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Linking the literacy curriculum with technology

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Abstract

Evaluating the process and needs of linking literacy and technology in the educational setting. The technology is presented as the driving force of change in the literacy. Teachers, administrators, and parents need to formulate a plan for training sessions along with organizing supportive people around them to integrate technology into the curriculum. They need to design professional development to empower teachers to use technology, in the curriculum. Understanding that students are exposed to multimedia literacy, technology will be a medium to motivate and synthesize learning. Teachers facilitate students to be responsible and empowered learners for their own learning. There is evidence that technology can be integrated and linked to literacy and will work in all areas of the curriculum.

Linking the Literacy Curriculum with Technology

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Table of Contents

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Introduction

The most important skill for any student to be successful in school is to be able to read. When a student is able to read it opens the doors for education in all curricular areas. Students who can read can also learn to write effectively. With reading and writing skills, often referred to as literacy skills, students can learn successfully in any environment. With technology becoming more important in the student's life, new literacy skills are being learned and developed. Hancock (1999) states that schools are "fast approaching the moment when literacy and computers will no longer be perceived as separate technologies, but rather as ineluctably (inevitably) intertwined and interdependent" (p. 3). Teachers are not prepared to use technology to support and facilitate students in their quest to learn. There is a gap that has become very visible because schools are networked, but instructors are not trained to incorporate these technologies (McKenzie, 2001). Some teachers are using technology, but separately from the curriculum. The technology has created different ways in which students will read and write. Students are using technology to gather information for themselves, school projects, or just because they are interested in a topic. The students will read for pleasure and research. They will need to be taught how to sort through important information and how to use the technology to help them in the process. The purpose of this paper is to show that in linking literacy with technology, students will increase their ability to learn while teachers will discover different delivery methods and become facilitators of learning.

Literacy is very important to students in all aspects of the educational system. With evolving technology, literacy does not involve just the basic books anymore (Wepner, Valmont, & Thurlow, 2000). Books will not disappear or be replaced by computers, but there are electronic books available. Another way technology can be used is to expand beyond the words in a book. Technology can provide background information about books and encourage students to have literature discussions via e-mail (Wepner, et al.).

Computers are becoming a larger part of our lives all the time. Students know more about technology than some parents or teachers. To prepare students for the future, the education community needs to look at what technology can offer to the learning process. Students will use computers for all types of communication, research, and games. They have come to expect multimedia presentations that are colorful and fast moving (Wepner et al., 2000). Some students have a hard time sitting and listening to teachers who lecture for long periods of time. Students are motivated by different methods of teaching than those applied in the past. They have witnessed technology becoming more abundant and have greater capabilities. They have more access to the technology than ever before. Much of this has already happened to students before they have even entered school. Students are familiar with multi-sensory instruction because they have been brought up in a multimedia world (Wepner et al.).

A connection must be made between the literacy and technology. Teachers need to find ways of connecting with students through the use of multimedia programs (Wepner et al., 2000). Raising students' motivation levels will influence an increase in their literacy skills. If students who are reading a story about a famous American baseball player from the past and do not have the prior knowledge of what baseball is and who they are reading about, technology can aid in gaining the important knowledge needed for the story. The technology will support reading and writing in all of the curricular areas. Technology can be integrated into units across the curriculum and help all teachers become interested in incorporating technology into their teaching.

Schools that integrate the technology to help teach literacy components could see test scores increase because students are motivated to learn how to read. Most standardized tests require the student to be able to read well. Also, there will be an obvious increase in technology use. The use of technology will become seamless to the curriculum. Teachers will demand more hardware and software to expand what they are teaching in the classrooms. More classroom computers will be needed for student use, not a new separate computer lab where

they visit once a week for forty-five minutes. The use of technology will increase over the whole curriculum, more from student and teacher willingness, rather than because the district has new computers. Schools need to be realistic, though. "We must realize that the Internet is a tool that can help us empower every student and elevate each individual to new levels of intellectual capacity and skill. That is the great opportunity of this new technology" (U.S. Department of Education, 2000, p. 7).

How can technology be used to support literacy? What can a teacher do to begin to use technology in the classroom? How may literacy teachers learn new technologies effectively inn their professional work (Lankshear & Snyder, 2000)? How are literacy and technology related, and how can literacy teachers make sense of this relationship to develop sound instruction? What are some reading skills that can be supported by technology? How can technology support reading development? How can technology be used for developing writing? What are some examples of software that can be used to support literacy? What do teachers who use technology do in their classrooms? This paper will review the research and literature involved with these questions.

Methodology

This paper is a culmination of research over a graduate program. In trying to find connections to real curriculum issues, the researcher looked into content that spans the curriculum. Since reading research has been an emphasis throughout his course of the graduate study, many connections have been made to learning how to read and how to help students who have a need for remediation or language barriers. Within the course of learning how to integrate technology into the curriculum, it became apparent that reading was very important in the curriculum. Schools are putting emphasis on reading. The scores at the state level have become very important to districts and with classrooms having space problem, multicultural, multi-language, and disinterested students, teachers need different ways to make connections with students. Through good design, technology can be used to motivate these types of students to support literacy.

Identifying information that talked about technology and different ways to use it in the classroom was very important. There were numerous articles available with this sort of information. The next step was to find information that contained different ways to teach reading and writing. The researcher searched for ways in which the basics of reading and writing was taught. Also important are skills and different ways of teaching to achieve those skills. As more information was collected, names of researchers in the field become more recognizable and cross-referenced to other references. The final part of research that was searched for was information on how to integrate technology into literacy. Again information was highlighted and the references cited were cross-referenced with others to find authors and sources that were repeated.

The types of references varied, with the search beginning with the discovery of different district web sites that dealt with technology and literacy. References were studied and books were ordered through the use of the local public library's inter-library loan program. The library searched for authors and titles and ordered materials from local and state colleges and universities. Many sources started through the use of these books. From reading the books, topics for the research were decided upon and information was located on the Internet. In comparing articles and authors from referenced materials in books, the researcher was able to weigh the validity of the articles.

The rationale in choosing material to use for research was to look for current sources that match the topic in literacy and technology. There were a few meaningful research items for this topic, looking at ways to teach reading. Next, the researcher looked at ways in which technology can be used to support the learning of reading and writing. Another important step is to look at ways in which technology can extend and challenge students with literacy. Instruction and the way students learn are important to the learning process. Software or Internet sites can help with the technology integration process. The search for information that pertained to the items listed above was carried out through the use of the local library, Western Hills A.E.A, the Internet, and through using Ebsco searches for

Internet articles. All areas covered were important by themselves as well as together. With literacy and technology all curriculum areas are covered, not just the traditional reading classes. Literacy defined for this research purpose encompasses more than reading; it also includes the skill of writing as well.

After looking through all the information gathered from the research and the books read, the researcher placed the articles and research into categories that would make up the research paper. The information located throughout the remainder of this paper is the resulting culmination of the research that has taken place. The categories relate to the important issues and factors in literacy and technology. All are important steps for the usage of technology with the literacy curriculum and beyond.

Analysis

According to McKenzie (2001), it is "short-sighted" to have schools working toward the goal of being connected and networked. School districts will need to implement goals to attain integration of the curriculum and technology. Teachers will need to make a commitment to learning how to integrate technology into the classroom for students. As teachers become more familiar with technologies, they become more comfortable. Fehring and Green (2001) state that as each new invention in technology is used it slowly becomes commonplace. As technology is developed a corresponding change occurs in literacy and the "role it plays in society" (p. 145). For example, manuscript literacy evolved into print literacy, which evolved into video literacy, which eventually changed into digital literacy (Fehring & Green). Digital literacy has now allowed the use of hypertext and multimedia literacy.

In an interview with Chris Dede about technology and schools, O'Neil (1995) asked: "Some experts predict that technology will have an enormous impact on K-12 education. Do you agree?" (p. 1). Dede stated that it depends on what type of models that educational systems use with technology. If the schools use the traditional models of teaching and instruction, then the technology will not have an impact on the learning of the students. "If it's used to enable new models

of teaching and learning, models that can't be implemented without technology, then it will have a major impact on schools" (O'Neil, 1995, p. 1). Technology can also enable teaching and learning beyond the schools' walls to make an enormous impact on education and learning (O'Neil, 1995). With the ability of technology to make ordinary results exciting, students will be more motivated to learn through the use of this type of instruction.

Using traditional instruction with technology as an add on for drill-and-practice or free time games will not result in increased learning (Dede, cited in O'Neil, 1995; McKenzie, 2001). Although using technology for drill-and-practice is useful for simple skills, more complex skills can be synthesized through the use of computers. Williams (2001) says to improve classroom instruction, teachers need to look at what is being taught and the delivery, or how it is being taught. In all grade levels, across the curriculum, including reading and writing, students need to learn specific skills for each subject. These skills include being able to formulate questions, researching relevant information, processing information, making inferences about that information, and being able to throw out irrelevant information. Williams suggests that technology used alone can not create a competent student, but used in the right way, through integration, can help students become critical thinkers.

Mckenzie (2001) talks about literacy skills and with the improvement of these skills, students will increase their scores on standardized testing. This process has a goal for the students. The goal is to have students become "infotectives." The characteristics for the process of being an infotective involves someone who is a good problem solver (McKenzie). An example of an infotective is a student that can differentiate between good information and not so good information. Infotectives are good problem solvers and invent paths toward the solutions. The school which develops these students is one where they place an emphasis on curriculum and learning. Students work on issues that will challenge them. As soon as a school district starts to worry about networked computers and the planning that goes with it, then the focus has switched from designing to the

functionality of what the school has within its walls (McKenzie). The integration of technology is there to support the learning and add new dimensions to learning. It is also there to motivate students and prepare them for the future.

The first important skill students learn that helps them in the educational environment for the rest of their lives is literacy. Functional literacy as described by Wepner et al. (2000, p. 5) says people are able to "process print in their environment" in newspapers, books, maps, signs, government documents. This now needs to include functional literacy for information technology. Since literacy skills are prevalent in all curriculum areas and lifelong survival, it is an important skill to learn. If this skill is moving from the traditional black-and-white lined book to a computer screen, then instruction within the schools needs to be adjusted and capitalize upon the resources that are available. With web sites becoming so widely accepted with companies and schools for access and registration, it quickly becomes clear that a person's ability to function through the use of the Internet must be considered part of the definition of functional literacy (Wepner et al., 2000). According to Fehring and Green (2001), another way to describe functional literacy is technical competence. Fehring and Green want more than just the minimum of functional literacy, they endorse the "3D" method. This view of literacy and technology learning dimensions involves operational, cultural, and critical views (Fehring & Green). This model contends that not one area is stronger than the others. "All dimensions need to be addressed simultaneously, in an integrated view of literate practice and literacy pedagogy" (p.151).

Literacy Learning

Literacy includes the learning of reading and writing. According to Fountas and Pinnell (2001), becoming a reader in the simplest terms means developing decoding skills. They do not stop there though. Becoming a reader also means reading voluntarily and frequently, reading a wide range of materials, being confident, reading for different reasons like for information or joy, recommending books to others, talking about what they read, knowing certain authors and illustrators, making connections, and thinking critically about what has been read.

Fountas and Pinnell state that readers do not read only when they are required to do so, they find the time to read on their own time. According to Fountas and Pinnell, students who are fluent readers, read outside of class and score higher on standardized reading tests. Students who read, and read in many different environments, will succeed in all areas of school.

The second part of literacy that is overlooked is the writing component. Fountas and Pinnell (2001) say that more people see themselves as readers and not writers. Again, learning to write involves developing composing and spelling skills. Fountas and Pinnell believe that to make the connection and learn to be a writer means to write voluntarily, write about many different types of topics and in different ways, be confident, organized, write about experiences, be able to communicate personally as well as professionally, draw on connections that have been made in their lives through reading and living, and be able to share what they have written through reading and critiques of their own and others' writing. Fountas and Pinnell see a writing program as "a way of life" (p. 3).

There are many skills teachers need to have students learn for literacy education. One skill that is important to literacy education is the conceptual understanding of reading and writing (Dockterman, 2002). When students exceed the mechanics of writing and show higher order thinking, Dockterman says these students have made connections to understanding writing skills. It is an analogy of baseball, it's "a deep understanding of the game that enables a baseball player to create strategy and to anticipate what will happen next" (p. 81). An example of conceptual understanding in language arts would be when readers understand what theme and symbolism mean. With this understanding, students will have a great insight into what they read beyond the words in the text. Students who understand how authors will have a style to their writing, can greatly improve both their reading and writing (Dockterman).

In literacy, reading and writing are very connected throughout. Fountas and Pinnell (2001) say that when writers read, they notice the text which in turn becomes part of what they write. After reading different genres by different

authors, connections are made and their styles of writing will be affected. In both reading and writing the goal is to enjoy, understand, and interpret the text (Fountas and Pinnell). Lankshear and Snyder (2000) developed the idea that literacy and text are so connected that these words are difficult to separate. Text has changed through the use of the printing press, copy machines, and now to computer text; including hypertext and hypermedia, word processing documents, and databases to name a few (Lankshear and Snyder). This development of text has caused a shift in the way society thinks. With this change, "electronic apparatuses are profoundly different from mechanical apparatuses, and with these differences come different ways of understanding and experiencing reality" (Lankshear & Snyder, p. 39). This causes teachers and students to "perceive and experience" reality in the classroom differently.

Effective teachers find a way to integrate reading and writing. Leu and Kinzer (1999) state that there are four reasons why it is important to connect these skills that make up literacy. First of all, connecting reading and writing makes literacy learning more relevant for students; they will use it in all other subjects without even realizing they are learning literacy. Second, instruction is maximized because it will be used across the curriculum. Third, writing can be used to learn reading skills such as comprehension. Finally, they see these two skills are integrated because they prepare students for the everyday world where they will receive e-mails, phone calls, notes, and letters. They will solve problems and communicate back to the sender. Students will switch back and forth from reading to writing back to reading.

According to Surprenant (2001), research provides information on what learners need to do to read, what teachers need to do for the readers, what programs need to be taught to learn to read, and what parents need to do to have their child become a successful reader. Fountas and Pinnell (2001) state that continuous good teaching can make the difference between students who become good readers and writers and those who do not become efficient in these areas. This section will not attempt to analyze all the methods and ways reading and writing can be learned. Instead this will be an overview of the programs and

research that is available for the good teaching for literacy. When programs are effective(Fountas & Pinnell), they will foster active, responsible learning.

According to the Reading First Initiative (U.S. Department of Education, 2002), there are five important issues to focus on for reading which include: phonemic awareness, phonics instruction, fluency, vocabulary development, and comprehension. The research suggests that a good reading program will have all of these components to foster good reading skills. As far as the students learning these skills, there are factors which play a role there as well. One of the student components is motivation. This plays a key role in any learning environment. By using technology, students could be motivated through the use of audio and video. If the students are interested by what is being taught, then connections will be made and learning will take place. Technology can also help in looking at the strengths and weaknesses of students so that the instructors can plan support and address the areas that need improvement. With the Reading First Initiative, focus is placed on the classroom and how the instructor is teaching students how to read (U.S. Department of Education, 2002). In using an instructional design model to plan for linking literacy and technology, the five goals of the Reading First Initiative will play a major role in driving the direction of instruction.

With the suggestion to have a variety of materials and instruction when it comes to literacy, teachers need to vary the delivery of how students are learning. Wheaton and Kay (1999) write about the 1,000 Days to Success program which states that schools have 1,000 days between kindergarten and second grade to teach children to read. They have mathematically narrowed it down for a student moving through those grades that they may have only a half an hour per week of individualized instruction. Fountas and Pinnell (2001) state that by the beginning of third grade students have already developed their expectations of reading and texts. With this in mind, teachers need to find other ways of getting students to exercise their ability to read. Through technology, students have a choice to be supported in their effort to learn to read.

As Fountas and Pinnell (2001) suggest, new words arrive daily into our language. The communication on the Internet is a new way to communicate that involves both reading and writing. The framework that represents the language is an integration of "reading, writing, talking, technology, and the visual arts as a way to represent, apply, and communicate" what has been learned (p. 21). An example of this would be creating a PowerPoint presentation for a social studies project to deliver to the class. Fountas and Pinnell created a Language and Literacy Framework for Literature and the Content Areas (p. 22), with a framework that connects reading, writing, and word study as three types of communication, oral, visual, and technological. The technology is used in many different ways for students to communicate what has been learned.

Fountas and Pinnell (2001) have also developed what is called the "negotiated curriculum" (p. 23). This curriculum model looks like a Venn diagram, with three overlapping ovals. It suggests that when planning the curriculum you first look at your state and district standards. Then the instructor will add to them and adjust according to personal preferences and comfort levels. The instruction will also be adjusted to suit family and student needs as well. The most important parts of this diagram are the areas of the teacher's and the students' interest and expertise. The teacher will be able to plan literacy lessons to include the technology that can support the learning. Students will be more motivated to read, write, and communicate about the topic with others. Technology can support all parts of this curriculum.

Leu and Kinzer (1999) state that in using the Internet and computer for instructional purposes, teachers will instinctively choose activities and Internet sites that match the learning outcomes. When it comes to literacy learning, teachers will focus their choice on what they believe or are trying to emphasize. Leu and Kinzer, for example, say that if you are teaching specific skills, the software that is chosen will include student record keeping. Teachers will also choose "internet strategies that enhance the development of the skills taught" (p. 658).

Leu and Kinzer (1999) illustrate the definition of a literacy framework. A literacy framework consists of "beliefs about what to teach and how to teach" (p. 15). This framework, "based on an understanding of reading comprehension and response, organizes the teacher's beliefs about literacy around two issues: What should I teach? and How should I teach?" (p. 15). Since computers can be tools for teachers that will allow them to support literacy, Leu and Kinzer have developed some major points to consider for applying to the framework when integrating technology. In using technology to become an effective teacher a literacy, Leu and Kinzer suggest:

- The use of computers in literacy instruction falls into five categories: learning with computers, learning about thinking with computers, learning from computers, managing learning with computers, and learning about computers.
- The Internet is a powerful and appropriate tool for use in literacy instruction.
- Issues of child safety and professional growth are important to the students and the teacher.
- In addition to computers and their software, various other technologies, including videodiscs, answering machines, and televisions, are useful in reading instruction. These other technologies can be effectively used independently or with the support of computers.
- All types of software, including drill-and-practice, tutorial, game-like, simulation, and programming, can have a place in reading instruction, if appropriately used.
- Teachers should carefully evaluate software before using it in reading instruction (p. 15).

Technology and Literacy

Why should technology be integrated into, or used to support and enhance, literacy learning? Computer assisted learning is found in schools across all subject areas in the curriculum. Technology can play an important role in literacy programs. There are many uses for technology which is redefining the way teachers are teaching. Boice (2000) states that the use of technology supports the

development of the the student's understanding and knowledge which is stimulated by using different means of learning curriculum. Boice believes that technology can introduce and model skills for the testing of reading problems in children and make them more successful in a school setting. Wepner et al. (2000) states that there is an increasing amount of research that technology is effective at motivating and engaging students to be successful. Technology also improves student performance (Wepner et al.). Dockterman (2002) does warn that teachers still play a very important role in student achievement. He states that literacy software can be very "good at capturing and reporting results, but diagnosing the cause of the mistakes and perceiving areas that need improvement often requires direct student observation" (p. 80) by the teacher. As with any other teaching tool, the teacher still needs to be the main focus. Technology needs to provide support, helping students reach the designated goals in reading and writing.

In the technology field there are many resources available to the educator to assist with the integration of the computer (El-Hindi, 1998). One choice would be the Internet or the world wide web. The world wide web offers the tool to linking the student to text, graphics, animation, and sound. In a report by El-Hindi (1998), children in a Maryland elementary school corresponded back and forth with children in an elementary school in Japan. The teachers used this tool as a very meaningful learning experience as it allowed the students to be involved in a very powerful authentic literacy experience (El-Hindi, 1998). Technology, as a support, is a very powerful tool. It opens the world to students, it also allows for them to become more literate in all areas of education. Leu and Kinzer (1999) state that the classroom computer and the Internet have "the potential to transform the teaching and learning of literacy" (p. 626).

The use of the Internet for educational purposes means web sites have to be accessible to the students to use for learning. The U.S. Department of Education (2000) declares the use of basic design and development guidelines among developers to insure accessibility to support all learners. The report goes on to state there is not one "typical learner, just as there is not one path to learning"

(p. 30). Educational web sites need to provide support to students, while challenging the students. U.S. Department of Education (2000) lists three areas to aid in the accessibility of Internet sites for students:

- Multiple means of representation (e.g., a math concept in both text and graphic modes, animated science simulations, poetry read aloud by the author, etc.).
- Multiple means of expression for the learner (use of text, sound, images, video, and combinations of media as vehicles for expressive literacy through writing, illustrating, speaking, video making, and drawing).
- Multiple means of engagement to attract the easily bored or the easily distracted learner (p. 30).

Internet designs with complications impair students and teachers trying to access the site for educational purposes. The report states if the Internet is meant to create a better learning environment and improve the support system for education, then everyone needs to have access to the site (U.S. Department of Education, 2000).

According to Roblyer and Edwards (2000), another resource for literacy instruction is software that would provide Cloze activities. These activities involve sentences with words missing in a given pattern, for example, every fifth word or tenth word. The readers try to fill in the words as they are reading the sentences. This method of Cloze is a good measure of reading comprehension (Roblyer & Edwards). There are also opportunities for students to use interactive CD-Roms. With the interactive CD-Roms, students may explore the screen as well as have the book read to them. These examples are all designed to to motivate students as well as increase reading and writing fluency (Roblyer & Edwards). This motivation will transfer through the technology and into the classroom.

According to the International Reading Association (IRA, 2001), the Internet and other forms of technology such as word processors, presentation software, Web editors, and electronic mail are all redefining what we think of as literacy. In the present world in which we live, students must become accomplished and

experienced in all of these areas to be considered literate. The IRA believes that all educators need to integrate these technologies into their curriculum to prepare students to face the world that lies ahead of them. Teachers need to be skilled in effective use of technologies for teaching and learning along with a literacy curriculum that integrates these technologies into the instructional programs that are provided by school districts (IRA).

Wepner et al. (2000) asserts that we are entering a time when online activity "will be the only activity accepted by major institutions and service providers" (p. 5). So what do children gain from using the Internet in the classroom? Stoicheva (2000) feels that teachers have a large number of resources available to them that will assist them in developing lesson plans and ideas for plans. Teachers can also find teaching strategies, guides on how to use the Internet in the classroom, and guides to conduct information searches. Teachers may also connect with other teachers and educational professionals to discuss issues and get ideas. Teachers have also found and developed sites that help students foster research skills, integrated learning, interactivity, writing for a real purpose, collaborative problem solving, etc. (Stoicheva).

There are several advantages for using computers in schools to improve literacy skills. Computers allow students the ability to view what is happening almost anywhere in the United States or the world. Web sites allow teachers and students to locate information as well. Students are also able to create and publish their own information on the Internet with simple web pages, as well as being able to retrieve information. The advantage of using a computer is that the student is able to navigate his/her own learning throughout a lesson. Teachers can step back and be more of a facilitator in the learning process. Hypermedia allows students the ability to click on unknown words and check background information on stories. "Computers bring to students the world of knowledge unavailable though traditional print" (Wepner et al., 2000, p. 8). Computers are able to bring students an abundance of knowledge that teachers are not able to do as easily. Wepner et al. suggests that technology allows teachers to open their classroom doors to

additional teachers who are all involved in participating in discussions for helping students develop their literacy skills as fully as possible. "The traditional view of literacy as interacting with printed text in a linear fashion" (Wepner et al., p. 79).

There are many examples of what technology can do for literacy achievement. Some involve specific software that will be discussed in another section. The examples that follow are some specific ways in which technology can be used to support and expand literacy. One such resource would be the use of e-books, or digital books. These books are delivered to students through the use of a hand-held device such as a personal digital assistant or and e-book reader. These devices are portable just as other books are, but much lighter in weight than a heavy volume book. With digital books, unknown words can be figured out just by a click (McLester, 2001). When reading a chapter about electricity in a science book, the reader can click on the name Ben Franklin and automatically locate more information about his discoveries and inventions with electricity. McLester states that this is a great technology, but says that the idea of printed text disappearing is "disturbing."

The ability to add functionality to reading or writing, through the use of technology, is an amazing function that is available to students in today's educational system. An example of adding functionality would be the use of hypertext within a story. According to Bushweller (1998), traditional literary genres, which include novels, short stories, or poems, have the reader follow a beginning to end pattern. With hypertext, words can be accompanied by sound, video, and graphics. Students do not need to read the book in a sequential order to get meaning from the pages. Students can access meanings from words or context by selecting the hypertext and clicking on the word or phrase. This will take the students to a place to give meaning through more text, sounds, pictures, or videos (Bushweller). "Hypertext is expanding the definition of literature, from words to hybridization of words, images, and sound" (p. 3). An example that Bushweller writes about is students reading a Shakespeare story. The concept of having students sit and read a play by Shakespeare is more motivating if they can use

hypertext versions and click on a scene to hear it read in an Old English accent or even watch it on a video. This will motivate them to learn more about what is being read.

The changes for literacy are direct results of the increasing amount of information that has become available through the use of technology. Thornburg (1998) describes some trends that are affecting our education currently and for future planning. One trend is the amount of information which doubles in volume every two years. He states that there are arguments that this information is worthless, but then he goes on to say this is the reason that makes teachers' jobs more difficult. Another trend is the global market becoming smaller. Not smaller in size, smaller in the amount of time it takes to communicate with someone on the other side of the planet. Business can now be conducted virtually around the world. Another great factor is the power of computers strengthen, while the cost drops due to competition. The reason technology is more powerful is due to the fact that the computer chips continue to double in capacity every 18 months. How does all this affect education and learning? Thornburg looks at what the Internet has already done for education. It already allows teachers and student access to events that are just happening and will not show up in a text book for many years. He also states that students may research almost any topic in the world and post it on the Internet for evaluation from teachers or other students. Thornburg also indicates that educators are preparing students for jobs that have not even been invented or developed yet. Learners must become capable in communication, collaboration, and creative problem solving (Thornburg).

To increase integration of technology into literacy programs, Marcus (1998) suggests that teachers are given an opportunity to share successes and pitfalls with other coworkers. Take some risks and do not be afraid of risks. According to Marcus, failure can generate much learning because teachers will learn from mistakes. Plan for the use of technology as you would plan for writing a paper. Start with prewriting, writing, and then rewriting. This is a process that will take some time. Give teachers adequate training in terms of professional development. Train

them on using software and hardware. Also allow time to use equipment. A computer lab that is tied up all day does not help a classroom teacher.

Curriculum Issues

Why do teachers want to integrate technology into the classroom? Integration of technology gives them more scope into the different parts of the curriculum. This allows different ways to approach the students. It gives the students more ways to learn. Another issue to look at is how students are motivated by technology. Motivation is a big factor in learning. A student who is motivated can and will learn (Surprenant, 2001). Schank and Cleary (1995) indicate that students will ask questions when motivated to find information that interests them. Students will also be able to apply their knowledge to other curricular areas. This will allow for transfer of knowledge from one subject to another. Another important part to remember with integration is that computer skills should not be taught in isolation.

The technology should support the curriculum so that it does not become a separate part that is left in the corner of the classroom. What is being taught in the classroom as far as the skills in technology should be tied in a logical and orderly manner to the curriculum (The Center for Internet Technology in Education, 1999). This means that teachers and administrators must work hard to keep this in mind when integrating technology. When the integration process is complete, a clear view of what the roles of the teachers and students should be in place.

There are two important strategies to which school districts must attend for technology integration to occur (McKenzie, 2000a). First, school districts must realize that getting the school wired and networked, with every teacher having a connected computer, and each school having an updated computer lab as an answer to the technology integration problems. Schools need to look toward teacher training and planning for the integration. "A return on investment will come only to those who move beyond technology to literacy" (p. 1). Only when classroom teachers are able to take in and accept these new technologies, meaning have some ownership, will computers begin to become part of the daily routines.

The idea is to have the technology be part of the daily lesson plan, sort of like the task of taking out a pencil and piece paper is in classrooms now. McKenzie suggests that it is the emphasis on the literacy that shows students how to think, decide, and interpret information into their work.

The second issue that needs to be dealt with is the urgency of professional development (McKenzie, 2000a). Just as stated before, too many schools have been worrying about connectedness. The majority of technology money flows to hardware and some software, basically of the classroom or district management type. Teachers need training in how to integrate the technology into the curriculum. McKenzie states that far more attention needs to be paid toward teaching strategies and curriculum. Teachers are excited when learning new ideas for their classroom. School districts need to fuel what teachers learn and develop for literacy and technology integration. The presence of computers in a school or a classroom does not mean students' learning is going to be better or that they will use technology.

McKenzie (2000b) asserts that a school district has achieved technology integration upon recognition of certain characteristics. The first is invention, which means, according to McKenzie, that 25% or more of the school day is dedicated to problem solving, decision making, exploration, and the creation of new ideas. The next factor is fluency. McKenzie defines this as teachers moving back and forth between roles and instructional strategies. This is where integrated technology allows a teacher the ability to be more of a facilitator. Third, support, means that the school develops the learners' thinking and information skills. Fourth is navigation, which is where the students are able to understand and find their way through technology information. Fifth is searching, when students are able to find the information they are looking to find. Selection is the sixth characteristic and means when students can pick and choose the right information. Seventh is questioning, which means the learners know the types of questions that need to be asked to solve problems. The next characteristics are planning and interpretation. Planning

is making good choices, while interpretation is taking all the information collected and synthesizing it toward the student's own interpretations. The last three factors are deep thinking, commitment, and family involvement. Deep thinking has the learners reading and processing information for relevant information. The commitment comes from the districts' curriculum connections with technology. Finally, the family involvement means that parents are involved process for reading and collecting information for the students.

"Curriculum imagination" is a phrase that means the ability to imagine ways of enhancing curriculum delivery, or instruction, using technology (Hancock, 1999). The definition is another reason as to why technology integration is taking so long. According to Hancock, teachers are not lacking good curriculum ideas, it is being dependent on the availability of computers. Most schools have a computer lab, but the biggest problem with a computer lab is that it may be in use all day and thus, teachers do not have the flexibility that classroom teachers need and deserve. The curriculum imagination idea works best in schools that encourage teachers to try out new ideas and give the teachers the equipment and time to try those ideas. When teachers try out new ideas, they need to learn from both, the positive and the negative aspects of the experience. This is one way for teachers to become better at their roles in the classroom.

With any new concept in education, an assessment will be needed to show evidence that the integration works. This is something that will be an uneasy task. Wepner et al. (2000) says literacy teachers can take steps to assess progress. Teachers can observe how students are learning with the technology being used and assess their final products. While students are working and completing units, instructors will use formative evaluations to revise instruction. Another way is to compare work from year to year, especially if it can be saved electronically.

Teacher's and Students' Roles

As the process for learning how and what to read and write is changing the way teachers are teaching, there are many facets of the literacy classroom that will

not change (Wepner et al., 2000). Looking at the history of teaching, reading teachers have traditionally been the first teachers to get students to think logically and actively while reading. These teachers are also responsible for learning about what type of literature is being read, what the author's purpose is for writing, and what the important information in the reading is to formulate the main idea of the text. Reading teachers are also the ones who teach students how to use the information gained to write main ideas and summaries about what has been read. Reading teachers also draw students into different genres of reading and writing, which expands vocabularies and academic awareness. Wepner et al. makes the point that since reading teachers are well equipped to instruct students in these ways, they connect to the way technology should be taught to students. Reading teachers need to realize the different aspects of instructional technology that will work best for them in the classroom.

Does all of this information change what a teacher will do in the classroom? Where should a teacher start when integrating technology into the curriculum and classroom? Teachers need to become familiar with the information about technologies and the technologies themselves. Roblyer and Edwards (2000) suggest the more teachers become familiar with technologies, the more places they will find to fit it into their curriculum.

With the increasing availability of technology, many students now have the access at home. Students are more comfortable in some areas of technology than some instructors. Teachers need to realize that with home computers, students may be ahead of what they have learned about technology. Teachers need to start planning for this integration into the curriculum. Wepner et al. (2000) declares teachers who plan with technology in mind use broader thinking patterns. This allows students to initiate thinking and make decisions in the classroom. McKenzie (2001) states that technology is more of a delivery system for what is being taught. Teachers are seen as more of a facilitator in this situation rather than giving information, having the students memorize it through reading and writing, and then having a test over the material that has been covered (McKenzie, 2001).

The themes teachers create for instruction with technology allow students to explore learning in print and electronic formats. Students will gain important skills such as gathering, organizing, and sharing new information with classmates. Hancock (1999) talks about the word choose as the key phrase to literacy, because in literacy students need the ability to choose what they want to read. The vastness of the Internet allows students the choice. With this technology, a large range of literary works can be studied. Instructors need to be aware of this and use it to their advantage by instructing students to make informed choices about what they choose to read.

Research has shown that computers have changed the way teachers approach various topics in the curriculum (Williams, 2001). Technology is becoming a driving force in education to change the way instruction is delivered and carried out. Technology helps both the teacher and the student. According to Williams, teachers who want to improve classroom instruction through the use of technology need to take into consideration what it is that is being taught and how it is being delivered or how it is taught to the students. Williams suggests that students at all levels need to develop certain skills in education. These involve being able to form exact questions, search for related information, being able to reason, analyzing important concepts, being able to make inferences, and being able to see information from different points of view. "Technology alone can't teach children to become competent thinkers. But combined with the best teaching practices, it can act as an empowering educational tool and a stimulus for change" (Williams, 2001, p.3).

Roblyer and Edwards (2000) feel that "properly trained teachers make the difference between success or failure of an integration effort" (p. 33). This is a belief that teachers will have difficulties creating an integrated environment because it is different from the learning environment in which they experienced themselves (Roblyer & Edwards). Teacher training programs are first made most effective through hands-on integration by working through programs with the focus on how to use technology. Second, by training teachers over time instead of a one time

inservice. Third, by modeling, mentoring, and coaching, which means having the instructors show their use of technology in their own teaching and having support available for new teachers. Last of all, there needs to be post training, or a follow up to practice and use what has been learned (Roblyer & Edwards).

McKenzie (2001) emphasizes that professional development, adult learning, and support for development and technology creates a better learning environment. Professional development is very important to get instructors on board and ideas in which to use the technology for literacy. It will also help in the design process for the integration of technology. If a school district invests in a vigorous and in-depth professional development program, combining traditional teachings and technology will happen more often and not by mistake. Teachers need this opportunity to get the technology into what they teach. Technology is being used across the curriculum because the importance of its use is being realized. The goal needs to be shifted from the hardware to the training and implementation into the curriculum. Without the proper training, a school can have the best computers in the world, but they will not be used effectively. As the report by the U.S. Department of Education (2000) states, "Training helps teachers transform lifeless equipment into useful tools. Creating high tech educational tools without training teachers to use them would be as useless as creating a new generation of planes, without training pilots to fly them" (p. 39). The nation's teachers, including the principals and and administrators, need to be trained in the process of integrating technology (U.S. Department of Education).

Teachers are the ones who guide the instruction in a classroom. Teachers shape the instruction to suit students' needs. If teachers are comfortable with the integration of technology and they are able to apply it to the curriculum, then teachers will become "empowered to advance their own professional skills through these tools as well" (U.S. Department of Education, 2000, p. 39). Professional development is the most critical ingredient to the use of technology in the context of literacy education (U.S. Department of Education). Teachers need to develop

skills beyond the basic applications that make up software programs. These skills need to give them the self-assuredness to connect their curriculum with supported learning from technology.

While students will welcome a different approach apart from the traditional stand and deliver, educators need to make the leap into technology integration (Academy for Educational Development, 1998). Dede states that students are inherently motivated by different approaches in the classroom. If instruction is accomplished through educational technology, then students will be motivated to learn. Often teachers and educators alike are worn down from teaching uninteresting fragments of the curriculum. Dede feels that professionals can draw upon student motivation and be re-inspired to make that change (Academy for Educational Development).

As instructors are trying to increase the time spent on individual instruction with students, an important tool to use for the other students would be a computer (Surprenant, 2001). Often schools rarely have enough equipment to allow each student individual access. Because of this, teachers need to determine what the instructional problems will be, what parts of the curriculum will be covered, what will the classroom environment be like, and what will be used for materials (Roblyer and Edwards, 2000). With all of this, Roblyer and Edwards contend that teachers also need to structure the class time so students use the technology efficiently and effectively.

Another area in which computers will help the instructor would be assessing the readers and writers in the program. Diagnostic tests are mainly given by the teacher in a small group or one-on-one setting, leaving the class to work quietly on other materials. Why not use the computer to assist in this process and alleviate some of the time constraints and allow the teachers to work with more students (Surprenant, 2001)? There are many ways in which a teacher can use the computer for the assessment of reading and writing. For example, students can post their work on computers for others to see and work through the writing process with revisions and editing.

As technology fits in across the curriculum, teachers are spending more time planning and locating information on the Internet that will support instruction (Wepner et al., 2000). "Teachers are becoming better facilitators, helping students stay active in their pursuit of knowledge" (Wepner et al., p. 161). Classroom instructors are planning more authentic instruction, students are becoming more motivated and engaged in the learning taking place (Wepner et al.).

According to Kulik (1994, cited in Schacter, 1999), students, who are using computers in the classroom for instruction, averaged a score at the 64th percentile on achievement tests compared to students without computer instruction who averaged a score at the 50th percentile. It was also noted that students learn in less time and the attitude toward that subject area is more positive than classes without computers. The peripheral choices that will support technology integration include scanners, digital cameras and camcorders, and other equipment, but these are expensive. Wepner et al. (2000) concludes that students are learning to be responsible and careful when the availability of these devices are used because it makes the instruction more motivating. Wepner et al. also states that if these technologies are made a natural and important part of the instruction students will increase their responsibility for their own learning. Another responsibility that students must have is to help classmates master the technology and software being used in the classroom (Wepner et al., 2000). This is a great situation for teachers and students to get the classroom to work together in group situations cooperatively.

How do you get students using technology to support literacy and the curriculum? The theme throughout has been with professional development. That one part of the process. According to CEO Forum (1999), school districts need to set relevant and realistic goals. First, everyone who is involved, teachers, administrators, parents, and students, needs to have a clear picture of the direction the district is heading. Second, make sure those same set of people, administrators through parents, are involved in all professional development activities. Third, link the professional development to the goals and objectives set

forth at the beginning. These can be changed as they are assessed. Fourth, use the technology to teach about the technology. Fifth, people learn best by doing, including teachers and students. Create learning environments that are hands-on situations. This will empower the learners to use technology for educational purposes. Last, make resources available to everyone who needs the help. Give the learners reason to keep on learning and provide the support to keep them going. Do not leave them to fend for themselves after the start of integration.

Resource Materials

Resource materials include software and Internet sites that can be used to integrate into literacy. Applications that might be appropriate for literacy learning are word processing, multimedia presentations, and anything else that adds functionality to a computer. Teachers might think they have no software programs to use, but in reality they already have some tools to use on their classroom computers.

Leu and Kinzer (1999) state that there are fundamental changes taking place within the classrooms. The learning tool they credit these changes to is the Internet. These sites listed by Leu and Kinzer support literacy in the classroom. First, The Children's Literature Web Guide (http://www.acs.ucalgary.ca/~dkbrown/index.html). This site is a resource for children's literature with reviews and discussions by authors of the books. Another example is Inkspot for Young Writers (http://www.inkspot.com/young). This site, and sites like it, supports young writers by integrating advice from authors and editors. It also has interviews with young writers along with a forum to post and exchange ideas. The last one for consideration is Reading Online (http://readingonline.org/). This site is sponsored through the International Reading Association and presents articles, critical issues, development in literacy, and other aspects which will support classroom teaching and knowledge.

There are different types of software formats that are available to be used on computers to support literacy. Wepner et al. (2000) gives "guideposts" for

grading selected software and determining if it fits your needs or goals. Wepner et al. lists some certain assumptions that coincide with the guideposts set forth. First, the software offers a skill that cannot be completed with traditional instruction. Second, the software does what it says it does. Lastly, the contents of the software are accurate, developmentally appropriate, and considerate of race, age, gender, ethnicity, and disabilities. Wepner et al. suggest that software can be a significant investment, so they advocate "no use rather than poor use" (p. 90). Some of the points made on the checklist are to make sure the activities and tasks are interesting and will hold the attention of the student. Another point is to see if the graphics and sound are are high quality, appropriate, and are meaningful to the program. Some of the other guidelines include having enough support in place for students and the accessibility. Very careful planning needs to go into the evaluation of software. There are two things to look for, one is the content load, which means can students read what they need to and process the problem they are trying to solve. Second, that the skills required to run the software are achievable by the students. There are many sites on the Internet that provide guidelines on how to evaluate software. The best way to look at whether or not the software will work is to watch students use it.

Goldberg and Sherwood (1983, cited in Leu and Kinzer, 1999) offer a classification system that was created to benefit classroom teachers so they can be aware of what computers and the software can accomplish. Teachers who are researching ways in which to integrate technology and literacy can use these classifications to evaluate Internet sites and software. The classification system of computer use includes:

- Learning with computers, these examples include simulations that reflect real-world situations and problems to be solved.
- Learning about thinking with computers, these examples include problem solving and the potential influence on children's thinking skills that results from working with computers and some types of software.

- Learning from computers, these examples include drill-and-practice games and tutorial software.
- Managing learning with computers, these examples support classroom management for the teachers, including record keeping, filing, grade book, and attendance.
- Learning about computers, these examples include computer literacy, meaning learning about the equipment, languages, and basic operation knowledge to run the computer (p. 627).

With the different types of technology available, teachers need to take a look at what that software or Internet site do for my students? Will they work individually or with partners? Will the instruction improve with the use of this software? If a teacher involves as many of these classifications as possible, then literacy learning will be supported with technology (Leu & Kinzer, 1999).

Schacter (1999) provides research on the effectiveness of reading technologies. Schacter asserts, for the most part, these reading technologies have not been up to standard. Reading technologies have been designed and implemented without much planning. Most of these reading technologies are expensive and the results for the students have been minimal. Schacter states the most successful reading technologies have been through school-wide programs, small group programs, and professional tutoring programs that are less expensive per student. The educational software companies have created programs that work on reading skills such as phonological awareness, concepts of print, vocabulary, oral story comprehension, etc. These skills are desirable at all levels. The programs reviewed in the next paragraph include all of these skills in some capacities depending on the grade level. For example, lower grades will focus on functional literacy and the higher grades will focus on comprehension skills. Some students will need remedial help because of learning disabilities or language barriers.

Programs such as Read 180, Reading Counts, and Accelerated Reader all appear to improve the low readers' ability and to support or increase exceptional

readers. According to Scholastic Inc. (2000), Read 180 is designed to deliver individualized, adjusted reading instruction, provide practice and application of skills in different areas, and support and motivate students as they increase reading skills. This program works for students who are lagging behind classmates in the different skills of reading. It takes a look at using a balanced literacy classroom, which includes the technology, to increase literacy in the areas of reading, writing, and oral communications. The skills that are gained through the use of this software can be used and applied to other areas of the curriculum.

Reading Counts, another software program from Scholastic, works on improving the literacy through the use of motivation. Reading Counts is a management program that monitors students' progress with independent and curriculum related reading (Scholastics, 1999). Basically, the students read selected books from a list of books. They read the book at their own pace and take a short quiz on the computer to assess comprehension. The software keeps track of all the students' reading for the year so teachers can monitor problems or success to make recommendations or interventions for students' success.

Two other programs that use technology to supplement instruction, with online support, are Literacy Launcher and Beyond Books. The Literacy Launcher combines multimedia activities that guide students through reading and math skills. It allows each student to work at his/her own levels independently. It also allows a home connection because of the Internet based software. Parents will be able to view what their child has been working on and have reports of their child's progress. Teachers and parents will have a common starting point to discuss the student's progress. Another online program is Beyond Books. This is an interactive source for education curriculum for grades 6-12. This is designed to compliment classroom activities. It can also be used as a primary source for instruction as well. The program features a standard based content, connections to state and national

curriculum standards, grade appropriate links that supplement the instruction, online teacher support, and interactive activities and questions that guide student discovery.

There are so many different software titles, the possibilities to fit it into the curriculum that is being taught are limitless. There are many sources that give reviews on specific software for all parts of the curriculum. There are books in print and web sites that feature reviews and comparisons for the software. As an educator or administrator careful analysis needs to be completed when software is being reviewed. Also take into consideration who is giving the information on the software. If it is reviewed by the company that is putting out the software, then try to find more information about it.

Another equally important issue is the hardware that will be used to run the software. Roblyer and Edwards (2000) say "adequate funding can determine the success or failure of even the best technology plan" (p. 32). Administrators will first inspect areas that concern what the schools need to help the current problems, second, see what kind of funding it will take, and finally where and how will schools come up with the funds (Roblyer and Edwards). With this in mind there are several problems that cause complications in this process which include keeping technology current so that the software can be run on the computers. Another problem could be the lack of computers in the classroom or the availability of school labs. The hardware could obstruct the success of any technology plan (Surprenant, 2001).

Conclusion

Wepner et al. (2000) declare that schools are transforming because of technology. In these schools students are connected to information that is up to date, varied, and complete. Students are able to communicate in ways that were not imaginable 10 years ago. There are no boundaries for students. Technology spans across the curriculum as well as varied aspects of everyday life. Students need a changing curriculum to be literate in today's world. As students become more and more comfortable with using technology in their homes, the schools need

to catch up. Computers are changing the ways students are motivated to learn, the schools need to realize this and start to support the integration as a whole, not just hit or miss with one teacher here or computer class there. Reading and writing skills do not just involve printed or written text anymore. Wepner et al. (2000) poses these questions:

- Can any student truly be literate today without a proficient understanding of how to operate computer hardware and major types of software such as word processors, spreadsheets, and databases?
- Can any student truly be literate today without the ability to navigate the Internet to find information and resources and reorganize them in personally meaningful ways?
- Can any student truly be literate today without an understanding of how to create multimedia resources such as web pages? (p. 204).

Integration of technology in the school curriculum structure needs to be implemented by using a plan. This plan needs to include research and data to support the reasons for integration. Throughout this process teachers, administrators, and parents need to be involved to improve the instruction that the students are getting. The impact of computer based instruction on student achievement has been demonstrated to increase reading scores on the Stanford 9 test as well as other tests (Schacter, 1999). The process of getting to a desired goal can be reached in a variety of ways. One reason is that students have different learning styles. The goal of educators is to have everyone reach a desired outcome, that does not mean they have to use the same route to get to that outcome and that is where integration of technology supports the learner.

The components that are important to the process of integrating technology include using computers as support not isolated material (Surprenant, 2001). Another component is the teachers and what they are comfortable doing with technology. The teacher also has to consider student motivation and what computers can do to increase it. Students have also been able take less time using computers. Additionally, educators know that the more students read, the

better readers they become. Computer programs allow students to get more reading time using a different approach, which is a positive in education.

In a report from CEO Forum (1999) schools need to take certain steps to improve education through the use of technology. The following will help increase the use of technology throughout the educational system:

- Schools of education (universities and colleges) should prepare new teachers to integrate technology into the curriculum.
- Current teachers and administrators should be proficient in integrating technology into the curriculum.
- Education policy makers and school administrators should create systems that reward the integration of technology into the curriculum.
- Corporations and local businesses should collaborate with the education community to help ensure that today's students will graduate with 21st century workplace skills (p. 3-4).

There needs to be research and data available on schools that do link technology and literacy. Conducting research analysis is difficult because of the lack of broad-based research available (CEO Forum, 1999).

The researcher believes that there are many options to help students become better readers. The obstacles that need to be overcome include lack of teacher inservice and training of new teachers. Teachers need to take the time to learn about what can be done with the technology that is put in front of them. School districts need to also support their teachers in the learning process. Professional development in the integration of technology needs to happen in the schools before widespread use happens.

The definition of being literate in today's world needs to include technology. If being literate means a student is able to read or write, access an article in hypertext, operate a computer's applications, or surf the Internet, then traditional education needs to transform into instructing students with the support of technology. Thornburg (1998) states, "We must transform all formal institutions of learning, from pre-K through college, to ensure that we are preparing students for

their future, not for our past. Schools that ignore the trends shaping tomorrow will cease to be relevant in the lives of their students and will disappear quickly" (p. 4). In addition to teacher training, the selection of the effective software and the funds needed to buy it are also very important. Finally, a tough obstacle to overcome is outdated computers or lack of computers for the schools. This is what slows down the transition or infusion of computer assisted lessons. Teachers and students can use technology to become better readers across the curriculum (Surprenant, 2001).

References

Academy for Educational Development. (1998). Chris Dede on how technology changes the role of the teacher. [On-line]. Available: http://millennium.aed.org/dede.shtml

Boice, J.E. (2000, November). Reading diagnosis redux: How technology redefines reading diagnosis instruction. T.H.E. Journal [On-line]. Available: http://www.thejournal.com/magazine/vault/A3164.cfm

Bushweller, K. (1998). Hyper-Lit: Welcome to English for the 21st century. Electronic School Online. [On-line]. Available: http://www.elctronic-school.com/

The Center for Internet Technology in Education. (1999). Teachers of the 21st century know the what, why, and how of technology integration. [On-line]. Available: http://www.thejournal.com/magazine/vault/A2084.cfm

CEO Forum. (1999). Professional development: A link to better learning in School Technology and Readiness Report. [On-line]. Available: http://www.ceoforum.org

Dockterman, D. A., Ed.D. (2002). Weaving technology into your teaching: A practical guide to how computers can help teachers inside and outside the classroom. Watertown, MA: Tom Snyder Productions.

El-Hindi, A. (1998, May). Beyond the classroom boundaries: Constructivist teaching with the Internet. The Reading Teacher, 694-700.

Fehring, H. & Green, P. (Eds.). (2001). Critical Literacy: A collection of articles from the Australian Literacy Educators' Association. Newark, DE: International Reading Association.

Fountas, I. C., & Pinnell, G. S. (2001). Guiding readers and writers grades 3-6: teaching comprehension, genre, and content literacy. Portsmouth, NH: Heinemann.

Hancock, J. (Ed.). (1999). Teaching literacy using information technology: A collection of articles from the Australian Literacy Educators' Association. Adelaide, South Australia, Australia: Australian Literacy Educators' Association and International Reading Association.

International Reading Association. (2002). Integrating literacy and technology in the curriculum. Newark, NJ: International Reading Association. [On-line]. Available: http://www.reading.org/positions.html

Lankshear, C. and Snyder, I. (2000). Teachers and technoliteracy: Managing literacy, technology and learning in schools. St. Leonards, NSW, Australia: Allen and Unwin.

Leu, D.J., Jr. & Kinzer, C. K. (1999). Effective literacy instruction (4th ed.). Upper Saddle River, NJ: Prentice-Hall.

Marcus, S. (1998). A friend for the language arts: How technology can enrich reading and writing instruction. Electronic School Online. [On-line]. Available: http://www.elctronic-school.com/

McKenzie, J. (2000a). Beyond technology: Making a difference in student performance. Electronic School Online. [On-line]. Available: http://www.elctronic-school.com/

McKenzie, J. (2000b). Beyond technology. Bellingham, WA: FNO Press.

McKenzie, J. (2001). Planning good change with technology and literacy. Bellingham, WA: FNO Press.

McLester, S. (2001). E-books are bound to be better for teaching. Los Angeles Times [On-line]. Available: http://tsearch1.epnet.com/

O'Neil, J. (1995). On technology and schools: A conversation with Chris Dede. Educational Leadership, 53, (2). [On-line]. Available: www.ascd.org/readingroom/edlead/9510/oneil.html

Roblyer, M.D. & Edwards, J. (2000). Integrating educational technology into teaching (2nd ed.). Upper Saddle River, NJ: Prentice-Hall.

Schacter, J. (1999). The impact of education technology on student achievement: What most current research has to say. Milken exchange on education technology [On-line]. Available: http://www.milkenexchange.org

Schank, R.C., & Cleary, C. (1995). Engines for education. Hillsdale, NJ: Lawerence Erlbaum Associates.

Scholastic, Inc. (1999). Scholastic reading counts!: Research and results report. New York: Scholastic, Inc.

Scholastic, Inc. (2000). Read 180: Research and results report. New York: Scholastic, Inc.

Stoicheva, M. (2000). The digital divide and its implications for the language arts. (Report No. 153-EDO-CS-00-04). Bloomington, IN: Eric Clearinghouse on Reading, English, and Communication. [On-line]. Available: http://eric.indiana.edu/www/dighub/digprint.cgi?filename=d153.txt

Surprenant, S. J. (2001). Using technology to enhance reading instruction. Unpublished report, University of Northern Iowa, Cedar Falls, IA.

Thornburg, D.D. (1998). Reading the future: Here's what's on hand for technology and education. Electronic School Online. [On-line]. Available: http://www.elctronic-school.com/

U.S. Department of Education. (2000). The power of the internet for learning. [On-line]. Available: http://www.webcommission.org/

U.S. Department of Education. (2002). Reading first initiative. [On-line]. Available: http://www.ed.gov/offices/OESE/readingfirst/

Wepner, S. B., Valmont, W. J., & Thurlow, R. (Eds.). (2000). Linking literacy and technology: A guide for K-8 Classrooms. Newark, DE: International Reading Association.

Wheaton, C. & Kay, S. (1999, October). Every child will read-we guarantee it. Educational Leadership, 52-55.

Williams, K. (2001). Building knowledge: One teacher's experience combining technology and constructivism. Electronic School Online. [On-line]. Available: http://www.elctronic-school.com/