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CHAPTER 42

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# New Literacies: A Dual-Level Theory of the Changing Nature of Literacy, Instruction, and Assessment

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## Literacy as Deixis

Today, the nature of literacy has become deictic. This simple idea carries important implications for literacy theory, research, and instruction that our field must begin to address. *Deixis* is a term used by linguists (Fillmore, 1966; Murphy, 1986; Traut & Kazzazi, 1996) to define words whose meanings change rapidly as their context changes. *Tomorrow*, for example, is a deictic term; the meaning of “tomorrow” becomes “today” every 24 hours. The meaning of literacy has also become deictic because we live in an age of rapidly changing information and communication technologies, each of which requires new literacies (Leu, 1997, 2000). Thus, to have been literate yesterday, in a world defined primarily by relatively static book technologies, does not ensure that one is fully literate today where we encounter new technologies such as Google docs, Skype, iMovie, Contribute, Basecamp, Dropbox, Facebook, Google, foursquare, Chrome, educational video games, or thousands of mobile apps. To be literate tomorrow will be defined by even newer technologies that have yet to appear and even newer discourses and social practices that will be created to meet future needs. Thus, when we speak of new literacies, we mean that literacy is not just new today; it becomes new every day of our lives.

How should we theorize the new literacies that will define our future, when literacy has become deictic? The answer is important because our concept of literacy defines both who we are and who we shall become. But there is a conundrum here.

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How can we possibly develop adequate theory when the object that we seek to study is itself ephemeral, continuously being redefined by a changing context? This is an important theoretical challenge that our field has not previously faced. The purpose of this chapter is to advance theory in a world where literacy has become deictic. It suggests that a dual-level theory of New Literacies is a useful approach to theory building in a world where the nature of literacy continuously changes.

We begin by making a central point: Social contexts have always shaped both the function and form of literate practices and been shaped by them in return. We discuss the social context of the current period and explain how this has produced new information and communication technologies (ICTs), and the new literacies that these technologies demand. Second, we explore several lowercase new literacies perspectives that are emerging. We argue that a dual-level New Literacies theory is essential to take full advantage of this important and diverse work. Third, we identify a set of principles, drawn from research, that inform an uppercase theory of New Literacies. Then, we present one lowercase theory of new literacies, the new literacies of online research and comprehension, to illustrate how a dual-level theory of New Literacies can inform new literacies research that takes related but different theoretical perspectives. We conclude by considering the implications of a dual-level theory of New Literacies for both research and practice.

## Literacy in Today's Social Context

Literacy has always changed. Historical analyses demonstrate that both the forms and functions of literacy have been largely determined by the continuously changing social forces at work within any society and the technologies these forces often produce (Boyarin, 1993; Diringer, 1968; Gee, 2007b; Illera, 1997; Manguel, 1996; Mathews, 1966; N.B. Smith, 1965). This story began in Sumeria with the invention of cuneiform tablets, the first system of writing, during the fourth century B.C. (Boyarin, 1993; Diringer, 1968; Manguel, 1996). It continues to the present day.

Often, we lose sight of these historic roots. We need to remember that social forces, and the technologies they produce, often define the changing nature of literacy today just as they have in the past. Clearly, the social forces in the present context will exert similar changes. Thus, attempts to develop any theory of literacy must begin by exploring the critical social forces at work today.

What are the important social forces at work today that frame, and are framed by, the changes to literacy we are experiencing? We believe they include the following:

1. Global economic competition within economies based increasingly on the effective use of information and communication.
2. The rapid appearance of the Internet in both our professional and personal lives.
3. Public policy initiatives by nations that integrate literacy and the Internet into instruction.

## *Global Economic Competition Within Economies Based Increasingly on the Effective Use of Information and Communication*

The world of work has been undergoing fundamental transformation (Kirsch, Braun, Yamamoto, & Sum, 2007; Organisation for Economic Co-operation and Development & the Centre for Educational Research and Innovation, 2010; Rouet, 2006; M.C. Smith, Mikulecky, Kibby, Dreher, & Dole, 2000). Indeed, it is this social context that prompts many of the changes to ICTs and to literacy that we experience, making the effective use of Internet technologies a central component of the literacy curriculum.

Traditionally, industrial-age organizations were organized in a vertical, top-down fashion where most decisions were made at the highest levels and then communicated to lower levels (see Figure 1). This wastes large amounts of intellectual capital within an organization and results in lower productivity. Today, global economic competition requires organizations to abandon these traditional command and control structures to leverage all of their intellectual capital, operate more productively, and become more competitive.

In a postindustrial economy (Reich, 1992), organizations seeking to achieve greater productivity and become more competitive reorganize themselves horizontally. Instead of all decisions emanating from the top of an organization, teams within lower levels of organizations are empowered to identify and solve important problems that generate new knowledge and lead to better ways of producing goods or providing services. These high-performance workplaces seek to use the intellectual capital of every employee to increase effective decision making and increase productivity. The effective use of information to solve problems allows a horizontally organized workplace to become much more productive and competitive (see Figure 2).

Figure 1. The Typical Organizational Structure of Industrial-Age Workplaces

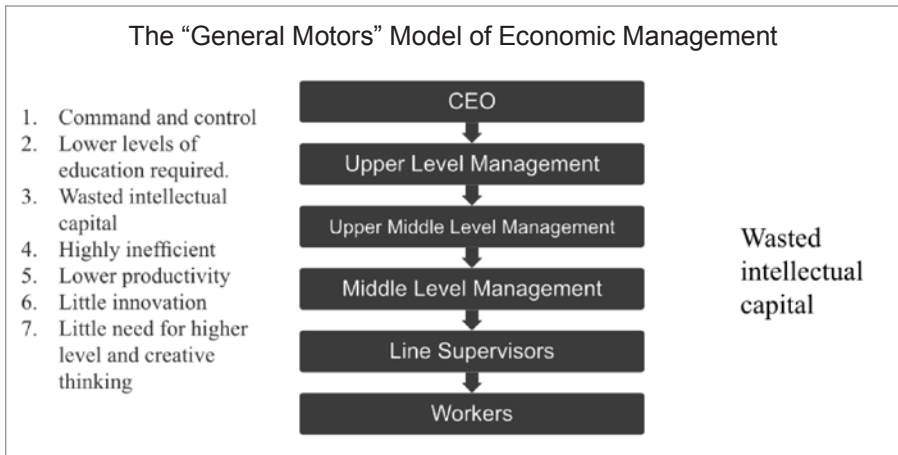
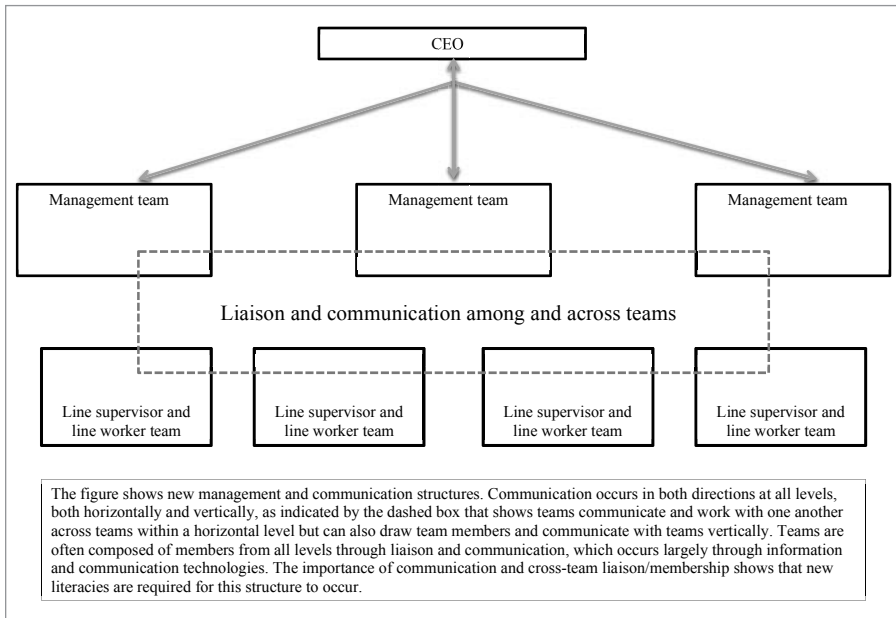


Figure 2. The Typical Organizational Structure of Postindustrial Workplaces



This change has had a fundamental effect on the nature of literacy within organizations. At the broadest level, members of these teams must:

- Quickly identify important problems in their work
- Locate useful information related to the problems they identify
- Critically evaluate the information they find
- Synthesize multiple sources of information to determine a solution
- Quickly communicate the solution to others so everyone within an organization is informed
- Monitor and evaluate the results of their solutions and decisions and modify these as needed

How do teams do this? Often they rely upon the Internet. Many economists have concluded that productivity gains realized during the past several decades have been due to the rapid integration of the Internet into the workplace, enabling units to better share information, communicate, and solve problems (Matteucci, O'Mahony, Robinson, & Zwick, 2005; van Ark, Inklaar, & McGuckin, 2003). Internet use in U.S. workplaces, for example, increased by nearly 60% during a single year (2002) among all employed adults 25 years of age and older (U.S. Department of Commerce, Economic and Statistics Administration & National Telecommunications and Information Administration, 2002).

## *The Rapid Appearance of the Internet in Our Professional and Personal Lives*

It is not surprising that the Internet and other ICTs have appeared and become such a prominent part of our lives during the transition from an industrial to a postindustrial society. These new information and communication tools allow horizontally organized workplaces to identify important problems, address them, and nimbly modify and customize solutions as contexts and technologies change. In many cases, all of this is accomplished with team members situated in different locations around the globe.

This analysis suggests that competence with the new literacies required by the Internet and other ICTs is a crucial determinant of an engaged life in an online age of information and communication. However, it is important to recognize that these skills are not limited to simply creating more productive workers and workplaces. Even more important, the information resources and opportunities available on the Internet provide individuals with opportunities to make their personal lives richer and more fulfilling. This happens while advocating for social justice, refinancing a home, selecting a university to attend, managing a medical question, purchasing books, or any one of the hundreds of other tasks important to daily life. We also see this happening as citizens in some parts of the world use these skills and new technologies to overthrow corrupt and undemocratic political systems. Preparation in the new literacies required to use the Internet and other ICTs enables individuals to have more fulfilling personal as well as professional lives.

## *Public Policy Initiatives by Nations That Integrate Literacy and the Internet Into Instruction*

Previously, we reported on public policies in nations beginning to recognize how the Internet was changing the nature of literacy (Leu & Kinzer, 2000; Leu, Kinzer, Coiro, & Cammack, 2004). At that point, however, public policies about literacy and the Internet often traveled on separate but parallel tracks. Today, we are beginning to see the evolution of these parallel public policies as they slowly become more integrated in nations such as Australia, Canada, and the United States.

In Australia, for example, the Australian Curriculum, Assessment and Reporting Authority (ACARA; n.d.) has developed the Australian Curriculum. This Australian initiative integrates literacy and the Internet *within* the English curriculum, not outside of it as it had been previously. As indicated in the Australian Curriculum:

ICT competence is *an important component of the English curriculum* [italics added]. Students develop the skills and understanding required to use a range of contemporary technologies. In particular, they explicitly develop increasingly sophisticated word-processing skills to enhance text construction. Students also progressively develop skills in using information technology when conducting research, a range of digital technologies to create, publish and present their learning, and communication technologies to collaborate and communicate with others both within and beyond the classroom. (ACARA, n.d., General Capabilities, Information and Communication Technology Competence section, para. 2)

The English curriculum integrates this capability into each year's statement of the content standards. Evidence of this integration also appears in the "Elaborations" of the English curriculum such as this one from Year 4 English (ELBE900): "Participating in online searches for information using navigation tools and discussing similarities and differences between print and digital information." In Australia, literacy and the Internet are becoming integrated with new literacies.

In another example, this time from Canada, the province of Manitoba has developed an educational framework called Literacy With ICT Across the Curriculum (Minister of Manitoba Education, Citizenship, and Youth, 2006). This initiative outlines skills and includes standards required in the 21st century in all aspects of their curriculum:

Identifying appropriate inquiry questions; navigating multiple *information networks* [italics added] to locate relevant information; applying critical thinking skills to evaluate information sources and content; synthesizing information and ideas from multiple sources and networks; representing information and ideas creatively in visual, aural, and textual formats; crediting and referencing sources of information and intellectual property; and communicating new understandings to others, both face to face and over distance. (p. 18)

In the United States, the Common Core State Standards Initiative (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) has sought to establish more uniform standards across states to prepare students for college and careers in the 21st century. One of their key design principles, research and media skills, shows that literacy and new technologies are beginning to be considered together:

To be ready for college, workforce training, and life in a technological society, students need the ability to gather, comprehend, evaluate, synthesize, and report on information and ideas, to conduct original research in order to answer questions or solve problems, and to analyze and create a high volume and extensive range of print and non-print texts in media forms old and new. The need to conduct research and to produce and consume media is embedded into every aspect of today's curriculum. (p. 4)

This design principle, however, is implemented most directly in the Common Core State Standards for writing than for reading (Leu et al., 2011). Consider, for example, these two (of 10) Anchor Standards (A.S.) in Writing:

A.S. 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

A.S. 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. (National Governors Association Center for Best Practices & Council of Chief State School Officers, p. 41)

In the Anchor Standards in Reading, we find a focus on the higher level thinking skills required while reading and conducting research online (Leu, Forzani, et al., in press).

Although these changes are more evolutionary than revolutionary, it is clear that literacy and Internet use are beginning to slowly become more integrated into the public policies and curricula of nations in ways that have a direct impact on literacy education. Because of global economic competition, even nations with a long tradition of local school control, such as Australia and the United States, are beginning to develop important national initiatives to raise literacy levels and prepare students for the use of the Internet.

## A Dual-Level Theory of New Literacies

That the Internet changes the nature of literacy can be seen in the common ways that nations are trying to prepare students for these changes. It can also be seen by the fact that many scholars recently have been attracted to studying this problem and have sought to describe the changes taking place (e.g., Gee, 2007c; Kress, 2003; Lankshear & Knobel, 2006; Lemke, 2002; New London Group, 1996; Street, 1995, 2003). Many use the term *new literacies* to describe their work. *New literacies*, however, means many different things to many different people.

Some people use the term *new literacies* to capture the new social practices of literacy that are emerging (Street, 1995, 2003). Rather than seeing new social practices emerging from new technologies, they tend to see new technologies emerging from new social practices. Others use the term *new literacies* to describe important new strategies and dispositions that are essential for online research and comprehension (Castek, 2008; Coiro, 2003; Henry, 2006; International Reading Association, 2009). Still others see new literacies as new discourses (Gee, 2007b) or new semiotic contexts (Kress, 2003; Lemke, 2002). Others see literacy as differentiating into multiliteracies (Cope & Kalantzis, 1999; New London Group, 1996) or multimodal contexts (Hull & Schultz, 2002), and some see a construct that juxtaposes several of these orientations (Lankshear & Knobel, 2006). When one includes terms such as *ICT literacy* (International ICT Literacy Panel, 2002) or *informational literacy* (Hirsh, 1999; Kuiper & Volman, 2008), the construct of new literacies becomes even broader.

How are we to solve the conundrum posed earlier, where the nature of literacy changes even faster than we can develop adequate theory, especially within a context where there are so many competing theoretical perspectives that have emerged to direct separate lines of research? We believe the answer to this question is not to privilege one theoretical framework over another, but rather to take advantage of multiple perspectives, and new ones that will ultimately emerge, to capture the full range of the complexities defining literacy during a period in which literacy continually changes. In short, we see the separate lines of work taking place within a context that rapidly changes as an opportunity and not as a problem.

## Lowercase and Uppercase New Literacies

Just as economic units have found it more productive to restructure from a command and control mentality to take advantage of everyone's intellectual capital, we must do the same in the literacy research community. We must find ways to bring all of our intellectual capital to the important task of understanding the extraordinary complexities that now define literacy as it continually changes and becomes richer and more complex. We can no longer afford to work in separate theoretical worlds, ignoring others and privileging our own. Recognizing that changes to literacy are taking place at many levels, and being dissatisfied with isolated attempts to capture those changes, we believe that a collaborative approach to theory building is essential, one that takes advantage of the power of multiple perspectives (Labbo & Reinking, 1999). This approach suggests that the best solutions result from collaborative groups who bring diverse, multiple perspectives to problems (Page, 2007). New Literacies theory takes an "open-source" approach, inviting everyone who studies the Internet's impact to contribute to theory development and to benefit from others' contributions. This includes more traditional theoretical and research traditions as well as those specific to new literacies because both old and new elements of literacy are layered in complex ways, and the nature of this layering and commingling is yet to be understood.

To account for the continuous changes taking place to literacy as well as the growing multiplicity of perspectives that are emerging, we frame new literacies theory on two levels: lowercase (new literacies) and uppercase (New Literacies). Lowercase theories explore a specific area of new literacies and/or a new technology, such as the social communicative transactions occurring with text messaging (e.g., Lewis & Fabos, 2005). Lowercase theories also include those that explore a focused disciplinary base, such as the semiotics of multimodality in online media (e.g., Kress, 2003) or a distinctive conceptual approach such as new literacy studies (Street, 1995, 2003). These lowercase theories are better able to keep up with the rapidly changing nature of literacy in a deictic world because they are closer to the specific types of changes that are taking place and interest those who study them within a particular heuristic. Lowercase theories also permit our field to maximize the lenses we use and the technologies and contexts we study. Every scholar who studies new literacy issues is generating important insights for everyone else, even if we do not share a particular lens, technology, or context. How, though, do we come to understand these insights, taking place in many different fields from many different perspectives? For this, we require a second level of theory, an uppercase New Literacies theory.

What defines this broader theory of New Literacies? New Literacies, as the broader, more inclusive concept, includes those common findings emerging across multiple, lowercase theories. New Literacies theory benefits from work taking place in the multiple, lowercase dimensions of new literacies by looking for what appear to be the most common and consistent patterns being found in lowercase theories and lines of research. This approach permits everyone to fully explore their unique, lowercase perspective of new literacies, allowing scholars



to maintain a close focus on many different aspects of the shifting landscape of literacy during a period of rapid change. At the same time, each of us also benefits from expanding our understanding of other, lowercase, new literacies perspectives. By assuming change in the model, everyone is open to a continuously changing definition of literacy, based on the most recent data that emerges consistently, across multiple perspectives, disciplines, and research traditions. Moreover, areas in which alternative findings emerge are identified, enabling each to be studied again, from multiple perspectives. From this process, common patterns emerge and are included in a broader, common, New Literacies theory.

This process enables the broader theory of New Literacies to keep up with consistent elements that will always define literacy on the Internet while it informs each of the lowercase theories of new literacies with patterns that are being regularly found by others. We believe that when literacy is deictic and multifaceted, a dual-level theory of New Literacies is not only essential but also provides a theoretical advantage over any single-dimensional approach to theory building and research. We are richer for working together and engaging in common research and theoretical conversations, something we believe happens too rarely.

## Central Principles of an Uppercase Theory of New Literacies

Although it is too early to define a complete uppercase theory of New Literacies emerging from the Internet and other ICTs, we are convinced that it is time to begin this process by identifying the central principles upon which it should be built. Our work is pointing us to these principles of New Literacies that appear to be common across the research and theoretical work currently taking place:

1. The Internet is this generation's defining technology for literacy and learning within our global community.
2. The Internet and related technologies require additional new literacies to fully access their potential.
3. New literacies are deictic.
4. New literacies are multiple, multimodal, and multifaceted.
5. Critical literacies are central to new literacies.
6. New forms of strategic knowledge are required with new literacies.
7. New social practices are a central element of New Literacies.
8. Teachers become more important, though their role changes, within new literacy classrooms.

### *The Internet Is This Generation's Defining Technology for Literacy and Learning Within Our Global Community*

From a sociolinguistics perspective, Gee (2007b) and the New London Group (2000) have argued that literacy is embedded in and develops out of the social

practices of a culture. We agree. We have argued that the Internet and related technologies now define the new literacies that increasingly are a part of our literacy lives. Put simply, a central principle of New Literacies theory is that the Internet has become this generation's defining technology for literacy in our global community.

We can see this in several data points. More than a decade ago, 90% of adolescent students in the United States with home access to the Internet reported using the Internet for homework (Pew Internet & American Life Project, 2001). Over 70% of these students used the Internet as the primary source for information on their most recent school report or project, while only 24% of these students reported using the library for the same task. Four years later, in 2005, we reached the "tipping point year" for online reading among adolescents in the United States. For the first time, students ages 8–18 reported spending more time reading online, 48 minutes per day, than reading offline, 43 minutes per day (Kaiser Family Foundation, 2005). More recently, the first international assessment of online reading among 15-year-olds took place in 2009. The PISA International Assessment of Reading (Organisation for Economic Co-operation and Development, 2011) provided important information about online research and comprehension to public policymakers around the world who were demanding it (see also R.E. Bennett, Persky, Weiss, & Jenkins, 2007).

Perhaps the most compelling evidence, though, for this claim may be found in usage. According to one of the most systematic evaluations of worldwide Internet use, over 2.4 billion individuals now use the Internet—more than one third of the world's population (Internet World Stats, 2011). Moreover, at the current rate of growth, Internet use will be ubiquitous in the world within the next decade. Never in the history of civilization have we seen a new technology adopted by so many, in so many different places, in such a short period of time, with such powerful consequences for both literacy and life.

### ***The Internet and Related Technologies Require Additional New Literacies to Fully Access Their Potential***

New technologies such as the Internet and other ICTs require additional social practices, skills, strategies, and dispositions to take full advantage of the affordances each contains. Typically, new literacies build upon foundational literacies rather than replace them completely. Foundational literacies include those traditional social practices of literacy and the elements of literacy required for traditional text reading and writing, such as word recognition, vocabulary, comprehension, inferential reasoning, the writing process, spelling, response to literature, and others required for the literacies of the book and other printed material. However, foundational literacies will be insufficient if one is to make full use of the Internet and other ICTs (Hartman, Morsink, & Zheng, 2010; International Reading Association, 2009). Reading, writing, and communication will take new forms as text is combined with new media resources and linked within complex information networks requiring new literacies for their use (Dalton & Proctor,

2008; Wyatt-Smith & Elkins, 2008). During this process, new online and traditional offline literacies are often layered in rich and complex ways.

### ***New Literacies Are Deictic***

We began this chapter by suggesting that literacy has become deictic. The rapid transformations in the nature of literacy caused by technological change is a primary source for the deictic nature of literacy; new technologies regularly and repeatedly transform previous literacies, continually redefining what it means to become literate.

The deictic nature of literacy is also caused by a second source: the environments we construct as we create new social practices with new technologies. Envisionments take place when individuals imagine new possibilities for literacy and learning, transform existing technologies and practices to construct this vision, and then share their envisionment with others (Knobel & Wilber, 2009; Lankshear & Knobel, 2006; Leu, Karchmer, & Leu, 1999).

Finally, rapid transformations in the nature of literacy are produced because the Internet and other ICTs permit the immediate exchange of new technologies and social practices. Because we can immediately download a new technology from the Internet or send it to millions of individuals with just a keystroke, the changes to literacy derived from new technologies happen at a pace faster than ever before. In short, the Internet and other ICTs not only change themselves but also provide the central vehicle for exchanging new technologies for information and communication and new social practices. Thus, the already rapid pace of change in the forms and functions of literacy is exacerbated by the speed with which new technologies and new social practices are communicated (Leu, 2000).

### ***New Literacies Are Multiple, Multimodal, and Multifaceted***

New literacies are multiple, multimodal, and multifaceted, and as a result, our understanding of them benefits from multiple points of view. From a sociolinguistic perspective, the New London Group (2000) has defined *multiliteracies* as a set of open-ended and flexible multiple literacies required to function in diverse social contexts and communities. We believe the same multiplicity of literacy has also emerged because of multiple technological contexts. The Internet and other ICTs require that we develop a systematic understanding of the multiple literacies that exist in both new literacies practices (Lankshear & Knobel, 2006) and in the skills, strategies, and dispositions that are required with new technologies (Leu et al., 2004). This multiplicity of new literacies is apparent on at least three levels.

First, meaning is typically represented with multiple media and modalities. Unlike traditional text forms that typically include a combination of two types of media—print and two-dimensional graphics—Internet texts integrate a range of symbols and multiple-media formats, including icons, animated symbols, audio, video, interactive tables, and virtual reality environments (Callow, 2010; Lemke, 2002; Walsh, 2010). As a result, we confront new forms and combinations of texts and images that challenge our traditional understandings of how information

is represented and shared with others (Jewitt & Kress, 2003; Unsworth, 2008). Semiotic perspectives on new literacies (e.g., Kress, 2003) allow an especially rich understanding of changes taking place in these areas.

Second, the Internet and other ICTs also offer multiple tools. Literate individuals will be those who can effectively determine, from the Internet's multiple offerings, a combination of tool(s) and form(s) that best meet their needs (American Association of School Librarians, 2007). Thus, New Literacies theory includes research that is taking place with multiple forms of online meaning and content construction. It assumes that proficient users of the Internet must understand how to construct meaning in new ways as well as construct, design, manipulate, and upload their own information to add to the constantly growing and changing body of knowledge that defines the Internet.

A final level of multiplicity consists of the new social practices and skills that are required as we encounter information with individuals from a much wider range of social contexts (Hull, Stornaiuolo, & Sahni, 2010; Hull, Zacher, & Hibbert, 2009). The global sharing of information permitted by the Internet introduces new challenges as we interpret and respond to information from multiple social and cultural contexts that share profoundly different assumptions about our world (Fabos & Young, 1999; Flanagin, Farinola, & Metzger, 2000). These multiple contexts for new literacies have important implications for educators preparing students to critically understand and interpret the meanings they find on the Internet and to communicate with others (see Hull et al., 2010).

In a world of exploding technologies and literacy practices, it becomes increasingly difficult to think of literacy as a singular construct that applies across all contexts. As a result, we benefit from the complexity that multiple theoretical perspectives provide (Labbo & Reinking, 1999). Any research study in new literacies benefits when multiple theoretical frameworks inform the research questions and results. It also suggests that new literacies are best studied in interdisciplinary teams as questions become far too complex for the traditional single-investigator model.

### *Critical Literacies Are Central to New Literacies*

New Literacies demand new forms of critical literacy and greater dependency on critical thinking and analysis. Open networks, such as the Internet, permit anyone to publish anything; this is one of the opportunities this technology presents. It is also one of its limitations; information is much more widely available from people who have strong political, economic, religious, or ideological stances that profoundly influence the nature of the information they present to others. As a result, we must assist students to become more critical consumers of the information they encounter (Bråten, Strømsø, & Britt, 2009; Clemitt, 2008; Flanagin & Metzger, 2010; Metzger & Flanagin, 2008). Although the literacy curriculum has always included items such as critical thinking and separating fact from propaganda, more instructional time devoted to more complex analytic skills will need to be included in classrooms where the Internet and

other ICTs play a more prominent role (Hobbs, 2010). As we begin to study the new literacies of the Internet, we will depend greatly on work from the communities of critical literacy and media literacy to provide us with the best research in this area.

### *New Forms of Strategic Knowledge Are Required With New Literacies*

New technologies for networked information and communication are complex and require many new strategies for their effective use. Hypertext technologies, embedded with multiple forms of media and unlimited freedoms of multiple navigational pathways, present opportunities that may seduce some readers away from important content unless they have developed strategies to deal with these seductions (Lawless & Kulikowich, 1996; Lawless, Mills, & Brown, 2002). Other cognitive and aesthetic changes to text on the Internet presents additional strategic challenges to comprehension (Afflerbach & Cho, 2010; Coiro, 2003; Hartman et al., 2010; Spires & Estes, 2002), inquiry (Eagleton, 2001), and information seeking (Rouet, Ros, Goumi, Macedo-Rouet, & Dinet, 2011; Sutherland-Smith, 2002). Thus, new literacies will often be defined around the strategic knowledge central to the effective use of information within rich and complexly networked environments.

### *New Literacy Practices Are a Central Element of New Literacies*

It is increasingly clear that new literacy practices are a central feature of New Literacies. Work by Lankshear and Knobel (2006) show us how two important elements of the changing nature of literacy generate additional, new literacies practices. First, new digital technologies enable new ways of constructing, sharing, and accessing meaningful content. Second, the collaborative, distributed, and participatory nature of these digital spaces enable the generation of what Lankshear and Knobel call a *distinctive ethos* and what Jenkins (2006) refers to as *engagement in participatory culture*. As a result, continuously new social practices of literacy will emerge, often within new discourse communities, and serve to redefine literacy and learning.

New social practices will be needed in classrooms to interact within increasingly complex technologies for information and communication (Jonassen, Howland, Moore, & Marra, 2003; Kiili, Laurinen, Marttunen, & Leu, 2011). Models of literacy instruction, for example, have often focused on an adult whose role was to teach the skills he or she possessed to a group of students who did not know those skills. This is no longer possible, or even appropriate, within a world of multiple new literacies. No one person can hope to know everything about the expanding and ever-changing technologies of the Internet and other ICTs. In fact, today, many young students possess higher levels of knowledge about some of these new literacies than most adults.

Consequently, effective learning experiences will be increasingly dependent upon new social practices, social learning strategies, and the ability of a teacher to orchestrate literacy learning opportunities between and among students who

know different new literacies (Erstad, 2002). This will distribute knowledge about literacy throughout the classroom, especially as students move above the stages of foundational literacy. One student, for example, may know how to edit digital video scenes, but another may know how best to compress the video so it can function optimally in a Web-based environment. This social learning ability may not come naturally to all students, however, and many will need to be supported in learning *how* to learn about literacy from one another (Labbo, 1996; Labbo & Kuhn, 1998).

### ***Teachers Become More Important, Though Their Role Changes, Within New Literacy Classrooms***

The appearance of the Internet and other ICTs in school classrooms will increase the central role that teachers play in orchestrating learning experiences for students. Teachers will be challenged to thoughtfully guide students' learning within information environments that are richer and more complex than traditional print media, presenting richer and more complex learning opportunities for both themselves and their students (Coiro, 2009).

In a world of rapidly changing new literacies, it will be common for some students to be more literate with some technologies than their teacher is (Erstad, 2002; Harper, 2006). As a result, teachers will increasingly become orchestrators of learning contexts rather than dispensers of literacy skills. By orchestrating opportunities for the exchange of new literacies, both teachers and students may enhance their literacy skills and their potential for effective communication and information use (O'Brien, Beach, & Scharber, 2007; Schulz-Zander, Büchter, & Dalmer, 2002). Because teachers become even more important to the development of literacy and because their role changes, an expanded focus and greater attention will need to be placed on teacher education and professional development in new literacies.

## **The New Literacies of Online Research and Comprehension: A Lowercase Theory of New Literacies**

The new literacies of online research and comprehension (Leu, Everett-Cacopardo, Zawilinski, McVerry, & O'Byrne, in press; Leu, Forzani, et al., in press) is one example of a lowercase new literacies theory. This frames online reading comprehension as a process of problem-based inquiry and includes the new skills, strategies, dispositions, and social practices that take place as we use information on the Internet to conduct research to solve problems and answer questions. It describes how students conduct research and read online to learn. A more formal definition is as follows:

The new literacies of online research and comprehension include the skills, strategies, dispositions, and social practices necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge and influence all areas of our personal and professional lives. Online research and comprehension is a self-directed process of constructing texts and knowledge while engaged in several online reading practices: identifying

important problems, locating information, critically evaluating information, synthesizing information, and communicating information. Online research and comprehension can take place individually, but often appears to be enhanced when it takes place collaboratively.

What do we know about the new literacies of online research and comprehension? We are beginning to uncover many elements of this aspect of new literacies. They include the following:

1. Online research and comprehension is a self-directed process of text construction and knowledge construction.
2. Five practices appear to define online research and comprehension processing: (1) identifying a problem and then (2) locating, (3) evaluating, (4) synthesizing, and (5) communicating information.
3. Online research and comprehension is not isomorphic with offline reading comprehension; additional skills and strategies appear to be required.
4. Online contexts may be especially supportive for some struggling readers.
5. Adolescents are not always very skilled with online research and comprehension.
6. Collaborative online reading and writing practices appear to increase comprehension and learning.

### ***Online Research and Comprehension Is a Self-Directed Process of Text Construction and Knowledge Construction***

Readers choose the online texts that they read through the links that they follow as they gather information and construct the knowledge needed to solve a problem. Each reader typically follows a unique informational path, selecting a unique sequence of links to information and sampling unique segments of information from each location (see, e.g., Canavilhas, n.d.; McEneaney, Li, Allen, & Guzniczak, 2009). Thus, in addition to constructing knowledge in their minds, readers also physically construct the texts they read online (Afflerbach & Cho, 2008; Coiro & Dobler, 2007). While this is also possible during offline reading, of course, it always takes place during online reading (see Hartman et al., 2010). As a result, seldom do two readers read the same text to solve the same problem during online reading.

### ***Five Processing Practices Appear to Define Online Research and Comprehension Processing***

At least five processing practices occur during online research and comprehension: (1) reading to identify important questions, (2) reading to locate information, (3) reading to evaluate information critically, (4) reading to synthesize information, and (5) reading to communicate information. Within these five practices reside the skills, strategies, and dispositions that are distinctive to online reading comprehension as well as to others that are also important for offline reading comprehension (Leu, Reinking, et al., 2007).



**Reading to Identify Important Questions.** We read on the Internet to solve problems and answer questions. How a problem is framed or how a question is understood is a central aspect of online research and comprehension. Work by Taboada and Guthrie (2006) within traditional texts suggests that reading initiated by a question differs in important ways from reading that is not.

**Reading to Locate Information.** A second component of successful online research and comprehension is the ability to read and locate information that meets one's needs (Broch, 2000; Eagleton, Guinee, & Langlais, 2003; Guinee, Eagleton, & Hall, 2003; International ICT Literacy Panel, 2002; Sutherland-Smith, 2002). The reading ability required to locate information on the Internet may very well serve as a gatekeeping skill; if one cannot locate information, one will be unable to solve a given problem. New online reading skills and strategies may be required, for example, to generate effective keyword search strategies (Bilal, 2000; Guinee et al., 2003; Kuiper & Volman, 2008), to read and infer which link may be most useful within a set of search engine results (Henry, 2006), and to efficiently scan for relevant information within websites (McDonald & Stevenson, 1996; Rouet, 2006; Rouet et al., 2011).

**Reading to Evaluate Information Critically.** Critically evaluating online information includes the ability to read and evaluate the level of accuracy, reliability, and bias of information (Center for Media Literacy, 2005). Although these skills have always been necessary to comprehend and use offline texts, the proliferation of unedited information and the merging of commercial marketing with educational content (Fabos, 2008; Federal Trade Commission, 2002) present additional challenges that are quite different from traditional print and media sources. Tillman (2003), for example, contends that promotional efforts and related advertising may be more difficult to differentiate on the Internet than in print and other mass media forms (see also Fabos, 2008). Others (Britt & Gabrys, 2001) cite the lack of uniform standards and cues regarding document type in online text environments as necessitating a renewed interest in how students evaluate online information. Without explicit training in these new literacy skills, many students become confused and overwhelmed when asked to judge the accuracy, reliability, and bias of information they encounter in online reading environments (Graham & Metaxas, 2003; Sanchez, Wiley, & Goldman, 2006; Sundar, 2008). Consequently, as more students turn primarily to the Internet for their information (Pew Internet & American Life Project, 2005), these critical evaluation strategies become more relevant than ever before (Bråten et al., 2009; Bråten, Strømsø, & Salmerón, 2011).

**Reading to Synthesize Information.** Successful Internet use also requires the ability to read and synthesize information from multiple online sources (Jenkins, 2006). Synthesis requires the reader to bring together an awareness of the reading processes and an underlying understanding of the text. The Internet introduces



additional challenges to coordinate and synthesize vast amounts of information presented in multiple media formats, from a nearly unlimited and disparate set of sources (Gilster, 1997; Jenkins, 2006; Rouet, 2006). This presents important challenges to online readers as they determine what to include and what to exclude.

**Reading to Communicate Information.** A fifth component of successful online research and comprehension is the ability to communicate via the Internet to seek information or share what one has learned (Britt & Gabrys, 2001). The interactive processes of reading and writing have become so intertwined on the Internet that they often happen simultaneously during communication. Moreover, each specific communication tool on the Internet is constituted differently and presents a range of new skills, strategies, and social practices to use them effectively (Coiro, Knobel, Lankshear, & Leu, 2008). New types of strategic knowledge are required, for example, to effectively participate and communicate in social networking environments such as e-mail, blogs, wikis, and instant messaging (Castek, 2008; Lewis & Fabos, 2005).

### *Online Research and Comprehension Is Not Isomorphic With Offline Reading Comprehension*

Findings from several studies suggest that online research and comprehension appears not to be isomorphic with offline reading comprehension; additional reading comprehension skills seem to be required (Coiro, 2011; Coiro & Dobler, 2007; Leu et al., 2005; Leu, Zawilinski, et al., 2007). One study, among sixth-grade students proficient at using the Internet (Coiro & Dobler, 2007), found that online research and comprehension shared a number of similarities with offline reading comprehension but was also more complex and included notable differences. A second study found no statistically significant correlation between scores on a state reading comprehension assessment and an assessment of online research and comprehension with good psychometric properties (Leu et al., 2005). A third study (Coiro, 2011) found that offline reading comprehension and prior knowledge contributed a statistically significant amount of variance to the prediction of online research and comprehension, but an additional 16% of independent variance was contributed by knowing students' online research and comprehension ability. These data suggest that additional skills are required for online research and comprehension beyond those required for offline reading comprehension.

Similarly, Afflerbach and Cho's (2010) review of 46 studies involving think-aloud protocols that focused on reading strategy use during Internet and hypertext reading found evidence of strategies that "appeared to have no counterpart in traditional reading" (p. 217). Many of these strategies clustered around a reader's ability to apply new strategies to reduce levels of uncertainty while navigating and negotiating appropriate reading paths in a shifting problem space (see also Afflerbach & Cho, 2008; Cho, 2010; Zhang & Duke, 2008). Hartman et al. (2010) also offer examples of how Internet research and comprehension places many more processing demands on the reader that amount to a host of new cognitive

reading challenges for comprehending online texts. Finally, case studies and videos of online research show that students who perform at a low level on state reading assessments sometimes perform at unexpectedly high levels on tasks of online research and comprehension (Castek, Zawilinski, McVerry, O'Byrne, & Leu, 2011; Leu, Zawilinski, et al., 2007). Together, these results support the claim that additional skills and strategies may be required during online research and comprehension beyond those required for offline reading and comprehension.

Although differences appear to exist, we do not fully understand how and why offline reading comprehension and online research and comprehension are not isomorphic. Several explanations are possible. Current results, showing a lack of correlation between the two, may be because online research and comprehension is a problem-based task, while offline reading includes a wider range of comprehension tasks (cf. Taboada & Guthrie, 2006). Or it may be that the reading skills required to locate information online are such "bottleneck" skills that students who lack this ability perform poorly online, even though they may be high-performing offline readers. Or the fact that greater levels of critical evaluation are typically required online may be the source of the difference. Finally, differences may be due to the new communication tools that are often used.

It is also likely that we can increase or decrease statistical relationships between offline reading comprehension and online research and comprehension by simply varying the nature of the online research task. Online assessments that require richer, more complex use of online tools (search engines, e-mail attachments, blogs, wikis), or more complex information spaces, may generate less of a relationship with offline reading comprehension compared with online assessments that simply require the reader to read information on a single website. So it is still early to claim that the lack of isomorphism between online and offline reading is either strong or weak. That it can be demonstrated appears to be the case, but we require much more work to be able to fully understand the conditions under which the two contexts for reading require different skills and strategies.

We also do not know very much about the relative contribution of various elements of online research and comprehension to successful online research outcomes. It is likely that skill areas often required earlier in the process (defining a problem, locating information, and evaluating information) may be more determinative of successful performance than other areas are, but we have not yet evaluated this claim.

### *Online Contexts May Be Especially Supportive for Some Struggling Readers*

It is surprising to find that some struggling readers do very well with online research and comprehension. Why might this be the case? Units of text are typically shorter online as readers follow informational links from one location to another, seeking information that will help them solve their informational problem. Shorter units of text are easier for struggling readers to process. In addition, online readers construct their own texts to read, as they choose different paths to

follow. This increases engagement and makes it more likely that readers find their way to texts appropriate for their abilities. Also, online texts contain multimedia, a traditionally supportive context for struggling readers. Finally, each webpage is really a graphic image, and struggling readers are often quite skilled readers of information presented graphically. Sometimes, too, these readers use a new literacies skill, the use of Command + F, to quickly scan for information on a webpage with extensive amounts of text.

### ***Adolescents Are Not Always Very Skilled With Online Research and Comprehension***

Although adolescent “digital natives” may be skilled with social networking, texting, video downloads, MP3 downloads, or mash-ups, they are not always as skilled with online research and comprehension, including locating (Bilal, 2000; Eagleton et al., 2003) and critically evaluating information (S. Bennett, Maton, & Kervin, 2008; Sutherland-Smith, 2002; Wallace, Kupperman, Krajcik, & Soloway, 2000). In fact, adolescents tend to overgeneralize their ability to read online information effectively, informed by their ability to engage successfully with online social networking, texting, and video games (Kuiper, 2007).

### ***Collaborative Online Reading and Writing Practices Appear to Increase Comprehension and Learning***

Emerging work suggests that collaborative online reading and writing may yield important gains in literacy and learning. Work by Kiili et al. (2011) suggests that collaborative reading of online information about a controversial issue can lead to important learning gains. Comparing individual reading (Kiili, Laurinen, & Marttunen, 2008) with collaborative online reading (Kiili et al., 2011), individual readers concentrated on gathering facts, whereas the collaborative reading context offered additional opportunities for deeper exploration of ideas and different perspectives. Greater collaborative online reading also appears to lead to greater meaning construction and knowledge construction (Kiili et al., 2011).

Work by Everett-Cacopardo (2011), Zawilinski (2011), O’Byrne (2011), and Coiro, Castek, and Guzniczak (2011) also explores the importance of framing online research and comprehension as a collaborative, social practice. Everett-Cacopardo discovered that a number of teachers find it highly effective to have their students engage in collaborative, online projects with students in other nations. Zawilinski found that collaborative blogging in social studies between students in first and fifth grades led to important gains in understanding and communication. O’Byrne found that collaborative development of spoof sites led to greater skill with the critical evaluation of information related most closely to the elements students focused on in the creation of their webpages. Coiro et al. found that opportunities to co-construct meaning and responses to prompts that require students to read on the Internet may foster more efficient and productive comprehension of online informational texts—even among readers who are skilled at comprehending online texts independently. Thus, we are beginning to

see this area of new literacies research consider more fully the important collaborative dimensions of online research and comprehension.

## **New Literacies Theory: Implications**

New Literacies theory tells us that the Internet and other continuously emerging ICTs will be central to both our personal and professional lives and that these technologies require new literacies to effectively exploit their potential (International Reading Association, 2009; Kinzer & Leander, 2002). It also suggests that we must begin to integrate these new literacies into classrooms if we hope to prepare all students for the literacy futures they deserve. Most important, it suggests that continuous change will define the new literacies of the Internet and other ICTs (Cammack, 2002; Leu, 2000). Because of this rapid and continuous change, misalignments in assessment and instruction are likely to appear until we begin to recognize that literacy has become deictic, and take action not to fall behind the more contemporaneous realities of literacy. These misalignments are likely to create important problems for any educational system unable to keep up with the changes.

Consider, for example, the consequences that result from our current literacy assessments, such as the National Assessment of Educational Progress or any of the state assessments of reading in the United States. None of these assessments include any elements of new literacies. This misalignment with the contemporaneous realities of literacy may result in increasing existing gaps in reading achievement between rich and poor. How does this happen? The poorest students in any nation have the least access to the Internet at home (Cooper, 2004). Unfortunately, it is often the case that the poorest schools are also under the greatest pressure to raise scores on reading tests that have nothing to do with new literacies (cf. Henry, 2007). In poorer schools, there is often little incentive to teach the new literacies of online research and comprehension simply because they are not tested (Leu, O'Byrne, Zawilinski, McVerry, & Everett-Cacopardo, 2009). Thus, students in our poorest schools become doubly disadvantaged; they have less access to the Internet at home, and schools do not prepare them for new literacies at school.

In contrast, most children from advantaged communities have broadband Internet connections at home. As a result, teachers feel greater freedom to integrate the Internet into their curricula (Henry, 2007). Thus, students in richer districts become doubly privileged: They have greater access to the Internet at home, and they integrate it more often at school. It is a cruel irony that students who most need to be prepared at school for an online age of information are precisely those who are being prepared the least. This situation must change. We cannot afford to help the rich get richer and the poor get poorer through misalignments in our assessment instruments.

During a period of rapidly changing new literacies, we will need to adapt to the continuously changing nature of literacy in several areas. These include research, assessment, and professional development and teacher education.

## Research

Research might begin by focusing on two major issues: (1) What are the social practices, skills, strategies, and dispositions essential to the acquisition of new literacies? and (2) How might we best support the development of these aspects of new literacies within both real and virtual learning contexts? As we develop answers to the first question, we should keep in mind that any answers will be in continuous evolution, as even newer technologies will require additional skills, strategies, dispositions, and social practices for their effective use. We should begin now to conceptualize this problem from a deictic perspective, perhaps with a research focus on how students and teachers continually adapt to the changes that will be a part of our lives. Research on how students and teachers learn how to learn may be far more important than a listing of specific skills and strategies within the continuously changing landscape of literacy that will define our future.

Answers to the second question are likely to take place within a context of problem-based learning (see Dochy, Segers, Van den Bossche, & Gijbels, 2003; Hmelo-Silver, 2004) because we have argued that new literacies are often used to solve problems and communicate solutions with online information. One instructional model has been developed for 1:1 computing classrooms in the Teaching Internet Comprehension to Adolescents project (Leu & Reinking, 2005) and described by Leu et al. (2008).

This project focused on inquiry-based learning around diverse informational texts that students encountered on the Internet while engaged in a series of curriculum-based information challenges. A three-phase approach to instruction was designed, called Internet reciprocal teaching (IRT). Over a 20-week period, with about 40 hours of instruction, this approach resulted in significant effects on online research and comprehension among typically low-achieving readers in seventh-grade language arts classrooms in rural South Carolina and urban Connecticut school districts (Leu & Reinking, 2009).

There is some indication that a more sustained period of IRT instruction can yield an even greater effect size. Castek (2008) found positive effects for fourth and fifth graders who were instructed using IRT and laptops. Students in the experimental group showed significantly greater gains in online research and comprehension than did control students:  $t(52) = 5.79, p < .001$ , with a large effect size (Cohen's  $d = 1.58$ ). This study took place in self-contained classrooms rather than the rotating, 40-minute classes typical of middle schools, providing more time each day for instruction. From these results, it appears that a longer period of time, more than 40 hours, may be necessary to generate high levels of online research and comprehension.

Another area in which important research is taking place is online gaming. Several people have noted that literacy practices and literacy-related learning activities occur within online game play (Gee, 2007a; Squire, 2008, 2011; Steinkuehler, 2006). Leander and Lovvorn (2006), for example, note how an adolescent from the United States learned Finnish and various communication

strategies as a result of collaborative video game play experiences. Yet, schools continue to emphasize traditional text-based literacy practices while doing little to integrate the potentials of gaming into the school curriculum.

We also need to consider broader sources of meaning beyond text. Work by Kress, Hull, and others (Hull & Schultz, 2002; Jewitt & Kress, 2003; Kress, 2003) tell us that we must understand more fully the roles of semiotics and multimodal forms if our students are to use the affordances of tools now required in informal as well as high-performance workplace and academic settings. We must begin to shift from a focus mainly on text comprehension strategies to the interaction among text, graphics, and other content (Kinzer, Hoffman, Turkey, Gunbas, & Chantes, 2011; Kinzer et al., in press), especially during out-of-school contexts (Kleifgen & Kinzer, 2009).

These and other areas of research that need to be explored may not be able to keep up with the rapidly changing landscape of literacy if traditional research paradigms are used; important aspects of literacy are likely to change before a body of consistent research findings can be gathered. Because new literacies continuously change, we require new epistemologies and research practices that keep up with the rapid changes we anticipate. How, for example, can we keep up with new ideas about what to teach and how to teach within research and dissemination paradigms that require five years or more between the conception of a research problem and the wide dissemination of results through research journals? How can we assess students on their ability to use the Internet and other ICTs when the very skills we assess will change as soon as new technologies appear? While a New Literacies perspective does not provide complete answers to these questions, it suggests that these are critical questions to ask.

The answers may emerge in the new models of research likely to appear among those who understand the changes we are experiencing. Those who develop digital curricula, for example, may come to realize that their most important resource is not the digital curriculum they provide to schools but rather the data they obtain from students who use the curriculum. With a network that both delivers curricular activities and assesses learning each day, data could be used to conduct immediate research on the design of lesson activities, revising a different element each night to obtain immediate results on the effects of that change the next day. Anyone with access to these data, and with the appropriate resources, will be able to conduct research on a scale and with a speed that we have not previously experienced. It is quite possible that the assumptions we currently have about how, when, where, and why instructional research is conducted will change rapidly in an age of new literacies.

### *Assessment*

We currently lack valid, reliable, and practical assessments of new literacies to inform instruction and help students become better prepared for an online age of information and communication. As a result, new literacies are not often integrated into reading or language arts instruction (Hew & Brush, 2007) and are, instead,

typically viewed as an optional add-on rather than a vital component (O'Brien & Scharber, 2008). Until we develop valid, reliable, and practical assessments of new literacies to inform instruction, their integration into the classroom will always be delayed. Developing these assessments will be an important challenge in the years ahead.

Dynamic, online texts and their associated literacy practices require dynamic assessments that are sensitive to the diverse, multiple, and rapidly changing ways in which learners read, write, learn, and communicate information in the 21st century (Churches, 2009; International Reading Association & National Council of Teachers of English, 2010; Knobel & Wilber, 2009). Similarly, a range of social networking and information-sharing tools (e.g., Facebook, Twitter, Skype) continue to emerge and give rise to new means of communication and ways of connecting and sharing with wider and more diverse groups of individuals than ever before (Greenhow, Robelia, & Hughes, 2009; Johnson, Levine, Smith, & Smythe, 2009). Consequently, authentic assessments of new literacies should incorporate the information and communication tools used in the workforce and in students' daily lives (e.g., interactive blogs, wikis, e-mail) to pose and answer questions, reflect on and synthesize new learning, and collaborate across classrooms.

Assessments of new literacies should also document students' evolving dispositions toward participation in globally networked communities (Coiro, 2009; Popham, 2009). This includes assessments that document the ability to work productively as a team, appreciate differences in cultural practices and work patterns, demonstrate flexibility and perseverance during online inquiry, and respond appropriately to peer feedback (Afflerbach, 2007; American Association of School Librarians, 2007; O'Byrne & McVerry, 2009). Finally, we require better assessments of online research and comprehension, ones that are both reliable and valid and also practical. The ones we currently have appear to be valid and reliable but require extensive time to reliably score (Castek & Coiro, 2010).

Current work taking place in the Online Research and Comprehension Assessment (ORCA) project seeks this broader objective (Leu, Kulikowich, Sedransk, & Coiro, 2009). This project has developed 24 assessments that present authentic problems to students in science with text messages and collects data on both process and product aspects of the research they conduct online. The task concludes with students using their result to revise a classroom wiki or e-mailing a school board president about the results they discovered. A video of one assessment may be viewed by linking to this URL: [neagu.uconn.edu/orca-video-ira/](http://neagu.uconn.edu/orca-video-ira/). The ORCAs are currently being piloted and validated with representative state samples of nearly 2,800 seventh-grade students in Connecticut and Maine.

The most prominent challenge, perhaps, is that literacy assessments, to date, are always assessments of an individual working alone. Given the importance of social learning and collaborative meaning construction on the Internet and other ICTs, we will need to assess how well students can learn new literacies from others and how well they can co-construct meaning and collaborate in constructing



written information with others. Learning how to learn from others and learning how to collaboratively construct meaning will be increasingly important in the years ahead. It seems clear that new technologies will require new approaches to both what is assessed and how we go about doing so (Coiro & Castek, 2010; Kinzer, 2010; National Research Council, 2001).

### *Professional Development and Teacher Education*

Perhaps the greatest challenge that we face lies in professional development. It is safe to say that our educational systems have never before faced the professional development needs that will occur in our future. Current professional development models are often short in duration, with a focus on technology as a tool (Warschauer, 2006), despite the fact that studies of laptop integration universally conclude that extensive professional development on higher level learning with technology is required before gains can be realized (Penuel, 2006; Silvernail & Buffington, 2009; Silvernail & Gritter, 2007; Silvernail & Lane, 2004; Warschauer, 2006). The continuous changes that lie ahead for literacy will require continuous professional development.

It is likely that new models of professional development will require more extended commitments from school leadership teams, over longer periods of time, than we are used to. It is well established that professional development with technology integration takes longer than other areas of classroom instruction do, as much as two to three times as long to produce the expected effects (Becta, 2003; McKenzie, 2001; Saylor & Kehrhahn, 2003). This is because training requires teachers to develop more than new instructional strategies. They also have to develop proficiency with new technologies, an even greater challenge for some.

Emerging work (Spire, Hervey, & Watson, 2012; Spire, Zheng, & Pruden, 2011) has found Mishra and Koehler's (2006) TPACK model to be a useful framework for helping educators understand the complex relationships among technology, content, and pedagogy to facilitate teacher growth in new literacies (see also Lohnes Watulak & Kinzer's, 2013, argument for an extension of this model). However, we need more research and clear data on the efficacy of these and other new models to direct us in this area.

Our colleagues who conduct research on teacher education also need to apply their finest heuristics, helping us to better understand how to prepare new and experienced teachers to support children in the new literacies of ICTs in the classroom. This will require an understanding of new literacies by academic institutions and teacher educators, who will need to implement changes in our college and university preservice programs.

What seems certain is that Internet resources will increase, not decrease, the central role teachers play in orchestrating learning experiences for students as literacy instruction converges with Internet technologies. The richer and more complex information environments of the Internet will challenge teachers to thoughtfully support student learning in these new literacies contexts (Coiro &



Fogleman, 2011). This alone should make professional development and teacher education important priorities.

## **The Challenges of Change: Theory Building in a Deictic World of New Literacies**

We believe that we are on the cusp of a new era in literacy theory, research, and practice, one in which the nature of reading, writing, and communication is being fundamentally transformed by the Internet. It will be up to each of us to recognize these changes and develop a richer understanding of them as we seek to prepare students for the new literacies of the Internet and other ICTs that define their future. They deserve nothing less.

To help us begin this journey, we have argued that one way to understand the changes taking place to literacy is to build theoretical models around change itself. We have outlined a dual-level theory of New Literacies, a perspective that provides a useful starting point to inquiry in this area and one that is both close to the continuous changes taking place at the lowercase level and also provides an understanding of the generalized principles that are common to all of the many contexts at the uppercase level.

Our own work tells us that each of us will be challenged in many ways as we enter this new world of new literacies. We will be challenged to conduct and publish research before the very issues that we study have changed as even newer literacies have appeared. We will be challenged to use collaborative models of research because so many of us work in institutions that still privilege the single-investigator model for dissertations, tenure, and promotion. We will be challenged to gain access to school classrooms when schools are under intense pressure to raise test scores, with assessments that exclude the new literacies we seek to study, and have little time for anything other than what is on their test. We will be challenged by the shift to centers of research where curriculum developers have access to massive amounts of daily data and rapidly change the classroom contexts for instruction in literacy and learning.

The most important challenge for each of us, though, may be of looking beyond our own lowercase theoretical framework to include findings taking place in other, related, new literacies work. We must begin to think in ways that do not simply privilege our own work but embrace the many other perspectives that can enrich our own understanding. By looking across multiple, lowercase, new literacies, we will develop a far richer understanding of the important work that each of us is conducting.

This chapter has explored emerging theoretical perspectives in new literacies and explained why we believe a dual-level, New Literacies theory is especially useful to understand the changes that are taking place. We hope that by sharing this perspective and the many challenges that we face, you will be encouraged to bring your own expertise to the important research that lies ahead. Nothing is more important to our collective future.

## QUESTIONS FOR REFLECTION

1. What are some examples of new literacies that have arisen or will arise in the Internet age?
2. How can you apply the recommendation for “collaborative online reading and writing practices [that] appear to increase comprehension and learning”?
3. With respect to new literacies, what can schools of education do to avoid “misalignments” of assessment and instruction?

## NOTES

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## REFERENCES

- Afflerbach, P. (2007). *Understanding and using reading assessment*. Newark, DE: International Reading Association.
- Afflerbach, P.A., & Cho, B.Y. (2008). Identifying and describing constructively responsive comprehension strategies in new and traditional forms of reading. In S. Israel & G. Duffy (Eds.), *Handbook of reading comprehension research* (pp. 69–90). Mahwah, NJ: Erlbaum.
- Afflerbach, P.A., & Cho, B.Y. (2010). Determining and describing reading strategies: Internet and traditional forms of reading. In H.S. Waters & W. Schneider (Eds.), *Metacognition, strategy use, and instruction* (pp. 201–255). New York: Guilford.
- American Association of School Librarians. (2007). *Standards for the 21st-century learner*. Retrieved from [www.ala.org/ala/mgrps/divs/aasl/guidelinesandstandards/learningstandards/standards.cfm](http://www.ala.org/ala/mgrps/divs/aasl/guidelinesandstandards/learningstandards/standards.cfm)
- Australian Curriculum, Assessment and Reporting Authority. (n.d.). *The Australian Curriculum* (Version 1.2). Retrieved from [www.australiancurriculum.edu.au/Home](http://www.australiancurriculum.edu.au/Home)
- Becta. (2003). *What the research says about barriers to the use of ICT in teaching*. Retrieved October 29, 2012 from [www.mmiweb.org.uk/publications/ict/Research\\_Barriers\\_TandL.pdf](http://www.mmiweb.org.uk/publications/ict/Research_Barriers_TandL.pdf)
- Bennett, R.E., Persky, H., Weiss, A.R., & Jenkins, F. (2007). *Problem solving in technology-rich environments: A report from the NAEP technology-based assessment project*. Retrieved from [nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2007466](http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2007466)
- Bennett, S., Maton, K., & Kervin, L. (2008). The digital natives debate: A critical review of the evidence. *British Journal of Educational Technology*, 31(9), 775–786.
- Bilal, D. (2000). Children's use of the Yahoo!igans! Web search engine: Cognitive, physical, and affective behaviors on fact-based search tasks. *Journal of the American Society for Information Science*, 51(7), 646–665. doi:10.1002/(SICI)1097-4571(2000)51:7<646::AID-ASI7>3.0.CO;2-A
- Boyarin, J. (Ed.). (1993). *The ethnography of reading*. Berkeley: University of California Press. doi:10.1525/california/9780520079557.001.0001
- Bråten, I., Strømso, H.I., & Britt, M.A. (2009). Trust matters: Examining the role of source evaluation in students' construction of meaning within and across multiple texts. *Reading Research Quarterly*, 44(1), 6–28. doi:10.1598/RRQ.44.1.1
- Bråten, I., Strømso, H.I., & Salmerón, L. (2011). Trust and mistrust when students read multiple information sources about climate change. *Learning and Instruction*, 21(2), 180–192. doi:10.1016/j.learninstruc.2010.02.002
- Britt, M.A., & Gabrys, G.L. (2001). Teaching advanced literacy skills for the World Wide Web. In C.R. Wolfe (Ed.), *Learning and teaching on the World Wide Web* (pp. 73–90). San Diego, CA: Academic. doi:10.1016/B978-012761891-3/50007-2
- Broch, E. (2000). Children's search engines from an information search process perspective. *School Library Media Research*, 3. Retrieved from [www.ala.org/arasl/aaslpubsandjournals/slmrb/slmrcontents/volume32000/childrens](http://www.ala.org/arasl/aaslpubsandjournals/slmrb/slmrcontents/volume32000/childrens)
- Callow, J. (2010). Spot the difference: The changing nature of page-based and screen-based texts. *Screen Education*, 58, 106–110.

- Cammack, D. (2002). Literacy, technology, and a room of her own: Analyzing adolescent girls' online conversations from historical and technological literacy perspectives. In D. Shallert, C. Fairbanks, J. Worthy, B. Maloch, & J. Hoffman (Eds.), *Fifty-first yearbook of the National Reading Conference* (pp. 129–141). Chicago: National Reading Conference.
- Canavilhas, J. (n.d.). *Web journalism: From the inverted pyramid to the tumbled pyramid*. Retrieved from [www.bocc.ubi.pt/pag/canavilhas-joao-inverted-pyramid.pdf](http://www.bocc.ubi.pt/pag/canavilhas-joao-inverted-pyramid.pdf)
- Castek, J. (2008). *How do 4th and 5th grade students acquire the new literacies of online reading comprehension? Exploring the contexts that facilitate learning*. Unpublished doctoral dissertation, University of Connecticut, Storrs.
- Castek, J., & Coiro, J. (2010, April). *Measuring online reading comprehension in open networked spaces: Challenges, concerns, and choices*. Alternative poster session presented at the annual meeting of the American Educational Research Association, Denver, CO.
- Castek, J., Zawilinski, L., McVerry, G., O'Byrne, I., & Leu, D.J. (2011). The new literacies of online reading comprehension: New opportunities and challenges for students with learning difficulties. In C. Wyatt-Smith, J. Elkins, & S. Gunn (Eds.), *Multiple perspectives on difficulties in learning literacy and numeracy* (pp. 91–110). New York: Springer.
- Center for Media Literacy. (2005). *Literacy for the 21st century: An overview and orientation guide to media literacy education. Part 1 of the CML medialog kit: Framework for learning and teaching in a media age*. Retrieved from [www.medialit.org/cml-medialog-kit](http://www.medialit.org/cml-medialog-kit)
- Cho, B.-Y. (2010, December 3). *A study of adolescents' constructive strategy use in a critical Internet reading task*. Paper presented at the annual meeting of the Literacy Research Association, Fort Worth, TX.
- Churches, A. (2009). *Bloom's digital taxonomy*. Retrieved from [edorigami.wikispaces.com/Bloom%27s+Digital+Taxonomy](http://edorigami.wikispaces.com/Bloom%27s+Digital+Taxonomy)
- Clemitt, M. (2008). Internet accuracy. *CQ Researcher*, 18(27), 625–648.
- Coiro, J. (2003). Reading comprehension on the Internet: Expanding our understanding of reading comprehension to encompass new literacies. *The Reading Teacher*, 56(5), 458–464.
- Coiro, J. (2009). Promising practices for supporting adolescents' online literacy development. In K.D. Wood & W.E. Blanton (Eds.), *Literacy instruction for adolescents: Research-based practice* (pp. 442–471). New York: Guilford.
- Coiro, J. (2011). Predicting reading comprehension on the Internet: Contributions of offline reading skills, online reading skills, and prior knowledge. *Journal of Literacy Research*, 43(4), 352–392.
- Coiro, J., & Castek, J. (2010). Assessment frameworks for teaching and learning English language arts in a digital age. In D. Lapp & D. Fisher (Eds.), *Handbook of research on teaching the English language arts* (3rd ed., pp. 314–321). New York: Routledge.
- Coiro, J., Castek, J., & Guzniczak, L. (2011). Uncovering online reading comprehension processes: Two adolescents reading independently and collaboratively on the Internet. In P.J. Dunston, L.B. Gambrell, K. Headley, S.K. Fullerton, & P.M. Stecker (Eds.), *60th yearbook of the Literacy Research Association* (pp. 354–369). Oak Creek, WI: Literacy Research Association.
- Coiro, J., & Dobler, E. (2007). Exploring the online comprehension strategies used by sixth-grade skilled readers to search for and locate information on the Internet. *Reading Research Quarterly*, 42(2), 214–257. doi:10.1598/RRQ.42.2.2
- Coiro, J., & Fogleman, J. (2011). Capitalizing on Internet resources for content-area teaching and learning. *Educational Leadership*, 68(5), 34–38.
- Coiro, J., Knobel, M., Lankshear, C., & Leu, D.J. (2008). Central issues in new literacies and new literacies research. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research on new literacies* (pp. 1–22). Mahwah, NJ: Erlbaum.
- Cooper, M. (2004). *Expanding the digital divide and falling behind on broadband: Why telecommunications policy of neglect is not benign*. Washington, DC: Consumer Federation of America. Retrieved from [www.consumerfed.org/pdfs/digitaldivide.pdf](http://www.consumerfed.org/pdfs/digitaldivide.pdf)
- Cope, B., & Kalantzis, M. (Eds.). (1999). *Multiliteracies: Literacy learning and the design of social futures*. New York: Routledge.
- Dalton, B., & Proctor, P. (2008). The changing landscape of text and comprehension in the age of new literacies. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research on new literacies* (pp. 297–324). Mahwah, NJ: Erlbaum.
- Diringer, D. (1968). *The alphabet: A key to the history of mankind*. New York: Funk & Wagnalls.
- Doehy, F., Segers, M., Van den Bossche, P., & Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. *Learning and Instruction*, 13(5), 533–568. doi:10.1016/S0959-4752(02)00025-7
- Eagleton, M. (2001). *Factors that influence Internet inquiry strategies: Case studies of middle school students with and without learning disabilities*. Paper presented at the annual meeting of the National Reading Conference, San Antonio, TX.
- Eagleton, M., Guinee, K., & Langlais, K. (2003). Teaching Internet literacy strategies: The hero inquiry project. *Voices From the Middle*, 10(3), 28–35.
- Erstad, O. (2002). Norwegian students using digital artifacts in project-based learning. *Journal of Computer Assisted Learning*, 18(4), 427–437. doi:10.1046/j.0266-4909.2002.00254.x
- Everett-Cacopardo, H. (2011). *Classrooms without borders: How online collaboration can connect*

- adolescents to literacy and learning around the world. Manuscript submitted for publication.
- Fabos, B. (2008). The price of information: Critical literacy, education, and today's Internet. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research on new literacies* (pp. 839–870). Mahwah, NJ: Erlbaum.
- Fabos, B., & Young, M.D. (1999). Telecommunications in the classroom: Rhetoric versus reality. *Review of Educational Research*, 69(3), 217–259.
- Federal Trade Commission. (2002, April). *Protecting children's privacy under COPPA: A survey on compliance*. Retrieved from [www.ftc.gov/os/2002/04/coppasurvey.pdf](http://www.ftc.gov/os/2002/04/coppasurvey.pdf)
- Fillmore, C. (1966). Deictic categories in the semantics of 'come.' *Foundations of Language*, 2(3), 219–227.
- Flanagin, A.J., Farinola, W.J., & Metzger, M.J. (2000). The technical code of the Internet/World Wide Web. *Critical Studies in Media Communication*, 17(4), 409–428. doi:10.1080/15295030009388411
- Flanagin, A.J., & Metzger, M.J. (2010). *An empirical examination of youth, digital media use, and information credibility*. Cambridge, MA: MIT Press.
- Gee, J.P. (2007a). *Good video games and good learning: Collected essays on video games, learning and literacy*. New York: Peter Lang.
- Gee, J.P. (2007b). *Social linguistics and literacies: Ideology in discourses*. London: Routledge.
- Gee, J.P. (2007c). *What video games have to teach us about learning and literacy* (2nd ed.). New York: Macmillan. doi:10.1145/950566.950595
- Gilster, P. (1997). *Digital literacy*. New York: John Wiley.
- Graham, L., & Metaxas, P.T. (2003). Of course it's true: I saw it on the Internet! *Communications of the ACM*, 46(5), 71–75.
- Greenhow, C., Robelia, B., & Hughes, J. (2009). Web 2.0 and classroom research: What path should we take now? *Educational Researcher*, 38(4), 246–259. doi:10.3102/0013189X09336671
- Guinee, K., Eagleton, M.B., & Hall, T.E. (2003). Adolescents' Internet search strategies: Drawing upon familiar cognitive paradigms when accessing electronic information sources. *Journal of Educational Computing Research*, 29(3), 363–374. doi:10.2190/HD0A-N15L-RTFH-2DU8
- Harper, D. (2006). *Generation YES (Youth and Educators Succeeding)—Vision to action: Adding student leadership to your technology plan*. Retrieved from [www.genyes.com/media/programs/how\\_to\\_include\\_students\\_in\\_tech\\_plan.pdf](http://www.genyes.com/media/programs/how_to_include_students_in_tech_plan.pdf)
- Hartman, D.K., Morsink, P.M., & Zheng, J. (2010). From print to pixels: The evolution of cognitive conceptions of reading comprehension. In E.A. Baker (Ed.), *The new literacies: Multiple perspectives on research and practice* (pp. 131–164). New York: Guilford.
- Henry, L. (2006). SEARCHing for an answer: The critical role of new literacies while reading on the Internet. *The Reading Teacher*, 59(7), 614–627. doi:10.1598/RT.59.7.1
- Henry, L.A. (2007). *Exploring new literacies pedagogy and online reading comprehension among middle school students and teachers: Issues of social equity or social exclusion?* Unpublished doctoral dissertation, University of Connecticut, Storrs.
- Hew, K.F., & Brush, T. (2007). Integrating technology into K–12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, 55(3), 223–252. doi:10.1007/s11423-006-9022-5
- Hirsh, S.G. (1999). Children's relevance criteria and information seeking on electronic resources. *Journal of the American Society for Information Science*, 50(14), 1265–1283. doi:10.1002/(SICI)1097-4571(1999)50:14<1265::AID-ASI2>3.0.CO;2-E
- Hmelo-Silver, C.E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235–266. doi:10.1023/B:EDPR.0000034022.16470.f3
- Hobbs, R. (2010). *Digital and media literacy: A plan of action. A white paper on the digital and media literacy recommendations of the Knight Commission on the information needs of communities in a democracy*. Washington, DC: The Aspen Institute. Retrieved from [www.knightcomm.org/digital-and-media-literacy/](http://www.knightcomm.org/digital-and-media-literacy/)
- Hull, G., & Schultz, K. (2002). *School's out: Bridging out-of-school literacies with classroom practice*. New York: Teachers College Press.
- Hull, G., Stornaiuolo, A., & Sahni, U. (2010). Cultural citizenship and cosmopolitan practice: Global youth communicate online. *English Education*, 42(4), 331–367.
- Hull, G., Zacher, J., & Hibbert, L. (2009). Youth, risk, and equity in a global world. *Review of Research in Education*, 33(1), 117–159. doi:10.3102/0091732X08327746
- Illera, J.L.R. (1997). De la lectura en papel a la lectura de multimedia [From reading on paper to reading multimedia]. In Fundalectura (Ed.), *Lectura y nuevas tecnologías: 3er congreso nacional de lectura* [Reading and new technologies: 3rd National Congress of Reading] (pp. 69–88). Bogotá, Colombia: Fundación para el Fomento de la Lectura.
- International ICT Literacy Panel. (2002, May). *Digital transformation: A framework for ICT literacy*. Retrieved from [www.ets.org/Media/Tests/Information\\_and\\_Communication\\_Technology\\_Literacy/ictreport.pdf](http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf)
- International Reading Association. (2009). *New literacies and 21st century technologies* (Position statement). Newark, DE: Author. Available from: [www.reading.org/General/AboutIRA/PositionStatements/21stCenturyLiteracies.aspx](http://www.reading.org/General/AboutIRA/PositionStatements/21stCenturyLiteracies.aspx)
- International Reading Association & National Council of Teachers of English. (2010). *Standards for the assessment of reading and writing* (Rev. ed.). Newark, DE, & Urbana, IL: Authors. Retrieved from [www.reading.org](http://www.reading.org)

- .org/General/CurrentResearch/Standards/AssessmentStandards.aspx.
- Internet World Stats. (2011). *Internet users in the world: Distribution by world regions*. Retrieved July 1, 2011, from [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)
- Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. New York: New York University Press.
- Jewitt, C., & Kress, G.R. (2003). *Multimodal literacy*. New York: Peter Lang.
- Johnson, L., Levine, A., Smith, R., & Smythe, T. (2009). *Horizon report: 2009 K-12 edition*. Austin, TX: The New Media Consortium.
- Jonassen, D.H., Howland, J., Moore, J., & Marra, R.M. (2003). *Learning to solve problems with technology: A constructivist perspective* (2nd ed.). Columbus, OH: Merrill/Prentice-Hall.
- Kaiser Family Foundation. (2005). *Generation M: Media in the lives of 8-18 year-olds*. Retrieved from [www.kff.org/entmedia/7251.cfm](http://www.kff.org/entmedia/7251.cfm)
- Kiili, C., Laurinen, L., & Marttunen, M. (2008). Students evaluating Internet sources: From versatile evaluators to uncritical readers. *Journal of Educational Computing Research*, 39(1), 75-95. doi:10.2190/EC.39.1.e
- Kiili, C., Laurinen, L., Marttunen, M., & Leu, D. J. (2011). *Working on understanding: Collaborative reading patterns on the Web*. Manuscript submitted for publication.
- Kinzer, C.K. (2010). Considering literacy and policy in the context of digital environments. *Language Arts*, 88(1), 51-61.
- Kinzer, C.K., Hoffman, D.L., Turkay, S., Gunbas, N., & Chantes, P. (2011). Exploring motivation and comprehension of a narrative in a video game, book and comic book format. In P.J. Dunston, L.B. Gambrell, K. Headley, S.K. Fullerton, & P.M. Stecker (Eds.), *60th Yearbook of the Literacy Research Association Yearbook* (pp. 263-278). Oak Creek, WI: Literacy Research Association.
- Kinzer, C.K., Turkay, S., Hoffman, D.L., Gunbas, N., Chantes, P., Chaiwinij, A., et al. (in press). Examining the effects of text and images on story comprehension: An eye tracking study of reading in games and comics. In P.J. Dunston & S.K. Fullerton (Eds.), *61st yearbook of the Literacy Research Association*. Chicago: Literacy Research Association
- Kinzer, C.K., & Leander, K. (2002). Technology and the language arts: Implications of an expanded definition of literacy. In J. Flood, D. Lapp, J.R. Squire, & J.M. Jensen (Eds.), *Handbook of research and teaching the English language arts* (pp. 546-566). Mahwah, NJ: Erlbaum.
- Kirsch, I., Braun, H., Yamamoto, K., & Sum, A. (2007). *America's perfect storm: Three forces changing our nation's future*. Princeton, NJ: Educational Testing Service. Retrieved from [www.ets.org/Media/Research/pdf/PICSTORM.pdf](http://www.ets.org/Media/Research/pdf/PICSTORM.pdf)
- Kleifgen, J., & Kinzer, C.K. (2009). Alternative spaces for education with and through technology. In H. Varenne & E. Gordon (Eds.), *Comprehensive education explorations, possibilities, challenges* (pp. 139-186). Lewiston, NY: Ewin Mellen.
- Knobel, M., & Wilber, D. (2009). Let's talk 2.0. *Educational Leadership*, 66(6), 20-24.
- Kress, G. (2003). *Literacy in the new media age*. London: Routledge. doi:10.4324/9780203164754
- Kuiper, E. (2007). *Teaching Web literacy in primary education*. Retrieved from [dare.ubvvu.vu.nl/bitstream/1871/10836/1/7533.pdf](http://dare.ubvvu.vu.nl/bitstream/1871/10836/1/7533.pdf).
- Kuiper, E., & Volman, M. (2008). The Web as a source of information for students in K-12 education. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research on new literacies* (pp. 241-246). Mahwah, NJ: Erlbaum.
- Labbo, L. (1996). A semiotic analysis of young children's symbol making in a classroom computer center. *Reading Research Quarterly*, 31(4), 356-385. doi:10.1598/RRQ.31.4.2
- Labbo, L., & Kuhn, M. (1998). Electronic symbol making: Young children's computer-related emerging concepts about literacy. In D. Reinking, M. McKenna, L.D. Labbo, & R. Kieffer (Eds.), *Handbook of literacy and technology: Transformations in a post-typographic world* (pp. 79-92). Mahwah, NJ: Erlbaum.
- Labbo, L.D., & Reinking, D. (1999). Negotiating the multiple realities of technology in literacy research and instruction. *Reading Research Quarterly*, 34(4), 478-492. doi:10.1598/RRQ.34.4.5
- Lankshear, C., & Knobel, M. (2006). *New literacies* (2nd ed.). Maidenhead, UK: Open University Press.
- Lawless, K.A., & Kulikowich, J.M. (1996). Understanding hypertext navigation through cluster analysis. *Journal of Educational Computing Research*, 14(4), 385-399. doi:10.2190/DVAP-DE23-3XXMV-9MXH
- Lawless, K.A., Mills, R., & Brown, S.W. (2002). Children's hypermedia navigational strategies. *Journal of Research on Computing in Education*, 34(3), 274-284.
- Leander, K.M., & Lovvorn, J.F. (2006). Literacy networks: Following the circulation of texts, bodies, and objects in the schooling and online gaming of one youth. *Cognition and Instruction*, 24(3), 291-340. doi:10.1207/s1532690xci2403\_1
- Lemke, J.L. (2002). Travels in hypermodality. *Visual Communication*, 1(3), 299-325. doi:10.1177/147035720200100303
- Leu, D.J., Jr. (1997). Caity's question: Literacy as deixis on the Internet. *The Reading Teacher*, 51(1), 62-67.
- Leu, D.J., Jr. (2000). Literacy and technology: Deictic consequences for literacy education in an information age. In M.L. Kamil, P. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, pp. 743-770). Mahwah, NJ: Erlbaum.
- Leu, D.J., Castek, J., Hartman, D., Coiro, J., Henry, L., Kulikowich, J., et al. (2005). *Evaluating the development of scientific knowledge and new forms*



- of reading comprehension during online learning. Final report presented to the North Central Regional Educational Laboratory/Learning Point Associates. Retrieved from [www.newliteracies.uconn.edu/ncrel.html](http://www.newliteracies.uconn.edu/ncrel.html)
- Leu, D.J., Coiro, J., Castek, J., Hartman, D., Henry, L.A., & Reinking, D. (2008). Research on instruction and assessment in the new literacies of online reading comprehension. In C.C. Block & S. Parris (Eds.), *Comprehension instruction: Research-based best practices* (pp. 321–345). New York: Guilford.
- Leu, D.J., Everett-Cacopardo, H., Zawilinski, L., McVerry, J.G., & O'Byrne, W.I. (in press). The new literacies of online reading comprehension. In C.A. Chapelle (Ed.), *The encyclopedia of applied linguistics*. Oxford, UK: Wiley-Blackwell.
- Leu, D.J., Forzani, E., Burlingame, C., Kulikowich, J., Sedransk, N., Coiro, J., et al. (in press). The new literacies of online research and comprehension: Assessing and preparing students for the 21st century with Common Core State Standards. In S.B. Neuman, L.B. Gambrell (Eds.), & C. Massey (Assoc. Ed.), *Reading instruction in the age of Common Core Standards*. Newark, DE: International Reading Association.
- Leu, D.J., Jr., Karchmer, R., & Leu, D.D. (1999). The Miss Rumphius effect: Environments for literacy and learning that transform the Internet. *The Reading Teacher*, 52(6), 636–642.
- Leu, D.J., Jr., & Kinzer, C.K. (2000). The convergence of literacy instruction and networked technologies for information and communication. *Reading Research Quarterly*, 35(1), 108–127. doi:10.1598/RRQ.35.1.8
- Leu, D.J., Jr., Kinzer, C.K., Coiro, J., & Cammack, D. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. In R.B. Ruddell & N.J. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 1570–1613). Newark, DE: International Reading Association. doi:10.1598/0872075028.54
- Leu, D.J., Kulikowich, J., Sedransk, N., & Coiro, J. (2009). *Assessing online reading comprehension: The ORCA project*. Research grant funded by the U.S. Department of Education, Institute of Education Sciences.
- Leu, D.J., McVerry, J.G., O'Byrne, W.I., Kiili, C., Zawilinski, L., Everett-Cacopardo, H., et al. (2011). The new literacies of online reading comprehension: Expanding the literacy and learning curriculum. *Journal of Adolescent & Adult Literacy*, 55(1), (pp. 5–14). doi:10.1598/JAAL.55.1.1
- Leu, D.J., O'Byrne, W.I., Zawilinski, L., McVerry, J.G., & Everett-Cacopardo, H. (2009). Expanding the new literacies conversation. *Educational Researcher*, 38(4), 264–269. doi:10.3102/0013189X09336676
- Leu, D.J., & Reinking, D. (2005). *Developing Internet comprehension strategies among adolescent students at risk to become dropouts*. Research grant project funded by the U.S. Department of Education, Institute of Education Sciences.
- Leu, D.J., & Reinking, D. (2009). *Final report: Developing Internet comprehension strategies among poor, adolescent students at risk to become dropouts*. Research grant funded by the U.S. Department of Education, Institute of Education Sciences.
- Leu, D.J., Reinking, D., Carter, A., Castek, J., Coiro, J., & Henry, L.A. (2007, April 9). *Defining online reading comprehension: Using think-aloud verbal protocols to refine a preliminary model of Internet reading comprehension processes*. Paper presented at the American Educational Research Association, Chicago. Available from: [docs.google.com/Doc?did=dcbjhrtq\\_10djqrhz](https://docs.google.com/Doc?did=dcbjhrtq_10djqrhz)
- Leu, D.J., Zawilinski, L., Castek, J., Banerjee, M., Housand, B., & Liu, Y. (2007). What is new about the new literacies of online reading comprehension? In L. Rush, J. Eakle, & A. Berger (Eds.), *Secondary school literacy: What research reveals for classroom practices* (pp. 37–68). Urbana, IL: National Council of Teachers of English.
- Lewis, C., & Fabos, B. (2005). Instant messaging, literacies, and social identities. *Reading Research Quarterly*, 40(4), 470–501. doi:10.1598/RRQ.40.4.5
- Lohnes Watulak, S., & Kinzer, C.K. (2013). Beyond technology skills: Toward a framework for critical digital literacies in pre-service technology education. In J. Ávila & J.Z. Pandya (Eds.), *Critical digital literacies as social praxis: Intersections and challenges* (pp. 127–153). New York: Peter Lang.
- Manguel, A. (1996). *A history of reading*. New York: Viking.
- Mathews, M. (1966). *Teaching to read: Historically considered*. Chicago: University of Chicago Press.
- Matteucci, N., O'Mahony, M., Robinson, C., & Zwick, T. (2005). Productivity, workplace performance and ICT: Industry and firm-level evidence for Europe and the US. *Scottish Journal of Political Economy*, 52(3), 359–386. doi:10.1111/j.0036-9292.2005.00349.x
- McDonald, S., & Stevenson, R.J. (1996). Disorientation in hypertext: The effects of three text structures on navigation performance. *Applied Ergonomics*, 27(1), 61–68. doi:10.1016/0003-6870(95)00073-9
- McEaney, J.E., Li, L., Allen, K., & Guzniczak, L. (2009). Stance, navigation, and reader response in expository hypertext. *Journal of Literacy Research*, 41(1), 1–45. doi:10.1080/10862960802695081
- McKenzie, J. (2001). *Planning good change with technology and literacy*. Bellingham, WA: FNO.
- Metzger, M.J., & Flanagin, A.J. (Eds.). (2008). *Digital media, youth, and credibility*. Cambridge, MA: MIT Press.
- Minister of Manitoba Education, Citizenship, and Youth. (2006). *A continuum model for literacy with ICT across the curriculum: A resource for*

- developing computer literacy. Retrieved from [www.edu.gov.mb.ca/k12/tech/lict/resources/handbook/index.html](http://www.edu.gov.mb.ca/k12/tech/lict/resources/handbook/index.html)
- Mishra, P., & Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. doi:10.1111/j.1467-9620.2006.00684.x
- Murphy, S.M. (1986). Children's comprehension of deictic categories in oral and written language. *Reading Research Quarterly*, 21(2), 118–131. doi:10.2307/747840
- National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*. Washington, DC: Authors.
- National Research Council. (2001). *Knowing what students know: The science and design of educational assessment*. Washington, DC: National Academy Press.
- New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60–92.
- New London Group. (2000). *Multiliteracies: Literacy learning and the design of social futures*. London: Routledge.
- O'Brien, D., Beach, R., & Scharber, C. (2007). "Struggling" middle schoolers: Engagement and literate competence in a reading writing intervention class. *Reading Psychology*, 28(1), 51–73. doi:10.1080/02702710601115463
- O'Brien, D., & Scharber, C. (2008). Digital literacies go to school: Potholes and possibilities. *Journal of Adolescent & Adult Literacy*, 52(1), 66–68. doi:10.1598/JAAL.52.1.7
- O'Byrne, W.I. (2011). *Facilitating critical evaluation skills through content creation: Empowering adolescents as readers and writers of online information*. Unpublished doctoral dissertation, University of Connecticut, Storrs.
- O'Byrne, W.I., & McVerry, J.G. (2009). Measuring the dispositions of online reading comprehension: A preliminary validation study. In K.M. Leander, D.W. Rowe, D.K. Dickinson, M.K. Hundley, R.T. Jimenez, & V.J. Risko (Eds.), *58th yearbook of the National Reading Conference Yearbook* (pp. 362–375). Oak Creek, WI: National Reading Conference.
- Organisation for Economic Co-operation and Development. (2011). PISA 2009 results: Students on line. *Digital technologies and performance* (Volume VI). Available from [dx.doi.org/10.1787/9789264112995-en](http://dx.doi.org/10.1787/9789264112995-en)
- Organisation for Economic Co-operation and Development & the Centre for Educational Research and Innovation. (2010). *Trends shaping education 2010*. Paris: OECD.
- Page, S.E. (2007). *The difference: How the power of diversity creates better groups, firms, schools and societies*. Princeton, NJ: Princeton University Press.
- Penuel, W.R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education*, 38(3), 329–348.
- Pew Internet & American Life Project. (2001). *The Internet and education: Findings of the Pew Internet & American Life Project*. Retrieved from [www.pewInternet.org/reports](http://www.pewInternet.org/reports)
- Pew Internet & American Life Project. (2005). *Teens and technology*. Retrieved from [www.pewinternet.org/topics.asp?c=4](http://www.pewinternet.org/topics.asp?c=4)
- Popham, W.J. (2009). Assessing student affect. *Educational Leadership*, 66(8), 85–86.
- Reich, R. (1992). *The work of nations*. New York: Vintage.
- Rouet, J.-F. (2006). *The skills of document use: From text comprehension to Web-based learning*. Mahwah, NJ: Erlbaum.
- Rouet, J.-F., Ros, C., Goumi, A., Macedo-Rouet, M., & Dinet, J. (2011). The influence of surface and deep cues on primary and secondary school students' assessment of relevance in Web menus. *Learning and Instruction*, 21(2), 205–219. doi:10.1016/j.learninstruc.2010.02.007
- Sanchez, C.A., Wiley, J., & Goldman, S.R. (2006). Teaching students to evaluate source reliability during Internet research tasks. In S.A. Barab, K.E. Hay, & D.T. Hickey (Eds.), *Proceedings of the seventh international conference on the learning sciences* (pp. 662–666). Bloomington, IN: International Society of the Learning Sciences.
- Saylor, P., & Kehrnhahn, M. (2003). Teacher skills get an upgrade. *Journal of Staff Development*, 24(14), 48–53.
- Schulz-Zander, R., Büchter, A., & Dalmer, R. (2002). The role of ICT as a promoter of students' cooperation. *Journal of Computer Assisted Learning*, 18(4), 438–448. doi:10.1046/j.0266-4909.2002.002.x
- Silvernail, D.L., & Buffington, P.J. (2009). *Improving mathematics performance, using laptop technology: The importance of professional development for success*. Retrieved from [www.usm.maine.edu/cepare/pdf/Mathematics\\_Final\\_cover.pdf](http://www.usm.maine.edu/cepare/pdf/Mathematics_Final_cover.pdf)
- Silvernail, D.L., & Gritter, A.K. (2007). *Maine's middle school laptop program: Creating better writers*. Gorham: Maine Education Policy Research Institute, University of Southern Maine.
- Silvernail, D.L., & Lane, D. (2004). *The impact on Maine's one-to-one laptop program on middle school teachers and students*. Gorham: Maine Education Policy Research Institute, University of Southern Maine.
- Smith, M.C., Mikulecky, L., Kibby, M.W., Dreher, M.J., & Dole, J.A. (2000). What will be the demands of literacy in the workplace in the next millennium? *Reading Research Quarterly*, 35(3), 378–383. doi:10.1598/RRQ.35.3.3
- Smith, N.B. (1965). *American reading instruction*. Newark, DE: International Reading Association.
- Spires, H.A., & Estes, T.H. (2002). Reading in Web-based learning environments. In C.C. Block & M. Pressley (Eds.), *Comprehension instruction:*

- Research-based best practices (pp. 115–125). New York: Guilford.
- Spires, H.A., Hervey, L., & Watson, T. (2012). Scaffolding the TPACK framework in reading and language arts: New literacies, new minds. In C.A. Young & S. Kadjer (Eds.), *Research on technology in English education* (pp. 33–61). Charlotte, NC: Information Age.
- Spires, H.A., Zheng, M., & Pruden, M. (2011). New technologies, new horizons: Graduate student views on creating their technological pedagogical content knowledge (TPACK). In K. Moyle & G. Wijngaards (Eds.), *Student reactions to learning with technologies: Perceptions and outcomes* (pp. 23–41). Hershey, PA: IGI Global.
- Squire, K. (2008). Open-ended video games: A model for developing learning for the interactive age. In K. Salen (Ed.), *The ecology of games: Connecting youth, games, and learning* (pp. 167–198). Cambridge, MA: MIT Press.
- Squire, K. (2011). *Video games and learning: Teaching and participatory culture in the digital age*. New York: Teachers College Press.
- Steinkuehler, C. (2006). Massively multiplayer online videogaming as participation in a Discourse. *Mind, Culture, and Activity*, 13(1), 38–52. doi:10.1207/s15327884mca1301\_4
- Street, B. (1995). *Social literacies*. London: Longman.
- Street, B. (2003). What's new in new literacy studies? *Current Issues in Comparative Education*, 5(2), 1–14.
- Sundar, S.S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M.J. Metzger & A.J. Flanagin (Eds.), *Digital media, youth, and credibility* (pp. 73–100). Cambridge, MA: MIT Press.
- Sutherland-Smith, W. (2002). Weaving the literacy web: Changes in reading from page to screen. *The Reading Teacher*, 55(7), 662–669.
- Taboada, A., & Guthrie, J. (2006). Contributions of student questioning and prior knowledge to construction of knowledge from reading information text. *Journal of Literacy Research*, 38(1), 1–35. doi:10.1207/s15548430jlr3801\_1
- Tillman, H.N. (2003). *Evaluating quality on the Net*. Retrieved September 14, 2009, from www.hopetillman.com/findqual.html
- Traut, G., & Kazzazi, K. (1996). *Dictionary of language and linguistics*. New York: Routledge.
- Unsworth, L. (2008). Multiliteracies and meta-language: Describing image/text relations as a resource for negotiating multimodal texts. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research on new literacies* (pp. 377–405). Mahwah, NJ: Erlbaum.
- U.S. Department of Commerce, Economic and Statistics Administration & National Telecommunications and Information Administration. (2002). *A nation online: How Americans are expanding their use of the Internet*. Washington, DC: Author.
- van Ark, B., Inklaar, R., & McGuckin, R.H. (2003). ICT productivity in Europe and the United States: Where do the differences come from? *CESifo Economic Studies*, 49(3), 295–318. doi:10.1093/cesifo/49.3.295
- Wallace, R.M., Kupperman, J., Krajcik, J., & Soloway, E. (2000). Science on the Web: Students on-line in a sixth-grade classroom. *Journal of the Learning Sciences*, 9(1), 75–104. doi:10.1207/s15327809jls0901\_5
- Walsh, M. (2010). Multimodal literacy: What does it mean for classroom practice? *The Australian Journal of Language and Literacy*, 33(3), 211–239.
- Warschauer, M. (2006). *Laptops and literacy: Learning in the wireless classroom*. New York: Teachers College Press.
- Wyatt-Smith, C., & Elkins, J. (2008). Multimodal reading and comprehension in online environments. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research on new literacies* (pp. 899–942). Mahwah, NJ: Erlbaum.
- Zawilinski, L. (2011). *An exploration of a collaborative blogging approach to literacy and learning: A mixed method study*. Unpublished doctoral dissertation, University of Connecticut, Storrs.
- Zhang, S., & Duke, N.K. (2008). Strategies for Internet reading with different reading purposes: A descriptive study of twelve good Internet readers. *Journal of Literacy Research*, 40(1), 128–162. doi:10.1080/10862960802070491