



Reading, the Digital Classroom, and LEAD21

Program Research Base



Wright Group

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Executive Summary

There is little doubt that the Internet is rapidly changing the way we think about literacy and learning in today's classrooms. A quick glance through recent publications in *Time Magazine* (Wallis 2006), the *New York Times* (Rich 2008), and PBS's *Frontline* (*Frontline* 2008), in addition to emerging collections of theory and research related to digital literacies (Coiro, Knobel, Lankshear, and Leu 2008; McKenna, Reinking, Labbo and Keiffer 2006) provides a myriad of evidence that emerging Internet technologies are not only transforming learning and teaching, they are also changing the very nature of childhood, school, and work experiences for today's learners.

In fact, the definition of literacy itself has "expanded from traditional notions of reading and writing to include the ability to learn, comprehend, and interact with technology in a meaningful way" (Selfe, cited in Pianfetti 2001). Digital texts (particularly those on the Internet) present students and teachers with new opportunities and new challenges—some that provide motivating ways to practice traditional reading skills; others that ask readers to extend their use of traditional comprehension skills to new contexts for learning; and still others that demand fundamentally different sets of literacy skills and strategies not currently covered in most reading and language arts curriculums (Coiro 2003). Given the rapidly changing nature of texts, reading and learning tasks, it is not surprising that these changes have important implications for understanding effective literacy instruction, assessment, and professional development.

Wright Group **LEAD21** is committed to helping classroom teachers and curriculum designers respond to the broadening view of reading comprehension in the context of a digital age. **LEAD21** integrates opportunities for teachers and students to engage in comprehension and response activities using tools that cut across five categories of information and communication technologies (ICT): (1) computer-assisted instruction; (2) open-ended tool applications; (3) digitally supported reading environments; (4) online information technologies; and (5) social networking and other Web 2.0 communication technologies.

Furthermore, **LEAD21** has aligned specific components of the reading and writing curriculum to emerging classroom instructional models to guide teachers in seamlessly incorporating information and communication technologies (ICT) into a wide range of electronic book activities: interactive white-board lessons, age-appropriate online inquiry projects, and opportunities for interactive web talk and response. These activities are designed to be available within a safe online interface to foster the literacy development of elementary-aged students, at school and at home with their families. Supporting students' and teachers' understanding of key literacy concepts and their relationship to emerging technologies is a centrally important piece of the rapidly changing puzzle known as effective literacy instruction for 21st century learners.

Understanding Reading Comprehension in the 21st Century

A complete picture of reading comprehension in the 21st century incorporates the

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skills, strategies, dispositions, and practices required to comprehend and use a wide range of print, non-print, and digital texts for multiple purposes and with multiple audiences. Effective literacy instruction in a digital age considers how best to integrate instructional practices that develop students' offline reading comprehension ability and online reading comprehension ability.

What is offline reading

comprehension?

A balanced and comprehensive literacy curriculum provides an evidence-based framework for integrating the essential components of offline literacy instruction in ways that help learners actively construct meaning through reading, writing, viewing, listening, speaking, and representing (Pearson and Raphael 1999; Pearson, Raphael, Benson, and Madda 2007). Comprehension is, in many respects, the central component of a literacy curriculum: it is the reason why we read. Offline reading comprehension can be defined as the skills, strategies, dispositions, and practices required to actively decode and construct meaning from the many text forms found offline, or not in electronic, networked environments. The RAND Reading Study Group (RRSG 2002) defined reading comprehension, as “the process of simultaneously extracting and constructing meaning through interaction and involvement with written language.” According to the RAND group, reader characteristics include “all the capacities, abilities, knowledge, and experiences that a person brings to the act of reading.” As described in **LEAD21**'s white paper Reading Comprehension: Program Research Base, offline reading comprehension involves reading strategies such as predicting, determining important information, summarizing, inferencing, visualizing, asking and answering questions, monitoring, and making connections (Raphael 2009). Other key components of offline reading comprehension ability include oral and written language (Roth, Speech, and Cooper 2002; Snow, Burns, and Griffin 1998; Tierney and Pearson 1983) and affective variables such as engagement, attitudes, motivations, and beliefs about reading books and other offline/printed materials (Guthrie, Wigfield, and Perencevich 2004; Malloy and Gambrell 2008).

How have new technologies shaped reading comprehension?

In its 2009 literacy and technology position statement, the International Reading Association (IRA) suggested that “traditional definitions of reading, writing, and viewing, and traditional definitions of best-practice instruction—derived from a long tradition of book and other print media—will be insufficient.” The Rand Reading Study Group (2002) reported, “we live in a society that is experiencing an explosion of alternative texts” and that “electronic texts that incorporate hyperlinks and hypermedia introduce some complications in defining comprehension because they require skills and abilities beyond those required for the comprehension of conventional, linear print.” More recently, the National Council of Teachers of English (NCTE 2008) recognized in their 21st century literacies policy brief that, “global economies, new technologies, and exponential growth in information are transforming our society” in ways that prompt “new literacies that are central to individual and community success.” Clearly, reading and language arts communities recognize that texts and literacies have continued, and will continue to rapidly change as new technologies emerge. Consequently, to prepare our students for success in school and society, we must expand the traditional understanding of reading comprehension to encompass the new literacies that emerge.

While there are many perspectives associated with the terms “digital literacies” or “new literacies,” the most recent review of this work concludes that all share a set of common assumptions: (a) new skills, strategies, dispositions, and social practices are required of readers and writers by new technologies for information and communication; (b) these new literacies are central to full participation in a global community; (c) new literacies regularly change as their defining technologies change; and (d) new literacies are multifaceted and benefit from analysis from multiple points of view (Lankshear and Knobel 2003; Gee 2003; Street 1999; Coiro, Knobel, Lankshear, and Leu 2008).

What is online reading comprehension?

Within the broader context of new literacies theory, online reading comprehension can be generally defined as the skills, strategies, dispositions, and practices required to actively decode and

construct meaning from the many text forms found online (on the Internet).

This perspective means that we should think of online reading comprehension as a problem-based inquiry process involving additional skills, strategies, and dispositions in order to ask important questions and

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then locate, critically evaluate, synthesize, and communicate answers to those questions with *online* information and communication technologies (Leu, Kinzer, Coiro, and Cammack 2004).

Recent work in this area indicates that traditional, offline reading comprehension skills are necessary, but not sufficient, to read and learn from information on the Internet (Coiro 2007). For example, in addition to knowledge of vocabulary and informational text structures—which are part of offline comprehension—skilled online readers must efficiently use search engines, navigate multilayered website structures, and monitor their relative location in an unbound, three-dimensional online space (Coiro and Dobler 2007). Moreover, for some tasks, online reading performance is not at all correlated with performance on a standardized test of offline reading comprehension (Leu, Castek, Hartman, Coiro, Henry, Kulikowich, and Lyver 2005; Leu, Zawilinski, Castek, Banerjee, Housand, et al. 2008). In fact, there are instances of *high* achieving offline readers who are *low* achieving online readers, and likewise, *low* achieving offline readers who read with *high* comprehension when reading online. In other words, a student’s offline reading comprehension may, but does not necessarily, predict how well he or she will read and comprehend information encountered on the Internet.

Using Information and Communication Technologies (ICT) to Support Literacy Instruction in LEAD21

Information and communication technologies (ICT) is an umbrella term encompassing all technologies for viewing, manipulating, and communicating information. As we explore how best to prepare strong readers for the 21st century, classroom teachers, curriculum designers, school administrators, and policy makers must begin now to consider the roles of ICT in instruction for offline and online reading.

LEAD21 includes opportunities for teachers and students to use digital tools associated with five categories of technologies that have especially rich potential for enhancing classroom literacy instruction: (1) computer-assisted instruction; (2) open-ended tool applications; (3) digitally supported reading environments; (4) online information technologies; and (5) social networking and communication technologies. Each type of technology is used to address a particular set of literacy objectives.

- **Computer-assisted instruction** uses a computer to assist in the instructional process. It is typically provided in an electronic interface (CD-ROM or computer-based instructional game) and offers practice and reinforcement activities for skills previously introduced by the teacher. In the literacy curriculum, computer-assisted instruction might be used to practice letter identification, apply early phonics and decoding skills, sort vocabulary words to meet different criteria, or select appropriate answers to comprehension questions (Barker and Torgeson 1995; deJong and Bus 2002; Labbo and Reinking 1999; McKenna 1998). Often, computer-assisted skills practice is delivered within a series of interactive games

and activities. Typically, skills in these environments are taught sequentially, and often, the computer electronically tracks student accuracy and provides teachers with summary reports of correct and incorrect responses.

In **LEAD21**, a series of **ePractice Games and Activities** at each grade level guides teachers in integrating computer-assisted instruction for phonics, vocabulary, and word study into digital lessons that change weekly to align with each themed unit. Computer-assisted vocabulary activities for students in grades K–5 incorporate both theme and differentiated vocabulary to encourage students to revisit **LEAD21** vocabulary skills and strategies introduced each week. These activities give students additional opportunities to interact with vocabulary words in a variety of engaging environments and contexts. Students receive both positive and corrective feedback and are required to achieve a prescribed level of mastery before moving to subsequent activities. In addition, engaging computer games model contemporary online game play by incorporating motivating elements such as scoring, reward animations, and levels that progressively increase in complexity. These games encompass phonics concepts at the K–2 level and word study concepts for students in Grades 3–5.

- **Open-ended tool applications** help students and teachers process, manipulate, organize, and communicate information they encounter at school and at home. These applications include word processors, newsletter programs, spreadsheets, databases, electronic graphic organizers, audio/video editors, and presentation programs. In an elementary school literacy classroom, open-ended tools provide opportunities for students to use computers for drawing, stamping, organizing data, recording, adding images, making slide shows, and revising their work before, during, and after reading experiences (Labbo, Love, Prior, Hubbard, and Ryan 2006; Zucker and Invernizzi 2008). Often, younger students are encouraged to work with a partner or small group while using these open-ended computer tools in order to encourage conversation, creativity, and collaboration. One example of a free, online, open-ended tool that may enrich reading instruction is Create a Graph at <http://nces.ed.gov/nceskids/createagraph/>, which enables students and teachers to work together to generate visual representations of information they have read.

LEAD21 makes use of three open-ended tool applications as part of the digital literacy experience. The eTools 21 application features two components in this category. **The Writing Tool**, designed for students in grades K–5, offers opportunities to practice the writing process in an online format. Simple text entry and posting options reflect the tool’s ease of use and make it possible for the entire class to view each other’s writing. **Story Starter** provides an interactive writing space where teachers use program-provided story starters—or they create their own—and then invite students to post threads to the starter as well as to each

others' threads. This is similar to the "choose your own adventure" style stories. This format of online discussion introduces elementary students to the practice of participating in online discussion board from within a safe, networked **LEAD21** environment. With both the Writing Tool and Story Starter, teachers have the ability to edit or delete students' postings.

A third open-ended tool application in the **LEAD21** curriculum is built into the **Teachers' eBook Whiteboard**. It consists of a set of **electronic resource masters** in a database that enables teachers to access a series of graphic organizer templates in PDF format that can be displayed and used on a whiteboard. Also, included in the program is a Text Tool which is a point-of-use, or "teachable moment" tool. Teachers can use the Text Tool to grab any text from the page and manipulate the text for any purpose. For example, to tie-in to another current subject's theme, to tie-in to a language arts concept they're covering or covered in the past, and so on.

- **Digitally supported reading environments** are electronic texts that have been intelligently transformed to increase access, support comprehension, and extend meaningful content-area learning. Well-designed digitally supported reading environments scaffold students' literacy learning with multiple means of representation, multiple means of expression, and multiple means of engaging with text (Meyer and Rose 1998). Digitally supportive texts for elementary school students might include any or all of the following:

- *Explanatory supports*: A student can click on a word or phrase in the text and the computer pops up a definition or example that helps clarify its meaning.
- *Presentational supports*: A student can customize the look or feel of the text by easily changing its color, font, style, or layout.
- *Illustrative supports*: A student can supplement words in a text by selecting from a series of pictures or a movie to explain concepts in science like photosynthesis or events in social studies like colonial times in America.
- *Translational supports*: A click can adjust the readability level of the text, or change the text from one language to another.

Such digital supports help to meet each reader's individual needs (Anderson-Inman and Horney 2007). Other digital supports might offer additional online resources the reader could consult to extend understanding; instructional prompts such as suggestions for how to think about particular points or connections between text ideas and other ideas; notational tools for marking key ideas or taking notes directly in the text; or collaborative electronic features for working together or sharing ideas with other students or adults.

LEAD21 uses a wide range of digital reading supports to scaffold and enrich the literacy experience. First, each of the eight units at each grade level features one **Electronic Theme Reader** and four **Differentiated eBooks**. Electronic Theme Readers are used initially for whole-class instruction and are digital versions of the content and literature selections in the Big Books (Grades K–2) or in the students’ anthologies (Grades 3–5). The four Differentiated eBooks are electronic versions of the four print Differentiated Readers for each themed unit. Both the Electronic Theme Readers and Differentiated eBooks include a range of digital reading supports: (a) full-text audio; (b) a pop-up Glossary; (c) Preview view; (d) Online Coach view; and (e) Virtual Field Trip.

Another set of digital support tools can be found in the **LEAD21 Teacher’s eBook Whiteboard**. The electronic whiteboard features pop-up text tools and a set of graphic organizer resources that are launchable from all eBooks. Teachers can select the text tool option in the eBook interface to highlight certain text, use a pen tool to elaborate on the text, record ideas about the text using a digital notepad, or work with students to generate new ideas in a graphic organizer to facilitate comprehension of the text.

Additional digital-reading supports are integrated into the **eTools21 Interactive Glossary**. The glossary contains all of the vocabulary words and definitions for each grade-level unit.

- **Online information technologies** constitute a rapidly growing collection of informational websites and resources available on the Internet for both children and adults. Online information technologies include search engines, informational websites, online databases, interactive simulations, geographic visualizations (Google Earth or Google Sky) and the like. On the one hand, online information technologies offer students opportunities to choose their own texts or explore information in a range of nonlinear, interactive, multi-modal formats (see, for example, NASA Kids’ Club at <http://www.nasa.gov/audience/forkids/kidsclub/flash/index.html> or America’s Story from the Library of Congress <http://www.americaslibrary.gov/>). These online texts (and the technologies that host them) can be used as part of the literacy curriculum to build background knowledge and content-area learning while also encouraging inquiry, problem solving, writing, and critical reading (Castek and Bevans 2006; Coiro 2003; Kara-Soteriou, Zawilinski, and Henry 2007).

However, online information technologies also present a series of challenges that require new approaches to reading comprehension as part of students’ inquiry process (Coiro 2005). As mentioned earlier, traditional, offline reading comprehension skills are necessary to understand these sites and resources, but they are not sufficient for the comprehension necessary to locate the most useful and reliable information on such sites (Coiro 2007; Coiro and Dobler 2007;

Leu et al. 2005). To be able to read these 21st century resources adequately, students need explicit and age-appropriate instruction in how to use the Internet to effectively question, locate, critically evaluate, and synthesize disparate sources of information hosted by online information technologies.

LEAD21 integrates explicit instruction and age-appropriate opportunities to practice online reading and inquiry skills into a key component of the program called **Inquiry Projects**. Inquiry Projects feature web-based inquiry guides that accompany each unit for students in Grades 1–5. This Inquiry online presents a webquest style Internet walk-through that displays inquiry content in an easy-to-use click-through format and scaffolds learners with explicit and age-appropriate support. Links to appropriate outside websites are provided for further research, while teachers are given the option of turning off these links if desired. Each unit’s Inquiry project also provides brief tutorials on one or more 21st century skills, such as evaluating online information sources and collaborating with classmates using document-sharing software.

- **Social networking and other Web 2.0 communication technologies** encompass ways to communicate, exchange, and collaboratively create information with others connected through online networks at a local, national, international, or even global level. Many Web 2.0 tools can be tagged as communication technologies. Email, instant messaging, blogs, podcasts, wikis, nings, videos, document sharing, and web video conferencing are all ways to communicate and exchange information with the Internet. Social networking sites like FaceBook, Flickr, Del.icio.us, and Ning serve as communication tools too, especially among teens who increasingly “embrace the conversational nature of interactive online media” (Lenhart and Madden 2007). Social networking on the Internet involves grouping individuals into online communities with others who share a common interest or seek a common goal. The 2008 Horizon Report (a research effort to identify emerging technologies likely to have a large impact on teaching, learning, and creative expression) indicates that video sharing and virtual collaboration webs continue to grow “at some of the most prodigious rates on the Internet” (New Media Consortium 2008). For many, the Internet has become the “third place” (the first and second places being home and work) where people connect with others, build a sense of community, and express themselves as a unique member of their community (The New Media Consortium 2007). It makes sense then, that elementary-aged students should have access to age-appropriate uses of social networking technologies and online experiences that scaffold participation in their school and home literacy communities.

To that end, **LEAD21** integrates several social networking technologies into its literacy program using the applications in **eTools21**. First, each student is assigned his or her own **Student Home Page**, which is a fun, engaging interface, set up

similarly to a social networking site. Students may choose their own avatar (digital image of themselves) from a predefined list if they wish. From the Home Page, students can link to all of **LEAD21**'s electronic materials for the current unit or across the year (including eBooks, games and activities, as well as program-related, collaborative applications such as the Writing Tool, Story Starter, and Interactive Glossary).

A second component of eTools 21 is the **Interactive Glossary**. In addition to offering digital scaffolds with which students can communicate their ideas in multiple representations (images, definitions, or interpretations), the Interactive Glossary provides a networked forum in which students are invited to make personal connections to key concepts in the curriculum and to publicly share them with classmates and teachers. **LEAD21** also uses a networked **Theme Wall** to post and exchange ideas about a unit's theme. Teachers can use the wall to pose questions on unit-specific themes, concepts, people, and places to which students can publicly respond with their own reflections and images to create a group library. Teachers have the ability to edit or delete comments as needed, and the theme wall is available to students at school, in the public library, or at home. As mentioned earlier, the eTools21 package also includes the **Story Starter** and **Writing Tool** features (described in the sections above) to round out students' online reading and response experiences. Together, these social networking and communication technologies support teachers in their efforts to harness the power of collective intelligence in ways that enrich learning and information exchange in the literacy classroom.

Models of Effective Literacy Instruction with ICT in LEAD21

Underlying practices for selecting new technologies for literacy learning

When selected carefully to fulfill logical, authentic, and significant educational goals, technologies for literacy and learning have considerable potential. It is not easy to articulate a flexible set of criteria that can serve to guide the selection and use of new information and communication technologies in the literacy curriculum; however, the starting point should always be the unique literacy learning needs and instructional goals for a particular group of students rather than the technology itself and its potential for education. A review of the research literature on this topic identified three promising practices for considering which technologies might be most useful for achieving particular learning goals (Coiro, Karchmer-Klein, and Walpole 2005).

First, the decision for using certain technologies as part of reading instruction should be grounded in authentic and purposeful literacy activities rather than by technology type or function. For instance, rather than identifying which technology function a certain resource addresses—skill reinforcement, simulation, blog, or interactive video—the selection of instructional supports should be guided by understanding

which technologies provide important practice with decoding, vocabulary, fluency, or comprehension skills and which promote activities more holistically related to real-world reading and writing experiences.

First, the decision for using certain technologies as part of reading instruction should be grounded in authentic and purposeful literacy activities rather than by technology type or function.

Second, personal dimensions of both students and teachers play an important role in deciding which technologies might be matched most suitably to the overall climate of the larger classroom community. A careful focus on a student's particular learning needs is

crucial for supporting literacy development with technology (Bader 2000). In addition, technology selection should consider the mode of instructional delivery (Hickey 1995); student reading level (Leu and Kinzer 2003); and the format of instruction and learning feedback (Bader 2000).

Third, particularly when selecting online information resources to use as part of literacy instruction, it is important to consider the impact of multi-modal and multicultural experiences that require a more global and critical stance. In elementary school, teachers should model for students a healthy dose of informed skepticism about printed *and* Internet texts, while helping students to understand who created the information, what their point of view might be, and for what type of audience the resource was designed (Coiro 2005; Lankshear and Snyder 2000).

Clearly, integrating new information and communication technologies into literacy instruction is a complex task, necessitating thoughtful, insightful, and knowledgeable teachers. **LEAD21** supports teachers in their efforts to select and use new and emerging technologies in ways that build on the underlying practices outlined above. It aligns technologies with appropriate types of literacy activities, matches tools to age-appropriate learning needs and individual learning styles, and integrates critical evaluation activities into Inquiry Project lessons.

Classroom models for using new technologies in LEAD21

Now that we have examined five categories of ICT use for supporting literacy and the principles underlying how those technologies are selected, let us examine three instructional models that are especially promising for helping teachers design engaging literacy lessons that employ **LEAD21** digital technologies to support and enrich learning for all students:

- 1. Electronic Book Activities:** These activities incorporate technologies outside of the Internet for pre-reading, guided reading, reading games, word sorts, graphic organizers, writing, and creative response.

2. Inquiry Projects: employs a highly scaffolded instructional framework that guides students through each step of online Inquiry with carefully designed prompts, annotated links to resources, a series of cooperative learning tasks, and opportunities to share their findings with others.

3. Web Talk and Response: themed discussions or creative response activities in which students collaboratively compose and critique each other's work using online communication technologies such as blogs, wikis, social networking sites, or podcasts.

1. Electronic Book Activities

An electronic book activity (Coiro 2003b) is designed to make use of the range of technologies *outside of the Internet* to provide opportunities for students to practice reading skills; apply their skills in new contexts; and/or respond to literature selections before, during, and after reading instruction. The literacy learning opportunities in electronic book activities are endless, but they all typically seek to foster aspects of offline reading comprehension (decoding skills, fluency, content vocabulary, comprehension of printed texts). The technologies used most often in an electronic book activity include computer-assisted instruction, open-ended tool applications, and digitally supported reading environments. Given the different levels and types of supports that may be provided with these technologies, electronic book activities are well suited to meet the needs, interests, and ability levels of each individual learner. To be most effective, computer activities are linked to children's books in meaningful ways that extend and enrich authentic reading and writing experiences (Labbo, Love, Prior, Hubbard, and Ryan 2006).

It is easiest to think of an electronic book activity as a type of classroom-center activity designed to focus on a specific literacy learning purpose. For example, electronic-book activities provide varied methods for presenting text (imagery, animation, digital speech, with or without music, variable text, background, and color) and varied options for expression (supports for spelling; opportunities to explore text and images by manipulating them; options to respond through text, recorded speech, images, or video). Most importantly, new ICTs offer options to easily tailor literacy-center activities to address an individual reader's needs, preferences, and skill levels by pairing adjustable challenges and supports with timely and appropriate feedback (Meyer and Rose 1998).

There are five research-based electronic book activities that can foster literacy as part of a learning center include: a) electronic pre-reading activities; b) electronic guided-reading activities; c) electronic reading games and practice activities; d) electronic word sorts and graphic organizers; and e) electronic writing and response activities.

a. Electronic pre-reading activities typically use images and video (or audio) to hook and actively engage students with important ideas introduced in a book. These visual texts are displayed on a computer and projected onto a large screen or electronic whiteboard to provide a large and common focus for students. Teachers engage students in discussion about the images to activate prior knowledge and establish a purpose for reading—without potential decoding difficulties standing in the way. Research suggests that pictorial introductions as a pre-reading activity can facilitate high-level inferences that help readers link disparate ideas found in the text. Anstey and Freebody (1987), for example, found that fifth graders favored pictures as a pre-reading activity, compared to groups of students asked to answer a set of comprehension questions, or to free-associate with the passage’s title, or to complete an unrelated control task. In addition, the students given pictorial introductions performed best among the four groups on a measure of comprehension. Sharing and discussing visual images prior to reading is effective among English language learners as well (Kennedy and Canny 2002).

To set up an electronic pre-reading activity, the teacher gathers several images (from the book that will be read or from other sources) and short video clips that might be useful for fostering initial conversation about a subject or setting. For example, images of jungle animals and a short video clip of life in the rainforest can prepare students for reading texts about rainforests, habitats, weather patterns, or endangered animals. Optimally, multiple images should be provided in an electronic slide show so students can navigate through the visual texts directly from the whiteboard.

Prior to reading, students share their connections with a certain image. Discussion also encourages students to predict various facets of book content or to make connections with their own experiences. Once the images have been introduced, key vocabulary words or concepts can be linked with them. For example, a teacher might insert a label or caption that is projected next to the image and read it aloud for students. This open-ended labeling activity can help support readers in their transition from viewing and discussion (pre-reading) to decoding and comprehension (during-reading).

b. Electronic guided-reading activities offer students opportunities to read electronic storybooks (also known as eBooks) with audio and interactive supports that guide them through their reading experience. Generally, these texts are closed interactive systems that are separate from activities involving web-based electronic texts. These texts might be housed on a CD-ROM or within a multimedia digital reading environment developed by educational publishers as one component of a reading series. Consequently, teachers do not need to be concerned about Internet safety issues or students navigating outside the system to get lost or otherwise distracted on the Internet.

Electronic storybooks provide an assortment of multi-sensory features such as audio support, animations, and video clips, which are not found in the traditional texts (Pearman 2008). These allow young students to follow along with synchronized highlighting as words, sentences, and/or entire passages are read aloud. Readers might also click on difficult words to get their pronunciation, definition, and/or a visual representation. This text-to-speech technology models appropriate fluency and reduces the decoding demands of many challenging texts, allowing students to focus their attention on meaning construction and response (Dalton and Strangeman 2006). Some eBook systems contain additional resources such as a searchable glossary, voice-recording tools, extended narrations, or tools that translate words into another language. Finally, some eBook systems provide embedded supports that target metacognitive reading strategies, vocabulary development, and written response (Proctor, Dalton, and Grisham 2007). By considering the range of features now available within electronic storybooks, teachers can support the many learning styles of students and accommodate a variety of needs.

By considering the range of features now available within electronic storybooks, teachers can support the many learning styles of students and accommodate a variety of needs.

To set up an electronic guided-reading activity, teachers should first become familiar with the features and supports embedded in a particular eBook, and understand how these supports address an individual's reading needs. Teachers then set instructional goals based on their knowledge of the learner. For example, children needing fluency support may benefit from being asked to first listen to a text passage read out loud, and then to reread the text without the audio support while recording their voice. Later, they can play it back, reflect on their accuracy, rate, and expression with a teacher (or a partner), and then re-record their reading to monitor their own progress.

Other children needing to increase their vocabulary might be tasked with focusing on new words in the eBook during their guided reading activity: They would first use visualization strategies and context clues to predict the words' meaning, and then verify or adjust their predictions by exploring the vocabulary supports offered for a particular word. And most children can benefit from exposure to many different forms of text that vary in reading level and challenge their reading development with embedded comprehension strategy prompts and model think-alouds. All children should have opportunities to interact with a range of eBook selections above and below their estimated reading level, while listening to expert models and recording their own use of reading strategies in voice or in writing.

When eBook guided-reading activities are offered in conjunction with comprehensive reading instruction in the classroom, “these supports and features amplify the strategies that students are using in their own learning” (Learning Media 2007). Research indicates that the effective use of electronic storybooks as a reinforcement to systematic decoding instruction provides immediate decoding feedback to students (deJong and Bus 2002; Labbo and Kuhn 1998); increases emergent literacy skills and comprehension in kindergartners from low and middle SES backgrounds (Korat and Shamir 2008); fosters vocabulary gains among English language learners (Proctor, Dalton, and Grisham 2007); and helps improve students’ comprehension and motivation (Doty, Popplewell and Byers 2001; Grant 2004; Pearman 2008).

c. Electronic reading games and practice activities are those that embed reading practice and reinforcement opportunities into a game or simulation-type interface. These activities often focus on early reading skills such as phonological awareness and word recognition. Studies show that computer game-like activities designed to engage students in various phonological awareness tasks (rhyming, counting numbers of phonemes in isolated words, and pairing words based on similar initial, medial, or ending sounds) increased students’ ability to segment, blend, and recognize words among at-risk kindergarten and first graders (Barker, and Torgeson 1995; Foster, Erickson, Foster, Brinkman, and Torgeson 1994). Other researchers found that students’ fluency increased, and the number of reading miscues decreased with the use of a computer with digitized speech (Reitsma 1998).

While a more detailed explanation of how computer games and practice activities might foster literacy learning is outside the scope of this paper, a systematic review of 191 studies conducted between 1980 and 2002, with both typical and special populations, concluded that many different computer games and activities appear to contain the potential for supporting reading and writing development among elementary-aged children (Coiro, Leu, Kinzer, Labbo, Teale, Bergman, et al. 2003). However, this review also concluded that the potential for any electronic game-like environments to support the development of early literacy skills may only be realized when teachers make appropriate decisions about how the technology is used.

d. Electronic word sorts and graphic organizer activities provide opportunities for students to actively use new technologies to help analyze words for patterns in sounds, spelling, and/or meaning. Word sorts have long been advocated as an activity to help children form generalizations about word patterns that they can apply to new words they encounter in their reading (Bear, Invernizzi, and Templeton, and Johnston 2008; Henderson 1990). It has also been shown that students enhance their understanding of new content when they create graphic representations that organize the important relationships between new concepts (Alvermann and Boothby 1986; Armbruster, Anderson, and Meyer 1992). Until

recently, however, word sorting activities required the use of word cards that teachers had to cut and store ahead of time and students had to glue and/or keep track of during and after the activity. Similarly, constructing a graphic organizer without a computer required careful planning, and a student's ideas were not easily revised after they were put down on paper. New open-ended technology tools such as Kid Pix and Kidspiration have made it much easier for teachers and students to organize, save, revise, and share the products of their thinking.

To use these technologies effectively with elementary-aged students, many teachers now design word sorting and organizing activities with electronic templates that extend literacy skill practices to electronic interfaces. In their book *Literature Links: Thematic Units Linking Read-Alouds and Computer Activities*, for example, Linda Labbo and her colleagues (2006) offer template ideas that use Kid Pix and Kidspiration to introduce and practice a wide range of early literacy skills and strategies, addressing everything from phonemic awareness and phonics skills to vocabulary and comprehension (Belgum 2008; Gill 2007; Zucker and Invernizzi 2008). Kidspiration allows students to easily make links between words and choose from a large library of pictures to illustrate words and ideas in an attractive display.

- e. Electronic writing and creative response activities** provide unique opportunities for students to explore new technologies that “allow them to draw, paint, write, listen, view, compose, and craft their ideas on a malleable computer screen through multimedia symbols systems and interactive tools” (Labbo et al, 2006, p. 9). While many creative response activities might fall under this category, this paper features two promising practices found in studies involving young children in school classrooms.

The first is called the *Digital Language Experience Approach* [D-LEA] which is a computer-enhanced version of a traditional language experience approach (Stauffer 1970; Labbo, Eakle, and Montero 2002). A Digital Language Experience includes the following steps:

1. Set up a unit-related activity with small groups of students and take digital photographs (or video) of students' experiences as they engage in the activity (Labbo et al. 2006).
2. View the digital photographs with the children to elicit rich language through students' talk, dictation, or composing about the sequence of events.
3. Import the digital photographs or video into creativity and presentation software with the purpose of preparing a presentation that best tells the story for an audience of peers.
4. Sort photographs into a sequence of events and key in students' dictation to accompany the digital photographs.

5. Present the digital story to students in printed form or on a computer screen with creativity or presentation software.
6. Use small-group readings, choral readings, or multimedia readings as a springboard for literacy learning in follow-up activities (fluency practice, word sorts, vocabulary, decoding).

Labbo et al. (2002) found that “kindergarten children of varying literacy abilities have unique opportunities for literacy development with digital photography and creativity software when they are employed in one-on-one D-LEA experience.”

A second activity that falls into this category is the use of interactive whiteboards to foster literacy learning. An interactive whiteboard is a touch-sensitive screen that works in conjunction with a computer and a projector. Learning activities with an interactive whiteboard might include manipulating text and images, taking notes in digital ink, viewing websites as a group, interacting with electronic lesson activities with templates and images, showing or writing notes over educational video clips, or showcasing student presentations (SMART Technologies Inc. 2004).

A review of classroom case studies and research from the United States, United Kingdom, and Australia provides evidence that “the use of interactive whiteboards for learning demonstrated positive effects on student engagement and motivation as well as students’ ability to review and retain information presented in class. In addition to student learning, observations also indicate that designing lessons around interactive whiteboards can help educators streamline their preparations and be more efficient in their ICT integration” (SMART Technologies Inc. 2004). A study conducted by independent literacy researchers from the University of Minnesota and the British Educational Communications and Technology Agency [BECTA] for ICT Research (2003) reported similar findings: While the digital whiteboard did not result in a significant improvement over traditional skill instruction, it helped teachers prepare and organize instruction while providing engaging ways to scaffold, model, and guide primary-level students through their literacy lessons (Solvie 2004). These preliminary findings suggest more research should now focus on instructional practices that may increase the learning potential of using interactive whiteboards to facilitate literacy learning in elementary school classrooms.

2. Internet WebQuest

A WebQuest is a complete teaching/learning unit for students on the Internet. WebQuests are intended to help students conduct research in an authentic problem-solving environment (Dodge 1997). Teachers (or students) design a WebQuest using a series of directions and annotated resources that carefully scaffold students through each step of the online research process. The essential parts of a WebQuest usually include an introduction; the task definition; a description of the process; a list

of annotated resources often mapped to a series of cooperative learning roles; a set of criteria or rubric to evaluate learning; and a concluding activity (Lacina 2008; Leu, Leu, and Coiro 2004). WebQuests have a range of styles and purposes, but they are usually designed as either (a) short-term 2–3 day lessons that focus on knowledge integration and a specific set of skills objectives or (b) longer-term research projects in which students develop complex thinking skills and a creative product (Ikpeze and Boyd 2007). WebQuests can be designed to point learners to multiple perspectives or multiple representations of information about a certain topic and they enable learners to process information using a variety of complex thinking skills (Vidoni and Maddox 2002). For instance, WebQuests might be structured to support students in tasks that require them to design, decide, create, analyze, or make predictions about content they are studying; each process represents higher levels of thinking in Bloom’s Taxonomy (see more at <http://webquest.sdsu.edu/designpatterns/all.htm>).

With respect to research, a recent review (Abbit and Ophus 2008) found that WebQuests may have a positive impact on collaborative working skills (Milson 2002; Leahy and Tworney 2005); learner attitudes (Murray 2006); and vocabulary acquisition among English language learners (Tsai 2005). However, teachers may also find that WebQuests have little advantage over more traditional methods of instruction for increasing students’ achievement, unless age-appropriate support for online reading comprehension strategies is integrated into the WebQuest activities so that students can effectively use online resources to deepen their understanding of important concepts and issues (Strickland and Nazza 2005; Ikpeze and Boyd 2007; Maddox and Cummings 2007).

Inquiry Projects

Once students have become familiar with locating relevant and reliable Internet resources, Internet Inquiry may be a useful means to develop independent research skills and allow students to pursue a question that holds a special interest for them. Internet Inquiry may be conducted by small groups or individuals. Inquiry units usually begin with students identifying a topic and a question that they find personally important. After students develop a question, they use all of the strategies they have learned and practiced in more teacher-directed instructional models to use the Internet to locate and evaluate relevant sources, compose an answer to their questions, and share their answers or solutions with others.

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Importantly, however, Internet Inquiry requires students to “move beyond the ‘Who, What, Where, When questions that so often form the basis of classroom research projects’...to engage in ‘What does this mean, and how can I use this information’ questions” (Owens, Hester, and Teale 2002). Internet Inquiry is intended to push students to expand their understandings by creating new connections in ways that increase engagement and motivation for authentic reading and writing.

Early on in the Inquiry process, teachers might introduce the idea of classroom ABC books to promote individual Inquiry around a learning theme or unit. This helps students generate smaller questions around a big topic, while also encouraging them to work through each step of the Inquiry process independently. The resulting product might be a class Inquiry book that is published on the Internet. Once students are successful at these small Internet Inquiry projects, they are ready for something much more thought provoking.

While open-ended Inquiry occurs less frequently in the elementary grades than it does at older grade levels (due to child safety issues, challenges with emerging literacy skills, and limited navigation skills), a few exemplary models of primary school students engaged in inquiry that combined Internet research with offline investigations have emerged.

Research-based recommendations for Internet Inquiry with primary students also remind teachers to consider the advantages of online access to other people. Teachers working collaboratively in one first grade classroom observed the benefits of an email exchange between students and a local journalist sparked by a concern for social justice and celebrated with children’s final projects that incorporated pictures, written responses, and digital photos used to spark further discussion and reflection about the issue (Crafton, Brennan, and Silvers, 2007). Researchers who have explored inquiry with new technologies in elementary school classrooms remind teachers of the following lessons they have learned:

- Approach projects with enthusiasm.
- Teach critical reading skills—comparing and contrasting information from different sources.
- Consider the importance of their role in facilitating inquiry by continuously discussing the project with students, asking questions to keep the inquiry meaningful, and monitoring students’ ability to balance their use of new technologies with meaningful, informative content (Owens, Hester, and Teale 2002).

Teachers may wish to keep these principles in mind as they develop their own student inquiry projects, prompted by students’ individual questions related to the curriculum theme they are investigating.

7. Web Talk and Response

Web Talk and Response involves themed discussions and/or creative response activities in which students collaboratively compose and critique each other's work using online communication technologies such as blogs, wikis, social networking sites, or podcasts. This model of instruction is quite new and practices are steadily emerging as more and more teachers consider the potential for using new communication technologies in their literacy curriculum. Cutting-edge communication technologies offer "new and exciting ways to capitalize on the strengths of authentic writing, the power of the writing process, and the engagement of collaborative writing" (Boling, Castek, Zawilinski, Barton, and Neirlich 2008).

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For those not familiar with these new technologies, three popular online communication tools are blogs, wikis, and podcasts. A *blog* is a website structured like an online journal (or *weblog*) that contains regular entries, commentaries, or other material such as photos or video. Blog entries are commonly displayed in reverse-chronological order, and most include space for other readers to comment on the entry with their own opinion or critique. A *Wiki* is a piece of server software that allows users to freely create and edit webpage content using any web browser. A wiki allows users to edit both the content and the organization of contributions on the page. Finally, a *podcast* is a series of audio or video digital-media files that are distributed over the Internet through web feeds or made available by direct download or real-time streaming technologies.

While these technologies pose challenges to schools concerned about the safety and privacy of young students, many classroom teachers have worked to develop acceptable use policies and are beginning to experience the benefits of providing students the opportunity to publish and critique their work for a global audience.

Conclusion

Recent literature demonstrates that the Internet has become important because it provides us with information that improves the quality of our personal, civic, and professional lives. Access to this online information, however, requires new reading, writing, and communication skills. In the 21st century, being able to read, think critically, and communicate with the Internet has become just as important as being able to read a book and write a letter were during an earlier age. Within the walls of education, Wood (2000) described a “collision between two cultures...[namely] the literacy community with the techno-enthusiasts” and reported a hesitancy of adults to include digital text formats and tools in their repertoire of literary instructional strategies. Through the examples provided in this white paper, we have tried to show that research has demonstrated that students are ready for technology and excited about the changes. “Revolution is not restrained by the capabilities of the technology, but by our own imaginations and dedication to help provide guidance in the evolution of these new communication tools” (Boone and Higgins 2001). In terms of literacy instruction in the 21st century, “The question of what to teach is accompanied by one just as urgent: how to teach” (Wood, 2000). Reading on the Internet is different, and our definition of reading comprehension needs to reflect those differences. Our job now is to envision new constructs of reading comprehension that introduce students to strategies for interacting with these new online literacies alongside more foundational offline literacies. We must help students appreciate the distinctions of each and also be willing to explore digital information environments together in more thoughtful ways. We need to prepare our students to use these new information and communication technologies because they enable students to fully participate in our society and lead productive personal, civic, and work lives. Nothing is more important for the future of our children. This is the challenge we face as educators in a digital information age.

LEAD21 Reading and the Digital Classroom Instructional Pedagogy

Research Says	LEAD21 Delivers
Well-designed, digitally supported reading environments scaffold students' literacy learning with multiple means of representation, multiple means of expression, and multiple means of engaging with text (Meyer and Rose 1998).	A comprehensive suite of digital eBooks that reproduces the student readers and includes additional support features such as audio recordings of the text, an electronic glossary tool, and a student-activated Online Coach for comprehension support at point of use.
Research suggests pictorial introductions as a pre-reading activity can facilitate high-level inferences that help readers link disparate ideas found in the text (Anstey and Freebody 1987).	Multiple levels of electronic pre-reading reinforcement. <ul style="list-style-type: none"> • Virtual Field Trip videos use visual and audio cues to help students build background knowledge about the Unit Theme. • A Preview feature is included for each selection in the students' eBooks that allows students to view key images from the selection, make predictions, and set a purpose for reading.
A systematic review of 191 studies conducted between 1980 and 2002, with both typical and special populations, concluded that many different computer games and activities appear to contain the potential for supporting reading and writing development among elementary-aged children (Coiro, Leu, Kinzer, Labbo, Teale, Bergman, et al. 2003).	Computer games and activities to support literacy development: <ul style="list-style-type: none"> • Differentiated digital vocabulary activities that reinforce student vocabulary acquisition in each week of the unit • Phonics Games for Kindergarten through Grade 2 • Word Study Games for Grades 3–5
Online texts (and the technologies that host them) can be used as part of the literacy curriculum to build background knowledge and content-area learning while also encouraging inquiry, problem solving, writing, and critical reading (Castek and Bevans 2006; Coiro, 2003; Kara-Soteriou, Zawilinski, and Henry 2007).	LEAD21 provides explicit instruction and age-appropriate opportunities to practice online inquiry skills. Web-based Inquiry guides accompany each unit for students in Grades 1–5. These Inquiry guides are web-based activities that parallel the print program's inquiry instruction and guide students in using online and offline technologies to conduct research, solve problems, and present their findings in an engaging way.
The 2008 Horizon Report (a research effort to identify emerging technologies likely to have a large impact on teaching, learning, and creative expression) indicates that video sharing and virtual collaboration webs continue to grow "at some of the most prodigious rates on the Internet" (New Media Consortium 2008).	Social networking technologies within its eTools21 suite: <ul style="list-style-type: none"> • The Story Starter allows a class to collaboratively write stories or articles related to their reading. • The Interactive Glossary allows students to augment existing glossary entries by uploading representative pictures, providing example sentences and explanations, and sharing their own custom definitions. • The Theme Wall provides a forum for students to post and share ideas, questions, and images related to the main concepts taught in each unit.

Author Biography

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Dr. Julie Coiro is an assistant professor in the School of Education at the University of Rhode Island, where she teaches undergraduate and graduate level courses in reading. Previously, Dr. Coiro worked as Co-Director of The New Literacies Research Lab at the University of Connecticut. She has a Bachelor's Degree in Special Education with a focus on students with learning disabilities, a Masters' Degree in Curriculum and Instruction from the University of New Orleans with a focus on reading, and a Ph.D. in Educational Psychology in Cognition and Instruction from the University of Connecticut. Her research focuses on reading comprehension strategy instruction, the new literacies of the Internet, online reading comprehension, and effective practices for technology integration and professional development.

From 2003-2006, Dr. Coiro worked in school classrooms as part of the *Teaching Internet Comprehension to Adolescents* (TICA) Project, a federal research project funded by the U.S. Department of Education. In 2009, she was a distinguished finalist for the International Reading Association's dissertation of the Year Award. Most recently, she is Co-Primary Investigator on a four-year federally funded research project (2009-2013) designed to develop three different formats of valid, reliable, and practical assessments of online reading comprehension. Dr. Coiro is a former middle school and elementary school teacher and has provided professional development to teachers around the country for the past 20 years. She has published 15 articles and book chapters in venues such as *Reading Research Quarterly*, *The Reading Teacher*, *Educational Leadership*, *Journal of Adolescent and Adult Literacy*, *The Handbook of Research on Teaching The English Language Arts*, *Theoretical Processes and Models of Reading* (5th edition) and *The International Handbook of Literacy and Technology* (2nd edition). She is also co-editor of the *Handbook of Research on New Literacies* (Erlbaum, 2008) and co-author of the 4th edition of the book, *Teaching with the Internet K-12: New Literacies for New Times* (2004).

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