

Technology and Literacy Education in the Next Century: Exploring the Connection Between Work and Schooling

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For over 10 generations in America, a traditional concept of literacy as the ability to read and write print on a page has dominated schooling and adequately served the literacy demands of the society and of the workplace (Venezky, Wagner, & Ciliberti, 1991). In this not-so-distant past, during industrial and print-based economic eras, students learned functional uses of literacy and a body of knowledge that directly applied to workplace positions and stable workplace affiliations that they were likely to experience throughout their lives (Papert, 1993). However, in the emerging digital economic era, spurred by the recent proliferation of

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technology tools and resources in the form of affordable desktop computers, an accessible Internet, and user-friendly multitask and multimedia software (Gilster, 1997; Tapscott, 1998), traditional concepts of what it means to be and to become literate are being challenged.

Mikulecky and Kirkley (1998) noted that changing marketplace literacy requirements create new demands for communicating, gathering information, solving daily work-related problems, participating in a global economy, and monitoring performance. For example, they noted that there is a trend for more employee involvement in job-related decision making that requires abilities to gather and analyze digital information to set goals, supervise development, make adjustments, and set policies. In this new knowledge-based digital economy, the workplace requires an enhancement of old skills, development of new skills, and understanding of new digital forms of literacy.

Many university students' basic literacy experiences are also being transformed by the availability of computers. Students at Massachusetts Institute of Technology and University of California, Los Angeles live in dorms that are equipped with Internet connections and may use computers by their bedsides to register for coursework, write electronic notes to peers, access references from an online library, seek out sources for term papers, or turn in class assignments (Reinking, Labbo, & McKenna, 1997). It is expected that students who enter into such computer-enriched environments are digitally fluent, possess the ability to quickly acquire digital literacy, or will avail themselves of resources provided by universities (e.g., computer labs, coursework, workshops, computer mentors) that will support their digital fluency.

Because computers in homes now equip families to arrange for digital shopping, travel services, studying, mail services, chatting, spiritual counseling, banking, paying of taxes, and, perhaps in the not-too-distant future, digital voting, notions of functional personal literacy are also changing (Reinking, 1994). The following two examples related to travel and broadcasting exemplify these trends. By the close of 1998, it is predicted that 75 million adults will use the Internet to research travel destinations and arrange bookings (Bly, 1997). In addition, one of the unique features of digital life at home or at work is the ability to personalize and instantly receive tailored information on demand (Negroponte, 1995). This might ultimately result in the demise of prime-time media broadcasts or academic conferences as consumers demand to access the information, whether it is a sporting event, a news event, a teaching demonstration, or a scholarly speech, whenever they wish to see it. Even though this capability is available via the use of video recorders, the crucial differences will lie in a person's ability to avoid programming a VCR

to capture a televised broadcast; to have access to forms of data that are not currently archived; and to easily request multiple data sources including all or portions of a broadcast, supplementary commentaries, statistical information, and a variety of other data sources connected to their interests. Just as print on the page is being transformed to electronic or digital data on a screen, traditional notions of personal literacy and workplace applications of literacy are also being transformed.

As digital literacy continues to take root and flourish in workplaces, in universities, and in homes, it is imperative that it also take root and flourish in primary and intermediate grade classrooms. We believe that this is not an unrealistic expectation in light of the fact that over the last 10 years computers have become more pervasive in elementary and kindergarten classrooms (Becker, 1991; Market Data Retrieval, 1987). Current statistics indicate that 90% of K-6 teachers use computers with students and that 52% have at least two computers in their rooms; however, reports as to how time on the computer is used weekly indicate that 2.9 hr are devoted to educational games and 3.4 hr are devoted to drill-and-practice software (Carey & Worthington, 1997). These statistics indicate that even though computers are present in classrooms, they are not currently transforming educational practice or traditional notions of literacy.

To provide a medical analogy, this situation seems to parallel a doctor who performs delicate eye surgery with a scalpel and uses an expensive laser instrument, one with the capacity to transform the surgical process, merely to cut bandages. In other words, because practitioners continue to approach their work in traditional ways that reflect their training, they tend to use new tools in old ways. Nevertheless, we maintain that computer-based activities will become critical components of classroom learning cultures, that teachers who have the necessary equipment and support will embrace transformed educational practice, and that traditional notions of reading and writing will inevitably expand to include electronic or digital literacy. Indeed, teachers originated, designed, and carried out many of the technological innovations we share in this article.

During the ensuing decades, the importance of aligning digital literacy instruction in the classroom with its eventual applications in the larger society will become ever more imperative. Educators must be aware of key concepts reflecting developing trends and practical applications for this to occur. Our purpose in this article is threefold. First, we provide a brief discussion of the unique features of digital text. Second, we identify key concepts about digital literacy as those concepts relate to technological trends in the workplace. Third, we describe a select set of innovative instructional uses of technology that have the potential to transform digital literacy education.

Unique Features of Digital Text

The term *digital* refers to electronic representations of alphabetic and graphic information using binary code. This coding enables computers to transmit and transform text and pictures quickly and fluidly, presenting individuals with situations for which there is little precedent. In this section, we draw from Reinking's (1994) work in briefly describing the following distinctions of the structure and symbolic elements of digitized text and the interaction between reader and digitized text.

The Structure and Symbolic Elements of Digitized Text

One of the most promising and unique features of some electronic texts relates to the format of hypertext and multimedia programs. Hypertext—electronic documents structured as nonsequential or nonlinear clusters of information—includes a set of electronic tools for flexible navigation through a database connected by a semantic network (Bolter, 1991). Readers of hypertext must learn how to construct meaning as they use the various tools of hypertext to read or compose. Multimedia programs creatively integrate various symbolic forms of digital data such as text, images, icons, video clips, sound, music, and animation.

The Interaction Between Reader and Digitized Text

Printed texts, in the form of classroom reading materials, are static and unmalleable once they are printed. Many students and educators view the act of reading traditional text as one of understanding and reconstructing meaning from the print in a linear fashion. Although some reading theories account for active reader involvement in applying prior knowledge to comprehending printed passages, Reinking (1994) pointed out that readers cannot literally converse with the text. On the other hand, electronic texts can be programmed to take on attributes of a dialogue and result in a literal text–reader interaction (Daniel & Reinking, 1987; Duchastel, 1988; Reinking, 1987). Thus, the text as it appears on the screen can be altered in direct response to input or manipulation of data sources by the reader.

Key Concepts of Digital Literacy

Based broadly on the body of research and opinion presently available concerning the impact of technology on literacy, we identify five key concepts about digital literacy as those concepts relate to technological trends in the workplace. In sharing each of the following five concepts, we also

provide statements about the responsibility of educators to provide occasions for students to develop associated thinking processes, insights, and skills. We acknowledge that in many instances the concepts we note have their roots in traditional notions of literacy; however, we contend that unique features of the digital domain require an elaboration of basic concepts. We believe that digital literacy (a) requires the ability to be a lifelong learner, (b) often occurs in the pursuit of other goals, (c) occurs in social contexts, (d) requires strategic competencies, and (e) requires critical knowledge assembly and production.

Key Concept 1: Digital Literacy Requires the Ability to Be a Lifelong Learner

There can be little doubt that educators at the turn of the 21st century will continue to view their primary purposes as preparing students to be successful in their chosen careers, to participate in a literate culture, and to be personally empowered. Although these ideals have long been recognized by educators, they will become imperative objectives in the classrooms of tomorrow. This will be a daunting task in an information era that is already characterized by innovation—an era in which the tools of technology are reinvented to such an extent that many become obsolete in less than a decade, or even in some instances in less than a year.

Papert (1993) reminded us that in many cases people in the workplace of today are doing jobs that were not in existence when they were born. In addition, many people in the workplaces of today and tomorrow will enter into six or more career paths. Thus, an affiliation with one particular company or with expertise in one particular set of digital literacy tools will not be sufficient. Although there are many implications that might be drawn from these notions, we highlight the belief that as educators we must realize that children's skills with using a computer must not be limited to their ease with using a particular program, but rather their ability to learn how to use any program they encounter. We believe that in an age of technological innovation, reinvention, and obsolescence, this is a crucial ability that we must learn to foster in classrooms.

Key Concept 2: Digital Literacy Acquisition and Development Often Occur in the Pursuit of Other Goals

Digital literates in the workplace seldom study computer programming or devote themselves to studying the use of technology applications as an end unto itself. On the contrary, people who are digitally literate and fluent (Papert, 1996) learn about technological applications as they encounter

and solve problems related to their communicative goals. In other words, people who are digitally literate do not necessarily set out to become experts in particular software programs, but they often become experts as they use the programs. This notion is similar to on-the-job training that involves learning job-related skills in the context of using those skills to accomplish work-related tasks. New computer performance systems consisting of word processors, e-mail, databases, networked connections, and spreadsheet applications enable employees not only to perform tasks but to learn new processes and new information while they are working (Hudzina, Rowley, & Wagner, 1996).

When educators come to view the computer as a tool that can augment thought, students may be provided with increasing opportunities to engage in processes of digital composing and reading that will allow them to discover their ideas, to realize communicative goals, and to develop digital fluency. Indeed, Heim (1993), who raised many cautions about the possible negative impact of technology on thinking processes, acknowledged that computers should be viewed as thought processors because digital writing with a word-processing program allows authors to see their thoughts formulated on a malleable screen. Manipulable tools that permit fingertip recursive revising and editing promote a fluid movement among ideas, enabling authors to take new perspectives and have unique encounters with their own thoughts (Labbo, 1996). In some classrooms, use of a computer word-processing program is limited to the production of a final draft, in which previous drafts have occurred in a linear, paper-and-pencil progression (Dickinson, 1986; Miller & Olson, 1994). We believe that educators need to create opportunities for students to digitally encounter, discover, and articulate their thoughts through digital composing and problem solving.

Key Concept 3: Digital Literacy Occurs in Social Contexts

Stereotypical images of a scientist working alone, hunched in front of a flashing green computer screen in an isolated lab; of a lonely adult sitting alone in a bedroom surfing the Internet all night; or of a child who is alone in the family room staring mesmerized at intriguing computer game graphics have resulted in a perception that digital skills and literacies typically occur in isolation and result in the isolation of individuals. Although we do not mean to deny the existence, or even the utility, of solitary computer use, we argue that workplace digital literacy necessitates various kinds of social interaction.

In his book *Growing Up Digital: The Rise of the Net Generation*, Tapscott (1998) suggested that digital work-related communication occurs ideally in a collaborative and flexible environment in which participants are viewed as molecular components that can be combined in countless ways to execute projects. In this ideal social context, a person with particular digital literacy skills might be assigned to one team for the duration of a project and then be assigned to an entirely different project team made up of 1 or 12 new colleagues. The assumption is that flexible and collaborative social grouping taps the finest contributions of individuals as they work in a dynamic culture that is goal oriented, synergistic, and mutually supportive. In addition, virtual or online social interactions occur through a variety of symbol systems when people interact in chat rooms or through e-mail exchanges. In these instances, digital literates know how to initiate communication, represent their point of view, participate in an exchange of information by providing relevant contextual details (Garner & Gillingham, 1998), and pose questions that are understood across geographic or economic distances. We believe that schooling for digital literacy must provide consistent opportunities for similar flexible, collaborative, and digital social interactions.

Key Concept 4: Digital Literacy Requires Strategic Competencies

Digital literates possess metacognitive and strategic competencies that reflect an understanding of the underlying assumptions of technology use related to accessing and managing digital information in multiple symbolic formats. Gilster (1997) indicated that digital literacy involves proficiency in the use and understanding of multiple forms of information organized in nonlinear ways and displayed in various formats on a computer. For example, when using hypertextual forms of literacy, students who are digitally literate understand that reading is not a linear event, and teachers understand that students will take idiosyncratic paths through materials that will doubtless result in unique constructions of meaning. A sense of community and a shared knowledge base may be built through mutual explorations of paths taken and discussions of how knowledge was constructed by individuals within the group.

We believe that students must develop strategies that will enable them to make sense of hypertextually formatted information in ways that meet their specific purposes. Students must learn how to strategically search for and select information embedded within networked hypermedia modules. Students must also be strategic in expressing their ideas through hypertextual products and the links among data that they create.

Key Concept 5: Digital Literacy Requires Critical Knowledge Assembly and Production

The Internet, possibly the ultimate hypertext and hypermedia network, requires the ability to be a critical consumer and producer of various forms of information. Leu and Leu (1997) noted that the Internet provides a digital forum for sending e-mail, acquiring information, communicating with others who share mutual interests, acquiring new software, conducting video conferences, or publishing web pages. Digital literates who encounter an appealing or entertaining website are able to discriminate between the presentation and design of the site and the quality of the content and links contained on that site.

Knowlton (1997) reported a recent trend in the poor quality of research papers written by university students who base much of their research on information they have quickly and superficially accessed from the Internet. These students have basic search-and-find skills, but they have not learned to question the reliability or integrity of the information they can so easily access. In addition, they may not know how to access more valuable and reliable sites because many of the pages they encounter are not routinely updated or the students may not question the lack of specific types of links to other information.

Digital literates understand that the hypertextual links provided on a website may be intended to guide or even manipulate readers (Gilster, 1997) and may skillfully obscure such a hidden agenda. Critical readers have the ability to draw on relevant background knowledge to determine the type of content links they should expect to encounter. If those links are not present, the digital literate should question the intent of the site designer. This is an especially crucial skill in the Internet environment of unedited materials, vanity press websites, persuasive advertising, and propaganda. In an age of search engines and search agents—digital programs or entities that may be customized to ferret out specific categories of data—students must learn how to accomplish their goals by strategically crafting their searches and analyzing the collective results of those searches. More important, they should be prepared to continue to search for relevant information until they can establish patterns, identify reliable sources, and organize their research reports in thoughtful ways.

We believe that as either synthesizers or producers of multimedia information, students must learn how to make meaning of and with a variety of symbol systems. Students must learn to integrate multiple digital tasks for specific communicative purposes. They must learn to ask themselves questions such as, What symbol system or combination of symbol systems will best convey my message?

To briefly recap, digital workplace literacies in the 21st century will include understanding the forms and functions of digital literacy, participating in a dynamic social environment to collaborate on flexible teams to accomplish communicative goals, critically assembling and analyzing information, strategically navigating through data sources, utilizing supportive features of software to foster lifelong learning, understanding the thought processes related to digital communication, composing, accessing information, and participating effectively in a global community.

Innovative Instructional Uses of Technology That Align With Workplace Digital Literacy

In this section we highlight a few innovative instructional uses of technology that have an alignment with the key concepts of workplace digital literacy outlined previously. Due to space limitations, we are unable to present examples of every effective technological classroom innovation of which we are aware, and so we encourage readers to continue to identify additional exemplary classroom innovations. With these constraints in mind, we have also chosen not to include some uses of technology in current educational settings. For example, we do not try to forge a link between skill-and-drill software that requires a student to simply answer literal-level questions posed by a computer. In so doing, we are not implying that such programs are void of any educational value; however, we do recognize that the relation of this type of electronic worksheet to demands of the 21st century workplace is comparable to the relation between skill-and-drill paper-and-pencil worksheets and the literacy demands of the current workplace.

The classroom-based ideas we share in this article are the outgrowth of our various scholarly endeavors including individually conducted research, action research conducted by classroom teachers with whom we have worked, relevant studies conducted by our colleagues in the field, and a project of the National Reading Research Center that resulted in the publication of a co-edited book called the *Handbook of Literacy and Technology: Transformations in a Post-Typographic World* (Reinking, Labbo, McKenna, & Kieffer, 1998). This collection of chapters, written by leading scholars in the field of literacy and technology, delves into a variety of issues related to how digital forms of text are revolutionizing how literate acts occur within society, the workplace, and the schools.

We assume that a primary goal of educational uses of technology is to foster the habits of mind, the skills, and the conceptual insights required for participation in the digital workplace of the 21st century. We also as-

sume that students' opportunities to develop digital literacy are dependent on the teacher's goals and instructional philosophies, as well as particular characteristics of software (Reinking et al., 1997). In other words, we recognize that the mere presence of technology in the classroom will not result in innovative classroom applications (Greenleaf, 1994; Weir, 1989). Therefore, as we describe the following instructional innovations, we note first the role of the teacher as a guide, facilitator, coach, coparticipant, unit planner, lesson writer, and evaluator. The innovations we feature include (a) instructional innovations in reading and composing with hypertext, (b) instructional innovations in accessing information on the Internet, (c) instructional innovations in computer-mediated communication, and (d) instructional innovations with sociodramatic play and CDs. Figure 1 illustrates the alignment we contend exists among grade levels, instructional innovations, and potential digital literacy concepts and skills related to workplace digital literacy.

Instructional Innovations in Reading and Composing With Hypertext

Teachers who understand the classroom potential of hypertext to foster collaborative interactions among students of diverse abilities are eager to include hypermedia and hypertext opportunities across a variety of content areas. Meyers, Hammet, and McKillop (1998) explored classroom computer innovations that foster students' collaborative abilities to access information, manage and manipulate data, strategically navigate through multimedia, and critically read and write digital texts. They recommend that teachers use hypermedia software, such as *StorySpace* (1994), that consists of electronic authoring tools allowing students to create linked paths through stacks or collections of data presented digitally as text, image, video, or sound in windows on a computer screen. Highlighted portions of the screen offer multiple links to other data displayed on other computer windows. Thus, an author can communicate a complex message by juxtapositioning multiple media sources within a window or across windows. Teachers who expect students to work in collaborative groups on hypermedia projects provide unique opportunities for students to gain critical digital literacy. Critical digital literacy is the ability to recognize, interpret, and evaluate underlying ideologies in various types of hypertextually linked information as it is presented in various data sources. A case in point is provided by a group of university undergraduates studied by Meyers and his colleagues. These students created a hypermedia project on "identity." By creating a quick-time movie of three images of Pocahontas (a Disney image, an early

Grade Levels	Instructional Experience	Concepts Related to Workplace Digital Literacy
PreK-K	Sociodramatic play	Functions of workplace digital literacy enriched with digital props
		Forms of workplace digital literacy
		Collaboration to accomplish communicative goals
K-5	CD books	Critical analysis of information
		Strategic navigation through multimedia
		Supportive features of some software
3-5	Hypertext	Strategic navigation through multimedia
		Information access, management, and manipulation
		Meaning-making takes various symbolic forms
		Symbol-making is a recursive process
		Procedures are learned as needed
		Symbol form is guided by communicative purpose
3-5	E-Mail	Multimedia composing augments thinking
		Global and/or cross-cultural perspectives
		Synchronous and asynchronous interactions

Figure 1. Alignment between school-based digital literacy and workplace digital literacy.

17-century portrait in an Elizabethan low-cut blue dress, and an authentic photograph of a Native American girl), they discovered underlying cultural assumptions about women, historic documents, and representations of historical figures as expressed in each image.

In a similar vein, Reinking and Watkins (1996) found that when teacher introduced and supported the use of HyperCard for creating multimedia book reviews, there were positive effects on students' social interaction, collaboration, and organization of information. In addition, lower ability students exhibited more leadership and confidence when working with

abler peers on computer-generated reviews of books. In these instances, the teachers used a template, or format, that the students could follow in their initial attempts at creating digital book reports. They also encouraged peer tutoring as digital experts emerged in the classroom. The classroom digital literacy skills acquired in these hypertextual platforms related to workplace digital literacies such as abilities to collaborate to access information, manage and manipulate data, strategically navigate through multimedia, and critically read and write digital texts.

Instructional Innovations in Accessing Information on the Internet

Effective use of the Internet in the classroom depends ultimately on how teachers structure and support students' learning experiences. Leu and Leu (1997) suggested the following considerations for teaching students to be strategic users of the Internet. First, teachers need to find out district policies related to appropriate Internet usage (e.g., appropriate and inappropriate sites, appropriate language use on the Internet, and policies regarding interactions with strangers on the Internet). Some districts require students and parents to sign statements of Internet policy agreements. Possible policy guidelines are noted on the Internet at <ftp://ftp.classroom.net/wentworth/Classroom-Connect/aup-faq.txt>.

Second, teachers should start early in the year to demonstrate, directly teach, or conduct Internet guided tours involving navigation strategies in the course of whole group digital experiences. Follow-up to these lessons might include teacher-designed small-group scavenger hunts so students can practice the strategies. These activities address the concern that if students are simply allowed to "surf" the Internet on every occasion they have to use the computer, they are likely to become sidetracked in superficial examinations of a series of widely unrelated topics and will not be likely to become strategic users of Internet data (Bikerts, 1995).

Leu and Leu (1997) suggested that it is also important for educators to become familiar with and target educational websites such as Dr. Seuss in Cyberspace (<http://www.randomhouse.com/site/seuss2/chatcat.cgi>), The Science Learning Network (<http://www.sin.org>), A Beginners Guide to the Internet (<http://www.cs.unc.edu/~bedi/report.html>), and Whales: A Thematic Web Unit (<http://curry.edschool.Virginia.EDU/go/Whales/>). After a whole group introduction, teacher-supported explorations, whole class workshops, and paired practice, teachers will need to design collaborative activities that enable students not only to access or download information,

but to organize, synthesize, and reflect on the content—digital skills required for work in the 21st-century workplace.

Instructional Innovations With Computer-Mediated Communication

Beach and Lundell (1998) posited that unique opportunities to develop digital literacy occur during computer-mediated communication (CMC). CMC may be set up in two ways: either as an exchange of written messages in a synchronous, real-time chat mode or as asynchronous exchanges that do not occur in real time, such as e-mail. In studies conducted with seventh-grade students, several discourse forms became apparent within the unique social context of synchronous exchanges—namely jokes, memos, notes, bulletins, books, or formal letters. They found that students constructed shared perspectives, understood the contexts and consequences of the text as it emerged on the screen, and reflected on their roles in the online discussions (e.g., being an anonymous participant, causing divergence from tasks, communicating with a diverse audience, creating social relationships, subverting or disrupting communication). Teachers who wish to arrange CMC environments in the near future will most likely use programs such as CommonSpace (Macintosh), Conference Writer (Macintosh), or Daedalus Integrated Writing Environment (DOS). Finally, they will create contexts for learning through participation, clarifying purposes for using CMC exchanges, organizing chat groups, acting as a correspondent to messages, analyzing transcripts of exchanges, and evaluating the effectiveness of CMC exchanges.

Researchers interested in the potential of e-mail to provide unique learning experiences in elementary classrooms offer the following observations about the digital literacy insights that children gain through international, cross-country, and school district keypal experiences in which individual children or groups of children share ideas with other children across time and space (Field, Labbo, & Lu, 1996; Garner & Gillingham, 1998; Labbo & Field, 1996). Young children in third grade are able to make their ideas clear to children who reside in other cultures, geographic regions, or countries. Students exchange a variety of digital data sources (e.g., video clips, photographs, descriptions, interviews, survey data) to compare cultural life styles and to share information. Students engage in various discourse forms related to informing, narrating, inquiring, arguing, persuading, and entertaining to make their ideas understandable and even memorable.

In most instances, e-mail exchanges afford opportunities for the teacher to take an advisory role and enact what Labbo and Field (1996) referred to as a "generative curriculum"—that is, a course of study in which the topics and resources for study are generated by the questions students raise, the ideas they share, and problems they encounter during cross-cultural e-mail exchanges. In this interactive environment, it is the students who select topics, make personal connections to content, and engage in authentic communication with an audience larger than the one they encounter in their classroom (Garner & Gillingham, 1998)—all skills that are related to digital literacy requirements of the workplace. Teachers who wish to arrange for digital keypals may find information on the Internet at E-mail Classroom Exchange (<http://www.iglou.com/xchange/ece/ecesarch.cgi>), the Intercultural E-mail Classroom Connections (<http://www.stolaf.edu/network/iecc>), and other sites.

Instructional Innovations With Sociodramatic Play and CDs

The two instructional innovations described in this section both relate to fostering playful learning interactions with the computer that foster children's digitally related conceptual development, collaboration, flexibility of thought, and insight into the supportive characteristics of software. Labbo (in press) found that when young children are given opportunities to design and play in sociodramatic play centers that have been enriched with computer props, they have opportunities to learn basic concepts related to digital literacy and to workplace roles of computers. In prekindergarten and kindergarten classrooms, the children studied went on fact-finding field trips to a local business to discover how computers were used in either a florist shop, a fast-food restaurant, a hospital, a travel agency, or a bookstore. With the guidance of their teachers, the children collaborated to set up and role play job-related work in their sociodramatic play centers. Some teachers placed a computer in the sociodramatic play centers; others obtained cardboard models of computers previously used as displays in local office supply stores. Children enriched their concepts about digital literacy by learning that computers are used to access information, store and retrieve data, keep track of inventory, order supplies, maintain correspondence, and achieve other communicative goals.

Young children or struggling readers who encounter interactive CDs in the form of computerized talking books and informational texts also have occasions to playfully interact with digital resources (Anderson-Inman & Horney, 1998; McKenna, Reinking, Labbo, & Keiffer, in press). Such digitized texts support readers by providing pronunciations of words; listening versions; engaging animation; video clips; vocabulary definitions; sound ef-

fects; and, in some cases, story extension activities. In these instances, children gain crucial insights into the supportive features of software, their ability to learn from software, and their ability to successfully select and navigate through a variety of supportive features and types of digital data.

Conclusions

In closing, we believe that teachers often feel fortunate when they find themselves presented with classroom computers; however, many feel less fortunate when they soon discover that they are not offered much training; much onsite support; or a cultural context that embraces the use of technology for educational, professional, and personal communicative purposes. In these instances, it is little wonder that available technology ends up being relegated to a corner, or exists as a machine for skill-and-drill practice, or even remains turned off for most of the day. We believe that when computer placement is accompanied by responsive onsite support, technology will transform the professional lives of teachers and even help to dispel the sense of isolation experienced by many educators who spend the majority of their professional lives behind closed classroom doors. We believe that the same habits of mind and attitudes toward technology that will prove to be effective in the marketplace and home of the 21st century will also pertain to the school workplace settings.

In technologically transformed schools, teachers will appreciate the distinctive forms and functions of digital literacy. They will participate in a dynamic social environment as they collaborate on flexible teams to accomplish communicative and professional goals. They will critically assemble, analyze, and synthesize digital information by strategically navigating through data sources and utilizing supportive features of software to foster their own lifelong learning and their educational objectives in the classroom. There can be little doubt that innovative instructional uses of technology in literacy classrooms that reflect an alignment with workplace digital literacy will occur when teachers receive the support and equipment necessary to become digitally literate. When this occurs, a concurrent transformation will take place between the teachers' own realm of work and the opportunities for digital literacy development they create for their students.

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