to the next grade in school (USDE, 2001). Consequences for schools whose students are not proficient are serious. Failing schools are threatened with being taken over by improvement teams or providing transportation for students who wish to opt for enrollment in higher performing schools. Teachers' and administrators' jobs are at stake if test scores do not show student proficiency after a period of time. Other high-stakes decisions, such as college entrance, special programs, and scholarships, are based on the standardized test scores as well (Nichols & Berliner, 2007). Since these important decisions are based upon one single test score, or snapshot of student performance, the tests have come to be called high-stakes tests.

High-stakes testing is somewhat contradictory for education. Its purpose is to make stakeholders in education, particularly schools, teachers, and educators, accountable for providing students with an excellent and equitable education (Nichols & Berliner, 2007). Nichols and Berliner point out that when taken at face value,

accountability in education sounds very appealing to many stakeholders, including parents, business leaders, and policy-makers. The appeal may be justified to some degree; however, high-stakes testing can have negative consequences. Pressures from high-stakes testing squelch the innovative spirit in schools. Lubienski (2008) states, “The development of innovations involves nurturing and shielding such efforts from immediate mandates and competitive pressures, rather than forcing schools representing new ideas to sink or swim in the educational marketplace” (p. 1).

Research shows that when the stakes are high, standardized testing leads to a narrowing of the focus in school curricula (Cuban, 2007; Nichols & Berliner, 2007). In other words, subjects which are not tested are not likely to be taught or are given a low priority. Such dire consequences exist for schools whose students do not perform at proficient levels that instructional time is spent on the tested subjects at the expense of others which are not tested. Since NCLB does not require that technology literacy be assessed, it is often not integrated into schools’ literacy instruction (Cuban, 2007; Leu, 2008; Labbo, 2006; Leu et al., 2004).

Labbo (2006) perceives NCLB to be a road block to the implementation of a new literacies curriculum in schools. None of the new literacies for the Internet or other ICTs are required to be assessed; and, furthermore, NCLB does not provide for the funding necessary for schools to implement the technology standards that it mandates. In addition, the law’s definition of technological literacy is vague, making implementation of new literacies difficult for schools that choose to do so (Miners & Pascopella, 2007). Again, this underscores the fact that the message the federal government is sending to educators is that digital literacies are not a priority. The result is that schools have no incentive to

implement new literacies (Castek et al., 2006; Cuban; 2007; Gee, 2000; Labbo; Leu, 2008; Leu et al., 2004; Leu et al., 2005; Miners & Pascopella, 2007).

## The Consequences of the Curricular Mismatch of the Digital Gap

Regardless of whether the curricular mismatch between literacy practices inside and outside schools is intentional or not there are far-reaching consequences. One consequence of the digital gap is that students report feeling a disconnect between the literacy practices in their life outside school and those inside school (Williams, 2005). Chandler-Olcott and Mayer (2003) report finding that multimedia texts play a crucial role in students' literacy practices outside school. Yet, they also note those same digital literacy practices are generally not valued within the context of school. Students' usage of the Internet and other ICTs outside school require creativity; yet, if technology is used at all in school, students complain that the quality of the assignments is poor and unimaginative (Levin et al., 2008). Additionally, since technology is seldom incorporated into the curriculum, students feel that the digital literacies they bring to school are not valued by school personnel (Williams, 2005).

Concerning the disconnect between literacy practices inside and outside school, Larson (2005) states:

> Given the potential negative effects of this disconnect on the ability of many students to learn and succeed within school, and on the possibilities available to them in the contemporary context of work, we need to focus more specifically on the context of language and literacy practices going on beyond the school walls in order to move past disconnection to meaningful use of those practices in ways that do not simply pedagogize them (p. 321).

Furthermore, Larson believes that participation in new literacies inside school as well as outside, provides more opportunities for authentic learning, and, "as a result, the division between inside and outside is blurred as literacy learning occurs across time and in multiple spaces" (Leander, 2001, as cited in Larson, 2006, p. 322).

By failing to integrate technology into the curriculum, educators may be missing a valuable opportunity to not only motivate and engage students, but to potentially improve achievement. Ironically, experts believe the integration of the Internet and other digital tools into school curricula could have a positive effect on student engagement and motivation. Many researchers find improved student engagement with literacy when new literacies are adopted into the curriculum (Chandler-Olcott & Mahar, 2003; Friedman & Heafner, 2007; Heafner & Friedman, 2008; Miners & Pascopella, 2007; Luce-Kapler, 2007; Luce-Kapler & Dobson, 2005; Williams, 2005) and believe this could have positive effects on student achievement, motivation, and drop-out rates (Miners & Pascopella, 2007). In fact, Guthrie (2004) identifies motivation and social interaction as important attributes of engaged readers. Furthermore, he states that greater amounts of engaged reading result in growth in reading comprehension.

The qualitative study by Chandler-Olcott and Mahar (2003) examined twelve seventh and eighth grade girls' use of digital technologies in their literacy practices. Findings highlight the level of engagement and motivation of the students with digital narrative writing. For example, they note the high degree of "…tenacity and engagement [regarding the] online composing" (p. 381) of two focal participants in their study. Additionally, a major theme points to the importance of being involved in a social learning environment and the high value placed upon digital literacies in the students'

lives outside school, which are undervalued in the context of schooling. Chandler-Olcott and Mahar conclude that instruction which couples digital tools with a social learning environment may lead to increased student motivation and engagement.

Gulek and Demirtas (2005) reported on their longitudinal study designed to examine the effects of a one-to-one laptop program on student achievement. Cohorts of 259 middle school students were divided into an experimental laptop group and a non-laptop control group. Baseline measures showed the groups to have no statistical differences in mathematics, English language arts, writing, or overall grade point achievement. The data collection measures included students' overall cumulative grade point averages (GPAs), end-of-course grades, writing test scores, and state-mandated norm- and criterion-referenced standardized test scores. After the first year in the program, the laptop group showed significantly higher achievement in all measures. Cross-sectional analyses in the second and third years yielded the same results, and longitudinal analysis independently verified the significantly positive effect of laptop use on student achievement measures. While the study boasts positive results for student laptop use, there are several study limitations worthy of notice. First, teachers volunteered for the laptop program instead of being randomly assigned, and only anecdotal evidence was gathered regarding the ways students used the laptops. While the anecdotal evidence indicated that the laptops were used in a variety of ways, still, there was no systematically collected data on how students used technology. However, the positive effects of the laptop program on student achievement as measured by state-mandated standardized testing are important in light of the concerns about standardizing testing resulting in a narrowing of the curriculum (Cuban, 2007; Nichols & Berliner,

2007) and the fact that no state currently uses technology to assess reading comprehension (Leu, 2008) as mandated by NCLB (USDE, 2001).

A three year qualitative study involving both middles and secondary students was designed by Luce-Kapler and Dobson (2005) to investigate the teaching and learning skills involved in acquiring digital literacies. The nature of reading and writing e-literature, also known as hyperfiction or literary hypertext, was explored with twelve undergraduate students the first year of the study. Students read examples of published e-literature and used wikis to create their own e-literature texts. A wiki is a collaboratively created and edited text located at a particular website. Disorientation with the hyperfiction text was a major theme to emerge. The disorientation seemed to result from reader expectations based on traditional print narrative which participants imposed upon the hyperfiction text. During the second year of the study, Luce-Kapler (2007) explored wiki writing with 30 economically, academically, and ethnically diverse sixth grade students. After reading aloud a radical change text (see Luce-Kapler, 2007 for a detailed explanation) to the students, they then created their own radical change text with wiki writing. Findings from this study indicate that students developed connections with the visual elements of texts and made gains in visual literacy skills and became highly engaged with the text. The wiki writing provided an opportunity for social interaction and collaboration in meaning making and text creation. A conclusion drawn from the cumulative years of the study is that reading and writing e-literature requires new skills that should be explicitly taught and fostered, but has the potential to increase student engagement.

Larson (2007) carried out a qualitative case study in order to understand how the acquisition of new literacy skills is facilitated by the integration of technology into the curriculum. The study was set in the context of an electronic reading workshop in a fifth grade classroom. Data analysis revealed literacy development in the categories of personal meaning making, character and plot involvement, and literary criticism. This particular finding has importance due to the fact that these elements are typically assessed in traditional standardized reading comprehension assessments (USDE, 2001). Additional findings showed that the technology fostered socially constructed learning as students interacted with one another to construct personal meaning. The findings led Larson to conclude that not only did technology in the context of an electronic reading workshop support new literacy skills in a fifth grade classroom, but encouraged student engagement and motivation as well. This study makes important contributions to new literacies research by linking new literacies instruction with student engagement and motivation and student growth in reading components which are typically assessed by traditional methods.

Wolsey and Grisham (2007) explored the role of threaded discussion groups in eighth graders' literacy instruction in a three year mixed methods study. The study specifically focused on how technology influences students' engagement with writing tasks as well as how technology instruction may serve to combat the digital divide. Findings reveal student gains in new literacies skills and critical thinking skills. Not only did the students' perceptions of themselves as writers improve, but so did their engagement with literature and writing.

Researchers believe the Internet and other ICTs engage students of all types, even those who have difficulty with traditional reading (Heron-Hruby, Wood, & Mraz, 2008; Leu, 2008; Leu et al., 2007; Miners & Pascopella, 2007). A 2007 mixed methods study by O'Brien, Beach, and Scharber investigated struggling seventh and eighth grade students' literacy practices as they engaged in both traditional and new literacies. The two year study specifically examined how engaging in digital media projects impacts student engagement as compared to engaging in tradition literacy practices only. Additionally, the study examined how new literacies engagement influences students' perceptions of their competence. Findings reveal that students exhibited increased motivation, perseverance, and engagement with new literacy tasks over traditional ones. The new literacy practices promoted students' sense of competency; however, conflict resulted from the fact that students were placed in a remedial class which was identified with a sense of incompetence. The researchers conclude that instruction free from the stigma of being deficient and rich in a mixture of traditional and new literacies would foster engagement, agency, and improved performance in struggling readers.

Literacy instruction is not confined to a block of time designated as such. As Kinniburgh and Busby (2008, p. 60) state, "Since the goal of reading is to gain meaning from print, reading is a tool for the larger goal of learning content." Literacy instruction is often combined with social studies. Kinniburgh and Busby explain that (p. 60), "…the social studies content is what gives the reading process relevancy. Social studies and reading seem to be particularly well-suited for integration." Massey and Heafner (2004) stress the importance of all middle and high school teachers including the teaching of literacy skills in their content area curricula. Daniels, Zemelman, and Steineke (as cited in

Street & Stang, 2008, p. 94) tout the benefits of writing in social studies, such as heightened student engagement, understanding of content, and metacognition. Street and Stang (2008) explain that when social studies content and writing are integrated together, the benefits are compounded by also introducing technology into the mix.

There is a considerable amount of research investigating the mesh between social studies content and technology. Noting that learning disabled students of middle school and high school age often encounter difficulty with content area reading and comprehension, Boon, Fore, Blankenship, and Chalk (2007) reviewed the literature on technology-based interventions for elementary through secondary learning disabled students. They conclude that the integration of technology into the social studies curriculum improves the achievement, engagement, motivation, and study skills of students both with and without learning disabilities. Other research shows heightened student engagement, motivation (Friedman & Heafner, 2007; Heafner & Friedman, 2008), and understanding of content (Heafner & Friedman, 2008) when the technology is integrated into the social studies curriculum.

Clearly federal education policy is setting the direction for the path of new literacies for the entire nation. Some experts worry that it is possible that this path is leading to another gap (Leu, 2000; Leu, 2008; Leu et al., 2004; Miners & Pascopella, 2007). A gap is developing between the United States and other industrialized nations in regards to the way their educational systems prepare students with the twenty-first century skills necessary to compete in a global market.

Global economic competition, made possible by the Internet and ICTs, is dictating a meshing of literacy instruction and technology (Friedman, 2005; Leu, 2000).

National governments across the globe are responding by making changes in their educational systems (Leu, 2000; Leu, 2008; Miners & Pascopella). Countries such as Australia, Canada, Ireland, the U.K., and New Zealand are implementing higher national standards, integrating the Internet and ICTs into the curriculum, and developing Internet resources for students and faculty. Sixty-seven nationalities of 15-year-olds were set to take the PISA reading test in late 2009 and many are concerned about how American students will compare to their international peers. Leu (2008) points out that there is no way to tell how far behind other nations American students are in terms of readiness to compete globally with new literacies because there are no measures in place for assessment. He believes that policy-makers are putting the nation's students in peril for their refusal to acknowledge the need for new literacies in curricula and their inclusion in assessments.

Summary of the Lack of Technology Use in Classrooms

Research indicates that despite the important role technology plays outside of school and its ability to engage students (Chandler-Olcott & Mahar, 2003: Miners & Pascopella; Luce-Kapler, 2007; Luce-Kapler & Dobson, 2005; Williams, 2005), it is receiving relatively little use in classroom instruction (Cuban, 2001, 2007; Hitlin & Rainie, 2005; Peck, Cuban, & Kirkpatrick, 2002; Yeo, 2007). Furthermore, technology is not affecting change in the type of instruction given in many classrooms (Cuban, 2001, 2007; Peck et al., 2002) due to the fact that much instruction is still based on traditional print literacy (Gambrell, 2005; Yeo, 2007).

The reasons for failing to integrate technology into instruction are multiple and complex (Teo et al., 2006). Inadequate training in the use and application of

technological hardware and software (Leu et al., 2007; Peck et al., 2002), lack of funding (Leu et al, 2007) as well as a lack of time (Cuban, 2007) are factors that hinder technology integration. Some see the federal legislation, NCLB, as a major impediment to technology use in education (Cuban, 2007; Leu, 2008; Labbo, 2006; Leu et al., 2004). Although technology literacy is mandated under NCLB (USDE, 2001), it is an unfunded mandate, which is one of the reasons districts cannot afford to purchase technology or provide staff development for teachers (Leu et al., 2004). Student growth in reading, science, and math is required to be assessed under NCLB, but there is no assessment required for technological literacy (USDE, 2001). This, as experts believe, leads to a narrowing of curricula (Cuban, 2007; Leu, 2008; Leu et al., 2004) because teachers tend to teach only those topics that are assessed.

There are consequences for the failure to utilize technology in instruction. Students, especially those in low socio-economic districts (Leu, 2008; Steinberg & Kincheloe, 2004), experience a mismatch in their literacy practices inside and outside school, causing them to feel that their literacy practices are not valued by school officials. Finally, the failure to integrate technology and to make it a priority in federal education policy puts the United States at a disadvantage when compared to other nations who are making technology a priority in terms of policy, curriculum integration, and funding (Leu, 2008).

## The Future of New Literacies

Although new literacies have not found their way into state assessments, some states do recognize the need for the incorporation of new literacies into the curriculum (Leu et al., 2004; Miners & Pascopella, 2007). Maine, South Dakota, and Massachusetts

have partnerships with outside organizations to bring 21st Century skills into their schools. Wisconsin has ICT standards in place, though they are not being implemented yet due to a lack of funds to provide the necessary training for teachers. West Virginia is implementing a 21st Century skills initiative to incorporate the Internet and ICT literacy skills into curricula. The North Carolina Center for 21st Century Skills is developing partnerships with business, educators, and policy makers to integrate technological literacy into schools.

Across state boundaries other initiatives can be found. The International Society for Technology in Education (ISTE) works to help school administrators nationwide to implement new literacy skills in their districts (International Society for Technology in Education, 2007). The Partnership for the 21st Century Skills (Partnership for the 21st Century Skills, n.d.) advocates for the integration of 21st century skills into schools nationwide and forms partnerships with states to make it possible. Currently the organization has partnerships with six states. The New Literacies Research Lab, housed at the University of Connecticut, conducts research on new literacies, advocates for the inclusion of new literacies in school curricula, and works with school administrators across the country to bring 21st Century skills into their schools (Leu, 2008; Miners & Pascopella, 2007).

There is evidence that federal policy makers may be listening to new literacies advocates such as Partnership for the 21st Century Skills. The U.S. Department of Education released *A National Education Technology Plan* in 2010 which outlines the steps being taken to develop standards and assessments for technology-based learning. The plan calls for states, districts and individual schools to provide resources to better

equip pre-service and in-service teachers for success with technology. Furthermore, the National Assessment of Educational Progress (NAEP) test, which is governed by a board appointed by the U.S. Secretary of Education and assesses the nation's fourth and eighth graders biennially for the purpose of tracking and comparing student progress across states (NAEP, n.d.a), is developing a Technology Literacy Assessment Framework with plans for implementing the assessment in 2012 (NAEP, n.d.b). Organizations lending their support to the development process include the ISTE, ITEA, and the Partnership for the 21st Century Skills.

States are responding to these initiatives by including technology objectives in their standard courses of study. For example, North Carolina not only has a statewide technology plan which includes a directive for each district to submit its own technology plan consistent with the statewide plan, but there are now objectives added to the English Language Arts course of study consistent with those (NCDPI, 2004) advocated by new literacies researchers (Leu et al., 2004).

While high level policy makers having conversations about the inclusion of 21st Century skills in school curricula is a step in the right direction, the points outlined above are only "recommendations" (p. 15). There are still no plans to fund the recommendations and no plans to require a systematic yearly assessment of students' new literacies skills. Some see these as serious flaws because the lack of testing and funding cause educators to overlook the implementation of technology into the curriculum, focusing only on test scores (Castek et al., 2006; Labbo, 2006; Leu, 2008; Leu et al., 2004; Leu et al, 2005; Miners & Pascopella).

The Internet and other ICTs introduced in the late twentieth century brought new ways for people to interact, communicate, and collaborate with one another, creating a global society. These innovations infiltrated social and working domains, causing rapid changes in the types of literate practices in which people engage. However, the same technology has been slow to find its way into classroom instruction (Cuban, 2001, 2007; Leu, 2008; Leu et al., 2004). Literacy experts and researchers call for not only the inclusion of technology into literacy curricula (Kalantzis, Cope, & Harvey, 2003; Leu et al., 2004), but an updated definition of literacy that would include the social contexts, new skills and new text types of the digital age literacy (Anstey & Bull, Johnson & Kress, 2003; Rhodes & Robnolt, 2008). Due to the rapid development of technological tools, research is only beginning to unveil the nature of the new literacies, causing a delay in the development of a new literacies theoretical framework, a new definition of literacy, and the integration of new literacies into literacy curricula.

Early research illuminates a complex relationship between old and new literacies. Studies indicate that online reading comprehension requires additional, new skills compared to those used in offline reading (Coiro, 2003; Coiro & Dobler, 2007; Leu et al., 2004; Leu at al., 2005). However, both types of reading comprehension require some of the same skills (Coiro, 2003, Coiro & Dobler, 2007; Leu et al., 2004; Wilder, 2007). In fact, traditional literacy skills may be more important than ever as a foundation for new literacy skills (Leu, 2008; Leu et al., 2004; Wilder, 2007).

In spite of benefits such as increased student engagement (Chandler-Olcott & Mahar, 2003: Miners & Pascopella; Luce-Kapler, 2007; Luce-Kapler & Dobson, 2005; Williams, 2005) and preparation for success in a globally connected business world

(Freidman, 2005; Gee, 2004; Leu, 2000), there is evidence that technology is underused in classrooms and failing to revolutionize instruction (Cuban, 2001, 2007). The consequences of failing to incorporate technology into classroom pedagogy are numerous.

When schools fail to incorporate the Internet and other technologies into classroom pedagogy, they fail to engage students in the Discourses vital to success in the twenty-first century job market. However, they also fail students in other ways. For example, they are failing to allow students membership in discourse communities accessed by those technologies. According to Bakhtin (1986), every utterance made is filled with the echoes of previous utterances. The Internet and other ICTs provide access to others' voices (Mahiri, 2004) and opportunities to engage in unique discourse communities. The addition of digital texts into the curriculum simply multiples the number of voices to which students are exposed to and provides a forum for each student's own voice to be heard.

The failure to give technology a prominent role in education may be due, in part, to the federal legislation, NCLB, (Cuban, 2007; Labbo, 2006; Leu, 2008; Leu et al., 2004), which requires technological literacy by the eighth grade, but does not fund or assess the mandate (USDE, 2001). This short-sightedness is not shared by other nations, many of whom have already changed their educational systems by mandating that technology is integrated into their curricula and funded (Leu, 2000; Leu, 2008; Miners & Pascopella, 2007).

While the review of literature exposes many impediments to the use of technology in instruction, there is a dearth of literature exploring the relationship

between teachers' beliefs and their utilization of technology, particularly in literacy instruction. Teachers have a good deal of authority in curricular decision-making (Judson, 2006), and research reveals that it is a teacher's belief system that has the greatest impact on decisions regarding instructional practice (Deemer, 2004; Fang, 1996; Lam & Kember, 2006). Whether or not a teacher will incorporate new teaching strategies and innovations or support educational reforms largely depends on his or her beliefs (Clark & Peterson, 1986; Cuban, 1990; Fang; Golombek, 1998; Munby, 1984).

Teachers' epistemological beliefs appear to be directly linked to the way technology is used in the classroom (Gobbo & Girardi, 2002; Maor & Taylor, 1995; Teo, Chai, Hung, & Lee, 2008) as well as teachers' willingness to integrate technology into instruction (Gobbo & Girardi, 2002; Maor & Taylor, 1995). Specifically, teachers who adhere to a more student-centered, constructivist approach to teaching are more likely to integrate computers and other ICTs into their curricula (Judson, 2006; Totter et al., 2006), use them more often (Becker & Ravitz, 2001) and more successfully (Judson, 2006; Totter et al., 2006). It may be possible, then, that the lack of technology use in instruction is tied more closely to teachers' beliefs than the tangible impediments identified by the literature. Therefore, it is imperative, as Lim and Chan (2007) argue, to examine teachers' beliefs regarding the role of technology in literacy instruction and the relationship of these beliefs to their actual use of technology in literacy instruction.

# CHAPTER III: METHODOLOGY

This study sought to examine teachers' beliefs across grade levels regarding the role of technology in literacy instruction in order to gain a deeper understanding of those beliefs in the context of one technology-rich elementary school. Furthermore, this study aimed to explore the degree to which those teachers' beliefs about technology were reflected in their actual literacy instruction. Three questions guided this study. In seeking to better understand literacy teachers' beliefs and practices regarding instructional technology in one elementary school with a technology-rich environment:

1. What are teachers' beliefs across grade levels regarding the role of technology in literacy instruction as measured by the *Technology Integration in the Classroom* survey?
2. How are teachers across grade levels using technology in literacy instruction?
3. How are the beliefs of three teachers of varying levels of technology integration reflected or not reflected in their practice as evidenced by interviews, observations, and the Technology Integration in the Classroom survey?

In order to fully address the research questions, both quantitative and qualitative methods were utilized. Quantitative methods were used first to gather information from a larger sample of teachers, to look at overall patterns, and to guide the purposeful selection of participants from which to gather in-depth details. Quantitative methods are often used to

gather measurable data on the instructional use of technology (Lee, 2006), but quantitative data alone would not have yielded the rich detail that would lead to a thorough understanding of teachers' beliefs regarding the use of instructional technology and the role those beliefs play in making their decisions on whether or not to incorporate technology into the curriculum (Hudgins, 2008). Therefore, this was a primarily a qualitative study, and as such, its goal was to yield rich, in-depth information.

Qualitative research includes a diverse assortment of pragmatic resources such as case studies, historical events, documents, life stories, and personal encounters that provide a descriptive picture of specific events or moments-in-time. According to Creswell (1994), qualitative research is an inquiry process that leads to the understanding and holistic description of an individual or social phenomenon. Researchers who pursue qualitative inquiry investigate incidents in their naturally occurring contexts in order to understand or interpret their meaning (Denzin & Lincoln, 2000).This chapter describes the research design in terms of the procedures used for the quantitative and qualitative methods, the participants, and the instrument. A summary of methodologies, data collection, analyses and connection to the research questions can be found in Table 1.

## Quantitative Research Design

Quantitative data was gathered through a survey instrument chosen specifically for this study. The review of literature revealed that there is abundant evidence linking teachers' beliefs with their decisions on whether or not to integrate technology. Therefore, the primary purpose of the survey was to gather baseline data on teachers' beliefs regarding the integration of technology into instruction, the ways teachers are using technology in their classrooms, the frequency of its use, and the degree to which

those beliefs were evidenced in their practice. The quantitative data informed the qualitative data, which served to add rich detail about the ways and frequency with which teachers are using technology in their literacy instruction, verify their actual practices, and provide a link to their beliefs by uncovering the teachers' perspectives on their instructional use of technology.

## Survey Instrument

The survey instrument reflected the reviewed research on teachers' beliefs about technology and the integration of technology into classroom instruction. It was borrowed from previous research which similarly investigated the relationship between teachers' beliefs about technology and their instructional use of technology (Hudgins, 2008), although slight modifications were made in order to best address my particular research questions. Hudgins' instrument was designed specifically for her study and was developed from the *Teaching, Learning, and Computing Survey* (Becker & Anderson, 1998) and a Fast Response Survey System instrument (National Center for Education Statistics, 2001). Both of these instruments have been used in large surveys of computer use by teachers from kindergarten through high school since 1994 (Hudgins, 2008). The questions in Hudgins' survey were developed to target the factors that influence teachers' beliefs about their instructional use of technology and the relationship between that technology use and their beliefs.

It is important to note that the survey instrument was designed to gather information about the instructional use of technology in general, not limited to literacy instruction. While the survey items are applicable to literacy instruction, they are also applicable to other subject area instruction. Furthermore, although it could be argued that

all elementary teachers are literacy teachers of necessity, 14% of the respondents were specifically math teachers. However, the purpose of the survey was to gather baseline data on teachers' beliefs about instructional technology and their uses of technology in instruction which would serve to inform the primary qualitative data. The primary qualitative data specifically focused on literacy instruction.

The initial part of the survey was aimed at gathering teachers' background information such as the highest degree earned, number of years experience, number of years at current school, grade and subject taught, and the amount and type of technology staff development received. The survey was divided into two parts with the items based on a Likert scale. There were two open-ended questions at the end of the survey.

*Part I: Teachers' Beliefs and Classroom Practices* addresses all three research questions. *Part II: Technological Information* addressed Research Question 2 and Research Question 3. For more information on which research question is answered by each survey question, see Table 2. The last question in Part II (What do you think it looks like to integrate technology into literacy instruction?) was designed to specifically gather information on technology use in literacy instruction, to provide an understanding of teachers' conceptualizations of technology integration, and to provide a clearer understanding of Research Question 3 (In one elementary school with a technology-rich environment, how are teachers' beliefs related to their use of technology in literacy instruction?). I added this question to Hudgins' survey in light of the literature reviewed which suggests that many teachers have a narrow, incomplete understanding of technology integration (Hutchison, 2009; Yeo, 2007). It was analyzed using qualitative methods.

The survey for this study was borrowed from previous research (Hudgins, 2008) with only the minor modification of adding the last question. Hudgins developed her survey from two widely used national surveys and pilot tested it for accuracy, understandability, flow, and technical difficulties in order to increase its reliability. In addition, to ensure participants responded to the survey questions consistently, Hudgins (2008) checked data using Cronbach's alpha. Cronbach's alpha is a test designed to assess the consistency of results across items (Gay, Mills, & Airasian, 2006). Using all survey responses except those indicating participant background information, the result of Cronbach's alpha was .855, indicating strong internal consistency (Hudgins, 2008). Furthermore, all variables were found to positively contribute to the internal consistency of the instrument (Hudgins, 2008). For these reasons, it was researcher judgment that no further pilot testing was warranted. A copy of the survey instrument can be found in Appendix B.

## Qualitative Research Design

According to Tellis (1997), case study is often used to answer research questions that probe into how or why a phenomenon works or occurs. Specifically case study research is "the in-depth study of instances of a phenomenon in its natural context and from the perspective of the participants involved in the phenomenon" (Gall, Gall, & Borg, 2003, p. 436). Case study allows researchers to "study the experience of real cases operating in real situations" (Stake, 2006, p. 3).

In general case study research is conducted because of one of three reasons. These reasons include the desire to describe, explain, or evaluate a phenomenon (Gall et al., 2003; Tellis, 1997). Researchers often wish to describe a phenomenon in rich detail. In

other cases, researchers desire to provide an explanation for the phenomenon. The explanations expose patterns within the phenomenon, such as relational or observational patterns (Gall et al., 2003). When a researcher intends to evaluate the phenomenon, judgments are made based upon the data collected in order to identify themes in the study.

Case study research allows researchers to describe, understand, and explain bounded systems, situations or phenomena within real-world contexts (Tellis, 1997) through the intense study of specific single or multiple cases (Crotty, 1998; Gall et al. 2003; Merriam, 1998). A case study research design is particularly appropriate for the purpose of this study as I seek to understand and describe how teachers' beliefs about technology influence their literacy instruction. In addition, case studies are described as instrumental if they provide insight into the phenomenon under study (Stake, 2005). This design will allow me to use observations and in-depth interviews to provide a thick, rich description of participants' beliefs about technology use in literacy instruction and to gain insights (Glesne, 2006) into how those beliefs influence their literacy instruction. In this instance, three teachers will be selected and each, along with their classrooms, constitute a bounded system, or case.

Specifically, the research design for this investigation was a cross-case study. Cross-case involves the collection from more than one case and analysis that includes comparisons between the cases (Merriam, 1998). A cross-case design was appropriate for this study as it attempts to understand the influence of teacher beliefs regarding technology on literacy instruction across grade levels and the differing levels of individual teachers' technology integration by comparing cases that represent differing

levels of technology integration. This will enable me to gain a deeper understanding of teachers' beliefs regarding the use of technology in their literacy instruction and what role those beliefs played in their decisions to implement technology. Yin (2003) explained that an advantage of case study is that it affords an opportunity for the findings to be corroborated through repetition, while the contrasts between cases lead to a deep understanding of the phenomenon. Additionally, according to Merriam (1998), the inclusion of multiple cases strengthens the external validity of a study.

## Research Site

This investigation was conducted at an elementary school located in a small town in the southeastern region of the United States. The school, Glenn Valley Elementary (a pseudonym), has a population of 464 pre-kindergarten through fifth grade students who are economically, ethnically, and linguistically diverse. The population is approximately 71% White, 17% Black, 8% Hispanic, and 1% Asian. American Indian students make up slightly less than 1% of the population and less than 1% is multi-racial. Over 50% of the school's students qualify for free or reduced lunch which qualifies the school for federal Title I status. There are two pre-kindergarten teachers, one Title I teacher, one media specialist, and 23 kindergarten through fifth grade teachers. In addition, a certified art, music, physical education, exceptional children's teacher, and 21$^{st}$ Century Skills Facilitator provide part time services. The school is located in a low socioeconomic district with over 40% of its total population qualifying for free or reduced lunch. The district, which prides itself on maintaining the concept of small community schools, is comprised of ten K-8 schools, five K-5 schools, three 6-8 middle schools, and four 9-12

high schools. Both the school and district embrace a vision of technology integration with a goal of preparing its students for success in the twenty-first century.

The research site was chosen for several reasons. First, an elementary school was chosen because a national survey of teachers (USDE, 2003) determined that technology integration is more common in elementary classrooms than upper grade classrooms. Therefore, conducting research at an elementary school seems more likely to yield useful data about technology integration than in middle or secondary classrooms. In addition, the school was chosen because of the socioeconomic status and diversity of its student body. The review of literature suggests that low socioeconomic districts may struggle with funding and, therefore, access to technology, making technology integration more difficult than in districts of high socioeconomic status (Belfield, 2008; Leu et al., 2007; Miners & Pascopella, 2007; Rebell, 2005). In addition, low socioeconomic schools are more likely to have lower standardized test scores and feel pressured to commit their time to academic remediation and test preparation rather than activities involving technology (Leu et al., 2007; Miners & Pascopella, 2007). However, the district in which the research site is located in has a long history of dedication to technology integration. Still, it was deemed worthwhile to investigate the ways and the extent to which teachers in a low socioeconomic district are integrating technology and how their beliefs are reflected their use of technology.

One of the reasons that Glenn Valley Elementary was chosen as the research site for this study is that it is a technology-rich school. There are 77 desktop computers and 31 laptops in the 27 instructional classrooms. All are networked, connected to the Internet, and are equipped with compact disc players and burners; the laptops are

equipped with digital video disc players. There are also 12 laser printers, 36 inkjet printers, 27 flatbed scanners, 27 televisions, and 27 electronic whiteboards in classrooms. Each electronic whiteboard accesses the Internet through a laptop computer. In addition, there are two computer labs which house a total of 48 desktop computers,3 laser printers, an inkjet printer, an electronic whiteboard, 9 digital cameras that also make video clips, 20 GPS, and 25 iPods. There are also 10 computers in the school's media center that students can access. Overall, the student-to-computer ratio at Glenn Valley is 2.8:1. The national average is a 5:1 ratio (Collins & Halverson, 2009). Teachers also have access to video streaming and a wide selection of software and other applications. While access to technology does not guarantee technology integration (Steinberg & Kincheloe, 2004), the site's abundance of technology at least eliminates lack of access as a barrier to technology integration. Furthermore, lack of technology training for teachers is often cited as a major barrier to technology integration (Peck et al., 2002), especially in low socio-economic schools (Leu et al., 2007). Since the district requires each teacher to complete two credit hours of technology training per five year certificate renewal cycle and the research site offered 10 hours of technology training on site during the school year in which this study was conducted, it was more likely that a lack of training would not act as a barrier to technology integration at Glenn Valley Elementary.

Prior to conducting this research, I taught for 31 years at the research site. This experience has both advantages and disadvantages. It provided me with a personal knowledge of the school's rich technological resources. This insider knowledge allowed me to quickly establish a rapport and trust with the administration and staff at Glenn Valley. However, I realized that my long-term relationship with Glenn Valley

Elementary could influence my research in other ways. Acquaintance with the staff could affect some teachers' responses. For instance, teachers may limit the amount of detail given in the open-ended survey question or in the interviews because they assume I have prior knowledge. In addition, the familiarity with the research site could influence my analysis. Glesne (2006) warns researchers regarding the dangers of conducting "backyard research" (p. 31). However, it was my belief that with careful monitoring I could avoid this kind of researcher bias, and well-planned interview questions would elicit detailed description from participants. The benefits of access and cooperation from participants outweighed potential bias which was mitigated with careful analysis that included triangulation of data sources.

## Data Collection and Participants

After gaining permission to conduct the study from the superintendent and site principal, the survey was administered at the end of a school staff meeting. I arranged with the principal to be placed on the meeting agenda in advance. At the conclusion of the business portion of the meeting, I asked classroom teachers in kindergarten through fifth grade to remain. After a brief explanation of the purpose of the research study and survey instrument, the 23 certified classroom teachers of kindergarten through fifth grade were asked to volunteer to take the survey. They were informed of their rights as volunteer research participants and assured that their responses would be stored and treated with strict confidentiality. The 21 teachers who volunteered to take the survey were given a written invitation to participate and a consent form to sign along with the survey materials. After completing the survey, teachers handed in their informed consent and survey materials as they left.

Participants for the qualitative phase of this study were three individual teachers. Each teacher and her classroom constituted a case. The classroom was the bounded system (Tellis, 1997) within which each teacher planned and carried out literacy instruction. Participants were selected using a nonrandom, purposeful method, particularly appropriate for qualitative research studies (Merriam, 1998; Yin, 2003). According to Merriam, a purposeful selection of participants allows the kind of rich information to be gathered that fosters an in-depth study of research questions.

Following the collection of the survey data, surveys were sorted in order to select participants for the three case studies. Because teachers in grades three through five at Glenn Valley departmentalized their instruction, responses from teachers who did not teach reading were sorted out. Participants who were literacy teachers and who indicated their willingness to participate in a case study when they gave informed consent for participation in the survey were grouped for selection of the potential case study participants. Next the questions in the subsection designed to assess the frequency with which teachers integrate technology were compared in order to select participants reporting varying degrees of technology integration. One participant with a self-report of a frequent user, one moderate user, and one infrequent user of technology were selected.

After obtaining informed consent for participation in the gathering of qualitative data, data was collected through interviews and classroom observations of technology integration in literacy instruction. Each participant was interviewed in at least three in-depth, semi-structured interviews (Merriam, 1998) which lasted approximately 45 minutes. The semi-structured interviews focused on eliciting a detailed description of teacher beliefs regarding technology and how technology was utilized in daily literacy

instruction. One interview was conducted prior to the first observation of a classroom lesson and one interview was conducted after at least three classroom lessons were observed. The second interview protocol was written specifically for each teacher after the three lesson observations so that clarifying information could be obtained to provide the in-depth details and unique patterns of each case. This approach provided a foundation of common questions across interviews, while allowing participants some degree of control in guiding the individual discussions (Merriam, 2002). Each participant chose to be interviewed in a secluded room of the school. Interviews were audio taped to provide an accurate and verifiable record of the data. The interview protocol for the first interview can be found in Appendix C.

Although the primary source of qualitative data was the interviews, data was also collected through classroom observations of literacy instruction. Prior to the observations, a letter was sent home with each student in each participating case study classroom informing parents of the purpose of the observations and the purpose of the study. Observation times were coordinated with the participants in order to minimize intrusion and accommodate class schedules. Participants were to select lessons for observation that were representative of their typical technology use. Participants were briefed on what types of tools constitute the definition of technology for the current study prior to selecting the lessons for observation. Three observations were scheduled per participant unless the participant indicated that additional observations would give a clearer picture of their technology integration or a lesson to be observed spanned multiple days. Only one teacher requested that I observe more than the three required times. The frequent user of technology was observed five times to obtain a complete picture of the ways

technology was utilized in her literacy instruction. I recorded field notes using an observation guide developed for this purpose. The classroom observation protocol can be found in Appendix D. No student or adult identifying information was recorded on this form.

## Data Analysis

Descriptive statistics were used to organize, summarize, and display the numerical data gathered from the survey. The survey data was first used to facilitate the purposeful selection of the three case study participants, and later, to provide baseline data to inform the qualitative data. The last two open-ended questions on the survey were analyzed for themes or patterns, which were compared to emerging patterns from the interviews and observations.

After the recorded interviews were completed and transcribed, within-case analysis was utilized, followed by cross-case analysis. Eisenhardt (1989) states that this analysis combination is advantageous for several reasons. Within-case analysis allows the researcher to become intimate with each case, allowing its unique patterns to emerge while still maintaining the distinctive identity of each case. To this end, the interview data within each case was examined first in order to prepare a written description of the teachers' beliefs regarding technology and the description of their technology use in literacy instruction. The transcripts were hand coded for important statements and quotes relating to the research questions. Important quotes were also recorded for later use. Initial codes, their sources, and their meanings were recorded in a code book (see Table 3 for examples of initial codes). The transcripts were read recursively to identify or revise codes, identify emerging patterns and establish categories. See Table 4 for examples of

final categories and codes. The recursive reading served to ensure important data was not overlooked and to diminish potential bias caused by my status as an insider. According to Eisenhardt (1989), following this procedure facilitates the next step, cross-case analysis.

During cross-case analysis, Eisenhardt (1989) suggests using multiple strategies for examining data in order to avoid drawing conclusions that are false or premature; therefore, interview transcripts across cases were compared for significant commonalities and differences. Those similarities and differences were listed and searched for patterns, categories, and concepts (Eisenhardt, 1989). Afterward, categories were searched for within-group similarities and intergroup differences, as suggested by Eisenhardt (1989).

Although the primary source of qualitative data was the interviews, classroom observations were conducted in order to verify teachers' self-reported practices and for triangulation purposes. Field notes were taken during the observations of the participants' classroom literacy instruction. The field notes were analyzed and cross-checked with data from the interview transcripts and surveys in order to provide triangulation. Data were examined for patterns which were categorized. Cross-case analysis was utilized, during which I compared the important statements and categories of data from each case for similarities and differences. The same cross-case strategies described for analyzing the interview transcripts were also applied to the analysis of the observation field notes. I looked for patterns of data that occurred in both cases and for sources of differences when the data from each case was conflicting. See Table 5 for examples of similarities and differences that emerged in the case study teachers' beliefs regarding instructional technology use.

As cross-case analysis was conducted and data from the interviews, observations and surveys were merged, a constant comparative (Glaser & Strauss, 1967) approach was applied. A constant comparative approach allows data collection and analysis to be an ongoing process in which each informs the other. Emerging categories were connected by comparing incidents and categories from one data source with those from other sources. This enabled me to gain the deep understanding needed to address each research question.

## Trustworthiness

Several steps were planned to specifically contribute to the trustworthiness of the current study. The research design was carefully selected to best answer the research questions. The survey, borrowed from previous research and based on two widely used, valid, and reliable national surveys (Becker & Anderson, 1998; National Center for Education Statistics, 2001), was pilot tested for reliability and determined to have strong internal consistency (Hudgins, 2008). Multiple data sources, both quantitative and qualitative, were used in order to provide triangulation. The inclusion of classroom observation data also served to verify teachers' survey responses. Judson (2006) reminded researchers that there are often incongruences between teachers' self-reported and actual observed practices. Furthermore, the selection of multiple case studies improved the external validity of the study (Merriam, 1998). A combination of within-case and cross-case analyses allowed the cases to retain their unique identities while also increasing the chance that no false or premature conclusions were drawn (Eisenhardt, 1989). In addition, two cross-case search strategies were employed. According to Eisenhardt (1989), the use of multiple "…cross-case search tactics enhance the

probability that the investigators will capture the novel findings which may exist in the data" (p. 541). First I compared the interview transcripts across cases for significant commonalities and differences. Those similarities and differences were listed and searched for patterns, categories, and concepts. Afterward, categories were searched for within-group similarities and intergroup differences, as suggested by Eisenhardt (1989).

Member checks were utilized to ensure accuracy and as an additional source of triangulation to affirm and disconfirm my own interpretation of the data. Member checks were accomplished by conferring with participants and allowing them to check the analysis of the interview and observation data to see if they concurred with my interpretation of the data. Participants were encouraged to examine the final analysis of data and conclusions before the completion of the study.

## Ethical Considerations

The ethical consideration taken into account was the relationship between the researcher and the research participants to ensure that all participant information remained confidential. Only those associated with the study had access to the information that was collected. Furthermore, pseudonyms were used to ensure anonymity of the participants. All data was stored securely in the researcher's home files in both hard and soft (password protected) format. In order to facilitate participant's willingness to openly respond, participants were informed that all of their responses were confidential.

There is always the risk of researcher subjectivity influencing data analysis (Glesne, 2006). I, as both a researcher and educator, have an interest in the subject under investigation which may constitute bias. To reduce the influence of personal biases and subjectivity, I engaged in constant discussion, reflection, and data analysis. Additionally,

I consulted with members of the dissertation committee which worked to reduced bias and subjectivity.

## Researcher's Role

I received my undergraduate degree in elementary and intermediate education from Pfeiffer University and a Masters of Human Development and Learning from the University of North Carolina at Charlotte. I am certified to teach kindergarten through ninth grade, the academically gifted through grade twelve, and hold National Board certification as a middle childhood generalist. At the end of the 2008-09 school year, I retired from public school teaching after 31 years. As I finished the school year, I paused for reflection on the many changes that had taken place in my classroom over the last three decades. Over the years walls replaced open classrooms, novels replaced basal readers, and podcasts replaced hand-written book reports. Interactive, electronic boards replaced whiteboards which replaced chalkboards. The introduction of technological tools into my classroom was one of the biggest changes.

Today a glance across a classroom during composing time may reveal children sprawled on the floor pecking away at a personal laptop. During a social studies lesson students navigate the internet or email an expert for information for a project. After school, parents check a school website to listen to their child's latest podcast or check the day's homework.

At first, the computers and other technological tools introduced into my classroom were a novelty to the students and a source of dread for me. Students were eager to show one another, and their teacher as well, how to use the tools and what could be done with them. However, I soon realized that these tools had the potential to change the literacy

habits and practices of my students. I saw alliterate students who had no interest in participating in literacy events or practices suddenly begin to take an interest. These students began to read on the Internet, apply knowledge gained on the Internet, and compose with the use of a word processor.

Technology did not hook every student, however, and others stumbled when reading an Internet page. Some were overwhelmed by the amount of information on a page. Still, these experiences changed the way I view literacy and literacy instruction. I also wanted to learn more about digital literacies, how they fit with traditional literacies, and their place in the twenty-first century classroom. Technology did not hook every teacher either. Many of my colleagues resisted using technological tools, continuing to conduct business as was usual for the last few decades. Why some teachers did not share my enthusiasm for using technology intrigued me.

All of these experiences with technology over the last three decades fueled my desire to choose new literacies as a research topic. Admittedly, these experiences may also constitute a source of bias as a researcher. I enjoyed learning about new technologies and saw in them a potential to transform teaching and learning. I adamantly believe schools must prepare students to be literate in a global society where collaboration, communication, and literacy with new text types is non-negotiable. Though I understand from my past experiences such constraints as a lack of time, resources, and scheduling conflicts that hinder technology integration, I know I must strive to overcome biases stemming from my belief in the importance of fostering technological literacy in our young people.

# CHAPTER IV: SURVEY RESULTS

The purpose of this research was to gain a deeper understanding of teachers' beliefs about the role of technology in their literacy instruction in the context of one elementary school with a technology-rich environment and to explore the degree to which those teachers' beliefs were reflected in their actual literacy instruction. Three questions guided this study. In seeking to better understand literacy teachers' beliefs and practices regarding instructional technology in one elementary school with a technology-rich environment:

1. What are teachers' beliefs across grade levels regarding the role of technology in literacy instruction as measured by the *Technology Integration in the Classroom* survey?
2. How are teachers across grade levels using technology in literacy instruction?
3. How are the beliefs of three teachers of varying levels of technology integration reflected or not reflected in their practice as evidenced by interviews, observations, and the *Technology Integration in the Classroom* survey?

In order to fully answer the research questions, both quantitative and qualitative methods were employed. A teacher survey was designed to obtain both quantitative and qualitative data and was conducted first in order to provide baseline data on teachers' beliefs regarding the use of technology in literacy instruction and inform the qualitative

data gained through the case studies. Together the survey data and data from the case studies provided in-depth details regarding the teachers' beliefs about the roles technology played in their literacy instruction, the ways they used instructional technology, and the ways their beliefs were reflected in their instruction. I first offer a preview of the findings of this study to enable the reader in constructing a mental map to refer to while reading Chapters IV through VIII. Chapter IV presents the survey results, organized with the quantitative results first, followed by the findings of the open-ended survey questions. Chapter V details the case study findings, and Chapter VI presents the cross-case analysis. The final chapter offers a discussion of the data as well as implications for education and future research.

## A Preview of the Findings

Analysis of both the quantitative and qualitative data yielded important patterns in the answers to the questions that guided this research. Those patterns are previewed by research question topic.

### Teachers' Beliefs Regarding the Role of Technology in Literacy Instruction

The case study participants believed that technology played several roles in their literacy instruction. Technology enabled teachers to enact their pre-existing pedagogical beliefs. Technology served as a manager of classroom behavior and as a tool to make classroom instruction more efficient. Teachers also used technology to make their literacy instruction more effective.

### Ways Teachers Used Technology in Their Instruction

Teachers used the computer, the Internet, and the interactive whiteboard most often in their instruction. Literacy teachers used these technologies in a variety of ways to

accomplish primarily traditional literacy tasks rather than to advance new literacy skills. The interactive whiteboard was used to access the Internet and to display traditional texts so that students could use the interactive tools to highlight, underline, or otherwise manipulate the texts.

The computer allowed children to play educational games and to access software, such as Powerpoint and tutorials designed to raise standardized test scores. The Internet enabled students to gather pictures to build background knowledge, to gather information for projects, and to access reading materials. Students also visited interactive websites frequently to reinforce literacy skills.

### Ways Teachers' Beliefs Were Reflected in Their Actual Practice

Based upon the survey results, teachers' conceptualizations of technology integration were generally narrow and incomplete. The majority of teachers, including one of the case study participants, defined technology integration in terms of activities that students completed with the use of technology. Several patterns emerged from the findings regarding the case study teachers' actual practice. Teachers' actual practice generally reflected their conceptualization of technology integration. In most cases their actual practice also reflected their pedagogical beliefs. A variety of factors influenced the frequency and ways in which teachers integrated technology into their instruction. Those factors included teachers' attitudes towards technology, their pedagogical beliefs, perceived administrative support, and the amounts and types of technology training they had received. In addition, all teachers reported barriers to their technology integration.

## Quantitative Survey Results

Only kindergarten through fifth grade classroom teachers were invited to participate in the study, and 91.3% of them accepted the invitation. Twenty-one teachers of the 23 eligible teachers at technology-rich Glenn Valley Elementary participated in the survey. Descriptive statistics were used to calculate the frequency and percentages of responses. The percentage scores for the items in both parts of the survey can be found in Table 6. The two-part survey, *Technology Integration in the Classroom*, was designed to address all three research questions. Therefore, I organize this section in terms of the general topics of the research questions. As explained in Chapter III, the survey items are applicable to all subject areas and, consequently, yield data on teachers' general beliefs about and use of instructional technology. Furthermore, although it can be argued that all elementary teachers are by necessity literacy teachers and trained as such, 14% of the survey respondents were primarily math teachers. First, teachers' beliefs regarding the role of technology in instruction are reported (Research Question 1), followed by the ways teachers used technology in instruction (Research Question 2). I then present what the survey reveals about the ways teachers' beliefs about the role of technology in instruction were reflected in their reported practice (Research Question 3). Finally, the survey results are summarized.

Teachers' Beliefs Regarding the Role of Technology in Instruction

Glenn Valley teachers participating in the survey appeared to have a positive attitude toward the instructional use of technology. Teachers unanimously reported that they desired to use technology in the classroom, and a large majority (85.7%) disagreed that using more technology resulted in more work for them. Furthermore, the majority of

the teachers surveyed (71.14%) indicated that they did not feel that technology changes too rapidly to properly implement in instruction.

Teachers responding to this survey expressed strong beliefs about technological literacy. All agreed that it is important for students become literate with a variety of digital technologies and to develop skills in using computers to analyze and present ideas. Furthermore, 66.7% strongly agreed with these ideas.

Teachers who take a constructivist perspective toward instruction tend to employ a more student-centered approach than teachers who take a traditional approach to instruction (Bransford et al., 2004; Fosnot & Perry, 2005; Kottalil, 2009). In student-centered classrooms, students take a more active role in learning. They may be involved in collaborative activities, projects, or cooperative learning rather than traditional teacher-directed lectures and skill-based activities. Teachers whose pedagogical beliefs include a more student-centered, collaborative, constructivist approach to teaching are more likely to integrate computers and other ICTs into their instruction (Judson, 2006; Totter et al., 2008). Therefore, participants were surveyed regarding their pedagogical beliefs. The survey responses revealed that the teachers were somewhat divided in their pedagogical beliefs, with both student-centered and teacher-centered beliefs being reported. Over two thirds (71.4%) of the teachers surveyed believed that their students learn content best when the teacher goes over the material in a structured way and agree it is their job to explain how to do the work and to assign specific practice. Yet, 57.1% of the teachers agreed and 28.6% strongly agreed that they view their role in the classroom as a facilitator and try to provide opportunities and resources for students to discover or construct concepts for themselves. Although all the teachers reported believing that they

have a lot of subject knowledge to share with students, the majority of them disagreed (57.1% disagreed and 4.8% strongly disagreed) that their job is to teach content using facts and textbooks. Other responses indicated that some student-centered pedagogical beliefs permeated the faculty. All teachers surveyed believed that it is a good idea to have all sorts of activities going on in the classroom, and 80.9% reported that group projects are a good way for students to learn. Furthermore, 66.7% of the teachers did not believe that it is important to give the whole class the same assignment or that assignments must be brief or match the class schedule.

Regardless of whether the participating teachers leaned toward a more teacher-centered or student-centered instructional environment, most agreed (57.1% agreed and 23.8% strongly agreed) that technology has affected their beliefs about teaching. The teachers taking part in this survey unanimously believed that technology can change the way content material is taught. Furthermore, they believed that computer technology and ICTs have the potential to impact instruction (61.9% strongly agree and 28.6% agree) and maximize student learning.

Survey responses seemed to indicate some disparity in teachers' comfort level concerning the use of technology. Slightly more than half (57.1%) indicated that they felt comfortable in operating tools such as scanners, iPods, and digital cameras. The majority of teachers reported feeling comfortable using computer hardware and software applications within the classroom. In fact, 57.1% agreed and 33.3% strongly agreed that they are comfortable using hardware and software applications in their subject area. Teachers reported the highest comfort level with using a word processor and the Internet, with only 4.8% of the teachers indicating that they did not feel comfortable with using

these two tools. Additionally, 42.9% agreed and 47.6% strongly agreed that they were comfortable using the Internet to facilitate student projects.

Teachers were surveyed regarding their comfort level with the use of telecommunications in instruction. Telecommunications refers to technological devices and applications, such as the Internet, cellular phones, satellite television, email, or video-conferencing, which allow the sending of messages through any combination of video, print, or voice signals (United States Department of Labor, 2009). Teachers reported less comfort with incorporating telecommunications in instruction to collaborate, publish, and interact with peers, experts, and other audiences such as schools or classrooms outside the district. More than half (57.2%) indicated feeling uncomfortable with these types of collaborative activities. Although most teachers reported being comfortable using the Internet, word processors, and digital tools, 19% reported that they did not understand terms such as media, multimedia, and hypermedia. However, the vast majority of teachers (80.9%) were comfortable with their ability to learn new technology.

Technology training appeared to be important to the school and the district. The district required each teacher to participate in 20 hours, or two credit hours, of technology training per five year licensure renewal cycle. To help teachers with this, the district and the school both offered periodic, optional technology professional development, much of which was based on teachers' reported needs and requests. Glenn Valley had already offered 10 hours of on-site technology training for the current year at the time that I began collecting data there in the spring. Every teacher surveyed had taken advantage of training in the use of technology offered either by the school or district during their current licensure renewal cycle of five years. A mean of 15.3 hours of technology

training was reported by the participating teachers. The amount of training reported by each teacher varied; 28.6% reported participating in more than 20 hours of technology staff development, 42.9% received 10-20 hours, and 28.6% received less than 10 hours of training. Of those teachers with less than 10 hours of training, a third of them had been teaching at Glenn Valley for five or fewer years. Additionally, it is important to note that every teacher was not at the same point during their five year licensure renewal cycle, accounting for some of the disparities in the number of technology hours reported.

Most teachers believed that their school (90.5%) and district (100%) were committed to technology integration. Most teachers (76.2%) also believed that their school provided enough opportunities for technology integration. Approximately 38% indicated that they are not satisfied with their use of technology in the classroom; however, the majority of teachers indicated that they enjoyed learning about new technologies and would welcome more opportunities to implement technology in instruction.

Ways Teachers Used Technology in Instruction

The technology used most often in instruction among teachers in this survey was the interactive whiteboard, with 100% of the participants reporting using it frequently in instruction. Interactive whiteboards allow users to write on the surface with a special stylus and are equipped with built in programs that allow users to manipulate text and graphics. In addition, the whiteboard is connected to a computer and projector so that anything that can be seen or done on the computer can also be seen or done on the whiteboard. All classrooms at Glenn Valley were outfitted with interactive whiteboards, laptop computers, scanners, and projectors. The laptop computers were also equipped

with CD-ROM (compact disc read-only memory), DVD (digital video disc) players and speakers. The interactive whiteboard was used in a variety of ways. At times it merely served as a writing surface much like a traditional whiteboard surface; at other times its tools were used to allow students to interact with text. The scanners and the Internet allowed teachers to import graphics and text for students to use on the interactive whiteboard.

Computers were the most widely used type of technology according to the survey responses. Most of the teachers reported using computers for administrative purposes or to indirectly support instruction through planning or gathering materials and information to enhance lessons. Teachers unanimously reported using computers to write lesson plans or other notes, make handouts for students, and gather information or pictures from the Internet for lessons. The majority of teachers (71.4%) used computers to record or calculate grades and to correspond with students, parents (100%) or other staff members (100%).

All of the surveyed teachers used computers during their instruction. The majority (81%) reported using computers frequently in instruction and 19 % indicated moderate instructional use of computers. The computer was used most often to access the Internet. All teachers accessed the Internet to gather pictures; 42.9% did so frequently, 42.9% moderately, and 14.2% reported sometimes gathering pictures for use in instruction. Well over half the teachers (66.7%) indicated that their students played online instructional games frequently, while online games were used a moderate amount by 9.5% and a small amount by 19% of the teachers. Most teachers (47.6% frequently, 28.6% moderately, and 9.5% a small amount) used the Internet to conduct information searches for instructional

purposes. Similarly, most teachers (47.6 % frequently, 19% moderately, and 28.6% a small amount) reported having students use the Internet to locate, evaluate, and collect information from a variety of sources. The majority of teachers had their students use the Internet in preparing individual and group projects at least occasionally. Many teachers also had their students read books or stories online (42.9% frequently, 9.5 % moderately, and 23.8% a small amount). The Internet was used least for publishing information on a wiki or blog (9%) and collaborating online with students from other classes (23.8%).

The survey respondents used several computer software tools in their instruction. All teachers indicated that they used word processors during instruction, with 76.2% using word processors frequently and 19% using them sometimes. Nearly two thirds (61.9%) frequently used computer games for practicing skills such as phonics, vocabulary, or decoding. Only 4.8% of the respondents did not make computer games part of their typical instruction. Graphics-oriented printing programs, such as Desktop Publisher, were utilized by 90.5% of the teachers, and more than two thirds (71.4%) of the teachers also used spreadsheets or database programs at least a small amount during instruction.

PowerPoint, a presentation software, was used in instruction at Glenn Valley; however, there were some discrepancies in the reporting. All teachers responded that they used computers to create student presentations, but 9.5% indicated that they never used presentation software for instructional purposes. It is possible that when responding to the two items about presentations, some teachers were referring to teacher-created instructional presentations for one response and student-created presentations in the other response. It may also be possible that some teachers did not understand the term,

presentation software. Regardless, 66.7% of the teachers reported that they sometimes used computers to create student presentations and a third of the teachers did so often.

The teachers surveyed at Glenn Valley also used other ICTs. Digital cameras were employed frequently for instruction (9.5%), while 23.8% reported moderate use and 47.6% used digital cameras only a small amount. Only 23.8% of the teachers surveyed incorporated iPods into instruction, but they used those iPods only a small amount. Approximately half (52.3%) of the teachers had their students use GPS; none used them frequently. Each classroom teacher was supplied with a scanner at the time his or her interactive whiteboard was installed; however 14.3% of the surveyed teachers never used the scanner. The scanner was utilized in instruction frequently by 23.8% and moderately by 38.1%. Finally, a camcorder received a small amount of instructional use by 47.6% of the teachers.

Ways Teachers' Beliefs Were Reflected in Their Actual Practice

Teachers responding to this survey expressed strong beliefs about technological literacy. All of the teachers agreed that it is important that students become literate with a variety of digital technologies. These beliefs were reflected in the teachers' self-reported practice as they employed a variety of digital technologies in instruction at one time or another. ICTs, such as iPods, digital cameras, and GPS units were a part of instruction at least a small amount. All teachers used computers in their typical instruction, with 81% using them frequently. Approximately half of the participating teachers incorporated the Internet, email, word processors, interactive whiteboards, computer games, and online games into their instruction frequently. The Internet was reportedly used for a variety of purposes, such as gathering pictures for lessons, reading stories, IM, and gathering

information. In short, a variety of digital technologies was incorporated into instruction on a frequent basis. It is possible that this is reflective of teachers' beliefs about instructional technology, that it does not change too rapidly to properly implement in the classroom, that it has the potential to impact instruction and maximize student learning, and that it is important for students to become literate with a variety of digital technologies.

The comfort level felt by teachers at Glenn Valley seemed to be reflected in the frequency with which teachers used digital tools. The overwhelming majority of teachers agreed or strongly agreed that they were comfortable using word processors, hardware and software applications and the Internet. All teachers integrated computers into their instruction, most using word processors, the Internet, and various hardware and software frequently with their students. A high percentage of teachers (90.5%) indicated that they were comfortable using the Internet to facilitate student projects which 80.9% believed are a good way for students to learn, and 85.7% of the teachers reported that they followed through by having students use computers to create multimedia projects. While more than 90% of the surveyed teachers felt comfortable with computer hardware and software, the Internet, and word processors, only slightly more than half the teachers reported being comfortable operating other ICTs such as camcorders, digital cameras, GPS, and iPods. The rates of usage for these ICTs were not as high as for the Internet and other computer applications. In particular, the iPods were used only a small amount; the majority (76.2%) never integrated iPods into instruction. Similarly, less than half the participating teachers considered themselves comfortable with using telecommunications in instruction to collaborate, publish, and interact with peers, experts, and other

audiences, and the use of these types of tools was lower than the previously discussed digital tools. For example, well over half the teachers never used multimedia authoring tools, and more than two thirds never used digital technology to collaborate with audiences outside their classroom.

The majority of teachers felt that group projects are a good way for students to learn, and every teacher surveyed believed that it is important for students to develop skills in using computers to analyze and present ideas. Two thirds of the respondents agreed strongly that students should learn to use computers to analyze and present ideas. These beliefs were evidenced in their self-reported practice. For example, 47.6% of the teachers had students use the Internet to locate, evaluate, and collect information from a variety of sources, consistent with the 61.9% that did not believe that their job was to teach content using facts and textbooks. Furthermore, students were allowed to use computers to create multimedia reports or projects in 85.7% of the participating teachers' classrooms. These practices reflect the beliefs of the 85.7% who view their role as a facilitator who provides opportunities and resources for students to discover or construct concepts themselves.

### Summary of the Quantitative Survey Results

The 21 teachers at Glenn Valley who participated in the survey had a positive view of technology and its role in instruction, with the majority believing that technology had not only affected their beliefs about teaching, but also had the ability to impact instruction and maximize student learning. Additionally, the majority of the teachers felt that it is important for their students to develop technological literacy.

The teachers' beliefs about technology were reflected in their self-reported practice. A number of technology tools were reportedly used to varying degrees in their instruction. The interactive whiteboard, computers, the Internet, and word processors received the most use. Other ICTs such as iPods, digital cameras, and GPS units were used less often. The majority of teachers reported a high comfort level with using these tools; however few were comfortable using telecommunications or multimedia authoring tools to collaborate, publish, and interact with peers, experts, and other audiences. These tools, consequently, received little use in instruction.

The majority of participating teachers felt that both their school and district were committed to technology and technology integration. Both the school and district offered ongoing technology training designed to assist teachers in using technology and to meet the two continuing education units required by the district for licensure renewal and continued employment. Teachers reported having earned a mean of 15.3 hours of technology training so far in their licensure renewal cycle.

The quantitative data from the survey was useful in that it provided insight into the participants' beliefs about pedagogy and technology. Specifically, the survey results gave insight into teachers' background knowledge and comfort level with technology tools and applications, as well as their general attitude toward technology and technology integration. In addition, the quantitative survey data helped to paint a broad picture of teachers' beliefs regarding the role of technology in their instruction, including literacy instruction.

The survey concluded with two open-ended questions. The qualitative data gleaned from these questions yielded a more in-depth portrait of the teachers' beliefs

about and perceptions of what it means to integrate technology. These findings are discussed in the following section.

## Findings from the Open-ended Questions

The last two questions on the survey were open-ended and were analyzed using thematic analysis. The two questions were as follows:

- Do you use computers or technology for any other activities not listed above? If so, explain.
- What do you think it looks like to integrate technology into literacy instruction?

Since I administered the survey first in order to gain data that would inform the qualitative data gathered from case studies, I organize this section with the findings of the open-ended survey questions first, followed by a summary of those findings and how they will inform the case study findings, which are presented in the next chapter.

Designed to gain a richer picture of the ways participants used technology in their instruction, the first of the open-ended questions (Do you use computers or technology for any other activities not listed above? If so, explain.) did not provide additional information regarding teachers' use of technology. There were no answers to this question on the survey.

The last question (What do you think it looks like to integrate technology into literacy instruction?) served two purposes. First, it provided a clearer understanding of Research Question 3 (In one elementary school with a technology-rich environment, how are teachers' beliefs reflected in their actual literacy instruction?). It also provided deeper insight into teachers' conceptualizations of technology integration. I felt that it was important to gain a clearer picture of teachers' ideas about what it means to integrate

technology in light of the literature reviewed which suggests that many teachers have a narrow, incomplete understanding of technology integration (Hutchison, 2009; Yeo, 2007).

Thematic analysis was applied to the answers for the question about teachers' perceptions of technology integration; however, 23.8% of the respondents did not answer this question. It is unclear why these respondents omitted the questions. Possible reasons are that they were unsure of how to phrase an answer, unsure of what was meant by technology integration, or did not answer because they were not specifically literacy teachers. Furthermore, 14.3% specifically stated that they were either not sure or did not know what was meant by technology integration. The remaining 13 responses revealed that participants held a wide range of perceptions about what technology integration looks like in literacy instruction. Two of the respondents indicated that technology integration involved students using technology to analyze and compare information. Despite the small number of responses that provided some description of technology integration, they were examined for important patterns and themes; however, caution was warranted in the interpretation due to the low number of responses. The three themes that emerged indicate that participating teachers at Glenn Valley believe technology integration in literacy instruction consists of a) students completing activities with technology, b) using the Internet as a source of reading material, and c) small groups of students working collaboratively to use multimedia in order to create and share projects that reflect content and literacy skills.

A theme to emerge from the answers to the final survey question was that technology integration consists of students completing activities with technology. Over

half (56.3%) of the participants responded to this question by giving an example of an activity other than reading which involved the use of technology. Examples given included activities such as playing games online, watching videos, or using the interactive whiteboard.

A second theme to emerge was the perception that technology integration is using the Internet as a source of reading material. A third (33.3%) of the responses stated that technology integration includes using the Internet to read for pleasure, for a class assignment, or for information. One of those responses specified that the Internet reading should include self-selected reading.

The third theme to emerge was that technology integration involves small groups of students working collaboratively to use multimedia to create and share projects that reflect content and literacy skills. This view was shared by 14.3% of the participants. Among those sharing this idea of technology integration were the two respondents who indicated that it should include students' use of technology to compare and analyze information.

## Synthesis of the Survey Findings

Through the quantitative portion of the survey, I gained a basic understanding of the participating teachers' beliefs about technology and pedagogy. Teachers' attitudes towards instructional technology were favorable; they believed that technology has the potential to maximize instruction. They also felt that it is important for their students to develop technological literacy. In addition, teachers indicated that they enjoyed learning about new technologies and would welcome more opportunities to integrate it into their curricula.

Teachers held a mix of student-centered and teacher-centered pedagogical beliefs. The majority of the teachers surveyed believed that their students learn content best when the teacher goes over the material in a structured way and agreed it is their job to explain how to do the work and to assign specific practice. Yet, many saw their role in the classroom as that of a facilitator whose job is to provide opportunities and resources for students to discover or construct concepts for themselves. Most disagreed that their job is to teach content using facts and textbooks.

While research reveals that it is not uncommon for teachers to hold both student-centered and teacher-centered pedagogical beliefs simultaneously (Pajares, 1992; Palak & Walls, 2009), the fact that both types of beliefs coexisted for the participating teachers is noteworthy when investigating their use of technology. Instruction which reflects student-centered beliefs has been linked with a greater likelihood of integrating technology into instruction (Judson, 2006; Totter, Stutz, & Grote, 2006). Indeed, the survey painted a portrait of teachers who were comfortable using a variety of digital technologies in their instruction, several of which were used on a frequent basis. The computer, Internet, and the interactive whiteboard were reportedly used daily in instruction. However, several factors potentially contributed to the teachers' frequent integration of technology, including their student-centered pedagogical beliefs, their beliefs in the ability of technology to positively impact student learning, and their belief in the importance of developing students' technological literacy.

Other factors which possibly influenced the frequency of technology integration at Glenn Valley were teachers' comfort level with technology tools and the perception that their school and district were committed to technology integration. Participating

teachers reported a high level of comfort using many types of technology. Teachers were most comfortable with the tools they integrated most frequently, the computer, the Internet, and the interactive whiteboard. Most felt uncomfortable using telecommunications in instruction and, therefore, rarely used telecommunications devices in their instruction. Teachers' comfort level with technology may have been due to the amount of training in which they had participated. Respondents reported a mean of 15.3 hours of training in the use of instructional technology during their current licensure renewal cycle. The majority of the training was provided either onsite or within the district. The district required teachers to engage in 20 hours of technology training per renewal cycle. This requirement and the fact that teachers believed that the school and district gave them ample opportunity to integrate technology, may explain why teachers felt that their school and district were committed to technology integration.

The purpose of the open ended survey questions was to provide a broad understanding of how participating teachers at Glenn Valley conceptualized technology integration and to shed further light on the participants' use of and beliefs about technology. While teachers did not share further information regarding their beliefs about technology or their uses of instructional technology, important details on their ideas about what it means to integrate technology emerged. Overall, participants' descriptions of technology integrate were vague; most were lists of activities in which students might use technology.

It is important to note that 23.8% of the participants did not respond to the question asking about their conceptualization of technology integration. Furthermore, 14.3% indicated that they either did not know or were unsure what is meant by

technology integration. Of the remaining responses, there was variability in teachers' perceptions of what technology integration looks like within the context of classroom instruction. Descriptions of technology integration ranged from vague descriptions of classroom activities that involved the use of technology tools to detailed, well-articulated visions of how technology should fit within the scope of students' academic development. The majority of the descriptions of technology integration were lists of activities students might do with technology, such as play computer games or read on the Internet, rather than descriptions. It is unclear whether these respondents misunderstood the question or whether their understanding of technology integration was limited to a vision of students using technology to complete activities. Two teachers indicated that technology integration should include students' use of technology to compare and analyze information. These two teachers were among the 14.3% who described technology integration as small groups of students working collaboratively to use multimedia to create and share projects that reflect content and literacy skills. In short, only 14.3% of the responses could be described as comprehensive descriptions of technology's actual role in instruction. In contrast to the descriptions that were limited to a list of activities that students might do with technology, the latter description reveals a belief that technology provides a vehicle by which students apply literacy skills in a socially mediated context. Furthermore, the descriptions provided by 14.3% of the participants are most in alignment with the definition of technology integration used for this study.

In summary, the responses to the open-ended question were analyzed thematically, with three themes emerging. The three themes that emerged indicate that

participating teachers at Glenn Valley believe technology integration in literacy instruction consists of a) students completing activities with technology, b) using the Internet as a source of reading material, and c) small groups of students working collaboratively to use multimedia in order to create and share projects that reflect content and literacy skills. Considering these themes with the 23.8% who did not answer the question and the 14.3% who either did not know or were unsure what is meant by technology integration, I cautiously interpreted these findings as suggesting that the faculty in general may lack a well-defined conceptual definition of technology integration. I felt caution was warranted due to the fact that the themes emerged from 13 responses, or 61.9% of those participating in the survey and the uncertainness surrounding the answers of those who listed activities rather than providing a description of technology integration. Additionally, a failure to respond to the question does not necessarily mean that the respondent did not understand what it means to integrate technology. Still, the ambiguity in the responses implies the lack of a clearly defined vision of technology integration on the part of the participants as a whole. This knowledge guided the design of interview questions used to probe into the case study participants' conceptualizations of technology integration so that a clearer and more in-depth picture of their views of technology integration could emerge.

While the open-ended portion of the survey provided a general picture of teachers' conceptualization of technology integration, the case studies provided a deeper look at how three teachers of various grade levels perceived technology integration and their beliefs about its role in their literacy instruction. The case study findings, which are

reported in the next chapter, afforded a deep understanding and elaboration of the general picture provided by the survey.

# CHAPTER V: CASE STUDY FINDINGS

The survey revealed that the majority of the Glenn Valley teachers participating in this study held positive attitudes towards technology and technology integration and believed that it is important for students to develop technological literacy. The majority of teachers also reported using technology in their instruction to some degree. However, the open-ended questions on the survey disclosed that most teachers had a vague, ill-defined notion of technology integration. The data gained from the survey provided a general overview of participants' use of and beliefs about instructional technology, as well as their understanding of what it means to integrate technology in instruction. Case studies followed the administering of the survey to shed further light on the data gleaned from the survey and to provide a detailed picture of three teachers' beliefs about and use of instructional technology.

Case studies were planned in order to yield the detailed description necessary for a deep understanding of the participants' conceptualizations of technology integration, its role in their literacy instruction, and the extent to which their beliefs about technology were reflected in their actual practice. To that end, three literacy teachers were purposefully selected to participate as cases based upon their responses to the survey and willingness to participate. The primary criterion for selection was frequency of instructional technology use. Secondary criteria for selection included the number of years of experience, grade level taught, and gender. Gender was a consideration only so

far as yielding participants who were as closely matched as possible. After analyzing the survey data, I sorted the responses according to the teachers' frequency of instructional technology use. There were three teachers who frequently used instructional technology and also indicated their willingness to participate in a case study. One was a female first grade teacher just finishing her first year of teaching. One was a female kindergarten teacher with 14 years of experience, and one was a male fourth grade teacher with 12 years of experience. There were two moderate users of technology willing to participate in the study. One was a female second year teacher; the other was also female and had seven years of experience. There was one female fifth grade teacher with 11 years of experience who reported infrequent use of technology in instruction and a willingness to participate. I began by selecting the infrequent user of technology. Next, I selected the third grade teacher as the moderate user of technology based upon the fact that her experience level was closer to that of the infrequent user of technology. Since the purpose of this study was to examine teachers' beliefs about and use of instructional technology across grade levels, I selected the kindergarten teacher to be the final participant. This participant matched the other two in gender, was similar in number of years of experience, and provided the greatest range of variation in grade level taught. Table 7 summarizes participant demographics, including their level of technology use and the primary technology tools used by each teacher.

The case study participants represent one frequent user of technology in literacy instruction, one moderate user, and one teacher who self-reported only a small amount of technology integration. The three cases represented the range of grade levels found at Glenn Valley, with the cases being one kindergarten teacher, one third grade teacher, and

one fifth grade teacher. I first used within-case analysis to allow the unique identity of each case, as well as important patterns, to emerge, followed by a cross-case analysis. I present the findings of the within-case analyses in this chapter. The results of the cross-case analysis, which identify significant similarities and differences across the three cases, are presented in Chapter VI. All names used are pseudonyms.

Because the qualitative methods used in this portion of the study were designed to answer all of the research questions, I organize the findings in terms of the topics of the research question just as I did for the survey results. Therefore, for each case study, I present the teachers' beliefs regarding the role of technology in literacy instruction (Research Question 1), the ways the teacher used technology in instruction (Research Question 2), followed by the ways the teachers' beliefs about technology are reflected in actual practice (Research Question 3).

## Case 1: Kathy, A Frequent User of Technology

Kathy, a frequent user of instructional technology, was a veteran kindergarten teacher with 14 years of experience in teaching children to read. She taught all subjects to her self-contained class, but the first half of her instructional day was devoted to literacy instruction. Kathy perceived literacy to be a very broad and complex concept. To Kathy, literacy meant:

> …every little thing that you do to teach a child to read and to understand what they read. You know, the goal of reading is to understand what you read, comprehension. And so, everything that you do, whether it's decoding, fluency, letters, sounds, rhyming, any of that... all of that comes together so a child learns to read the word. They learn the letters. They learn the words. They learn what the

words mean, and they put the meaning together to come up with their own ideas about what a story is about.

Literacy, according to Kathy, is how an individual perceives a story or passage, what it means to them, and how they connect with it on a personal level.

Although Kathy acknowledged other parts of reading, such as phonemic awareness and fluency, she used the terms of literacy and comprehension almost synonymously. When asked specifically about comprehension, Kathy stressed the importance of understanding and making personal connections with the text. The literacy assessments Kathy's district required on each kindergarten through second grade child measured comprehension through the student's ability to accurately retell a story. The advantages Kathy saw of the story retell were that she could determine whether a student understood the story and where misunderstandings occurred so that she could customize instruction according to the students' needs.

Kathy's Beliefs Regarding the Role of Technology in Literacy Instruction

Kathy exhibited a positive attitude toward technology and technology integration and did not believe that using instructional technology added to her work load. Kathy's survey responses indicated that she enjoyed learning about new technologies and would welcome more opportunities to incorporate technology in her literacy instruction. Kathy had strong beliefs about how technology had impacted her own teaching and her beliefs about teaching. These beliefs will be explored in depth later in a discussion of the ways Kathy used technology in instruction.

Kathy was exuberant when speaking of how she believed her students benefitted from using technology and constantly brainstormed new ways she might use technology in the future.

To Kathy, technology integration meant small groups of students interacting with "multimedia devices…to reflect what they are learning." When asked to describe what technology integration looks like in a classroom, she stated

> To me, you would see kids using an ActivSlate [a handheld remote device that allows a student to write on or operate an interactive whiteboard] to work on the ActivBoard [interactive whiteboard]…just a couple of them together…or a lesson being presented, and you would see whatever we're talking about on the ActivBoard. You would see a child online working with a skill. You would see kids with the iPods, listening to a story with a book in their hands. You would see projects being done….kids… making a podcast. You would see kids with laptops; you would see kids huddled together working on something. You would probably see digital cameras, kids working on projects, a puppet show, or a video.

In short, Kathy believed that instruction involving technology would be project-based, with student collaboration, rather than having students use games and software for drill and practice. However, Kathy did acknowledge that drill and practice applications have their place in literacy instruction and were used in her classroom.

Kathy firmly believed that technology must be given a place in education and that it is important to foster students' technological literacy. "Technology is so much a part of what education is now. If you're not using it, you're behind… I think it's very important [for students to be technologically literate]. I mean, if we're in the twenty-first century,

they'd [students] better know how to use it [technology]." In addition, she believed that teachers have a responsibility to teach children not only how to use technology tools, but how to apply those tools in various situations as well. Kathy admitted that while technology was not the most important thing in her literacy instruction, she felt that technology "definitely has its place" in literacy instruction "…and it definitely makes a difference in children." In other words, Kathy assigned important roles to technology in her literacy instruction.

The role that technology played in Kathy's literacy instruction was that of an "added tool" in "presenting a lesson." When planning, Kathy took into account several factors when deciding whether or not to incorporate technology in a particular lesson. She considered how well the technology would facilitate the teaching of the lesson objectives, whether or not the use of the technology would increase student motivation, and how well it would capture and hold students' interest. According to Kathy, she considered whether the use of the technology would accomplish the lesson goals better than she could with other means. In short, Kathy used instructional technology to manage both instruction and student behavior and to accomplish her curricular goals in the most effective manner.

Kathy believed there were many benefits of technology integration, which she attributed to the interactive nature of the technological tools used in her lessons. Some of those benefits were cognitive in nature. For example, Kathy believed that when students used technology their retention of content was higher. She saw evidence in her instruction that using technology helped students connect with what they were reading, build their vocabulary and background knowledge, and improve their reading comprehension. Kathy

explained that when using technology, her students discussed what they were learning with one another, something that she believed they were less likely to do in a traditional, teacher-led lesson. In addition, Kathy thought that technology aided students in internalizing content and skills. In fact, during the first interview, she stated that using technology seemed to help students "internalize it [content] much more than [using] paper and pencil." According to Kathy, her students were "more, more, way more engaged" with reading when using technology and was adamant that students' motivation and interest levels were vastly heightened when technology was integrated into lessons. As a consequence of the cognitive benefits she saw, Kathy believed that technology made her instruction more efficient and effective by enabling students to learn more than she alone could teach them within the timeframe of a lesson. Furthermore, Kathy reported that students appeared to maintain a higher level of time on task.

Kathy recounted a literacy project her students had completed to exemplify the benefits of integrating technology. The project was completed to prepare students for an upcoming field trip to the zoo.

> …the kids choose an animal that we're going to see in the African department of the zoo and they have to do a research project. They have to find out where they [the animals] live, what they eat, and their predators, if they're born in an egg or if they have a live birth. You know, any kind of interesting facts about them...I could never teach them all that information, but they can find it out on their own. And they remember; they remember the person [the student who presents the report on a particular animal], they remember the animal, and they remember the facts [about the animal]. And then at the zoo, they're like…oh, that was my

> friend's [animal]. They said this [about that animal]. That's what I hear when we go to the zoo. I'm like, well, that was so worth it. They're like wow, that was so and so's [animal]. She did the gorilla, and she said this. And, we don't spend as much time at the zoo saying this is the gorilla, they eat so and so. They [the students] talk to each other...they're eating that grass she told us about. She said that they would. And, they've got that [background experience gained from the students' presentations] to pull from… And, it's so neat because now they're using words like...One little boy used the word carnivore. And I said… Honey, do you know what that word means? And he explained to the class exactly what it meant, and they remembered it.

Kathy believed that the use of technology in this assignment increased efficiency in that her students could gain more information on their own via the Internet than she could teach them in a limited amount of time. More importantly, students were building background knowledge to draw upon at the time of the field trip¸ contextualizing the learning at the zoo, building vocabulary, and becoming independent learners in the process. The ultimate result was that Kathy saw evidence that students had internalized the knowledge.

Kathy also believed that technology played a role in student management. Specifically, she felt that student behavior improved when technology was integrated into instruction. She reasoned that student behavior improved when using technology because "they're intrigued, very intrigued, and especially, if they know they're going to get to be a part, use it…get involved with it." According to Kathy, when students are allowed to use technology to move through a lesson at their own pace on a level that challenges

them, then the lesson will be fun rather than boring, and behavior was less likely to be problematic.

Ways Kathy Used Technology in Literacy Instruction

Kathy used technology often for both administrative and instructional purposes. Kathy's district utilized numerical grades, computerized grade books, and report cards for grade three and above; therefore, kindergarten teachers did not use technology to record or calculate student grades. However, Kathy reported frequently corresponding with students, parent, and coworkers by email.

Kathy also used technology (computers, a scanner, the interactive whiteboard, word processors, and graphics-oriented printing programs) frequently in reading and writing instruction. Her children often typed their compositions on either word processors or the interactive whiteboard and used graphic programs to illustrate them. Computers, the Internet, and the interactive whiteboard were used most often in Kathy's literacy instruction. Kathy reported using the interactive whiteboard for whole group instruction and for small groups of students to do interactive literacy activities. Flipcharts, similar to interactive PowerPoint slide presentations, were often downloaded from the Internet for whole group instruction and for students to use on the interactive whiteboard during independent skills practice. The interactive whiteboard tools also made it possible for students to uncover hidden word parts and or manipulate letters during phonics instruction. The interactive whiteboard was also used to access the Internet. The Internet most often provided access to pictures for lessons, visuals for writing instruction, instructional games, educational websites, information for student research, and books or stories for students to read.

Kathy's class went to one of the school's two computer labs each Friday where students could visit one of several interactive websites designed to support emergent literacy. On these websites, I observed her kindergartners engaged in activities such as matching upper and lower case letters, vocabulary building activities, and drawing pictures to match words. Many of activities were in a game format with music and brightly colored graphics which captured and held students' interest. Students could also choose to listen to stories which had large illustrations and words for them to follow.

Kathy used digital cameras, iPods, and camcorders occasionally for instruction. Digital cameras were often used to spark dialogue and integrate content with language in Kathy's class. For example, the class took digital cameras on nature walks to look for signs of the season. The pictures were then downloaded into the computer and projected onto the interactive whiteboard for class discussions. For Valentine's Day, Kathy took pictures of her students, downloaded them, and had students create computerized photo cards to send to their parents. Seasonal songs that matched units of study or stories being read were sometimes downloaded into iPods for class sing-alongs.

Kathy's survey responses indicated that she was satisfied with her instructional use of technology; however, she reminded me that kindergarteners are limited in their abilities to read, write, and do basic technological skills such as keyboarding or Internet searches. She felt that those limitations, in turn, limited her extent of technology use. According to Kathy, she spent the first half of each year getting her children accustomed to kindergarten routines, doing pre-reading and writing activities, and introducing them to basic technology skills. By the spring semester, her students were usually beginning to read and write somewhat independently, ready to use word processors, go to

predetermined websites on their own and conduct simple Internet searches. I observed Kathy's class during the late spring and most students were reasonably successful in navigating the educational websites. Because most computer tasks were still laborious even in the spring, Kathy believed there was limited time to apply a wide range of technology or use technology in higher level activities in kindergarten. However, during our interviews, she seemed to be very open to new ways that she could integrate technology, including ways to use some of the tools that she generally used less frequently.

Kathy was comfortable using a wide range of technology tools such as word processors, digital cameras, scanners, the Internet, and iPods. In addition, she had a high comfort level with the use of hardware and software applications such as the ActivSlate designed for remote use of the interactive whiteboard. One of the software applications Kathy and her students used frequently was designed to aid in organizing thoughts and content through graphic organizers. Her students often used the software to map ideas in their pre-writing activities. Kathy indicated that she did not feel comfortable integrating telecommunications to collaborate, publish, or interact with audiences outside her classroom. Additionally, Kathy reported participating in 10-20 hours of technology training during her current licensure renewal cycle provided by the district at a site other than Glenn Valley Elementary. However, over a decade ago, Kathy had taken an intensive technology training program sponsored by the district which had spanned an entire calendar year. This training focused on the operation of various types of technology and how to integrate them into instruction. Participants in the training received a classroom computer and a plethora of applications and software, including

movie-making software and CD-ROMs which featured computer games, electronic encyclopedias, pictures and video clips. The training taught teachers how to integrate project-based learning into the curriculum. Participants were encouraged to use presentation software as an instructional tool and to have students use the software to create learning products. Kathy credited this extensive training for changing her teaching methods and her beliefs about the benefits of technology in instruction. According to Kathy, it was this particular training that "really got me to using technology a lot," and she continued to use instructional technology frequently over a decade later.

Ways Kathy's Beliefs Were Reflected in Her Actual Practice

Kathy's survey responses indicated that she gravitated toward student-centered beliefs concerning pedagogy. Although, Kathy acknowledged that her role in the classroom changed depending upon the lesson objectives and the part of the lesson being taught, she mainly saw her role as that of a facilitator. Her primary role, according to Kathy, was to provide opportunities and resources for her students to discover or construct concepts for themselves. She disagreed that a teacher's job is to teach the content using facts and textbooks. In fact, Kathy stated, "I don't like the textbooks. I'm not a textbook teacher. I don't like one book for 20 children**.**" Rather than assigning the whole class the same task, Kathy strongly believed in having many different activities going on simultaneously. Furthermore, she believed projects are a good way for students to learn. This belief was reflected in her explanation of the zoo projects described in the previous section.

It was Kathy's description of the zoo projects her current students had done that reflected the value she placed upon digital literacies and her recognition of digital texts as

authentic texts. When her students had finished the research and writing for their projects, Kathy decided to allow students to "do something with" their research, to "make a visual or something," because "I don't do the same thing every year. I like to change something every year to make it different." After finishing the research and writing in class, students were allowed to make a visual at home to extend their learning. When projects were finished the children shared them in class, and several of them had used technology. Kathy's description of the projects involving technology was very animated as she described several of the presentations which used either PowerPoint or Keynote presentation software. There was one particular project which Kathy thought was "just great" because the student had taken his project home and created a Facebook page for the animal. Kathy had been able to convince the district to unblock the site long enough for the student to share his project. Although Kathy acknowledged that the students had help on their projects, it was clear that she valued the students' projects as authentic texts.

Kathy believed strongly in the need to individualize literacy instruction and based her approach to literacy instruction upon this belief, as well as her inclination for nontraditional texts and small group activities. She was firm in saying, "You have to think outside the state adopted textbook that they've given you." So, rather than utilize a single textbook in a one-size-fits-all type of instruction, she developed a less traditional approach to her literacy instruction which featured multiple teaching methods, flexible grouping, and both traditional and digital texts.

The literacy period was divided into four blocks: shared reading, guided reading, independent practice, and self-selected reading. These blocks of instruction did not

necessarily take place sequentially. Small groups of students moved through the blocks in various orders so that multiple activities were occurring simultaneously.

The shared reading block consisted of whole group interactive read-alouds or shared reading. In an interactive read-aloud the teacher elicits participation from the students such as asking them to make predictions or read repetitive phrases. A shared reading is an interactive read-aloud that is reread numerous times, each time focusing on a different aspect of the story. An observation of a shared reading revealed that Kathy invited student dialogue during the reading and reinforced skills such as making predictions and author's purpose. During guided reading, small groups or pairs of students read with a teacher from a traditional book. The books used for guided reading were matched to the day's shared reading skill and the students' reading levels. Kathy often presented a 20 minute small group lesson on one skill during this time. These lessons were planned in response to individual needs that she diagnosed during instruction. When technology was used during this teacher-led instruction, it was most often either students manipulating letters and words on a flipchart displayed on the interactive whiteboard or to access pictures or emergent literacy websites on the Internet. Other skills were also reinforced during the guided reading groups with traditional print texts, paper, and pencil. During independent practice, students met individually with a teacher or assistant to discuss the book they had chosen for their self-selected reading time and then were sent to a literacy center. At the literacy centers, students worked either individually, in pairs, or in small groups to practice skills and reading. Kathy used her students' needs, as identified by their assessments, to plan each student's literacy center assignments, and students moved at their own pace through the centers.

Although not all literacy centers involved technology, technology played an important role in this part of Kathy's literacy instruction. There were centers stationed around three of the classroom's computers and the interactive whiteboard. At the computers children listened to electronic stories, worked on various instructional computer games, or on educational websites which were self-paced, multi-leveled, and interactive. At the interactive whiteboard, groups worked either directly on the whiteboard surface or used the ActivSlate to work through a flipchart designed to reinforce the particular skill they needed to practice. Sometimes they accessed one of the interactive websites through the electronic whiteboard. Another center featured a compact disc player with multiple headphones so that small groups of students could listen to a read aloud while following along in their own copy of the book. Students rotated through at least two centers during the half hour block of time allotted for centers.

Kathy's beliefs about technology's role in literacy instruction were reflected in her actual practice. Kathy believed that technology played a role in making her instruction more effective and efficient. The first thing I noticed as I arrived for the first of the five observations in Kathy's classroom was that the arrangement of the room was conducive to the implementation of Kathy's pedagogical beliefs as well as her beliefs regarding the role of technology. Various cabinets and bookcases divided the room into several alcoves where small group or individual activities could occur, with one section large enough to accommodate whole group activities. Child-sized tables, chairs, storage for manipulatives and books, and easels filled with posters or wipe-off story charts equipped each area. The four classroom computers were placed on tables across the room so that both students and teachers could access them easily. The room arrangement

facilitated both student-centered instruction and students' use of technology. I observed the computers and the interactive whiteboard being used frequently except during the whole group shared reading lesson. At times Kathy and her assistant worked directly with children and at times, they moved about monitoring and facilitating the activities. Across the five observations, Kathy's literacy instruction reflected her description of what technology integration should look like. Although, students were not engaged with a variety of ICTs, they were often working collaboratively with peers to use technology in literacy-related activities. During these observations, I noted evidence of Kathy's belief that multiple activities should be taking place simultaneously in the classroom (see Appendix E for an excerpt of the field notes taken while observing Kathy).

The technology used in Kathy's literacy centers served multiple purposes; it gave students access to engaging, interactive, and independent activities designed to meet their individual needs while freeing Kathy to move between groups as a facilitator, conduct student conferences, and manage many different activities simultaneously. In short, technology enabled Kathy to put her beliefs about pedagogy and technology into practice. I observed students moving effortlessly into their assigned literacy centers. It was clear that they were very familiar with how to log on to and navigate through the websites and flipcharts. It was also apparent that students were accustomed to multiple activities taking place simultaneously in the room because almost all students maintained a high level of time on task despite the close proximity of other groups and the sound of voices throughout the room. At each center, other than the listening center, I observed students talking with partners about their tasks. Kathy explained how she believed that technology fostered student dialogue, but I noticed task-related talk at other, non-technology centers

as well. Kathy also gave pairs of students time to discuss lesson objectives during her teacher-led mini-lessons. Vygotsky (1986) believed that social interaction, including dialogue, plays a critical role in children's cognitive development. Furthermore, he believed that adults and more capable peers can scaffold the learning of those less capable through activities such social interaction and dialogue, thus enabling them to accomplish tasks that they might not be able to do alone. Using Vygotsky's perspective, Kathy used social interaction and student dialogue to scaffold their learning and taught her students to provide scaffolding for one another in the classroom. Furthermore, the technology was used as a tool to mediate the learning process.

Kathy believed her current approach to literacy instruction required her to spend more time in lesson planning and preparation than when she used a more traditional approach. However, the key to its success, according to Kathy, was collaboration with fellow teachers. Kathy enlisted the support of a fellow kindergarten teacher, two assistants, and the school's literacy facilitator to meet with student groups. Kathy and another teacher grouped their students across classroom lines for the literacy blocks. Each of the adults assumed responsibility for one or more groups. According to Kathy, "We collaborate really well with one another…It's all about personal relationships and philosophies; our philosophies are the same." Additionally, Kathy sometimes collaborated with the school's technology facilitator on special projects or activities that required technology. I saw Kathy's value of collaboration reflected in her students as well. As students worked on various activities at the literacy centers, they worked together to solve problems and complete tasks.

The only barrier to technology integration that Kathy cited was its lack of dependability due to malfunctions; however, having four computers and the fact that Kathy usually assigned either a pair or a small group to a center diminished the impact of this barrier. During the first observation of Kathy's literacy center block, one of the computers would not access the Internet so the laptop, which was typically connected to the interactive whiteboard, was quickly transferred to the center. A nearby desktop computer, which was not being used for a center, was connected to the whiteboard for that center to use. Kathy seemed to have enough resources at her disposal that overcoming this barrier was not problematic.

There was another issue which indirectly acted as a barrier to Kathy's technology use. The district blocked access to certain sites on the Internet such as YouTube, a site where individuals post video clips, and the social networking site, Facebook. In order for Kathy's students to see the Facebook page that a classmate had made as part of the zoo animal project, she had to make a request for the district to unblock the site long enough for the project to be shared. By blocking access to sites which potentially contain material inappropriate for the classroom, the district takes away teachers' authority to selectively use the sites as teaching tools, thereby silencing their voices. In turn, students were denied access to a digital venue for communication and expression of ideas. By denying student access to these digital Discourses, their voices were silenced as well.

Grade level presented both advantages and disadvantages to Kathy's technology use. Kathy noted that her students' young age, developmental level, and reading level limited what they were able to do with technology. Kathy did not label this as a barrier to technology and did not let it hinder her use of technology; she was a frequent user of

instructional technology. However, in other ways her grade level facilitated the use of technology. Because kindergarten classes were self-contained, there were no fixed schedules to adhere to. If Kathy needed to add more time to the literacy block for completing an activity, she could. Similarly, Kathy did not have to devote instructional time to preparing for standardized testing or feel pressured to teach in a certain way to prepare for testing. The smaller class size of kindergarten increased the student-computer ratio, and Kathy had a full time assistant to aid in managing her literacy instruction.

Summary of Case 1

Kathy was purposefully selected for this case study because her survey responses indicated that she was a frequent user of instructional technology. Kathy maintained a positive attitude towards technology and believed in the importance of developing students' technological literacy. Kathy was comfortable using technology in the classroom, and reported having participated in 10-20 hours of technology training during her current licensure renewal cycle. In addition, she had extensive, year-long training in the use and application of instructional technology over a decade ago. Even though a lengthy amount of time had passed since this training, Kathy still credited it for having a significant impact on not only her desire to integrate technology, but the ways and frequency with which she continues to use it.

In the first interview, Kathy stated that she used technology in her literacy instruction from one to three hours most days. Although classes which the students had with itinerant teachers, such as music, art, and physical education, caused the length of her literacy lessons to vary, she aimed to use technology in some way every day. According to Kathy, her students were so accustomed to interacting with technology on a

daily basis that when technical problems precluded its use they were disappointed. The technology integration that Kathy described in her interviews aligned with what I observed in her classroom. Students worked collaboratively to problem-solve and complete literacy tasks using technology. Kathy's use of technology in instruction also reflected her ideas of what it means to integrate technology into instruction. Her definition of technology integration involved students working collaboratively with multimedia devices to reflect what they are learning. During the course of five observations in Kathy's classroom, I observed technology in use in a variety of ways each time. Children manipulated letters and words in various literacy activities displayed on the interactive whiteboard in both small and whole group settings. They also played literacy games or listened to stories on the Internet. Technology was used to promote literacy, social interaction, and independent learning in centers and in small and whole group instruction.

When planning instruction, Kathy stated that she chose technology as an added tool to deliver instruction based upon how well the technology would accomplish the objectives, capture and maintain student interest, and motivate students to learn. In actuality, Kathy also used technology to help put her beliefs about technology and pedagogy into practice. Kathy held many student-centered pedagogical beliefs and aimed for her instruction to be interactive, with students in control of their own learning. She believed technology integration should include small groups of students working together on activities which reflect their learning. Computers, the Internet, and the electronic whiteboard were the most often used types of technology and they were typically used for small groups of students to complete interactive literacy activities. Kathy also used the

interactive whiteboard for whole group instruction. Technology played a role in enhancing student interest, motivation, content retention, and behavior during literacy instruction. When technology was integrated into literacy instruction, Kathy reported benefits such as improved student behavior, time on task, motivation and engagement with texts. When Kathy's students used technology, Kathy believed her students engaged in more task-related dialogue. Technology seemed to provide more opportunities for meaningful social interactive between students that facilitated learning. In short, Kathy used technology as a tool to scaffold students' learning. In addition to the immediate benefits for students, Kathy believed that technological literacy is important to prepare students for their futures in the twenty-first century.

Technology played a role in making Kathy's instruction effective and efficient. When her students used instructional technology, she believed that they retained and internalized content better. She felt that technology provided opportunities for children to build and activate prior knowledge and vocabulary. Because students were more engaged and motivated when using technology, they spent more time on task and she spent less time managing behavior.

Kathy believed that the only barrier to her technology integration was equipment that failed to work properly. However, there were enough computers and other technology in Kathy's classroom that when a piece malfunctioned, she usually had others to rely upon. Regardless, time spent replacing a piece of technology was time taken away from instruction. Kathy's grade level seemed to work to her advantage in mitigating barriers to technology integration. The smaller class size in kindergarten resulted in a smaller student-computer ratio than in higher grades. In addition, as a kindergarten

teacher, Kathy reaped the benefits of having a full time assistant whereas higher grades either shared assistants or, as in the case of fourth and fifth grades, had no assistant. The presence of a full time assistant made it easier to incorporate technology with students who were not as independent as older students. In addition, kindergarten classes were self-contained and had more flexibility in the instructional schedule than upper grade classes with fixed schedules; therefore, Kathy had more time to devote to activities involving technology. In one respect, according to Kathy, the kindergarten grade level worked to restrict her use of technology. She believed that the kindergarteners' inexperience with literacy and the operation of technological tools, as well as their still under-developed fine motor skills, limited the ways that technology could be used in instruction.

### Case 2: Jennifer, A Moderate User of Technology

Jennifer had seven years of experience teaching third grade when I selected her to participate in this case study of a moderate instructional technology user. Since grades three through five departmentalized for instruction, Jennifer was responsible solely for her students' literacy instruction. To Jennifer, literacy meant "being able to do something with what you read. You've got to make connections to what you read. It is interacting with the text." Jennifer saw reading comprehension as being very complex. She believed other components of reading, such as phonemic awareness, phonics, vocabulary, and fluency, must be in place before a reader can comprehend. However, Jennifer believed that a reader's prior knowledge of story concepts is necessary for understanding texts on a deeper level. According to Jennifer, "…you have to have experiences to comprehend," because those experiences build students' prior knowledge.

Jennifer's Beliefs Regarding the Role of Technology in Literacy Instruction

Jennifer exhibited a somewhat ambivalent attitude toward technology and technology integration. She was positive about the benefits of using technology in instruction. According to her survey responses, she strongly agreed that computer technology and ICTs have the potential to impact instruction and agreed that technology is useful for maximizing student learning. In addition, Jennifer spoke of the academic and behavioral benefits of using technology for her students. She did not agree that integrating technology into instruction caused more work for her as a teacher. In fact, she elaborated by saying that technology can be efficient and is actually a time-saver in lesson preparation and delivery.

Jennifer had mixed feelings about some types of technology. Jennifer indicated that she enjoyed learning about new technologies and felt comfortable with all types of technology hardware and software except incorporating telecommunications to interact with audiences outside her classroom. Yet, Jennifer exhibited ambivalence toward using certain types of technology in instruction. Jennifer revealed that she felt that technology changes too rapidly to properly implement in the classroom. However, when asked about this belief during her first interview, the rapidly changing pace of technology did not seem to be an issue for her. Rather, she appeared disinterested in the use of certain ICTs because she did not think their use was worth the time it takes to use them in instruction. For example, Jennifer indicated that she had occasionally used digital cameras, iPods, and GPS in both reading and social studies instruction in previous years. According to Jennifer, "I don't really use iPods [now], mostly because of the time. It just takes too much time….I've used the digital cameras some….I've had

the class go take pictures of some things we were studying. And I've done some geocaching [an activity in which students use GPS to locate objects]. But, there again, that's just so time consuming, it's not really worth it what they got out of it." Jennifer did not think that there was enough benefit to her students to warrant the use of the GPS, digital cameras, and iPods in instruction. The result, according to Jennifer, was that "mostly, I just use the Internet." Jennifer used the Internet to gather pictures of things her class would read about to building their prior knowledge and vocabulary. She recognized the value of the Internet in making her literacy instruction more effective. Research shows that teachers are more likely to integrate technology into instruction when they perceive that doing so has value to students (Ertmer et al., 1999; Lee, 2006).

In her interviews, Jennifer expressed considerable frustration with technology. The frustration seemed to stem mainly from feeling that technology is unreliable due to frequent malfunctions. Jennifer explained:

> I've used technology before and it's taken me 20 minutes to get it to work, and the lesson itself was only five minutes. So, I've used up 25 minutes to do something that should have only taken five minutes to do. When that happens I get frustrated and say, well, I'm just not going to use it anymore. And, I'll go a while without using it.

Time was a precious commodity to Jennifer, and when she wasted instructional time trying to get technology to work she became frustrated enough to curb its use. The frustration that Jennifer felt when technology did not work properly may have

contributed to her feelings of ambivalence toward certain types of instructional technology.

Jennifer was also divided in her feelings about technological literacy. She indicated in the survey that she believed it is important for students to develop technological literacy; however, she struggled with whether or not she believed it was her responsibility to teach it and whether or not there was enough time to teach it. She stated:

> I think it's important, but I don't really think it's my job. I mean, I know it is, but I don't really have time to just…sit down…and teach them how to do it [use the technology]. They've got to know how to use the computers and technology, but…I just don't have time to…But, it is important to be literate with technology. It's everywhere. They'll need it when they're in the real world just to get along.

Jennifer seemed to be acknowledging that she is aware that teaching technological literacy is part of her curriculum based upon the North Carolina Standard Course of Study for English/ Language Arts (NCDPI, 2004) when she says, "I mean, I know it is [my responsibility to teach technological literacy]," but, her earlier words, "I think it's important, but I don't really think it's my job," appear to indicate her true feelings regarding teaching technological literacy. Jennifer felt that it is important for students to learn how to communicate and collaborate with technology. However, while she believed that technological literacy deserves a role in literacy instruction because there are many "types of reading", she also felt that the responsibility of helping students to become literate with technology belongs with teachers of other subjects as well. In

other words, since instructional technology is used in other subjects, those teachers should shoulder some of the burden of teaching students to become literate with technology.

To Jennifer, technology integration meant "students using the computer to read or do activities" either in a whole group, small group, or in a one-on-one setting. When technology worked properly, Jennifer believed its integration made her instruction more effective and efficient. Jennifer believed it was the interactive nature of technology that led to the greatest benefits for her students. She felt that when students could interact with technology, they were more focused and maintained a higher level of time on task. In addition, she thought her students were more engaged with reading and retained content better. Jennifer also credited technology with helping students to build their prior knowledge so that they could make connections when they read. "It's definitely more effective and they learn more, I think. They have a deeper understanding of what they read; their vocabulary is enriched." Because of the interactive nature of the technology and the way it captured her students' attention, Jennifer believed her students' behavior was better as well. When Jennifer's students were engaged with technology, she did not waste instructional time managing class behavior. In this way, technology facilitated efficient instructional delivery. However, the benefits of efficient, effective instruction were negated if malfunctioning equipment wasted Jennifer's instructional time.

Ways Jennifer Used Technology in Literacy Instruction

Jennifer used technology often for administrative purposes and for preparing for lessons. Student grades and lesson plans were kept electronically, and Jennifer often

used email for corresponding with other staff members, parents, and students. Jennifer spent a lot of time making handouts and presentations for student use during lessons. She frequently gathered pictures and videos from the Internet to help students in building their vocabulary and background knowledge.

Some technology found its way into Jennifer's literacy instruction, according to her survey responses. She used the computer, the Internet, and the interactive whiteboard daily. She used the Internet most often for gathering information related to reading selections, playing instructional games online, visiting interactive reading websites, and for reading stories or books online. In addition, Jennifer reported using presentational software and computer games at least four times per month. Jennifer used the presentational software to present lessons; students did not use the software to create their own presentations. The interactive whiteboard served several purposes during instruction. At times, she used it solely for writing, much like an ordinary whiteboard or chalkboard. Worksheets and articles were scanned into the computer and shown on the interactive whiteboard for whole group instruction. Students used the interactive tools to highlight or underline text. Jennifer also accessed the Internet via the interactive whiteboard.

Jennifer often used technology to practice reading skills that had been previously taught during whole group instruction. Her class typically spent three days per week in the computer lab using a self-paced reading tutorial program purchased by the district to help raise standardized test scores. Although the principal required reading teachers to use the tutorial for students identified as being at risk for not passing the end-of-grade testing, Jennifer had a standing reservation for the computer lab for

three days each week so that all of her students could use the tutorial as follow-up practice to her instruction.

Jennifer reported that she liked to keep reading instruction interactive and to give students a chance to apply reading skills in other subjects as well as real world settings. She liked the way technology allowed students to interact with the text, and this was taken into consideration when deciding whether or not to integrate technology into a particular lesson. Consequently, computer games, online instructional games, and interactive reading websites were frequently part of Jennifer's literacy program.

Jennifer reported infrequent use of graphics-oriented printing programs, digital cameras, and GPS, stating that she used digital cameras and GPS more in previous years when she also taught social studies. She also used a slightly wider variety of technology to integrate reading with social studies content; however, she generally felt that using most technology was too "…time consuming. It's not really worth it…what they get out of it." Jennifer did not value the contribution these ICTs made to her literacy instruction.

Ways Jennifer's Beliefs Were Reflected in Her Actual Practice

Jennifer's interview and survey responses indicated that she leaned toward a more traditional, teacher-centered pedagogy. She believed that a quiet classroom is generally needed for effective learning and that smooth, efficient classroom routines keep disruptions to a minimum. Her classroom arrangement was designed for efficient teacher-led instruction. Desks were arranged in short straight rows that formed a large square in the center of the room. Two straight rows of desks spanned the interior of the square. This arrangement was conducive for whole group instruction which Jennifer

used the majority of the time. All books, instructional equipment (including a laptop computer, a desktop computer, a television and VCR), and other furniture were positioned around the perimeter of the room within easy access. Jennifer felt that she had a lot of subject knowledge to share with students and believed it was her job to explain to students how to do the work and to assign specific practice. However, she agreed, though not strongly, that it is a good idea to have multiple activities going on in the classroom and that it is not necessary to give the whole class the same assignment that matches the class schedule.

Jennifer took a teacher-centered approach to instruction. She was usually found near the front of the class leading instruction or roving from desk to desk to monitor students as they practiced skills. In describing her teaching style, Jennifer said, "I'm in control…that's just my teaching style, just the way I am. I've got to be in control." Although Jennifer indicated on the survey that she believed projects were a good way for students to learn, student projects were not generally a part of her literacy instruction. Jennifer's description of a project that her class had completed on an Olympic sport illustrated why she rarely incorporated student projects into instruction. The project was assigned by the academically gifted teacher who came into Jennifer's class periodically, but Jennifer assisted because the two teachers worked together through an inclusion model of instruction.

> They had to pick an Olympic sport and do some research…The students were in control, but it was just a mess… hectic. When it's like that, they're all just raising their hand to ask questions, and I can't get around to

> everybody…There's just one of me….I just can't…it doesn't work well. It wastes time; it's just not efficient.

Jennifer viewed technology as a means to an end in instruction, as "…a quick way to deliver a lesson and a new tool for delivery." Therefore, technology was generally used to support Jennifer's traditional teaching methods. For example, Jennifer used a computerized reading tutorial program three days per week in her reading instruction. Typically, Jennifer introduced a particular skill at the beginning of instruction and then made assignments with the tutorial program in which students read short paragraphs with questions that reinforced the skill. In addition, Jennifer made homework assignments using the tutorial program. Students were required to sign a contract at the beginning of the year stating that they would complete the tutorial assignments on their home computer.

Jennifer's teacher-centered pedagogical beliefs, as well as her belief that technology was a means to deliver traditional instruction more efficiently, were evidenced in the lessons that I observed. All three lessons that I observed were very structured, whole group presentations with Jennifer maintaining control of the entire lesson. The interactive whiteboard was the only technological tool used in two of the lessons, and it was used to display the same text that students had in print form, and at various points during the lesson, Jennifer directed students to come up to the whiteboard and circle key words or phrases in the text. In one lesson, the interactive whiteboard was used to access the Internet and display the current issue of *Weekly Reader Connect*. Students had a print copy of the children's news magazine. The online version displayed the print issue's articles along with extra features such as hyperlinks

to related videos and definitions of key words. Individual students read aloud feature articles from their print editions or from the whiteboard as they were called upon, but Jennifer clicked on most hyperlinks. Students were occasionally called up to click links, but overall, their interaction with the text on the whiteboard was minimal. The use of technology in her actual practice reflected Jennifer's belief that technology was a tool to facilitate the efficient delivery of instruction, but did not reflect an effort to develop her students' technological literacy. Her instruction reflected a desire to be efficient rather than beliefs about the importance of developing students' technological literacy or that it was her job to teach technological literacy. In her follow-up interview, Jennifer indicated that the three lessons I observed were typical of her use of technology in instruction, though she had used technology slightly more and in more diverse ways in previous years. It is important to note, however, that the role technology played in Jennifer's literacy instruction was consistent with her perception of technology integration as "students using the computer to read or do activities."

Jennifer explained that the biggest impediment to technology integration was its failure to work properly. The economy also factored into this problem; Jennifer blamed recent budget cuts for the school not being able to update or repair broken technology. The unreliability of technology resulted in inconsistency in integrating technology. According to Jennifer, she was more apt to use technology in the fall and spring. She explained:

> Oh, I start the year out with a bang and … I say, this year I'm going to do better and use it a lot. And then, by the middle of the year I'm fed up with it not working and I don't use it much. But by this time of year [spring] I'm saying I

> need something to keep them interested and catch their attention so I use it more. I use it a lot this time of year actually.

Jennifer's words seem to be somewhat contradictory. By the middle of the year she abandoned the use of technology because the frustration level with it peaked. Yet, when she resumed the use of technology in the spring, it was because of the benefits she believed resulted from using technology. Technology captured her students' attention. Jennifer valued this benefit not only because her students were more focused on instruction, but because she spent less instructional time managing off-task behavior. This made her instruction more efficient, an attribute that Jennifer place high value upon. It is unclear what caused Jennifer to risk the frustration that resulted when equipment did not work to gain the benefits of increased student focus at this particular time of year. It is possible that she was willing to trade the frustration for the payoff of having more focused students just prior to the end-of-grade testing. Having taught a tested grade for a number of years, I know that having your students focused and engaged in the weeks prior to and during standardized testing is a priority so that it a good performance on the test is more likely.

Jennifer also said that a lack of time was a major barrier to integrating technology. She did not feel as though she had time to teach her students the minimal operating skills, such as keyboarding, that they need for using technology. Without a full time assistant, Jennifer felt that her students were not independent enough for one person to facilitate the use of technology for activities such as class projects. In the past, the school's technology facilitator taught skills such as keyboarding, how to use search engines, and how to create databases in regularly scheduled classes, as well as

collaborated with teachers on class projects. However, at the time of this study, the role of the technology facilitator was limited to consulting and collaborating on class projects. In addition, the configuration of the block scheduling reduced her reading classes to an hour or less, which Jennifer indicated was insufficient for completing research projects or other in-depth assignments. Furthermore, instructional efficiency was important to Jennifer, and she felt that the frequent failure of equipment to work properly caused her to lose instruction time which was already in short supply due to the block scheduling. The frustration over losing instructional time resulted in Jennifer using technology less frequently and, at times, abandoning it altogether.

### Summary of Case 2

Jennifer was purposefully selected for this case study because her survey responses indicated that she was a moderate user of instructional technology. Jennifer's perception of technology integration was students completing activities with technology. She did not employ a variety of technology tools; however, the computer, the Internet, and the interactive whiteboard were used in ways that were consistent with her perception of technology integration. Students used these technologies to complete such activities as reading stories, manipulating texts on the interactive whiteboard, and practicing reading skills.

Jennifer's beliefs about technology and her actual practice were somewhat conflicted. She expressed a belief in the importance of students' acquisition of technological literacy and she believed that using technology was beneficial to students. However, her students used a limited range of technology tools to accomplish traditional types of tasks compared to students in other classrooms in the school.

Although her survey responses indicated that she believed technology had the potential to impact and maximize student learning, Jennifer used technology in a very structured and traditional way, as an efficient tool for delivering instruction. Technology was used either in whole group instruction or when her students used computers in the lab to practice reading skills. During whole group instruction, Jennifer maintained control of the technology so that students had minimal interaction with it. Jennifer's pedagogical beliefs were relatively traditional and teacher-centered, and she utilized technology to put those beliefs into practice. She valued technology for the efficient way that she could accomplish her curricular objectives.

Jennifer reported having participated in 10-20 hours of technology training during her current licensure renewal period. According to Jennifer, most of the training covered the technical operation of technology, particularly technology used for administrative purposes such as attendance gathering and grading, rather than its application in instruction. This fact may have contributed to Jennifer's reluctance to use technology in instruction and her ambivalent attitude towards instructional technology. Although Jennifer reported feeling comfortable in using most types of technology, other than telecommunications devices, she did not seem to be comfortable using technology in her instruction unless she maintained control of it. She did not appear to be comfortable with her students using technology other than to practice reading skills in a supervised setting, perhaps due to the fact that the training she experienced did not include ways to use the technology to meet lesson objectives.

The primary barrier to Jennifer's technology integration seemed to be the failure of technology to operate in a dependable manner. Efficiency was important to Jennifer

and she felt frustrated when instructional time was lost trying to get technology to work. Jennifer valued technology as long as it worked properly. The high amount of frustration that Jennifer experienced from malfunctioning technology diminished the value she placed on it and the frequency with which she used it. According to Ertmer et al. (1999), a teacher must value technology before they can successfully integrate it into instruction.

A lack of time also prevented Jennifer from using technology in instruction more frequently. Jennifer stated that due to the block scheduling used by third grade, her schedule for literacy instruction was inflexible and short. She did not feel that her instructional scheduled allowed enough time for her students to use technology in any type of extended assignment, such as projects, or for her to teach students basic technology skills such as keyboarding.

Several factors, unidentified by Jennifer, seemed to inhibit her use of instructional technology. Jennifer appeared to be reluctant to use instructional technology because it restricted her control over the classroom environment. She chose not to assign student projects because she could not maintain control over the classroom when students were working independently on projects. Instead, she limited her use of technology to the use of the interactive whiteboard, from which she could access the Internet, and the computers in the lab. It is likely that this reluctance was due primarily to Jennifer's teacher-centered pedagogical beliefs. Her instruction was structured and she stated that she had to be in control of the instructional activities. In this respect, Jennifer's pedagogical beliefs constrained her instructional use of technology. However, two other factors may have contributed to Jennifer feeling a loss of control

when using technology. The technology training Jennifer had participated in did not prepare her for applying the technology to achieve curricular objectives. Training that focused on application may have helped Jennifer to find ways to reconcile her use of technology with her beliefs about pedagogy and the benefits of technology integration.

Another factor which may have contributed to Jennifer's anxiety over the loss of control when using technology for projects was that fact that she had fewer years of teaching experience than Kathy or Joan. Jennifer was in her seventh year of teaching at the time of this study. It is possible that she was unsure of her ability to manage the class when they were engaged in the activities which are less structured, such as working on projects.

Finally, Jennifer's reluctance to assume responsibility for teaching students technological literacy may have impacted the frequency with which she used technology in instruction. Jennifer reported that she recognized the importance of students' development of technological literacy, but also that she believed that teachers of other subjects shared the responsibility of fostering students' digital literacy. Therefore, her purposes for integrating technology did not seem to include building students' technological literacy. Jennifer's primary purpose for using instructional technology was to make her instruction more efficient. When technology failed to work, she discontinued its use.

In summary, technology played several roles in Jennifer's literacy instruction. It provided a means for her to enact her pedagogical beliefs. Jennifer maintained control of the technology itself in her structured, teacher-centered instruction. Technology also allowed Jennifer to carry out her pedagogical beliefs in an efficient manner. It enabled

her to retrieve pictures and instructional flipcharts from the Internet without spending her time to find or make them. However, the failure of technology to work properly often interfered with this role for technology and created a barrier to its integration. Because of the frequency with which technology failed, Jennifer used it more as an add-on to instruction, an extra tool that she used to facilitate lesson delivery, when it worked.

Technology played a role in making Jennifer's instruction more effective. When she used technology in instruction, Jennifer believed her students retained content better. According to Jennifer, the use of pictures and videos from the Internet helped to build her students' background knowledge and vocabulary.

A third role technology played in Jennifer's literacy instruction was that of improving classroom behavior. Jennifer reported that her students were more engaged with literacy activities and more motivated to perform when technology was integrated into instruction. Her students spent more time on task and she spent less time engaged in managing student behavior. This ultimately facilitated the effectiveness of Jennifer's instruction.

### Case 3: Joan, An Infrequent User of Technology

Joan, a fifth grade teacher and an infrequent user of instructional technology, had 11 years of experience teaching, the majority of which were in fifth grade. As a literacy teacher, she believed that the meaning of literacy varies as a student moves through the educational process. At the beginning of a child's education, Joan believed literacy encompasses decoding and comprehending; but "…if they're just decoding, they're not really reading." By the time students have moved toward the upper elementary grades,

Joan believed that literacy expands to include not only comprehension, but also writing and using multiple texts to gather information. Likewise, she felt that reading comprehension for fifth grade students includes more than just understanding. Specifically, she believed that "at this age, you can do something with it [what has been read]. You can analyze. You can evaluate. You can summarize. You can make a connection. And, if you're not able to do those, then you're not comprehending." Comprehension was a major focus in fifth grade because it is assessed by the state's high-stakes standardized end-of-grade reading comprehension test, and Joan's students spent much time preparing for it.

Joan's Beliefs Regarding the Role of Technology in Literacy Instruction

Joan exhibited a positive attitude toward technology and indicated that she enjoyed learning about new technologies. Joan's survey responses revealed that she believed that technology had impacted the way she teaches. This will be elaborated on in a discussion of the benefits Joan attributed to instructional technology.

Joan believed that it is important for children to develop technological literacy while they are still in school. She explained that "…nowadays when they go out into the work force, they're going to have to use technology… it's better to learn it here [at school] where they have the teacher to guide them [rather] than them going out to the workforce and … not being able to handle it [using technology tools]." Joan believed that it was her responsibility as a literacy teacher to prepare students for their future by fostering their technological literacy.

Joan had strong feelings regarding the importance of students developing skills in using computers to analyze, evaluate and present ideas. "I feel like they need more

practice with evaluating what's online...I've had them go on different sites and they'll see that things contradict each other." Joan believed that teaching students to be technologically literate meant also teaching them to think critically about both traditional and digital texts, "…teaching them how you have to go on other sites to…find one you can back up." She felt that students "need to know things like if you're going to do a report, would it be better to do it on an iPod or would it be better to do the digital pictures and have a visual display with it." Joan believed that when technology is being integrated into literacy instruction, small groups of students are working collaboratively to gather, analyze, organize, and present information for class projects with the aid of technology tools such as computers, the Internet, digital cameras, or iPods. There would be little whole class instruction and the teacher would be "walking around monitoring, not up teaching."

Joan also believed that when technology is integrated into literacy instruction there are many benefits for students. Extended exposure to technology early in school, according to Joan, prepares students for high school and the work force, where students may be expected to arrive technologically literate. She also felt strongly that technology results in more immediate benefits, such as more effective instruction. Joan explained that when using technology, her students spent more time on task and were very focused, with fewer behavior problems. She believed her students became more engaged with reading when using technology. One reason Joan saw for the heightened engagement with reading was that when reading on the Internet, her students seemed to have an authentic purpose for reading that was not necessarily present when reading from a basal or other traditional text. Joan believed technology benefitted students' literacy by

enabling them to access background knowledge, build connections with the text, and apply higher order thinking skills. She stated:

> I think any time you're doing a project or technology, you're having to… evaluate the usefulness [of the information]. You've got to evaluate, synthesize, and analyze the information. There's a lot more critical thinking skills involved than just sitting and reading a fiction story or a short nonfiction story. There's more for them to look through and for them to notice on their own.

Joan not only felt that these benefits were even more pronounced for her struggling readers, but believed that when using technology, struggling readers' levels of self-esteem and self-efficacy improved. She also saw unique benefits for her better readers. According to Joan, technology seemed to foster dialogue among better readers when they collaborated on projects. The better readers talked much more as they tried to make judgments on the value of certain pieces of information and argue for their inclusion in the project. She noticed increased task-related talk with her struggling readers, but it was mostly aimed at how to include every piece of information found by every group member rather than evaluating and justifying the inclusion of select pieces of information. Joan believed that instructional technology provided benefits for her students that she could not provide without its use. Moreover, the instructional use of technology prepared her students for their futures in a way that she could not do without technology. In this way, Joan believed that technology had impacted her instruction in a positive way.

Ways Joan Used Technology in Literacy Instruction

Joan reported that at times she used technology for administrative purposes such as recording and calculating student grades and frequently using it for corresponding with

other staff members, parents, and students. Technology was also used sometimes for planning and preparing for lessons. She reported using the computer to write lesson plans, create instructional presentations with PowerPoint, and gather information and pictures from the Internet to be used in lessons.

According to Joan, she was comfortable with hardware and software applications for literacy development and operating technology tools such as digital cameras, scanners, and GPS. However, a high comfort level did not guarantee the integration of the tool into instruction. Some tools, such as graphics-oriented printing, GPS, and camcorders, were not used at all. Joan never had classes read online stories or use multimedia authoring environments.

Although Joan reported having participated in 10-20 hours of technology training, she did not feel comfortable with all types of technology. She never used student blogs or wikis and her students never collaborated online with other students. Joan indicated that she did not feel comfortable using iPods because she had not received training in how to integrate them into instruction, so she never used iPods with her students. She knew how to use an iPod for personal use, but did not know what to do with it as part of her instruction. She also reported that she was not comfortable with telecommunications, such as the Internet, satellite television or video-conferencing, in instruction to collaborate, publish, and interact with peers, experts, and other audiences outside her classroom and did not incorporate those activities into her instruction.

The ways Joan used technology conflicted with her beliefs about technology. Although Joan believed that it was important for her students to be technologically literate, viewed technology integration positively, and reported feeling comfortable with

several types of technology tools, a fairly modest range of those tools was integrated into her literacy instruction. She used digital cameras, presentation software, email, and computer games occasionally. Joan's students sometimes used computer games for practicing skills, and articles from the Internet were sometimes printed for students to read. At times the students read hard copies of the articles printed from the Internet and at other times the articles were scanned into the computer and projected onto the interactive whiteboard. Students then used the tools on the interactive whiteboard to underline or highlight text during a lesson. Students also used the Internet for research. However, the interactive whiteboard was the only technology that Joan used frequently in literacy instruction.

Joan believed that group projects were a good way for students to learn, and she had students use the Internet to locate, analyze, and evaluate information for class projects. When working on class projects, students were also allowed to scan and print pictures and maps they found on the Internet to provide visuals for their presentation. However, students did not generally use technology for creating the actual projects except for using word processors to type written information. Joan valued project-based learning because it provided opportunities for her students to engage in higher order thinking and it fit with her student-centered pedagogical beliefs; yet, she had assigned only two projects to her students during the current year.

While Joan was responsible for teaching writing to her students, she admitted that there was little time for writing other than when her students responded to literature or wrote to demonstrate a particular text structure or author's purpose. Technology was not generally utilized for those activities. However, Joan pointed out that in past years,

writing was a part of her literacy instruction on a daily basis, and technology was frequently integrated into writing. Students used computers and word processors for planning, composing, editing, and publishing. The Internet was used together pictures for illustrations, and the interactive whiteboard was used to access the Internet for information and pictures.

Ways Joan's Beliefs Were Reflected in Her Actual Practice

Based upon Joan's survey responses, she favored student-centered pedagogical beliefs. Joan's responses indicated that she disagreed that her job was to teach content using facts and textbooks and that students learn content best when she goes over the material in a structured way. She did not feel that it is important to give the whole class the same assignment that matches the class schedule. Rather, Joan believed that it was a good idea to have all sorts of activities going on in the classroom and, in particular, felt that projects are a good way for students to learn.

Although in our first interview Joan confirmed that she believed instruction should be student-centered, her instruction had not always been as student-centered as she thought it should be. She revealed that she realized at the end of the previous school year that her teaching involved "more of me in the front and having that control" so she "started thinking and looking at [her teaching] and evaluating...I was thinking I had so much control I don't know how much they were doing, so I've released it [the learning] more to them." Joan stated that her "teacher input part of the lesson [now] is a lot smaller than it was." Through reflective practice, or looking back at her instructional practices and examining what she believed about instruction, Joan realized that her practice did not reflect her beliefs to the degree that she desired. She related that she tried to reconcile her

practice and beliefs by allowing students to exercise more control over their learning. However, this was not what I observed in Joan's instruction. During each of the three observations, Joan's instruction was teacher-centered. She controlled not only the instruction, but, to a degree, the use of the technology.

Joan believed her role should be that of a facilitator in the classroom. She did not agree that it was her job to explain to students how to do the work, but felt that she should provide students with the opportunities and resources to discover concepts on their own. Joan explained that at the beginning of a reading lesson she modeled a skill or strategy and then guided her students in practicing what she had modeled. An important part of the lesson, according to Joan, included ample time for students to practice strategies, skills, and critical thinking skills within the context of independent reading. Although, Joan indicated she was ready to step in to help students when necessary, she felt it was important for students to be allowed to practice and, sometimes, fail. When Joan's students experienced failure, she stated that, "I work with them again, but...I try not to hold their hand...at this age. I believe they need to be more independent. They need to be able to read and think about what they're reading and not just have direct answers in front of them."

There appeared to be a mismatch between Joan's student-centered pedagogical beliefs, her beliefs about the instructional use of technology, and her practice. Joan strongly believed that technology is useful for maximizing student learning and has the potential to impact instruction; however; she integrated technology minimally, according to her self-report and based upon my observations. Joan indicated that she relied mainly on the basal reader or other traditional print texts for reading instruction. Joan's use of

technology was primarily limited to Web 1.0 tools, which are used for consumption rather than production of content (Handsfield et al., 2009). For example, traditional texts or articles from the Internet were scanned into the interactive whiteboard for the whole group to read together. The use of the whiteboard tools made the scanned text more interactive for students. Joan's survey responses indicated that computers were used a moderate amount to access the Internet and word processors, and that the interactive whiteboard was the only technology tool that received frequent instructional use. Furthermore, despite believing that projects are a good way for students to learn, she rarely assigned projects to her students.

Joan's self-reported technology use was confirmed by the actual practice that I observed, at least in terms of frequency; however, the way technology was utilized did not reflect her beliefs about how technology integration should look. The technology used in her literacy instruction was restricted to the use of the interactive whiteboard. Furthermore, the interactive whiteboard was used in very traditional, teacher-centered lessons. In the first lesson I observed, Joan used a printed text designed to review figurative language in preparation for the standardized end-of-grade reading comprehension test. The text was scanned into her laptop and then projected onto the interactive whiteboard. Joan called on students, who were sitting in straight rows facing the whiteboard, to read aloud paragraphs. She then called on individuals to either answer a question she posed about the paragraph or to come up and highlight an example of a particular type of figurative language. The lesson was highly structured and teacher-controlled, with the interactive whiteboard used as a means of enlarging a traditional print text. The whiteboard tools made the text somewhat interactive in that students could

highlight, circle, or underline parts of the text. However, the same activity might have been done using more traditional tools such as an overhead projector, printed copies of the text and pencils. Following the guided, teacher-led part of the lesson, students were instructed to independently complete multiple choice questions from the printed test review booklet, have Joan check their work, and then correct any wrong answers. Two other lessons that I observed followed a similar format.

Although Joan's technology use was minimal, it may not have been as simple as a choice to use or not use technology in instruction. Joan indicated on the survey that she was not satisfied with her use of new technologies in instruction. In an interview, she elaborated by saying she would like to move her reading instruction away from the basal reading series and toward a more project-based instruction in which students use technology to locate information and use critical thinking skills to create and present class projects. Joan's dissatisfaction with her use of instructional technology may be rooted in her desire to transition from teacher-centered instruction to more student-centered instruction. She wanted her instruction to be more aligned with her student-centered pedagogical beliefs. However, she believed there were too many barriers prohibiting her from implementing this type of instruction, at least in the current school year.

Joan perceived a lack of time to be the biggest barrier impeding technology integration in her literacy class. When Joan wanted her class to do research for a project, she scheduled time in one of the school's two computer labs. However, she reported having a difficult time in finding enough time in either lab for students to complete their research. According to Joan, this was because the labs were generally filled with classes

that had standing reservations for a lab. Class size compounded the problem, according to Joan. While the labs were equipped with enough computers to accommodate each of the 24 students in her class, it took that number of students a lot of time to locate, read, and evaluate the information needed for a project. Typically, she allotted a minimum of one week for research, but stated that it was difficult to find consecutive open slots of time that fit with her schedule for literacy instruction. Because the upper grade classes blocked for instruction, her literacy schedule was not flexible. Although there were three computers with word processors and printers in her classroom, Joan did not feel that it was feasible for students to conduct their research in the classroom because the printers did not work. The only way for 24 students to practically share three computers was to have students locate and print information and take it to their desks to read, thereby giving access to the Internet to someone else.

Malfunctioning equipment, according to Joan, also impeded her use of technology. A limited budget, due to recent economic difficulties, precluded repairs and updates to technology, making technology unreliable and dependence upon it frustrating. The printers in Joan's classroom did not work, and even in the computer lab, delays in replacing ink cartridges slowed down progress on class projects. Joan cited the example of the school's outdated mobile cart containing a class set of laptops with a non-working printer and unreliable Internet access. "They haven't been up-dated in eight or nine years and you can't do a whole lot on them when they can't handle the [newer] software." The failure of equipment to work caused Joan to feel frustrated.

Finally, preparation for the standardized end-of-grade reading comprehension test was problematic when Joan wanted to plan class projects. One of the reasons that the

computer labs were difficult to schedule was because they were often used by reading and math classes in grades three through five to complete computerized drill-and-practice tutorials. The computer programs had been purchased specifically to help raise reading and math test scores. While the programs were used during the fall semester, the frequency of their use increased during the spring semester until it peaked during the weeks prior to the end-of-grade tests. Joan reported this as one of the reasons that she could not schedule enough time in the computer lab for all of her students to conduct research for projects. Generally, Joan scheduled class projects for the fall semester because it was more likely that the computer labs would be open. Furthermore, Joan felt so much pressure for her students to perform well on the standardized tests that she rarely used technology in the spring semester other than using the interactive whiteboard to make test preparation more interactive. This was in spite of Joan's belief that instruction is actually more effective when technology is integrated. Joan stated:

> You're not going to see as much technology [being used] right now [in my instruction] because…all we hear is get those scores up. You better get the scores up. Plus, in this economy, when you hear your job could be on the balance, you know, you may want to use technology, you may feel it benefits you, but you're going to go to something that…the students are more used to and is more like the EOG [end-of-grade tests]. I think technology is a better way to instruct. I think it prepares them for the world. I don't think it prepares them for what the EOG is going to be like, and that's why you've got to have them practicing that style.

Joan's words suggest that the pressures she felt due to standardized testing not only impeded her use of technology, but may have constrained other areas of her teaching as

well. Joan's actual instruction was structured and teacher-centered, in contrast to her student-centered pedagogical beliefs, her beliefs about technology, and her belief that her role as a teacher should be that of a facilitator. The pressures of standardized testing appeared to cause her to teach in a style that reflected the format of the test despite the fact that she felt using technology had more benefits and "is a better way to instruct." Furthermore, Joan's quote leads me to believe that she experienced internal tension due to the conflict between her beliefs and practices. It seemed that she could not reconcile the two because of such barriers as a lack of time, malfunctioning equipment, and the pressures that standardized testing brought. These were all institutional barriers that she had no control over. Joan said she constantly heard that the test scores must rise and believed that if they did not her job was "on the balance," so she conformed to what she believed was expected of her rather than align her beliefs and practices.

During the second interview with Joan, I asked if the three lessons which I had observed were typical of her technology use for the year, and she stated that they were not. I had observed Joan during the month just prior to the end-of-grade tests, and according to Joan, she generally used technology in more varied and less structured ways than she had in the lessons I observed. She also stated that she used technology much more frequently in previous years compared to the current year. She blamed the limited use of technology for the current year on the lack of time, the current class schedule, and malfunctioning equipment. Joan elaborated by saying that in recent years her classes typically completed seven or eight research projects rather than the two her class had done this year. Joan also blamed the lack of time caused by the block scheduling for rarely incorporating writing into her literacy instruction. Whereas, in past years writing

instruction took place daily, her class currently had very little time for writing. According to Joan, the current year's class schedule featured shorter blocks of time for literacy instruction than in previous years, and the computerized tutorial which was required for all at-risk children in grades three and above was new. Also, during this interview, Joan indicated that she planned to have her class do one last project in the last two weeks of school after end of grade testing was over, and she invited me to observe during that time. However, the project was cancelled because she spent the majority of that time remediating students who did not pass the end of grade test.

Summary of Case 3

I purposefully selected Joan for this case study because her survey responses indicated that she was an infrequent user of instructional technology. She rarely utilized technology other than computers, the Internet, and the electronic whiteboard. Despite her limited use of technology in literacy instruction, Joan maintained a positive attitude toward technology integration, believing that it had behavioral and academic benefits for students. In short, Joan felt strongly that teaching with technology was more effective than teaching with traditional print-based reading materials.

Joan held many student-centered pedagogical beliefs. She saw her role as that of a facilitator and believed that projects were a good way for students to learn. Yet, her actual practice revealed her instruction to be very traditional and teacher-centered. Joan's students were not often given time to use technology for class projects although she expressed a desire for her instruction to break away from the basal reader toward a project-based instruction. Joan realized that her actual instruction conflicted with her beliefs about pedagogy and technology and she worked toward giving students more

control over their own learning. However, students had little control over lesson content or technology use during the lessons I observed. Joan blamed her failure to integrate technology on a lack of time and access caused by factors such as scheduling, class size, a lack of money for repairs, and a systemic focus on preparing for high-stakes, standardized testing. Pressures to raise standardized test scores through a structured, drill-and-practice format constrained Joan's use of technology and approach to instruction. The pressure she felt to raise students' standardized test scores, along with the frustration she felt from believing that institutional forces beyond her control prohibited her from aligning her practices with her beliefs caused Joan to experience internal conflict. She felt frustration from the desire to use more student-centered instruction with more frequent integration of technology, yet feeling that she could not fulfill that desire due to the external pressures of testing and a rigid schedule. Joan was a teacher with a desire to transition her practice, including her integration of technology, so that it was not only more beneficial to her students, but more aligned with her beliefs; yet she believed she could not do that because of the barriers that stood in her way.

Joan had participated in 10-20 hours of technology training during her current licensure renewal cycle. However, the type of training she had seemed to limit her technology integration to some degree. Joan related that the majority of the training had focused on the operation of technology tools rather than their instructional application. She chose not to use certain pieces of technology, such as the iPod, because she was unsure of how to use it to meet her instructional goals. In this way, the type of training that Joan had received constrained her integration of technology. The impact of this takes on more meaning when Joan's case is contrasted with Kathy. Both teachers were similar

in their number of years of experience; both held primarily student-centered pedagogical beliefs. Both had 10-20 hours of technology training in their current licensure renewal cycle. In contrast, Kathy frequently integrated technology whereas Joan used technology infrequently. Given that Kathy taught kindergarten, a grade with flexible scheduling and no high-stakes testing, a big difference between the two was that Kathy had the intensive year-long training which focuses on operation and application. This was the training that Kathy credited with changing her practice to include frequent integration of technology.

## Chapter Summary

The case study participants were a kindergarten teacher who frequently uses technology in her literacy instruction, a third grade teacher and moderate user of instruction technology, and a fifth grade teacher who used only a small amount of technology in her literacy instruction. The findings afforded a detailed picture of the three teachers' beliefs about the role of technology in their literacy instruction and the ways each actually use technology in their instruction. Patterns in the teachers' beliefs about and actual instructional use of technology, as well as other factors impacting technology use, were exposed. The in-depth details and patterns revealed in the case studies facilitated a deeper understanding of how beliefs and actions related to technology use coagulate in the classrooms of teachers across grade levels and of differing levels of technology use. The cross-case analysis, presented in the following chapter, further deepens the understandings of the teachers' beliefs about and actual use of technology in their literacy instruction by illuminating significant similarities and differences among the details and patterns of the three case studies.

# CHAPTER VI: CROSS-CASE ANALYSIS

Cases studies yielded deep insights into the beliefs of three teachers regarding the use of technology in their literacy instruction as well as their actual uses of technology in that instruction. The first case was Kathy, a kindergarten teacher and frequent user of instructional technology. Jennifer was a third grade teacher and moderate user of instructional technology. Joan, the final case, taught fifth grade and used instructional technology only a small amount. A cross-case analysis of the data revealed significant patterns, similarities, and differences among the three cases. A summary of the major similarities and differences across the three cases can be seen in Table 5. The patterns, along with the similarities and differences among the cases, are discussed in this chapter. Those patterns include teachers' attitudes toward technology, barriers that impede technology integration, and the influence of pedagogical beliefs on technology integration.

## Attitudes toward Technology and Technology Integration

Kathy and Joan exhibited positive attitudes toward technology and utilized technology for administrative and instructional purposes. Both teachers not only placed a high value on the instructional use of technology and digital texts, but were also committed to some level of technology integration. However, Jennifer had a superficial positive attitude toward technology, which upon probing during interviews and observations, gave way to a more ambivalent attitude. Jennifer's level of commitment to

technology integration was not as strong as the others. Like Kathy and Joan, Jennifer believed her students benefitted from integrating technology into the curriculum, but she did not appear to be convinced that the benefits of using technology outweighed the troubles she experienced when technology failed to operate properly. Additionally, and contrary to Joan and Kathy, Jennifer did not seem to be convinced that teaching technological literacy was her responsibility as a literacy teacher.

Instructional technology had perceived benefits for students and their literacy instruction which may have influenced the teachers' attitudes towards technology and technology integration. Kathy, Jennifer, and Joan, all experienced literacy teachers, held similar beliefs about literacy instruction. Each believed that students' prior knowledge and ability to make connections with the text are key factors which contribute to reading comprehension, and each felt that their instruction needed to be as interactive as possible. To varying degrees, all three teachers believed that the interactive nature of technology benefitted their literacy instruction in several ways. They thought technology use helped children build their prior knowledge, make connections, retain content, and stay focused. Each also believed that students' motivation, interest, and time on task were improved when interacting with technology. The teachers credited the interactive nature of technology for the improvements, and all agreed that these benefits made their literacy instruction more effective. The increased engagement with texts and time on task resulted in teachers spending less time managing classroom behavior thereby increasing instructional time. This, according to all three teachers, made their instruction more efficient. Kathy and Joan also reported that technology use facilitated students' task-related dialogue. Both Kathy and Joan valued the social context of learning and perceived

the increased instructional dialogue as beneficial to students' cognitive development. The perceived student benefits of technology integration may have been responsible for Jennifer's attitude toward technology not being more negative than it was. For example, Jennifer expressed a good deal of frustration over the tendency of technology to malfunction during use. In fact, this problem diminished the frequency with which she used technology, and, at times, caused her to abandon its use. However, she increased her use of instructional technology in the spring prior to end-of-grade testing, perhaps because of the benefits to students.

Another factor which may have influenced the teachers' attitudes was the fact that they felt relatively comfortable using most types of technology. Both the district and the technology-rich school were perceived by the case study teachers to be committed to technology integration and provided ample opportunities for technological training based upon teachers' reported needs. Kathy, the frequent user of technology, had the most training with 10-20 hours of professional development during her current licensure renewal cycle. Additionally, she participated in an intensive year-long training over a decade ago which focused on technology use and its instructional application. She credited this prior training for her current frequent technology use. Joan also had 10-20 hours of technology training during her current licensure renewal cycle and desired to integrate technology to a greater degree, but blamed a number of barriers for her infrequent use of instructional technology. Jennifer, the moderate user of technology, had less than 10 hours of technology training during her current renewal cycle.

While the training the teachers' received seemed to increase the comfort with the use of technology, the type of training they received appeared to have some bearing on

the frequency with which they integrated technology into instruction. Kathy, the frequent technology user, was the only teacher who had participated in training that focused on the application of technology tools to meet instructional goals. Kathy had the benefit of the intensive year-long training which had covered both the technical operation of equipment and ways to use the technology in instruction. Kathy believed that it was this training that changed her teaching, causing her to integrate technology frequently. Joan, the infrequent technology user, reported the same number of training hours in her licensure renewal cycle as Kathy; however, she indicated that the training she had received only concentrated on the operation of technology. Joan and Kathy also held similar pedagogical beliefs and had similar years of experience. Likewise, Jennifer reported that the focus of her training was also on the operation of the technology. While the type of training received was not the only factor which may have impacted the teachers' frequency of technology use, Kathy's lengthy training which included application techniques appears to have made a difference in the frequency of her technology use and, possibly, her positive attitude toward technology integration.

All three teachers' conceptualizations of technology integration included groups of students interacting with technology to advance their understanding of content knowledge. Jennifer's conceptualization of technology integration was narrower than Kathy's and Joan's. Jennifer described technology integration as students, either singly, in small groups or whole groups, using technology to complete reading activities. She did not include writing activities in her definition perhaps because her students did little writing. Jennifer's idea of technology for student interaction was limited mainly to the use of the computer to access the Internet and tutorial programs. The students in

Jennifer's class generally used the computer and Internet for practicing reading skills in online games and computerized tutorials and reading stories online. The interactive whiteboard was also used during whole group instruction. In contrast to Jennifer, Joan and Kathy believed that the student-technology interaction should include peer collaboration with a variety of technology tools within small groups; while, Joan further believed that technology should aid in the evaluation and judgment of information. Joan's and Kathy's definition of technology integration aligned closely with Leu's (Leu et al., 2004, p. 1570) definition of new literacies. Both Jennifer's and Kathy's actual practice reflected their perception of technology integration. Joan's actual practice, however, did not match her beliefs about what technology integration should look like. Despite the fact that Joan's perception of technology integration was more inclusive and well-developed than the majority of the participants in this study, her students actually had limited interaction with instructional technology.

Each of these teachers recognized the importance of technological literacy in modern society. All expressed the belief that being literate includes the ability to operate and apply technology tools to solve problems in addition to being able to read and write traditional printed texts. Kathy and Joan strongly believed that technological literacy must be incorporated into literacy instruction. They both believed that their students' futures in education and in the work place depended on them being technologically literate. Although Jennifer iterated the same belief, she expressed some doubt about whether it is solely the responsibility of the literacy teacher to teach technological literacy. She also stated that she did not have enough instructional time to teach students

the basic operation of technology tools. These beliefs contributed to the air of ambivalence that permeated Jennifer's attitude toward technology.

Although all three teachers used instructional technology to varying degrees, neither used a wide variety of technology tools in their instruction even though many types of technology tools were available in the school for check-out. The three teachers primarily depended upon the Internet, the computer, computer games, and the interactive whiteboard. They all used other types of technology, such as digital cameras or GPS, infrequently in their current or past literacy instruction.

### Barriers Impede Technology Integration

Barriers, such as malfunctioning equipment, a lack of time, and standardized testing, impacted the degree to which technology was integrated. Malfunctioning technology restricted technology integration in each of the three cases. This was especially the case for Jennifer and Joan whose classes had a higher ratio of students to computers. They both cited malfunctioning technology as the biggest barrier to their technology integration. Jennifer used instructional technology a moderate amount, but when technology failed to work, she sometimes abandoned its use for a period of time. Although Kathy reported that malfunctioning equipment was a barrier to her integration of technology, she appeared to have enough technology resources to compensate for malfunctioning equipment most of the time.

A lack of time and standardized testing were barriers that were created by the larger institutional contexts of school and government. The institutional barriers appeared to affect teachers of grades three and above. Jennifer and Joan taught third and fifth grades respectively and reported that a lack of time impeded their use of instructional

technology. Both blamed the lack of time on the block scheduling used in grades three through five. The short class periods made it difficult to include activities in which the students interacted with technology. As a kindergarten teacher, Kathy's students remained in a self-contained classroom setting with a large part of the day devoted to literacy instruction. She was able to adjust her schedule, if necessary, because no other teacher depended upon her fidelity to an established scheduled. Kathy and Jennifer both had standing reservations for their classes to use the computer lab, but Joan found it problematic to find open time for all of her classes to use the lab. She did not feel that a standing reservation in the lab suited her schedule or that it was possible for every teacher to have a standing reservation. In short, scheduling proved to constrain technology integration for Jennifer and Joan, the third and fifth grade teachers. Scheduling, both class instructional schedules and procedures for scheduling the computer lab, were predetermined for teachers by the school principal thus making it an institutional barrier. Both Jennifer and Joan reported frustration from feeling as if they never had time to assign lengthy activities to their classes. For Joan, the frustration was compounded when she had difficulty scheduling time in the computer lab because she felt that the scheduling practices were inequitable across grade levels.

The federal legislation, NCLB (USDE, 2001), requires that students in grades three and above be assessed yearly in reading comprehension. In addition, the state government imposes additional standards that are assessed through the year-end testing program (NCDPI, 2004). The year-end high-stakes reading comprehension test required by the state of North Carolina to fulfill the federal mandate was perceived to be a barrier to technology integration by Joan. Since Kathy taught kindergarten, her students

were not assessed through standardized measures. Jennifer did not perceive end-of-grade testing as a barrier to technology integration because her class used the computerized tutorial program in the lab three times per week. She believed the tutorial served a dual purpose; it allowed her students an opportunity to use technology and prepared them for the standardized testing. Furthermore, Jennifer's increased use of instructional technology during the spring months may have been sparked by the desire to refocus her students prior to testing. Joan, however, perceived institutional pressure to prepare her students for testing from not only the local school and district institutions, but the broader institutions of the state and federal education systems. In addition, Joan perceived there to be pressure to not only teach a curriculum designed to prepare students for standardized testing, but to structure her lessons in a traditional way more aligned to traditional testing. The pressure Joan felt as a result of the high-stakes testing caused her to experience anxiety and frustration over being unable to reconcile her teaching practices with her pedagogical beliefs. The anxiety was a consequence of Joan's perception that keeping her job depended on her conformity to the preferred teacher-centered instruction to prepare students for the testing.

Indirectly, the grade level that each of the case study teachers taught impacted their technology integration. Because a lack of time only affected the third and fifth grade teachers, this barrier indirectly caused grade level to influence the way and frequency with which technology was integrated. Jennifer reported that she was unable to use technology in lengthy assignments due to the time constraints of the schedule, and Joan blamed a lack of time for being unable to plan class projects. Kathy's kindergarten class had a flexible schedule. In addition, kindergarten was unaffected by the pressures of

high-stakes testing. However, Kathy felt that the developmental level of kindergarteners limited the ways she could use technology in instruction, but she did not cite this as a barrier to her technology use.

Technology Integration is Influenced by Teachers' Pedagogical Beliefs

In all three cases, the teachers' instructional use of technology was influenced by their pedagogical beliefs. Kathy and Joan reported many student-centered pedagogical beliefs, and in their interviews each stated that they believed that student-centered teaching methods are more effective than traditional teacher-centered methods. Both teachers viewed technology as a way to enact their student-centered pedagogical beliefs as well as a way to support and enhance their literacy instruction. Additionally, each believed that technology has the potential to impact student learning and has changed the way they teach. Neither teacher could imagine doing their job without technology after seeing the positive effects it has on student behavior and achievement. Although both teachers incorporated teacher and student-centered activities in their instruction, Joan used more structured, teacher-centered instruction as she appeared to struggle to balance perceived pressure to teach to the standardized end-of-grade tests and the desire to use methods more aligned with her pedagogical and technology beliefs. Furthermore, despite the fact that both teachers favored student-centered pedagogy, Kathy frequently integrated technology into instruction whereas Joan only used technology infrequently for instruction. It appears that although Joan's pedagogical beliefs influenced her instructional use of technology, the institutional barriers of high-stakes testing and a lack of time exerted greater influence over her decisions about how to teach and whether to integrate technology.

Unlike Kathy and Joan, Jennifer reported teacher-centered pedagogical beliefs which were reflected in highly structured lessons in which she maintained complete control. Jennifer's control extended to the operation of the technology; students had minimal interaction with or control over technology during instruction. Jennifer never assigned her students projects or other less structured activities that involved technology because she preferred not to give up control of the class. Jennifer used technology to facilitate the efficient delivery of lessons, rather than as an integral part of instruction. Technology served as a tool to achieve the efficiency she desired. Although, Jennifer stated that technology had changed her literacy instruction, her students still experienced literacy in a traditional way.

## Chapter Summary

Kathy, Jennifer, and Joan represented three different grade levels and three different levels of technology integration. Kathy, the kindergarten teacher was a frequent user of technology. Jennifer, the third grade teacher, used instructional technology moderately, and Joan, the fifth grade teacher use instructional technology infrequently. The three teachers shared a positive view of technology integration and believed that it is important for children to develop technological literacy. Three factors seemed to influence the differences in the frequency of technology integration among the teachers, the teachers' pedagogical beliefs, perceived barriers to technology integration, and the grade level at which each teacher taught. Jennifer used technology in a traditional way to carry out her traditional teacher-centered pedagogical beliefs. She believed that technology made instruction more efficient. Kathy and Joan, teachers who favored student-centered pedagogy used technology as a means to enact their pedagogical beliefs.

Because of this, Kathy frequently used technology in her literacy instruction. Joan desired to integrate technology frequently; however, perceived barriers to integration prevented her from doing so.

Each teacher believed barriers impeded technology use to some degree. Kathy's only perceived barriers were malfunctioning technology and the limited abilities of her kindergarten students. Equipment failure also proved to be a barrier to integration for Jennifer and Joan. Institutional barriers were problematic for Jennifer and Joan. A lack of time due to scheduling hindered technology integration for both teachers, and perceived pressure to teach for performance on the end-of-grade high-stakes tests impeded technology integration for Joan.

Indirectly, the grade level that each teacher taught influenced the teachers' frequency of technology integration due to the presence or absence of barriers at a particular grade level. Although her kindergarten students were least able to use technology independently because of their age and cognitive development, Kathy integrated technology more frequently than the other two teachers. There was no standardized testing or imposed scheduling to hinder technology use as there was for Jennifer and Joan who taught third and fifth grades respectively.

The in-depth description obtained from the case study data painted a detailed picture of the technology use and beliefs of three teachers at Glenn Valley Elementary. Overall, the similarities and differences across the three case studies were significant and revealed important patterns in the teachers' beliefs about instructional technology and its integration into literacy instruction. The patterns enabled me to tease out important factors that influenced the three teachers' integration of technology into their literacy

instruction, as well as the multiple roles that technology play in the teachers' literacy instruction. These findings, along with the data gained from the survey, will be discussed in depth in the following chapter.

# CHAPTER VII: DISCUSSION AND IMPLICATIONS

This study was designed to gain a deeper understanding of elementary teachers' beliefs about the role that technology plays in their literacy instruction and the extent to which those beliefs are reflected in their actual practice. Set within the context of one technology-rich elementary school, both qualitative and quantitative methods were employed to gather data. In seeking to better understand teachers' beliefs and practices regarding instructional technology in literacy instruction, the following questions guided this study:

1. What are teachers' beliefs across grade levels regarding the role of technology in literacy instruction as measured by the *Technology Integration in the Classroom* survey?
2. How are teachers across grade levels using technology in literacy instruction?
3. How are the beliefs of three teachers of varying levels of technology integration reflected or not reflected in their practice as evidenced by interviews, observations, and the *Technology Integration in the Classroom* survey?

Since the quantitative data, gained through the administering of the survey, served to inform the qualitative data by providing baseline information on teachers' beliefs, a synthesis of the quantitative and qualitative data is presented first, followed by a discussion of the findings. The discussion is organized by research question topic, followed by a discussion of the implications for practice and future research.

## Looking Across the Data

The research site for this study was a low socioeconomic elementary school that qualified for federal Title I status. However the site was technology-rich; teachers had ready access to computers, hardware, software, and other ICTs. All classrooms were equipped with interactive whiteboards, at least three computers, at least one printer, and one scanner each. One lab was outfitted with an interactive whiteboard, 12 digital cameras, and class sets of iPods and GPS which were available for teachers to check out. All computers were networked and connected to high speed Internet.

Generally, participating teachers at this technology-rich elementary school exhibited a positive attitude toward technology and technology integration, believing unanimously in the importance of students being technologically literate with a variety of digital tools. They also believed that it is important for students to develop skills in using computers to analyze and present ideas. All participants expressed the desire to use technology in their instruction with the majority feeling that its use did not add to their work load. Rather, most teachers agreed that technology made lesson planning and preparation easier and instruction more efficient. Instruction was expedited through ready access to high speed Internet via classroom computers, the interactive whiteboard, and other ICTs which gave teachers and students immediate access to resources such as pictures, textual information, and virtual field trips. Teachers did not believe that technology changes too rapidly to incorporate into instruction.

Teachers also believed that technology has the potential to maximize student learning. They believed that integrating technology into instruction resulted in academic and behavioral benefits for students. Participants felt that the use of

technology aided students in building and accessing prior knowledge and vocabulary thereby enhancing the reading process. Additionally, teachers believed that technology's interactive nature improved students' engagement with texts, focus, interest, and motivation. The belief was that when students are interacting with technology during instruction, they spend more time-on-task and engage in more task-related dialogue. It was perceived, consequently, that students' behavior was better and more focused, with fewer discipline problems, when technology was integrated.

The positive beliefs and attitudes translated into the use of a variety of instructional technology tools. Some were used more frequently than others. The tools used most often were the interactive whiteboard, computers, and the Internet. These were the tools that were in use during the observations of actual practice. Teachers felt very comfortable using these tools and had participated in a mean of 15.3 hours of technology training either onsite or within the district, both of which were believed to be committed to technology integration.

Despite these beliefs and access to technology, certain barriers appeared to impede the frequency and quality of technology integration. Malfunctioning equipment was often problematic; this was compounded by a lack of funds to repair or update equipment. A lack of time due to scheduling conflicts and short class periods, as well as the demands of high-stakes testing were also reported barriers to technology integration.

Teachers' Beliefs Regarding the Role of Technology in Literacy Instruction

The teachers who participated in this study believed that technology played four roles in their literacy instruction. Teachers used technology as a means to enact their

pedagogical beliefs during instruction. Technology also played a significant role in classroom management as well as a role in managing instruction; both of these roles were closely related. Finally, technology served to make instruction more effective.

The teachers involved in this study used technology as a means to enact their pedagogical beliefs. Research (Pajares, 1992; Palak & Walls, 2009) indicates that teachers' beliefs are not categorically explicit, but rather, blur the lines of distinction between student-centered and teacher-centered pedagogy. Teachers generally lean toward one or the other and tend to use instructional technology in a manner consistent with their pre-existing pedagogical beliefs (Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Judson, 2006; Palak & Walls, 2009; Zhao et al., 2002). This is particularly the case when their beliefs are more teacher-centered (Palak & Walls, 2009). My findings are in congruence with this earlier research. I found both student-centered and teacher-centered beliefs across the faculty as a whole, and while teachers indicated that they frequently used technology in literacy instruction, it was often used to support traditional print-based literacy in teacher-led instruction. The majority of the faculty believed that group projects are a good way for students to learn and over 85% reported having their students create multimedia projects; yet I observed no project-based learning during the eight weeks I spent at Glenn Valley. Furthermore, each case study participant indicated that they seldom integrated projects into their curriculum even though they each felt that projects are a good way for students to learn.

Two of the case study participants, Kathy and Joan, were more student-centered in their beliefs. Kathy's literacy program was set up in a non-traditional format, as described in chapter IV, to accommodate those student-centered beliefs. The use of

technology supported Kathy's belief that literacy instruction should be within a small group context, interactive, and tailored to individual needs. The use of flipcharts on the interactive whiteboard and interactive emergent literacy websites were used during small group instruction and in literacy centers. Although the use of technology enabled her curricular objectives to be accomplished more effectively and efficiently, traditional print-based activities could have accomplished the same curricular objectives. However, technology enhanced the social interaction surrounding the learning experience, scaffolding instruction and providing opportunities for students to interact with one another and the technology as they worked on learning objectives.

Research (Leu et al., 2005; Reynolds, 2007) suggests that education stakeholders hold multiple and sometimes conflicting views of technology integration. Among them are what Reynolds (2007) terms a "technocratic" (p. 203), or skills-oriented view, and a view which takes a socio-cultural stance. The latter is concerned with how technology creates new modes of texts, new roles for readers, and new ways of meaning-making. Kathy's technology pedagogical beliefs were more in line with the socio-cultural in that she valued the multimodal texts used and created by her students and the influence of the technology on her students' literacy experiences. For Kathy, the technology tools mediated and socially situated the reading process while making the instruction effective and efficient.

Joan's actual instruction, which was structured and teacher-centered, did not match the student-centered beliefs she articulated. However, she desired for her instruction to be project-based and more closely aligned with her beliefs about pedagogy and technology. Joan appreciated the dimension that technology added to the social

context of her students' literacy experience. She saw more evidence of task-related dialogue among students when they were using technology. However, the actual technology use that I observed stripped away most of the social context of her students' literacy instruction. During the structured, teacher-led instruction, students had limited interaction with the technology.

Joan felt that certain barriers, such as a lack of time and outside pressure to teach to the standardized tests, kept her from engaging in the type of student-centered instruction that fosters students' technological literacy and situates literacy socially. Consequently, she felt that her literacy instruction was not as effective as it could be if she aligned her instructional practices with her beliefs. In particular, Joan felt that her voice, as well as her students' voices, was silenced by the institutional forces calling for a structured approach to instruction believed to be congruent to a standardized testing format.

As a former teacher, I identified with Joan's struggle to reconcile her teaching practices with her pedagogical beliefs. I, too, taught a grade which underwent standardized end-of-grade testing. I felt the institutional pressure increase to teach a structured skills-based curriculum designed to improve student test scores despite my belief that student inquiry and project-based learning yielded more academic benefits for students. Through most of the last decade I that taught I used technology for student inquiry and collaborative projects at least two to three times per month. However, like Joan, I began assigning fewer projects each year, due in part to the pressures to incorporate more drill-and-practice activities to prepare for the test and in part to a lack of

time. I remember feeling frustrated when I felt that outside forces, such as standardized testing and a lack of time, caused a misalignment between my practice and my beliefs.

Jennifer held strong teacher-centered beliefs about pedagogy and used technology to enact those beliefs. She used technology in a structured way either in teacher-led whole group instruction or for standardized test preparation. When Jennifer used technology during whole group instruction, she generally maintained control of the technology. Although Jennifer expressed a belief in the importance of developing students' technological literacy, she went on to say that she didn't "really think it's [teaching technological literacy] my job." Jennifer appeared to be ventriloquating what she assumed that I, as an investigator of teachers' beliefs about technology in literacy instruction, wanted to hear when she iterated her belief in the importance of developing students' technological literacy. According to Bakhtin (1981), ventriloquating is when a person echoes the voices of others in order to be perceived in a different light. Jennifer's goal was to achieve efficient instructional delivery rather than to develop her students' technological literacy, and she believed the best way to accomplish that goal was through teacher-led instruction. Technology simply facilitated the achievement of that goal. When technology failed to be an efficient instructional delivery tool due to its failure to work properly or it causing her to lose control of the classroom, Jennifer abandoned its use.

The pedagogical beliefs of the three case study teachers mediated the ways and frequency with which they used technology in instruction. I developed the model depicted in figure1 to illustrate how sociocultural theory can be used to provide a suitable lens for interpreting and blending the precepts of teachers' beliefs and the decisions teachers make regarding the use of technology. It demonstrates how, according to

sociocultural theory, a teacher's educational beliefs mediate behaviors and decisions within the institutional context of school. Windschitl and Sahl (2002) found that teachers' educational beliefs mediated their integration of laptops into their curricula in a powerful way. Similarly, Zhao et al. (2002) revealed that the more closely an innovation, such as a technological tool, aligns with pre-existing pedagogical beliefs, the more likely a teacher is to integrate it into instruction. For Jennifer, the use of technology as an innovative way to teach curricular goals did not fit with her pedagogical beliefs. Consequently, she did not integrate technology frequently and when she did use instructional technology, it was used merely as an additional tool to facilitate the efficient delivery of instruction.

Technology played the role of a classroom manager during literacy instruction. Across grade levels, teachers relied upon technology to manage both observable classroom behaviors and intangible factors that might have influenced outward behaviors either directly or indirectly. Teachers believed that technology captured and maintained student interest and focus by heightening the level of student interaction during instruction. All of the participating teachers used the interactive whiteboard frequently in instruction, and cited its ability to inject a level of student-text interaction into an otherwise traditional activity. In addition, teachers believed that technology increased student motivation and engagement with reading. Kathy, the kindergarten teacher, explained that "for a child that can't read, picking up a book is the worst thing…but, if you can get away from the paper and pencil…and get him on the computer, then they're just having fun with it and don't realize they're learning." By removing some of the frustration from reading and increasing interest and motivation, teachers believed student behavior improved.

Teachers saw benefits from using technology, such as increased motivation and engagement, and they believed student behavior "is definitely better because it [using technology] keeps their attention." When students were interacting with technology during instruction, teachers saw "less off-task behavior;" students were more focused, and there were "fewer discipline problems." Technology allowed students to be in control of their learning both literally and figuratively. When students used technology they were physically in control of the navigation and operation of the equipment, but by choosing hyperlinks or scenarios within programs, they exercised control over content and pacing and became more engaged students with less off-task behavior. Therefore, when technology was utilized in instruction, teachers could get on with the task of teaching. During my observations of the three teachers, I noticed that each of them spent little time managing classroom behaviors. Students were attentive, on task, and appeared engaged in the literacy activities going on in the class.

The case study teachers speculated that the increased interest, motivation, and engagement, all benefits credited to technology integration by previous studies (Chandler-Olcott & Mahar, 2003; Friedman & Heafner, 2007; Heafner & Friedman, 2008; Miners & Pascopella, 2007; Luce-Kapler, 2007; Luce-Kapler & Dobson, 2005; Williams, 2005), may be related to the way that technology bridges the gap between the types of literacy activities students engage in at home and those engaged in at school. The case study teachers agreed that the majority of students have computers at home, and, as Kathy added, are "computer savvy and ready to do those kinds of things [use technology]" at school. The consequences of a mismatch between literacy practices inside and outside school, often referred to as the digital gap (Leu et al., 2004), concern

educators (Chandler-Olcott & Mahar, 2003; Friedman & Heafner, 2007; Heafner & Friedman, 2008; Miners & Pascopella, 2007; Luce-Kapler, 2007; Luce-Kapler & Dobson, 2005; Williams, 2005) because students feel that their literacy practices are not valued at school. To their credit, the three case study teachers recognized the importance of matching the literacy practices of students at school with those outside school. All three teachers talked about how the majority of their students used technology in their homes and wanted to use it at school as well. They each noted that their students were more engaged when interacting with technology. Kathy valued digital texts enough to allow a student to create a Facebook page for a project and get the district to unblock the site so that the project could be shared with the class. However, recognizing the value and importance of aligning literacy practices used inside and outside school did not mean that the teachers took steps to actually match those literacy practices. Kathy's students' in-school literacy practices were the most closely aligned to their outside school practices. Her students used a greater variety of digital tools, including word processors for writing, iPods, and digital texts for reading. Jennifer made homework assignments from the computerized reading tutorial that they used at school, but that is not similar to the ways students use technology outside school. Because the students in Joan's and Jennifer's classes had limited opportunities to read and create digital texts, limited exposure to a variety of digital tools, and limited opportunities to actually operate digital tools, there remained disparity between their literacy practices inside and outside of school. Other factors were partly to blame for the disparity. For Joan, the lack of time and the pressures of high-stakes testing constrained the ways in which she used instructional technology, and Jennifer's pedagogical beliefs influenced the ways she used technology.

Technology played an important role in managing instruction by making it more efficient. Ready access to the Internet made it possible for teachers to search for information and pictures to enhance content and vocabulary. Jennifer particularly liked downloading ready-to-use flipcharts for the interactive whiteboard because the easy access to a tool designed to meet the objectives to be taught reduced planning time. Although Kathy could have accomplished the same objectives with traditional printed texts in her kindergarten groups, premade flipcharts, computer games, and Internet websites were within immediate reach and reduced planning time. Teachers also had instantaneous access to the Internet for the whole class via the interactive whiteboard at any point during instruction. Joan took advantage of this, frequently using the Internet and the interactive whiteboard in whole group instruction. Finally, as previously described, I observed across grade levels a high level of student time-on-task and minimal time spent managing student discipline, allowing teachers to spend more time in actual instruction.

Teachers in this study perceived that technology played a role in increasing the effectiveness of literacy instruction. Teachers made a distinction between efficiency and effectiveness in instruction; instruction can be efficient without necessarily being effective. Efficiency was associated with time management while effectiveness was associated with student achievement and retention of content. All three teachers believed that technology can change the way content material is taught, making instruction not only more efficient, but more effective as well. More to the point, they believed that computer technology and ICTs have the potential to positively impact instruction, maximize student learning, and, in particular, enhance reading comprehension.

Specifically, teachers argued that when technology was integrated into instruction, students "internalized" instruction and "retained content better." This belief is consistent with other literature on the positive effects of technology on achievement (Gulek & Demirtas, 2005; Heafner & Friedman, 2008). Participating teachers felt that the use of technology aided students in building and activating background knowledge, building vocabulary, and making connections with texts, all factors in students' ability to comprehend texts (Gunning, 2003). Teachers also saw increased student dialogue that was task-oriented, and as already described, a high level of student motivation and engagement with text was reported when technology was integrated into literacy instruction. Guthrie (2004) identifies motivation and social interaction as important attributes of engaged readers and states that great amounts of engaged reading result in improved reading comprehension.

Teachers and administrators at Glenn Valley used technology to provide the type of instruction and practice that they believed to be effective in preparing students for the end-of-grade standardized testing. All students in grades three through five were required to use reading and math computer programs to practice tested curricular objectives. The programs were self-paced and individualized so that each student worked on objectives which their teacher had identified as needing extra practice. Jennifer's students used the reading program in the computer lab three times per week to prepare them for the standardized testing.

The roles assigned to technology were, for the most part, designed to facilitate the teaching of a traditional curriculum rather than to advance new literacies. While students did interact with technology in ways such as computer games and interactive flipcharts,

technology was often used in a more traditional way, such as to display a copy of a printed text or for standardized test review. Only one of the three case study teachers allowed her students to create digital texts. Teachers generally did not feel comfortable incorporating telecommunications, such as the Internet, video conferencing, or cellular phones, in instruction for activities such as collaborating, publishing, or interacting with individuals outside the classroom. Even though a small percentage reported having students publish a wiki or blog, none of these activities were observed. Furthermore, when defining technology integration, over 56% of the participants responded that technology integration simply involved student using technology to do an activity. Only 14.3% of the participants mentioned that integration involved students analyzing and comparing information or working collaboratively to use multimedia to create and share projects that reflect content and literacy skills, a definition consistent with North Carolina's definition of technological literacy in its statewide strategic reading plan (NCDPI, 2007). However, when pointing out that only 14.3% of the participants' conception of technology integration aligned with the state's definition, I must also point out that the state's description of technology integration does not appear in the English-Language Arts Standard Course of Study (SCOS). The SCOS only contains a list of technical skills that students must acquire (NCDPI, 2004). While I was teaching, few teachers at Glenn Valley had knowledge of the existence of the state's strategic reading plan and the technology training offered by the school and district did not communicate the existence of the plan or address the technology literacy competences outlined in it.

Ways Teachers Used Technology in Literacy Instruction

The results of this study do not corroborate prior research which indicates that technology, such as the Internet and other ICTs, is generally not finding its way into classroom instruction (Cuban, 2001, 2007; Hitlin & Rainie, 2005; Hutchison, 2009; Peck et al., 2002; Yeo, 2007), even in technology-rich environments where access is not an issue (Cuban, 2001; Palak & Walls, 2009). Glenn Valley, the research site for this study, was a technology-rich school at the time I collected data for this study, and technology was being utilized in instruction. Computers, the Internet, interactive whiteboards, and various applications and software were used most frequently, with other ICTs, such as GPS, iPods, and digital cameras being used less frequently. There are several issues, however, that appeared to have some bearing on the participants' decisions to use technology, as well as the frequency of its use, at Glenn Valley. Those issues include ready access to technology, the existence of positive attitudes toward technology integration, teachers' level of comfort in using technology, and teachers' perceived barriers to technology integration.

Findings suggest that the easier the access to technology, the greater the likelihood that it will be used in instruction. Teachers who participated in this study reported using a variety of technology tools in their literacy instruction to varying degrees. The technology tools receiving the most use, the interactive whiteboard, computers, word processors, and the Internet, were located in classrooms and, therefore, constantly at teachers' fingertips. All of the participants reported using computers and the interactive whiteboard frequently in their instruction, and all reported using the Internet in some capacity frequently. The participating teachers at this school also reported using a variety of software applications in their instruction at

least a moderate amount, and both computers labs were used so often that some teachers had difficulty scheduling time in the labs. However, contrary to previous research findings (Rogers, 2007), the analysis of the data led me to conclude that access to technology does not guarantee to what degree teachers will integrate it into their instruction. They may use technology in instruction, but not necessarily to great depth.

In Kathy's case, her frequent use of instructional technology was supported by having enough computers in her classroom to enable small groups of students to use them simultaneously throughout the day. Although she cited malfunctioning equipment as a barrier to her technology integration, the quantity of computers in her classroom appeared to diminish the impact of this barrier. In addition, she reserved one of the computer labs for her kindergarteners to use once a week. Jennifer, the moderate user of instructional technology, had three working computers and printers in her classroom, and her third graders used the computer lab three days per week. Joan, the infrequent user of instructional technology, also had three computers in her classroom, but reported that her printers did not work. In addition, her student-to-computer ratio was higher than in the other two cases. Joan also had difficulty scheduling adequate time in the computer lab for her students. Joan and Kathy reported having similar beliefs regarding pedagogy and technology, yet their levels of access and their frequency of technology integration were very different. A lack of ready access to technology impacted Joan's decisions to use technology in instruction.

Technology located outside classrooms received less use at Glenn Valley. Although multiple digital cameras, which were centrally stored, were available for check out, less than half the participants reported using digital cameras in their

instruction and only for a small amount. One class set of iPods were available for checkout, but only 23.8% of the teachers surveyed incorporated iPods into literacy instruction, and they used those iPods only a small amount. Likewise, teachers could check out a class set of GPS; yet, half of the teachers surveyed had never used the GPS in instruction. Of the teachers reporting that their students had used the GPS; none used them frequently, despite the fact that the entire faculty had received training in the use and application of the GPS for literacy and content area instruction.

My own experiences using technology during the time I taught at Glenn Valley allow me a degree of understanding and insight into how easy access influences frequency of use. I was a frequent user of technology in literacy instruction. My students used word processors daily for writing and computers and the Internet daily for research or other purposes. My classroom had three working computers and a laptop, all connected to the Internet and working printers. I frequently collaborated with the technology facilitator and other resource teachers to send small groups of students to a computer lab to work on projects. The computer labs were used less often for remedial reading and math tutorials then so scheduling was not as difficult as reported in Joan's case. My students used digital cameras frequently in their daily writing and for projects. There were a dozen digital cameras housed in my classroom ready for use at any given moment and also available for students to check out and take home to make photographs for projects and writings. My students used iPods a moderate amount for listening to student-created podcasts or recordings of novels. Five iPods stayed in my room at all times. The digital cameras and iPods were not available for general check out to other teachers, and my classroom was the only one to be so equipped. For several

years a mobile wireless lab with 16 laptops and a printer was kept in my room, making the student-to-computer ratio almost one-to-one. Student computer, Internet, and word processor use was at an all-time high when the mobile lab was present because small groups, individuals, or the whole group could use them at any time without having to wait for computers to be free. The GPS and camcorder, which were housed in a central location for check out, were used less often in my instruction. The point is that one of the reasons I used certain technology frequently was because it was easily accessible within my own classroom. Instructional preparation and planning time was reduced because I did not have to retrieve equipment from central storage or vie with other teachers for its use.

Other researchers studying technology integration also found that access influences the frequency of integration. Prior research (Ertmer et al., 1999; Hutchison, 2009) revealed that teachers report lack of access to be a barrier to technology integration and that an increase in access would increase their integration. Furthermore, Honan's (2008) study of literacy teachers indicated that access to ICTs that could be matched in appropriateness to specific classroom activities would increase the likelihood of integration.

Another factor which seemed to influence the use of technology at Glenn Valley was the participants' positive attitudes toward technology integration. Teachers unanimously reported a desire to use technology in their literacy instruction, and the majority of teachers disagreed that technology changes too rapidly to implement in instruction. Most teachers indicated that they enjoy learning about new technologies and would welcome more opportunities to integrate it into their instruction. The data suggest

that participants valued the contributions that technology integration made in their day-to-day instruction. The majority believed that technology has the potential to maximize student learning and has positively impacted their beliefs about teaching. The cross-case analysis of the case study data revealed a common belief that instructional technology benefitted students academically and behaviorally, and made instruction more effective and efficient.

The literature points to the importance of teachers' positive attitudes and valuing of the effects of technology use on instruction (Becker, 2000, 2001; Cuban, 2001; Zhao et al., 2002). Research shows that teachers who believe that technology can influence instruction in a significantly positive way are more apt to place a higher value on technology than those whose attitudes towards technology are more moderate (Becker, 2000, 2001; Cuban, 2001; Zhao et al., 2002). Furthermore, Ertmer et al., (1999) posit that teachers must first value technology before they will successfully integrate it into their pedagogy.

Glenn Valley is a technology-rich elementary school. The student to computer ratio was 2.8:1 compared to the national average of 5:1 (Collins & Halverson, 2009). Every instructional classroom was outfitted with an interactive whiteboard and scanner. In addition a variety of other ICTs were located in the school including iPods, GPS, and digital cameras. Buckenmeyer (2010) found the availability of technological resources to be a powerful predictor of instructional technology use. However, whether or not the technology-rich environment at Glenn Valley contributed to the participating teachers' positive attitudes toward technology or not cannot be determined from this study. I can

only point to the fact that the participants' positive attitudes coexisted with access to an abundance of a variety of technology tools.

A belief which may have influenced both participants' positive attitudes toward technology and their inclinations to integrate technology was the teachers' beliefs in their ability and preparedness to use technology. The majority of teachers self-reported feeling very comfortable with a variety of digital tools. Teachers had high confidence in their ability to use computers, word processors, and the Internet to conduct information searches and gather pictures. These Web 1.0 tools received frequent use in their literacy instruction. The Internet was used least for publishing information on a wiki or blog (9%) and collaborating online with students from other classes (23.8%). Web 2.0 tools which teachers reported feeling uncomfortable incorporating into instruction to collaborate, publish, and interact with others outside their classroom were rarely used.

Prior research reveals that a belief in one's ability to use technology is a characteristic among those who use instructional technology (Ertmer et al., 1999; Hutchison, 2009; Radecki, 2009). Hutchison (2009) reported a high level of confidence in using ICTs among technology integrating literacy teachers who participated in her national survey, and speculated that the increase in confidence levels from those found in previous research (Ertmer et al., 1999) may have been due to the increased presence of ICTs in classrooms. Hutchison (2009) concluded that high confidence in one's ability to use ICTs was a characteristic of teachers who successfully integrated them into their curricula.

The high comfort level that the participants in this study felt with technology may have been affected by the perceived administrative support for technology integration as

well as the staff development provided by the school and district. Survey results revealed that the majority of teachers believed that the school and district administration were supportive of technology integration. Zhao et al. (2002) found that administrative support for instructional technology use appeared to be a major factor in whether or not teachers integrate technology.

One of the ways that the school and district supported instructional technology use was through the provision of professional development. The teachers who participated in this study reported a mean of 15.3 hours of technology professional development at their current point in their license renewal cycle. The majority of the staff development they had received had been provided either onsite or within the district. In addition, they felt strongly that both the school and district were committed to technology integration and provided ample opportunities to use technology. Hutchison's (2009) data also suggested that professional development in technology use and teacher support were related to successful technology integration. Teachers who participated in Hutchison's national survey indicated that both professional development and support would lead to their increased integration. Kathy, the most frequent user of technology, reported the most staff development in technology. Not only had she participated in 10-20 hours of training during her current licensure renewal cycle, but also the year-long training described in her case narrative. It was this intensive training that she credited for enabling her to create a more student-centered learning environment and increase her use of technology. The training provided an opportunity for Kathy to have extended positive experiences with technology which mediated her beliefs and attitudes about instructional technology. On the other hand, Joan indicated that gaps in technology staff development

inhibited her use of certain ICTs. For example, she never used iPods in instruction because she had not had training in how to use them.

Teachers' positive attitudes toward technology, the abundance of technological resources, technology training, and teachers' perception of administrative support for technology integration were among the factors which appeared to influence teachers' integration of technology at Glenn Valley. Prior research (Buckenmeyer, 2010; National Center for Education Statistics, 2000) not only finds that these factors influence teachers' adoption of instructional technology, but points to a distinctive relationship that exists among these factors and teachers' instructional use of technology. When these factors coexist, there is a greater likelihood that teachers will integrate technology into their instruction.

Barriers to technology integration are well documented in the literature (Cuban, 2001, 2007; Hudgins, 2008; Hutchison, 2009; Lee, 2006; Leu et al., 2004). A lack of time, funding, and staff development, as well as high-stakes testing, were identified as barriers to technology integration by Hudgins (2008) in her national survey of literacy teachers. The frequency and ways in which technology was used by participants in this study was influenced by certain perceived barriers. The greatest impediment to technology integration was malfunctioning equipment. The problem was often caused by outdated equipment or insufficient funds to repair, update, or replace broken equipment and resulted in a high level of frustration for teachers that ultimately led to the failure to use technology. All three case study teachers reported malfunctioning equipment as a barrier to their technology integrations; however, flexible scheduling

and grouping, a lower student-technology ratio, and the absence of high-stakes testing diminished the impact of malfunctioning equipment for the kindergarten teacher.

Other reported barriers were institutional in nature. The third and fifth grade teachers were limited by a lack of time and for the fifth grade teacher, high-stakes testing was perceived as a major barrier. Both Jennifer and Joan's literacy schedules were predetermined by the administration and were, therefore, inflexible. Both teachers cited a lack of time for technology integration or project-based instruction due to the short, inflexible times allotted for literacy instruction. Low performance on high-stakes testing resulted in the administration requiring teachers in grades three through five to use a computerized remedial program which tied up the computer lab, as well as class time. Consequently, Joan, the fifth grade teacher, had difficulty scheduling time in the lab for her students. In addition, there was perceived pressure to conform to a style of teaching in the classroom that was thought to better match the format of standardized testing than the project-based learning Joan preferred. Consequently, she altered her style of teaching despite the fact that she believed that integrating technology in project-based learning yielded more effective instruction. Joan's case was contradictory to Hudgin's (2008) conclusion that teachers' beliefs in the importance and benefits of technology integration lead them to overcome perceived barriers to integration. It appears that in this case, Joan's perceived barriers trumped the influence of her beliefs. However, it lends credence to other findings. Research shows that when the stakes are high, standardized testing leads to a narrowing of the focus in school curricula (Cuban, 2007; Nichols & Berliner, 2007) and squelches innovation in teaching (Lubienski, 2008). Joan felt she had little choice since the administration iterated a preference for a

particular teaching style, and she believed that her job depended on good test scores. According to Joan, "…in this economy, when you hear your job could be on the balance…you may want to use technology, you may feel it benefits you, but you're going to go to… something that the students are more used to and is more like the EOG [end-of-grade test]." Joan felt frustrated because forces outside her control limited her ability to teach in a way that she felt was in her students' best interest.

Ways Teachers' Beliefs Were Reflected in Their Actual Practice

For the purposes of this study, technology integration is defined as "the use of various technological tools that support and enhance teacher instruction and practice… and that provide access to resources that augment learning activities in classroom practices" (Hudgins, p. 7). Consistent with the existing literature on teachers' conceptualizations of technology integration (Hutchison, 2009; Yeo, 2007), the teachers in this study had a vague and poorly defined notion of what it means to integrate technology. Responses revealed that 14.3% were either not sure or did not know what was meant by technology integration, and 23.8% did not respond when asked to define technology integration. A third of the respondents believed that integrating technology meant using the Internet as a source of reading material, and over half of the participants responded by giving an example of an activity other than reading which involved the use of technology, such as playing games online, watching videos, or using an interactive whiteboard. For the majority of participants, the fact that they used technology in instruction constituted technology integration regardless of whether or not the technology actually supported or enhanced instruction. In this respect, the teachers' beliefs about technology integration were reflected in their

practice based upon their conceptualizations of technology integration and their self-reported, as well as actual, practice. However, Radecki (2009) cautions that many times teachers are simply integrating technology into their routine, and "one must be certain to distinguish between integrating technology into the curriculum…and integrating technology into the daily routine for skill building activities" (p. 122). In Jennifer's case, her use of technology was limited to providing practice for the reading skills that she had previously taught.

While the reported frequency of technology integration varied, in actuality, teachers' use of instructional technology rarely challenged students to use higher order thinking skills. Rather, the self-reported and observed uses of technology were of a low level use, such as using computer or Internet games to reinforce reading skills, using the Internet for picture-gathering, or reading a story online, that required few higher level thinking skills. Often, technology was used to accomplish in a digital format what could just as well have been accomplished through traditional print-based methods. For example, I often observed the interactive whiteboard being used to display a copy of the print text that students were using, and actual student interaction with technology limited. Although, two thirds of the participating teachers reported having students use the Internet to locate, evaluate, and collect information from a variety of sources and 80.9% believed that group projects are a good way for students to learn, these activities only occasionally found their way into teachers' literacy instruction. In fact, I observed no student engagement in project-based learning during the time I spent at Glenn Valley. Furthermore, during interviews, Kathy revealed that her students had completed only one project during the course of the current school year, and Joan's students had

completed two. Often, the observed instructional use of technology only minimally enhanced or supported instruction, therefore, minimally meeting the definition of technology integration used for this study. This fits with the trend I saw occurring over the last few years that I taught at Glenn Valley. Four years ago there was evidence of innovative teaching at Glenn Valley. Projects, many involving technology, could be seen in classrooms, on corridor halls, and in display cases throughout the school. Examples of projects included student-authored and published newspapers and trifold brochures made with software which allowed students to combine text with pictures imported from the internet. The brochures featured research students had conducted on topics such as biomes or famous North Carolinians. The school website featured a page of podcasts created by students. The podcasts included student-written newscasts and drama scripts based upon classroom novels. Groups of children roamed the school grounds using hand-held GPS units to find a geocache of items related to an upcoming lesson. However, four years ago when the test scores at Glenn Valley began to decline, the evidence of creative classroom learning declined and the amount of time students spent completing computerized reading and math tutorials increased.

In general, the actual technology integration failed to foster the new literacies skills advocated by Leu and his colleagues (2004) which allow students "to identify important questions, locate information, analyze the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others" (p. 1570), skills which teachers reportedly considered to be important. This finding supports earlier research (Cuban, 2001, 2007; Hutchison, 2009; Peck et al., 2002; Radecki, 2009; Yeo, 2007) that the presence of technology does not result in

instructional changes that include new literacies instruction, Furthermore, in keeping with previous research findings (Gambrell, 2005; Hutchison, 2009; Yeo, 2007), print based texts generally formed the core of the literacy instruction observed during the course of this study. Joan reported almost exclusive reliance on the reading basal text in her literacy instruction. In Hutchison's (2009) words, "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" (p. 112). Consistent with findings from previous research (Levin et al., 2008), Web 1.0 tools were those generally used in instruction at Glenn Valley rather than the Web 2.0 tools which allow students to become producers and communicators as well (Handsfield et al., 2009)

Teachers participating in this survey unanimously believed that it is important for students to become literate with technology and with a variety of technologies. It was suggested from their self-reported practices that the teachers did incorporate a variety of technology tools into their curricula, although some were used more frequently than others. However, I did not observe a variety of technology in instruction; the use of technology was usually limited to the interactive whiteboard, the computer, and the Internet. Students were developing some degree of competency with those tools, but not with a variety of technologies. This seems especially noteworthy when considering the variety of technologies that were available within the school. Furthermore, the technology integration observed in two of the three case studies afforded students minimal interaction with or control of the technology utilized during instruction, making it difficult for students to actually become literate with the tools.

While the belief in the importance of developing students' literacy with a variety of technologies may have been genuine, this belief was not always reflected in their actual practice.

Several reasons may account for the lack of variety in the technology that I observed in use. The previously described barriers to integration could influence the use of a variety of technology. I was observing in the weeks prior to end-of-grade testing and the focus of all of Joan's and Jennifer's lessons was test preparation. According to Joan, a lack of training in the use of iPods precluded her use of them in instruction. Malfunctioning equipment, also cited as a barrier, could impede the types of technology used as well as the frequency. Although Kathy, the kindergarten teacher, was a frequent user of technology in her literacy instruction and appeared to be relatively unaffected by barriers to integration, she did not employ a wide variety of digital tools on a regular basis. The technology that Kathy used for her literacy centers and group instruction worked well to accomplish her goals and objectives, but managing her literacy block took a lot of time. I know from experience that there are so many time consuming tasks that are part of the day-to-day job for a teacher, that time is always in short supply. It is difficult to find the time to experiment with new tools and instructional methods. Research confirms that a lack of time is a common barrier to technology integration (Cuban et al., 2001; Hutchison, 2009; Sandholtz et al., 1997). Furthermore, when equipment is stored in a central location so that it is not readily accessible, it takes extra effort and time to incorporate those tools into instruction. For example, during Kathy's first interview she mentioned that in a previous year, her class used iPods when they were learning a song to perform for a literacy production, but that reminded her that the

school had a class set of iPods that she had forgotten about. She also recalled that during that same year her class had taken their zoo projects one step further with technology. Her students wrote and recorded podcasts about the animals they researched, and the podcasts were uploaded to the school's website. Kathy concluded by saying that she wanted to remember to do that again the next time her class did a project. It is easy to forget about equipment that is not readily accessible.

Although the teachers at Glenn Valley reported what appeared to be ample opportunities for technology staff development and the vast majority reported having received more than the number of credit hours required by the district for their licensure renewal cycle, it is possible that the training may have facilitated the use of technology, but not its integration. In other words, the type of training the teachers had received may have focused on the operation of the technology tools rather than on application. According to Reynolds (2007), many states take a skills-based approach to technology in education, focusing on the skills needed to use technology tools rather than using them to promote higher order thinking and critical reading. Indeed, the case study data indicated that all of the technology training Joan and Jennifer had received was oriented toward the operation of the tools, the "how-to" according to Joan, rather than application in the curriculum. As previously described, Joan declined to use iPods in instruction because she had no training in how to use them. Upon exploring this issue in her second interview, I learned that Joan knew how to operate iPods and used one in her personal life; however, she did not know how she could use them to meet her instructional goals. Furthermore, Kathy, the frequent user of technology, had participated in the intensive, year-long technology training which focused not only on

the operation of the technology tools, but also on how to integrate the technology across the curriculum in ways aligned with the socio-cultural stance toward integration described earlier. Not only was Kathy a frequent user of instructional technology, but her integration of technology resonated more with a socio-cultural perspective (Reynolds, 2007) than Jennifer's or Joan's use of technology. In other words, Kathy's literacy instruction more often included the use of student-centered technologies to read and create digital texts.

The low-level uses of technology observed at Glenn Valley do not necessarily have to be interpreted in a negative light. In a review of the literature regarding teachers' pedagogical beliefs and technology integration, Ertmer (2006) concludes that the predominance of low-level technology use found in schools "may be due simply to the fact that low-level uses precede high-level uses [that require higher level thinking skills] and that not enough time has passed for high-level uses to emerge" (p. 6). Furthermore, Ertmer (2006) suggests that beginning technology integration with simple uses may be more successful in leading teachers to more complex integration than expecting teachers to start out with high-level technology uses. It is possible that the teachers at Glenn Valley are in the process of becoming comfortable with instructional technology for low-level uses before making the transition toward more high-level uses.

## Implications for Practice

The purpose of this study was to gain a deeper understanding of teachers' beliefs across grade levels regarding the role of technology in their literacy instruction. The use of qualitative methods yielded in-depth and detailed data which shed light on teachers'

beliefs about technology and the inter-related roles they perceived technology to play in their literacy instruction. The teachers in this study used technology to carry out their pedagogical beliefs, as an aid in classroom and instructional management, and in making instruction more effective. Understanding the roles that literacy teachers assign to technology in their instruction can assist administrators in setting the conditions that will support teachers in integrating technology into their curricula and providing the kind of staff development that will foster true new literacies integration. These findings, as do others in the literature (Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Judson, 2006; Palak & Walls, 2009), suggest the importance of taking pre-service and in-service teachers' pedagogical beliefs into account when planning training aimed at encouraging technology integration. Colleges, schools, and districts may wish to consider ensuring that future training focuses on helping teachers to recognize potential instructional uses of technology tools, find ways to integrate them into their curricula, as well as examine pedagogical beliefs and practices that may inhibit technology integration.

The findings of this study imply that if teachers are expected to use technology in their instruction, it is important to provide them with adequate training. Adequate training should provide teachers with extended positive experiences with technology in a supportive environment. Figure 1 shows how a teacher's experiences mediate their decisions and behaviors in an educational context. It is important to provide teachers and pre-service teachers with access to training that not only focuses on achieving technical skills, but also addresses other issues related to the instructional use of technology. Teachers need access to training that fosters their ability to develop critical literacy skills, higher order thinking, and other new literacies skills with continued support for teachers'

ability to apply and integrate new literacies into their curricula. Most importantly, teachers would benefit from training that enables them to develop a well-articulated definition and vision of technology integration that would guide them in planning for the instructional use of technology. Furthermore, school administrators might consider the benefits of developing a unified school or district definition and vision of technology integration that would produce cohesion and consistency in instruction.

Although the data for this study came from one elementary school, and while the results cannot be generalized, the results suggest some promising implications for this school that should be explored further in research. Contrary to previous findings (Leu, 2008; Steinberg & Kincheloe, 2004) which generalize that low socioeconomic schools do not have access to technology comparable to their higher socio-economic counterparts, the research site for this study was both a low socio-economic school and technology-rich. Also contrary to previous findings which reveal that technology is not finding its way into instruction (Cuban, 2001, 2007; Hitlin & Rainie, 2005; Hutchison, 2009; Peck et al., 2002; Yeo, 2007), the teachers who participated in this study not only reported a positive attitude toward technology integration, but also used much of the technology available to them in their literacy instruction. These findings lend hope that steps, however small, are being taken in some schools to bridge the digital divide that some experts say results from the disparity in digital skills among students across socioeconomic levels (Leu, 2008; Steinberg & Kincheloe, 2004). While the findings of this study suggest that the level of use on the part of this study's participants may do little to address new literacy skills, their actual instructional use of technology and acknowledgement of the importance in developing students' technology literacy can also

be seen as steps in the right direction, which may lead to more complex, higher level use (Ertmer, 2006) that facilitates the development of new literacies skills among students.

In this study, the teachers' use of instructional technology occurred within the context of access to an abundance of technology tools, perceived administrative (both school and district) support of technology integration, and access to training which supported the use of instructional technology. While the scope of this study cannot suggest correlations between teachers' use of technology and the presence of these three factors, the description afforded by the qualitative methods employed indicated that the teachers perceived that the presence of these conditions facilitated their use of instructional technology. It may be worthwhile for administrators to examine ways of increasing the ease and immediacy of access for teachers in order to encourage the integration of technology into the curriculum. Similarly, educators may wish to evaluate whether the purchase of small numbers of a wide variety of digital tools for a central check-out system or the purchase of larger numbers of a few basic technology tools for teachers to keep in their classrooms would make it more likely that teachers would use the technology in instruction.

This research adds to the body of literature documenting the fact that barriers to technology integration continue to exist. These barriers continue to impede technology integration and silence the voices of teachers and students alike¸ denying them access to digital Discourses. Knowledge of the barriers and how teachers perceive the barriers to impede their integration of technology potentially enable all stakeholders to work together to seek ways to reduce the effects of those barriers. In some cases, solutions may

be as simple as restructuring class schedules and protocols for access to equipment or venues.

## Implications for Future Research

This study points to a need for further research in several areas related to technology integration in literacy instruction. First, considering the small, but growing, body of research investigating the role of technology in literacy instruction, additional research is warranted in this area. There is a need for research that would lead to a clear conceptualization of what it means to integrate technology into literacy instruction and establish guidelines for effective technology integration. Furthermore, if teachers are expected to foster new literacies skills in students, additional research that would lead to the identification of effective instructional practices to do so and ways to reconcile traditional and new literacies instruction is needed.

The findings of this study also suggest that additional research is needed regarding the types of training that would be best suited for equipping pre-service and in-service teachers to effectively apply technology skills to instruction so that integration is more than the passing on of skills knowledge or a "you watch as I use" scenario in the classroom. Hutchison (2009) also noted the lack of research in this area and called for additional research on the type of staff development that enables teachers to achieve technology integration.

The results of this research suggest that when technological tools are close at hand, they are more likely to be used in instruction. Additional research to shed more light on this could be important as schools struggle with ways to increase instructional technology use, ways to use technology funds and logistics regarding the placement of

technology. For example, as schools look at implementing one-to-one laptop initiatives, an opportunity exists for researchers to investigate the quality and frequency of technology integration that results.

Finally, the fact that Glenn Valley is a low socioeconomic school with a technology-rich environment and teachers who not only profess the importance of developing their students' technological literacy, but integrate technology into their instruction on a regular basis gives hope in light of the digital divide. Additional research on low socioeconomic schools which provide students with opportunities to develop digital literacies could prove useful to low socioeconomic schools and districts who are struggling to provide such opportunities to their students.

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Table 1

*Summary of Quantitative and Qualitative Methodologies*

| Type of Data Collected | When Collected | Method of Collection | Participants | Method of Analysis | How Data Connects to Research Questions |
|---|---|---|---|---|---|
| Quantitative | March, 2010 | Survey | All K-5 certified classroom teachers at the research site | Descriptive Statistics | Yields baseline data on Research Questions 1-3 & frequency of use data will aid in selection of the case study participants |
| Qualitative | After initial analysis of frequency of use data from the survey | Open-ended question at the end of the survey; teachers will write responses.<br><br>2 In-depth interviews with each participant,<br>At least three classroom observations of each participant | All K-5 certified classroom teachers at the research site who provide consent and teach reading<br><br>3 teachers selected from survey data for case studies (1 high frequency user, 1 moderate user, 1 little – no use of technology | Thematic analysis of Survey Questions, With-in and Cross-case analysis | Yield rich description and detail to provide complement survey data and provide a complete picture that answers Research Questions 1-3 |

Table 2

*Category Design and the Research Question Addressed By Each Item*

| Categories | Research Question # Being Addressed |
|---|---|
| Part I: Teachers' Beliefs and Classroom Practices | |
| 1. Group projects are a good way for students to learn. | 1, 2, 3 |
| 2. I have a lot of subject knowledge to share with my students. | 1, 3 |
| 3. My job is to teach the content using facts and textbooks. | 1, 3 |
| 4. I feel it is important for students to develop skills in using Computers to analyze and present ideas. | 1, 2, 3 |
| 5. A quiet classroom is generally needed for effective learning. | 1 |
| 6. I mainly see my role as a facilitator. I try to provide Opportunities and resources for my students to discover or construct concepts for themselves. | 1, 2, 3 |
| 7. Smooth, efficient classroom routines keep disruptions to a minimum. | 1 |
| 8. I feel computer technology (e.g., e-mail, Internet, spreadsheets, multimedia, wikis) and Information and Communication Technologies (i.e. iPods, cell phones/texting devices, GPS) have the potential to impact instruction. | 1, 3 |
| 9. I have students use computers to create multimedia reports/projects. | 1, 2, 3 |
| 10. Students learn the subject best when I go over the material in a structured way. It's my job to explain to students how to do the work and to assign specific practice. | 1, 3 |
| 11. I have student use computers to practice skills. | 1, 2, 3 |
| 12. I feel comfortable with my ability to learn new technologies. | 1, 3 |
| 13. Technology is useful for maximizing student learning. | 1 |
| 14. Technology changes too rapidly to properly implement in classrooms. | 1 |
| 15. I am satisfied with my use of new technologies in the classroom. | 1 |
| 16. I welcome more opportunities to implement technology in class. | 1 |
| 17. I enjoy learning about new technologies. | 1, 3 |
| 18. My school provides enough opportunities for technology integration. | 1 |
| 19. My school is committed to technology integration. | 1 |

Table 2 *(continued)*

| | |
|---|---|
| 19. My school is committed to technology integration. | 1 |
| 20. My school district is committed to technology integration. | 1 |
| 21. I would rather not use technology in the classroom. | 1 |
| 23. Technology can change the way my content material is taught. | 1, 3 |
| 24. It is important for students to become literate with a variety of digital technologies. | 1 |
| 25. More technology in the classroom equals more work for me. | 1, 3 |
| 26. I am comfortable using a word processor. | 1, 3 |
| 27. I am familiar with hardware and software applications in my subject. | 1, 3 |
| 28. I am comfortable operating tools (e.g., scanners, camcorders, digital cameras, iPods, LCD projects, GPS) | 1, 3 |
| 29. I am comfortable using the Internet. | 1, 3 |
| 30. I understand such terms as media, multimedia, and hypermedia. | 1, 3 |
| 31. I am comfortable incorporating telecommunications in instruction to collaborate, publish, and interact with peers, experts, and other audiences (e.g., schools/classroom out of district/state). | 1, 3 |
| 32. I am comfortable using the Internet to facilitate student projects. | 1, 3 |
| 33. I am comfortable using the Internet to access information for my content. | 1, 3 |
| 34. I use technology for administrative purposes (e.g., grades and attendance). | 1, 2 |
| 35. Technology has affected my beliefs about teaching. | 1, 3 |
| 36. It's a good idea to have all sorts of activities going on in the classroom. | 1, 3 |
| 37. It's important to give the whole class the same assignment, one that has clear directions and one that can be done in short intervals that matches the class schedule. | 1, 3 |
| <u>Part II: Technological Information</u> | |
| How often do you use computers to: | |
| 38. Record or calculate student grades. | 2 |
| 39. Make handouts for students. | 2, 3 |

Table 2 *(continued)*

| | |
|---|---|
| 40. Correspond with students or parents. | 2 |
| 41. Correspond with other teachers and staff. | 2 |
| 42. Write lesson plans or related notes. | 2, 3 |
| 43. Create student presentations. | 2, 3 |
| 44. Get information or pictures from the Internet for lessons. | 2, 3 |
| Indicate the extent to which you use the following technological tools in your typical instruction: | |
| 45. Computer | 2 |
| 46. Camcorder | 2 |
| 47. Digital camera | 2 |
| 48. Scanner | 2 |
| 49. Smartboard / Activboard | 2 |
| 50. iPods | 2 |
| 51. Email | 2, 3 |
| 52. Word processor | 2 |
| 53. Computer games for practicing skills | 2, 3 |
| 54. Presentation software (e.g., PowerPoint) | 2, 3 |
| 55. Graphics-oriented printing (e.g., Inspiration, Kidspiration, Desktop Publisher) | 2, 3 |
| 56. Spreadsheets or database programs (e.g., Excel) | 2, 3 |
| 57. Instant messaging | 2 |
| 58. Information searches on the Internet | 2, 3 |
| 59. Geographical information systems/global positioning systems | |
| 60. Use of Internet to locate, evaluate, and collect information from a variety of sources | 2, 3 |
| 61. Multimedia authoring environments (e.g., Photostory, iMovie, and Move Maker) | 2, 3 |
| 62. Publishing information on a wiki or blog | 2 |
| 63. Reading a book or story online. | 2 |

Table 2 *(continued)*

| | |
|---|---|
| 64. Gathering pictures online. | 2 |
| 65. Playing games online. | 2, 3 |
| 66. Collaborating online with students from other classes. | 2 |

Table 3

*Sample Initial Data Codes*

| Code | Meaning | Interview Source |
|---|---|---|
| TF | Teacher Facilitator - Teacher saw her role As a facilitator | Kathy, Joan |
| TM | Time - Not enough time to integrate Technology | Jennifer, Joan |
| EOG | End of Grade testing | Jennifer, Joan |
| OT BEH | Students' on task behaviors | Kathy, Jennifer, Joan |
| ENG | Students are more engaged when using Technology | Kathy, Jennifer, Joan |
| ST | Students' task-related talk | Kathy, Jennifer, Joan |
| INT | Students internalize learning when Technology is used | Kathy, Jennifer, Joan |
| BK | Students' background knowledge is Enhanced with technology use | Kathy, Jennifer, Joan |
| MOT | Student Motivation – increased when Technology is used | Kathy, Jennifer, Joan |
| BAR | Barriers to technology integration | Kathy, Jennifer, Joan |
| CTRL | Teachers' control over learning Environment | Jennifer |
| INTERACT | Interactive nature of technology | Kathy, Jennifer, Joan |
| ATT | Attitudes toward Technology | Kathy, Jennifer, Joan |

Table 4

*Final Data Categories*

| Sample Categories | Subcategories | Sample Codes Included |
|---|---|---|
| Pedagogical Beliefs | Student-centered | Facilitator, monitoring, walking around, helping |
| | Teacher-centered | Control Over Learning Environment |
| Attitudes toward Technology | | Attitudes |
| Barriers | Institutional | Time, EOG, Malfunctioning Equipment, Grade Level, Economy, Staff Development |
| Effective Instruction | Academic Benefits | Student Engagement, Motivation, Builds Prior Knowledge, Vocabulary Increased Retention, Internalizes Content |
| | Social Benefits | Student Task-related Talk, Scaffolded Learning |
| Efficient Instruction | | Saves time, Fewer Behavior Problems, Student Time on Task, When Equipment Works |
| Behavior Management | | Fewer Behavior Problems, More Time on Task, Learning is Relevant And Authentic |

Table 5

*Comparison of Case Study Participants*

| Participant | Kathy | Jennifer | Joan |
|---|---|---|---|
| Frequency of Technology Use | Frequent | Moderate | Infrequent |
| Satisfied with Level Of Technology Use | Yes | Yes | No |
| Beliefs about Technology Integration Reflected in Practice | Yes | Yes | No |
| Pedagogical Beliefs | Student-centered | Teacher-centered | Student-centered |
| Pedagogical Beliefs Reflected in Practice | Yes | Yes | No |
| Technology Made Practice Efficient | Yes | Yes | Yes |
| Technology Made Practice Effective | Yes | Yes | Yes |
| Technology Managed Student Behavior | Yes | Yes | Yes |
| Perceived Barriers | Malfunctioning Equipment, Students' Age | Time Malfunctioning Equipment, Scheduling, Grade level | Time, Malfunctioning Equipment, Scheduling, Grade level |
| Attitudes toward Technology | Positive | Ambivalent | Positive |

Table 6

*Percentage of Responses to Parts I and II of the Technology Integration in the Classroom Survey*

| Items | Strongly Agree | Agree | Disagree | Strongly Disagree | Not Applicable |
|---|---|---|---|---|---|
| Part I: Teachers' Beliefs and Classroom Practices | | | | | |
| 1. Group projects are a good way for students to learn. | 47.6 | 33.3 | 14.3 | 4.8 | |
| 2. I have a lot of subject knowledge to share with my students. | 47.6 | 52.4 | | | |
| 3. My job is to teach the content using facts and textbooks. | 38.1 | 23.8 | 57.1 | 4.8 | |
| 4. I feel it is important for students to develop skills in using computers to analyze and present ideas. | 66.7 | 33.3 | | | |
| 5. A quiet classroom is generally needed for effective learning. | 0 | 19.0 | 66.7 | 14.3 | |
| 6. I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves. | 28.6 | 57.1 | 14.3 | | |
| 7. Smooth, efficient classroom routines keep disruptions to a minimum. | 47.6 | 52.4 | | | |
| 8. I feel computer technology (e.g. email, Internet, spreadsheets, multimedia, Wikis) and Information and Communication Technologies (i.e. iPods, cell phones/ texting devices, GPS) have the potential to impact instruction. | 61.9 | 28.6 | 9.5 | | |
| 9. I have students use computers to create multimedia reports/projects. | 19.0 | 66.7 | 4.8 | | |
| 10. Students learn the subject best when I go over the material in a | | | | | |

Table 6 *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| structured way. It's my job to explain to students how to do the work and to assign specific practice. | 14.3 | 57.1 | 28.6 | | |
| 11. I have students use computers to practice skills. | 47.6 | 52.4 | | | |
| 12. I feel comfortable with my ability to learn new technologies. | 47.6 | 33.3 | 19.0 | | |
| 13. Technology is useful for maximizing student learning. | 38.1 | 52.4 | 9.5 | | |
| 14. Technology changes too rapidly to properly implement in classrooms. | 9.5 | 19.0 | 57.1 | 14.3 | |
| 15. I am satisfied with my use of new technologies in the classroom. | 4.8 | 57.1 | 33.3 | 4.8 | |
| 16. I welcome more opportunities to implement technology in class. | 47.6 | 52.4 | | | |
| 17. I enjoy learning about new technology. | 42.9 | 57.1 | | | |
| 18. My school provides enough opportunities for technology integration. | 28.6 | 47.6 | 23.8 | | |
| 19. My school is committed to technology integration. | 42.9 | 47.6 | 9.5 | | |
| 20. My school district is committed to technology integration. | 38.1 | 61.9 | | | |
| 21. I would rather not use technology in the classroom. | | | 57.1 | 38.1 | 4.8 |
| 22. Anything the computer can be used for I can do just as well without. | | | 4.8 | 66.7 | 28.6 |
| 23. Technology can change the way | | | | | |

Table 6 *(continued)*

| | | | | |
|---|---|---|---|---|
| my content material is taught. | 61.9 | 38.1 | | |
| 24. It is important for students to become literate with a variety of digital technologies. | 66.7 | 33.3 | | |
| 25. More technology in the classroom equals more work for me. | 4.8 | 9.5 | 85.7 | |
| 26. I am comfortable using a word processor. | 61. 9 | 33.3 | 4.8 | |
| 27. I am familiar with hardware and software applications in my subject. | 33.3 | 57.1 | 4.8 | |
| 28. I am comfortable operating tools (e.g. scanners, camcorders, digital Cameras, iPods, LCD projectors, GPS). | 19.0 | 38.1 | 38.1 | 4.8 |
| 29. I am comfortable using the Internet. | 57.1 | 38.1 | 4.8 | |
| 30. I understand such terms as media, multimedia, and hypermedia. | 23.8 | 57.1 | 19.0 | |
| 31. I am comfortable incorporating telecommunications in instruction to collaborate, publish, and interact with peers, experts, and other audiences (e.g. schools/ classrooms out of district/ state). | 19.0 | 23.8 | 52.4 | 4.8 |
| 32. I am comfortable using the Internet to facilitate student projects | 47.6 | 42.9 | 9.5 | |
| 33. I am comfortable using the Internet to access information for my content. | 71.4 | 23.8 | 4.8 | |
| 34. I use technology for administrative purposes (e.g., grades, attendance) | 71.4 | 28.6 | | |
| 35. Technology has affected my beliefs about teaching. | 23.8 | 57.1 | 19.0 | |

Table 6 *(continued)*

| | | |
|---|---|---|
| 36. It's a good idea to have all sorts of activities going on in the classroom | 28.6 | 71.4 |
| 37. It's important to give the whole class the same assignment, one that has clear directions and one that can be done in short intervals that matches the class schedule. | 33.3 | 66.7 |

Part II: Technological Information
How often do you use computers to:

| | Never | Sometimes (2 or less times/ month) | Often (3 or more times/ month) |
|---|---|---|---|
| 38. Record or calculate student grades | 28.6 | 19.0 | 52.4 |
| 39. Make handouts for students. | | 14.3 | 85.7 |
| 40. Correspond with students or parents. | | 23.8 | 76.2 |
| 41. Correspond with other teachers and staff . | | 4.8 | 95.2 |
| 42. Write lesson plans or related notes. | | 23.8 | 76.2 |
| 43. Create student presentations. | | 66.7 | 33.3 |
| 44. Get information or pictures from the Internet for lessons. | | 33.3 | 66.7 |

Indicate the extent to which you use the following technological tools in your typical instruction:

| | Never | Small Amount (7 or less times a Year) | Moderate Use (1-3 times a month) | Frequent Use (4 or more times a month) |
|---|---|---|---|---|
| 45. Computer | | | 19.0 | 81.0 |
| 46. Camcorder | 52.4 | 47.6 | | |
| 47. Digital Camera | 19.0 | 47.6 | 23.8 | 9.5 |
| 48. Scanner | 14.3 | 23.8 | 38.1 | 23.8 |
| 49. Smartboard/ Activboard | | | | 100.0 |
| 50. iPods | 76.2 | 23.8 | | |
| 51. Email | 9.5 | 4.8 | 9.5 | 76.2 |
| 52. Word processor | | 4.8 | 19.0 | 76.2 |
| 53. Computer games for practicing Skills | 4.8 | 14.3 | 19.0 | 61.9 |
| 54. Presentation software (e.g., Powerpoint | 9.5 | 33.3 | 23.8 | 33.3 |

Table 6 *(continued)*

| | | | | |
|---|---|---|---|---|
| 55.Graphics-oriented printing (e.g., Inspiration, Kidspiration, Desktop Publisher) | 9.5 | 42.9 | 23.8 | 23.8 |
| 56. Spreadsheets or database Programs (e.g., Excel) | 28.6 | 33.3 | 23.8 | 14.3 |
| 57. Instant messaging | 47.6 | 23.8 | 4.8 | 23.8 |
| 58. Information searches on the Internet | 14.3 | 9.5 | 28.6 | 47.6 |
| 59. Geographical information Systems/ global positioning Systems | 42.9 | 33.3 | 19.0 | 4.8 |
| 60. Use of Internet to locate, evaluate, and collect information from a variety of sources | 4.8 | 26.6 | 19.0 | 47.6 |
| 61. Multimedia authoring environments (e.g., Photostory, iMovie, and Movie Maker) | 57.1 | 33.3 | 4.8 | 4.8 |
| 62. Publishing information on a Wiki or blog | 90.4 | 5.8 | | 4.8 |
| 63. Reading a book or story online | 23.8 | 23.8 | 9.5 | 42.9 |
| 64. Gathering pictures online | | 14.2 | 42.9 | 42.9 |
| 65. Playing games online | 4.8 | 19.0 | 9.5 | 66.7 |
| 66. Collaborating online with students from other classes | 76.2 | 9.5 | 4.8 | 9.5 |

Table 7

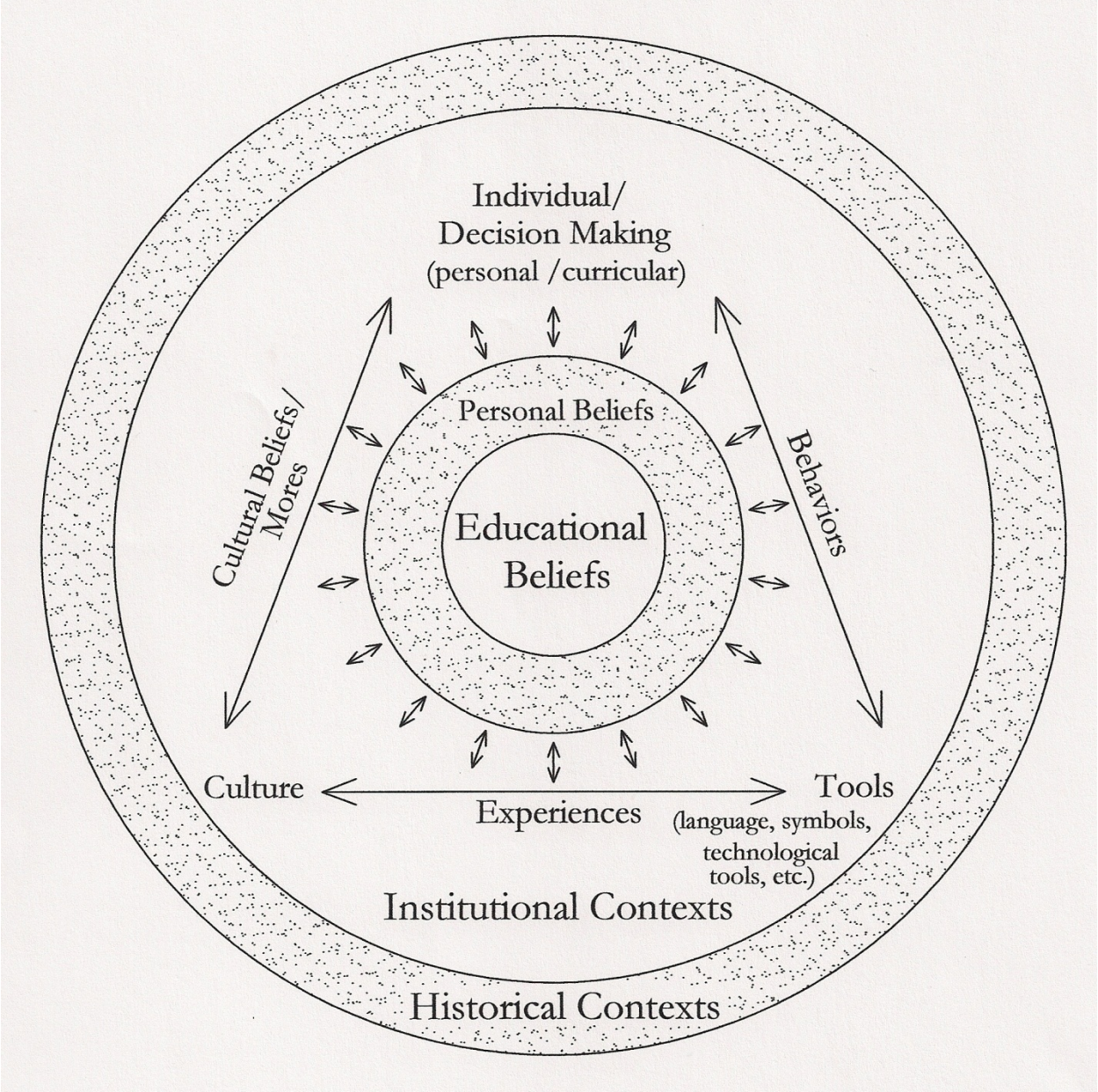
*Demographics of Case Study Participants*

| Case Study Participant | Level of Technology Use | Years of Teaching | Grade Level/ Subject Taught | Gender | Technology Used Most Often |
|---|---|---|---|---|---|
| Kathy | Frequent | 14 | K Generalist (all subjects) | Female | Computers, Internet, Word Processors, Interactive Whiteboard, Computer Games |
| Jennifer | Moderate | 7 | 3 Literacy | Female | Computers, Internet, Interactive Whiteboard, Software for Tutorials and Educational Games |
| Joan | Infrequent | 11 | 5 Literacy | Female | Computers, Internet, Interactive Whiteboard |

Figure Caption

*Figure 1*. Sociocultural Theory, Teachers' Beliefs, and Curricular Decisions Model

Figure 1


Individual/
Decision Making
(personal /curricular)
Personal Beliefs
Educational
Beliefs
Cultural Beliefs/
Mores
Behaviors
Culture
Experiences
Tools
(language, symbols,
technological
tools, etc.)
Institutional Contexts
Historical Contexts

# APPENDIX A: DEFINITION OF TERMS

ActivBoard – A brand of interactive whiteboard.

ActivSlate – A device designed for remote use of an ActivBoard.

Beliefs - Ideas and conceptions that a person either consciously or unconsciously

Blog (Web log) – A website in which journal entries are posted on a regular basis and usually consists of hyperlinks, digital images, and hypertexts (Kajder & Bull, 2004).

Information and Communication Technologies (ICTs) – Technologies that provide possibilities for and access to communication and information: Web logs (blogs), word processors, video editors, World Wide Web browsers, Web editors, e-mail, spreadsheets, presentation software, instant-messaging, plug-ins for Web resources, listservs, bulletin boards, virtual worlds, and many others (Leu et al., 2004).

New Literacies – "The new literacies of the Internet and other ICT include the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world" (Leu et al., 2004, p. 1570).

Teachers' Beliefs - beliefs teachers hold about teaching, learning, and curricula and beliefs they hold about the role of technology in literacy instruction.

Technology - a wide variety of hardware (including information and communication devices) and software, including, but not limited to, computers and computer applications, iPods, scanners, cell phones, digital cameras and video recorders, presentation and editing software, databases, spreadsheets, and word processors

that may potentially be used in an educational setting for teaching and learning.

Technology Integration - “the use of various technological tools that support and enhance teacher instruction and practice… and that provide access to resources that augment learning activities in classroom practices” (Hudgins, p. 7).

Technology-rich Environment - a technology-rich environment is defined as an environment in which a variety of technology hardware and software is easily and readily accessible to all teachers and students for immediate integration into the curriculum and is integrated into instruction in multiple ways.

# APPENDIX B: SURVEY INSTRUMENT

## Technology Integration in the Classroom Survey

District:_____
School:_____

Thank you in advance for participating in this study. The purpose of this survey is to examine teachers' beliefs about using technology in the classroom and the ways and frequency in which they are integrating technology. Should you have any further questions, please contact Beverly McIntyre (PhD candidate) at bkmcinty@uncc.edu or (704)982-6492.
Again, thank you!

Background:
Please print your first and last name. This information is for the researcher's use only. Your responses will be kept strictly confidential. Actual names will be changed to pseudonyms for data analysis.

_____ _____
First name Last name

Highest degree earned:
- o Bachelor's
- o Master's
- o Doctorate

Total number of years teaching: _____
Number of years teaching at this school _____

Have you ever received training on the use of technology in the classroom? If so, how many hours?
- o No, training never received
- o Yes, less than 10 hours
- o Yes, 10 to 20 hours
- o Yes, more than 20 hours

In what type of environment did you receive most of your technology training? (check all that apply)
- o On-site school training
- o Off-site school training (e.g., training provided by the district at another site within the district)
- o Off-site school training (e.g., training not provided by / affiliated with the district)
- o As part of your educational degree or certification program
- o Self-taught

What grade do you teach?

o K o 1 o 2 o 3 o 4 o 5

Do you teach reading / language arts?

o Yes o No

Part I: Teachers' Beliefs and Classroom Practices

I am interested in the relationship between teachers' beliefs and technology use for instruction, classroom practices, and student learning. Please indicate to what extent you 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree, or 5 = not applicable with each of the following statements:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Group projects are a good way for students to learn. | | | | | |
| 2. I have a lot of subject knowledge to share with my students. | | | | | |
| 3. My job is to teach the content using facts and textbooks. | | | | | |
| 4. I feel it is important for students to develop skills in using Computers to analyze and present ideas. | | | | | |
| 5. A quiet classroom is generally needed for effective learning. | | | | | |
| 6. I mainly see my role as a facilitator. I try to provide Opportunities and resources for my students to discover or construct concepts for themselves. | | | | | |
| 7. Smooth, efficient classroom routines keep disruptions to a minimum. | | | | | |
| 8. I feel computer technology (e.g., e-mail, Internet, spreadsheets, multimedia, wikis) and Information and Communication Technologies (i.e. iPods, cell phones/texting devices, GPS) have the potential to impact instruction. | | | | | |
| 9. I have students use computers to create multimedia reports/projects. | | | | | |
| 10. Students learn the subject best when I go over the material in a structured way. It's my job to explain to students how to do the work and to assign specific practice. | | | | | |
| 11. I have student use computers to practice skills. | | | | | |
| 12. I feel comfortable with my ability to learn new technologies. | | | | | |
| 13. Technology is useful for maximizing student learning. | | | | | |
| 14. Technology changes too rapidly to properly implement in classrooms. | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 15. I am satisfied with my use of new technologies in the classroom. | | | | | |
| 16. I welcome more opportunities to implement technology in class. | | | | | |
| 17. I enjoy learning about new technologies. | | | | | |
| 18. My school provides enough opportunities for technology integration. | | | | | |
| 19. My school is committed to technology integration. | | | | | |
| 20. My school district is committed to technology integration. | | | | | |
| 21. I would rather not use technology in the classroom. | | | | | |
| 22. Anything the computer can be used for I can do just as well without. | | | | | |
| 23. Technology can change the way my content material is taught. | | | | | |
| 24. It is important for students to become literate with a variety of digital technologies. | | | | | |
| 25. More technology in the classroom equals more work for me. | | | | | |
| 26. I am comfortable using a word processor. | | | | | |
| 27. I am familiar with hardware and software applications in my subject. | | | | | |
| 28. I am comfortable operating tools (e.g., scanners, camcorders, digital cameras, iPods, LCD projects, GPS) | | | | | |
| 29. I am comfortable using the Internet. | | | | | |
| 30. I understand such terms as media, multimedia, and hypermedia. | | | | | |
| 31. I am comfortable incorporating telecommunications in instruction to collaborate, publish, and interact with peers, experts, and other audiences (e.g., schools/classroom out of district/state). | | | | | |
| 32. I am comfortable using the Internet to facilitate student projects. | | | | | |
| 33. I am comfortable using the Internet to access information for my content. | | | | | |
| 34. I use technology for administrative purposes (e.g., grades and attendance). | | | | | |
| 35. Technology has affected my beliefs about teaching. | | | | | |
| 36. It’s a good idea to have all sorts of activities going on in the classroom. | | | | | |
| 37. It’s important to give the whole class the same assignment, one that has clear directions and one that can be | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| done in short intervals that matches the class schedule. | | | | | |

Part II: Technological Information

How often do you use computers to:

| | Never | Sometimes (2 or less times a month) | Often (3 or more times a month) |
|---|---|---|---|
| 38. Record or calculate student grades. | | | |
| 39. Make handouts for students. | | | |
| 40. Correspond with students or parents. | | | |
| 41. Correspond with other teachers and staff. | | | |
| 42. Write lesson plans or related notes. | | | |
| 43. Create student presentations. | | | |
| 44. Get information or pictures from the Internet for lessons. | | | |

Indicate the extent to which you use the following technological tools in your typical instruction:

| | Never | Small Amount (7 or less times a year) | Moderate Use (1-3 times a month) | Frequent Use (4 or more times a month) |
|---|---|---|---|---|
| 45. Computer | | | | |
| 46. Camcorder | | | | |
| 47. Digital camera | | | | |
| 48. Scanner | | | | |
| 49. Smartboard / Activboard | | | | |
| 50. iPods | | | | |
| 51. Email | | | | |
| 52. Word processor | | | | |
| 53. Computer games for practicing skills | | | | |
| 54. Presentation software (e.g., PowerPoint) | | | | |
| 55. Graphics-oriented printing (e.g., | | | | |

| | | | | |
|---|---|---|---|---|
| Inspiration, Kidspiration, Desktop Publisher) | | | | |
| 56. Spreadsheets or database programs (e.g., Excel) | | | | |
| 57. Instant messaging | | | | |
| 58. Information searches on the Internet<br>59. Geographical information systems/global positioning systems | | | | |
| 60. Use of Internet to locate, evaluate, and collect information from a variety of sources | | | | |
| 61. Multimedia authoring environments (e.g., Photostory, iMovie, and Move Maker) | | | | |
| 62. Publishing information on a wiki or blog | | | | |
| 63. Reading a book or story online. | | | | |
| 64. Gathering pictures online. | | | | |
| 65. Playing games online. | | | | |
| 66. Collaborating online with students from other classes. | | | | |

Do you use computers or technology for any other activities not listed above? If so, explain.

What do you think it looks like to integrate technology into literacy instruction?

_____
_____
_____
_____
_____

In order to gather details and teacher perspectives that cannot be captured via the survey, I would like to gather additional data from 3 participants who teach reading / language arts. You may be contacted regarding further participation in the form of one 30-45 minute interview and classroom observations to see how you integrate technology.

Thank you again for completing this study!

Would you like the survey results emailed to you?

- o Yes
- o No

# APPENDIX C: INTERVIEW PROTOCOL

Researcher's Introduction: *Thank you for agreeing to talk with me about how you use technology. This study is part of my dissertation with the Graduate School at UNCC. You recently completed a survey for this study, and I'm following up with some teachers to find out a little bit more about what technology integration means to you and why you choose to integrate technology into your literacy instruction. I'd like to ask you some questions about your use of technology. There are no right or wrong answers; I am just interested in finding out more about what you think. This interview should take no more than 45 minutes. With your permission, I am going to tape record our conversation for accuracy. No one will hear the recording except me. After I transcribe our conversation, I will destroy the recording and your responses will remain confidential and anonymous. If at any point you would like to stop the recording, please tell me and we'll stop. Do you have any questions before we begin?*

Rapport Building Questions:

- Please tell me about yourself.
- Tell me about your personal and professional goals.
- Tell me about your reasons for choosing education as a career.

Questions to address the research question 1: In one elementary school with a technology-rich environment, what are teachers' beliefs across grade levels regarding the use of technology in literacy instruction?

- What does the term "literacy" mean to you?
- Tell me about how you approach literacy instruction.
- What are your ideas specifically about reading comprehension?
- Tell me what role technology plays in your literacy instruction?
- Tell me about any types of texts you use in your literacy instruction other than traditional print-based texts.
- What are your ideas / feelings about technological literacy?
- What do you think it looks like when technology is being integrated into a lesson?

- How do you think that type of integration affects your instruction?
- What value do you believe student use of technology adds to their learning?
- Do you think that using technology (i.e. reading on the Internet, creating a digital text) in your literacy instruction requires any skills that a traditional lesson would not?

Possible Follow-up Questions:

- Tell me more about that.
- Can you give some examples?
- Why do you feel / think that?
- What might a typical reading or writing lesson look like in your classroom?

Questions to address the research question 2: In one elementary school with a technology-rich environment, how are teachers across grade levels using technology in literacy instruction?

- Can you give me some examples of the types of technology you use in your literacy instruction and ways that you use them?
- Would you say that when you are integrating technology into a lesson, you are in control of the lesson or your students are?
- During a typical situation, what are you usually doing?
- How does technology integration affect student behaviors? Engagement?
- Would you say that any of the activities your students do with technology engage their higher order thinking skills?

Possible Follow-up Questions:

- Can you tell me more about that?

- Why do you think so?

Questions to address the research question 3: In one elementary school with a technology-rich environment, how frequently are teachers across grade levels using technology in literacy instruction?

- How often do you typically integrate technology into your literacy instruction?
- Are there some types of technology that you use more often than others?

Possible Follow-up Questions:

- Can you tell me more about that?
- Why do you think so?

Questions to address the research question 4: In one elementary school with a technology-rich environment, how are teachers' beliefs related to their use of technology in literacy instruction?

- What affects your decision on whether or not to integrate technology into a particular lesson?
- What affects how often you integrate technology?

Concluding Question:

- Is there anything else you would like to share with me?

# APPENDIX D: CLASSROOM OBSERVATION PROTOCOL

Teacher_____ Date_____
Other adults present (position titles only)_____
Class/ Subject_____
Grade_____
Site of Observation_____Number of Students:_____ boys_____ girls____
Observation start time_____End time_____
Grouping of Students_____whole group _____small group _____individual
Instructional Materials Used_____
Technology Tools Used_____
_____

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Objective(s): What will the student know or be able to do at the end of the lesson?
_____
_____
_____

| Time | Observation Notes | Researcher Notes |
|---|---|---|
| | Student Behaviors:<br><br>Teacher Behaviors:<br><br>Ways Technology is Used: | |

# APPENDIX E: SAMPLE FIELD NOTES

## Classroom Observation Protocol

Teacher_____Kathy_____ Date_____May 3, 2010_____
Other adults present (*record only position titles*)_____teacher assistant_(TA)_____
Class/ Subject____English/ Language Arts_____ Grade_____K____
Site of Observation___Classroom__ Number of Students:__ boys__8__ girls__9_
Observation start time_____9:30_____ End time_____11:00_____
Grouping of Students____whole group _____X___small group _____individual
Instructional Materials Used_____assorted children's literary books, multiple copy book sets, write-on/ wipe-off story charts, magnetic alphabet set, literacy game sets_____
Technology Tools Used _____ interactive whiteboard, flipcharts for whiteboard, 2 computers with Internet access, listening center (CD player + headphones)___

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Objective(s): What will the student know or be able to do at the end of the lesson?
1. Students will review emergent literacy skills, 2. Students will develop fluency, listening comprehension as they read along with narrated stories, 3. Students will develop phonemic awareness as they substitute initial consonants sounds to make new words.

| Time | Observation Notes |
|---|---|
| 9:30 | Student Behaviors: Students are dismissed from a whole group activity To their literacy centers; students already knew where to go. 2 pairs of Students went to 2 computers, accessed www.abcya.com and independently practiced various emergent literacy activities. 4 students went to the listening center with copies of the story read in yesterday's shared reading. 2 students self-selected books to read on the floor. The TA worked with 1 student on skills; 2 students worked at a table with literacy games. The teacher pulled 4 students to the table in front of the interactive whiteboard, and pulled up a flipchart to work on initial consonant substitution. Students first uncovered the initial letter to read the new flipchart then the activity changed to children taking turns to write the initial consonant in a blank. Discussion included whether the result was a real or nonsense word. When this concluded, attention was turned to multiple |
| 9:44 | copies of a story book which the teacher gave out. The teacher led the students In a walk through the text, examining pictures, making predictions on What might happen in the story. Students were dismissed (for a whole group read- aloud) before actually reading it. During the activities, students talked, sometimes blurting out answers; they were eager to show what they knew. Teacher Behaviors**:** Teacher led the activity, but encourage student dialogue; Except blurting. She had students pair up and tell each other their predictions, |
| 10:00 | Ways Technology is Used: It supported instruction, kept it interactive, held Students' attention; provided independent practice, freeing teacher to facilitate. |