ENGAGING THE ADOLESCENT LEARNER

BY DOUGLAS FISHER AND NANCY FREY

Building Information and Communication Technology Skills Through Literacy
So states William Gibson, noted cyberpunk author, in 2003.

Technological innovations are rapidly changing the way educators teach and assess. This certainly isn’t news. From futurists like Buckminster Fuller who wrote of the interactions between language and design, to the burgeoning new literacies research (e.g., Coiro, Knoebel, Lankshear, & Leu, 2008), educators have long understood that digital, multimedia, and communication technologies shape our practice. For decades, teacher preparation standards have required that candidates demonstrate mastery of current technological tools. (One of our retired colleagues recalled that her educational technology final in 1970 required that she be able to thread a 16-millimeter projector in the dark to show that she could repair a broken film.) Likewise, state academic content standards have long contained language about student use of such tools.

From Tools to Functions

Understanding of technology has deepened in this century, especially in moving beyond relatively shallow discussions of tools. Instead, educators have come to understand that although the development of new tools occurs at an overheated rate no one could keep up with, they are better served by making technology decisions on the basis of the usefulness of the tools as they relate to specific functions: (a) finding information, (b) using information, (c) producing information, and (d) sharing information (Frey, Fisher, & Gonzalez, 2010).

Walk into a classroom today and you’ll see students and teachers using a wide range of digital tools to accomplish these functions. Students in an English class use search engines to find evidence for debate preparation in English. A world history student writes his notes with a smartpen that will play back the teacher’s lecture later when he touches the pen to the paper. A mathematics teacher demonstrates on a smartboard how to collect and organize the data his students will be gathering for a statistics project. A chemistry teacher communicates with her students via the school’s learning management system about a study guide they can use to prepare for next week’s test.

New Assessments, New Technology Demands

Assessment procedures, however, have largely lagged behind classroom practices. This is especially true of large-scale state assessments, which have remained unchanged for decades. Students bubble in answers in test booklets that are later scanned, and the results are reported back months later, often in the next school year. Written essays are especially torturous for students unaccustomed to extended writing with a pencil or pen. Even those tests that are administered online in testing centers are mostly a digitalized version of paper-and-pencil tasks.

But the announced plans of the two major testing consortia charged with developing instruments aligned with Common Core State Standards highlight innovative testing platforms that are sure to challenge students. Students in member states of the Smarter Balanced Assessment Consortium (SBAC) and Partnership for Assessment of Readiness for College and Careers (PARCC) will take online tests beginning in the 2014–15 school year that will require them to scroll windows, move between windows and tabs, play and pause embedded multimedia, grab and highlight digital text, and toggle back and forth between assessment questions and source documents. They will write constructed responses using the typing function of the device. Desktops and laptops are

"The future is already here—it's just not evenly distributed."
equipped with keyboards, while tablets commonly provide a touch-screen interface, with inherent differences in composing.

The technologies to be used by the SBAC and PARCC assessments are already having an impact beyond the states that have formally adopted the CCSS. The technology architecture and item development contractors working with these consortia also develop other testing instruments used to determine college admissions and placement, as well as other measures of achievement used by non-CCSS states and territories. In all likelihood, the testing platforms will follow a similar path in the next few years. These embedded basic technology skills are cause for concern among educators, who know that proficiency is unevenly distributed across students. While some regularly use the latest devices outside of school, others have only limited exposure or access.

The elephant in the room is that classroom teachers rarely construct opportunities for students to develop these skills in low-stakes situations. Tests are mostly paper-and-pencil tasks or are completed on machine-readable forms. Written projects, while often composed digitally, are printed and physically submitted in the same manner as when the teacher was in school. But these new assessments are reinvigorating discussions in states and territories across the world about the necessity of building students’ technology skills. More important, there is a growing recognition that technology-enhanced instruction is insufficient. If students are to achieve what the Partnership for 21st Century Skills calls the 4 Cs—critical thinking, communication, collaboration, and creativity—then students must have the opportunity to use information and communication technologies (ICTs) as a vehicle for learning.

**Uneven Distribution of Teacher Knowledge**

While most educators report that they believe strongly that ICTs are critical, their use is scattered. A large-scale survey of members of the International Reading Association (IRA) found that participating teachers most often cited student use of digital presentation tools (e.g., PowerPoint) as an example of technology use (Hutchison & Reinking, 2011). This is an example of technology as a supplemental instrument, because the vehicle—standing in front of the classroom to deliver a presentation—is unaltered. Conversely, few participants discussed the use of new forms of digital texts and writing, such as digital storytelling. The latter two are examples of integrated technology, where information and communication skills are transformed into a new form, and therefore occupy a place within the curriculum, not as a supplement to it. In other words, while a smaller number of students are learning in ways that are fundamentally different from the way their teachers learned, many others continue to experience a curriculum that has changed little since the last century.

Education is incrementally moving from technology as a supplemental tool that enhances conventional teaching to a more nuanced view of technology as a fully integrated component of our curricular and assessment practices. In the same way that no one would advocate for the construction of a “pencil lab” where students could work with the tool for 30 minutes once a week, we cannot afford to allow more current technologies to remain underused and limited to only occasional use. In this article, we examine the journey from technology-enhanced practices (e.g., the PowerPoint presentation) to integration of ICTs in the curriculum.

**Moving From Use to Integration**

The use of ICTs occurs across a continuum as teachers progress from conceptualizing technology use as a distinct part of the lesson to an understanding that these can transform learning. Labbo and Reinking (1999, quoted in Hutchison & Reinking, 2011) proposed the following hierarchy to describe the range of teacher knowledge and use:

1. Acquiring digital technology.
2. Employing it to teach conventional instructional goals.
3. Allowing it to transform instruction.
4. Adopting new instructional goals consistent with new forms of reading and writing.
5. Empowering students.

**Developing Information and Communication Technology Skills**

As the conversation is shifting from technology-enhanced instruction to true ICT practices, so too is the understanding of the role ICTs should play in our classrooms. Both of us became teachers at a time when “technology” meant anything with a plug. In other words, it was the device that took precedence. But our dual roles as high school educators and university professors have afforded us an opportunity to interact with students who expect to experience learning in and out of the classroom. There is still a need to master the operation of digital tools, and students need to be
taught how to operate and navigate digital platforms. But that is only the beginning of technology integration. Students must also learn how to make responsible decisions about technology use, and to leverage existing and emerging technologies to develop critical thinking.

In anticipation of these issues, the Fresno County (CA) Office of Education (FCOE) has developed a practical framework for accomplishing these goals. The framework delineates expectations across four grade bands: K–2, grades 3–5, grades 6–8, and finally grades 9–12. FCOE’s framework is further described across two elements: Digital Literacy and Technology Skills. This linkage is at the heart of ICT integration, as it forwards our thinking about the reciprocal relationship between these two concepts. (The entire framework can be downloaded in PDF form at commoncore.fcoe.org/sites/commoncore.fcoe.org/files/resources/FCOE_TechSkills_Flowchart_2012.pdf). These ICT skills call upon us as educators to develop curriculum and instruction such that students attain the critical thinking, communication, collaboration, and creativity skills they will need in college and career. Further, they pair well with the IRA/NCTE position statement on literacies and technology. In the next section, we discuss how digital literacy and technology interact, using the FCOE framework as our organizing structure.

**Digital Literacy: Using the Tools**

Without question, students must develop proficiency with tools that parallels the evolution of their thinking. The basic embedded technology skills related to using software, hardware, and connected networks are usually among the first concerns raised by teachers, especially in locations where new assessments will soon debut. In middle school and high school, these basic operations include keyboarding skills and storage functions such as using external devices and cloud-based applications. In addition, students must have the opportunity to develop word processing skills, especially those that relate to more advanced functions involving document elements such as headers and footers and table of contents.

### Databases

A closer examination of the FCOE framework, though, is a reminder that secondary students should be expected to create and maintain other productivity tools, especially databases and spreadsheets, both of which are ideal for content classrooms. For instance, middle school students in Erika Moline’s social studies class created a simple class database of photographs of significant architectural sites that corresponded to their studies.

“There are lots of pictures out there, especially on existing databases such as Photobucket and Flickr,” she said. “I ask my students to work in small groups to locate important sites as an introduction to our topic of study. When we began our look at ancient China, I asked them to find photographs on these databases for the Great Wall, the Porcelain Tower, and Liaodi pagoda. They compile them and make decisions about naming the files for consistency. They also create tags that will aid in keyword searches.” The database grows throughout the year as Ms. Moline’s students add items. “It’s important that they know how this information is assembled, cataloged, and organized,” she said. “It helps them navigate other information databases when they understand basic principles of how digital information is organized.”

### Spreadsheets

In the science classroom down the hall from Ms. Moline, teacher Albert Caruso fosters similar skills.
for creating spreadsheets. “Our labs lend themselves to spreadsheet development,” he noted. “We’re in a physical science unit right now and students are going to be gathering information related to density in a lab we’ll be doing later today.” The students in Mr. Caruso’s class work as lab partners to track the data they are collecting as they determine the mass and volume of a variety of objects. Using the spreadsheet, they use these values to calculate the density.

“It’s true they can do the same thing with a calculator, but I want them to see how setting up the spreadsheet incorrectly can mess with computing the answer,” said Mr. Caruso. “They compare their spreadsheet answer with the one they got with the calculator. If it’s not a match, they have to troubleshoot the error.” The teacher explained that although the main objective of the lab isn’t about correctly setting up a spreadsheet, it mirrors the work of scientists. “There’s all kinds of great tools you can use, but if you use them incorrectly your results are contaminated. Careful application, checking results—these are all behaviors needed to engage in scientific thought.”

**Web Authoring**

High school teachers often use various web authoring opportunities for their students. It has become much more common for teachers to create blogs and discussion boards, especially as learning management systems such as Haiku and Edmodo have made it easier and more affordable for schools. But these platforms are unidirectional in the sense that the digital space has been developed for them. Students, on the other hand, do not have the chance to create such spaces for others. High school psychology teacher Eric Huang has his students create websites containing content about topics of study such as neurology, child development, personality, and perception: “I am definitely concerned with their ability to synthesize information and construct it in terms that are accessible to a general audience, but I also want them to be conscious of accessibility as it relates to people with disabilities.”

Using the guidelines developed through federal requirements outlined in Section 508 of the Electronic and Information Technology Accessibility Standards, students address how visual, auditory, navigation, and cognitive accessibility can be improved for their websites. Mr. Huang states, “I know they can’t always completely address their accessibility issues, but it makes them more cognizant of these issues. As they move forward in their chosen careers, I hope that these accessibility issues will play a role.”

**Digital Literacy: Responsibility and Ethics**

Dating back to the early days of the Internet when Katie Tarbox was the victim of an online predator (see Katie.com: My Story, 2001), teachers and parents have been concerned that access to digital tools could place students at risk. In addition, the Internet has become a common way to bully others and victims of cyberbullying often experience long-lasting effects of their experiences (Tokunaga, 2010). Accordingly, any system designed to develop students’ skills in the area of digital literacy and technology skills must include a discussion of responsibility and ethics.

**Ethics**

As part of being digital citizens, students must develop an understanding of ethics. They must understand and comply with the acceptable use policies operating in a variety of environments, such as schools versus coffee shops. Responsible educators review their schools’ acceptable use policies annually. More and more schools are framing their technology policies in terms of respectful behavior. Regardless of the specific policy, students must be made aware of the expectations.

**Courtesy** is a code that governs the expectations of social behavior. Each community or culture defines courtesy and the expectations for members of that community or culture. As a learning community, it is our responsibility to define courtesy and to live up to that definition. As a school community, we must hold ourselves and one another accountable for interactions that foster respect and trust. Discourteous
behaviors destroy the community and can result in hurt feelings, anger, and additional poor choices.

In general, courtesy means that we interact with one another in positive, respectful ways. Consider the examples of courteous and discourteous behavior shown in the Table.

In addition to adherence to the acceptable use policies, ethical behavior requires that students respect copyright law and attribute the sources that they use (see our September 2011 article entitled *Plagiarism: Prevention Through Teaching* for additional information). Unlike the introductory lessons about acceptable use, providing students with instruction and then holding them accountable for implementation of these areas requires a concerted and continuous effort.

For example, the students in Carrie Larson’s art history class are reminded of source attribution for each project, and the evaluation rubric Ms. Larson uses contains specific information about in-text citations and referencing. As Ms. Larson noted, “I make sure that every whole-class lesson that I provide my students has all of the correct attributions and sources. For example, when we were focused on portraits, I showed my students some of the many wonderful examples that were provided by the British Museum as part of their digitization project that provides the world with access to over 1 million images (www.flickr.com/photos/britishlibrary). These are now public domain, but I wanted to show my students that I still attributed the source. My think-aloud included some information about where I got the images and how I could show my audience the source, so that they could find more if they wanted.”

### Credibility

In addition to the ethical use of the sources students find, they need to learn to assess the credibility of the source. Although not limited to online information, when students obtain information they should ask themselves about the authenticity, accuracy, appropriateness, and potential bias of the source. In doing so, they will become critical consumers of information and be less likely to fall victim to misleading information. In their biology class, the students in Duane Larkin’s class were introduced to the CARS framework for evaluating sources (see Figure, also www.virtualsalt.com/evalu8it.htm).

Mr. Larkin’s students are expected to include their analysis of each source, using the CARS framework when they submit their papers. Typically, students include a separate page for each major source that they use in their research.

Part of Hamzee’s analysis said, “This site [American Cancer Society] has lots of sources listed, and there are lots of ways to contact them. When I was looking for information about staying cancer free, there were many pages, like the one that says that smoking can cause cancer. The page about “who smokes cigarettes” has information on the bottom that says “last medical review” and “last update.” My one concern about this is that the last medical review was before the last update so there could be misinformation.

<table>
<thead>
<tr>
<th>Table. Examples of Courteous and Discourteous Behavior</th>
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<tr>
<td><strong>Courteous</strong></td>
</tr>
<tr>
<td>• Saying <em>please</em> and <em>thank you</em></td>
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<tr>
<td>• Paying attention in class</td>
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<tr>
<td>• Socializing with friends during passing periods and lunch</td>
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<tr>
<td>• Asking questions and interacting with peers and teachers</td>
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<tr>
<td>• Asking for, accepting, offering, or declining help graciously</td>
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<tr>
<td>• Allowing teachers and peers to complete statements without interruption</td>
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<tr>
<td>• Throwing away trash after lunch</td>
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<td>• Recycling materials and placing all trash in appropriate bins</td>
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<tr>
<td>• Cleaning your own workspace</td>
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<td>• Reporting safety concerns or other issues that require attention to a staff member</td>
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<tr>
<td><strong>Discourteous</strong></td>
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<tr>
<td>• Using vulgar, foul, abusive, or offensive language</td>
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<tr>
<td>• Listening to an iPod during a formal learning situation such as during a lecture or while completing group work</td>
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<td>• Text messaging or talking on a cell phone during class time</td>
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<td>• Bullying, teasing, or harassing others, in person or online</td>
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<tr>
<td>• Engaging in corporal punishment</td>
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<td>• Failing to show up for your scheduled appointments or completing tasks</td>
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<tr>
<td>• Failing to communicate when you’re not coming to school</td>
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on the page that the doctors did not approve.”

**Safety**

As with all aspects of children and youth’s lives and not just their digital life, part of our responsibility is to keep them safe. This means that they must learn how to manage and control their passwords, understand that they should not share personal information online, use safe practices when participating in online communities, including social networks, and maintain oversight of their devices. This is as demanding as all of the other areas because adolescents by and large are risk takers who generally feel that nothing bad will really happen to them. Wise educators model appropriate safety, note breaches in safety, and provide explicit instruction on creating a safe online presence.

For example, as part of their English class, Betsy Alvarado focuses her students’ attention on the consequences of lapses in security and safety. Each week, she selects an article from a new service that highlights what can happen when people are not safe online. One week, the students read the *New York Times* article “Swiped, Stolen and Sold” (topics.blogs.nytimes.com/2008/08/06/swiped-stolen-and-sold/?r=0) in which the police charged 11 people with stealing and selling 40 million credit and debit cards. As part of their lesson, the students in Ms. Alvarado’s class identify the breakdown in security. In this case, it was “sniffer software” that sent data to the hackers every time an infected machine was used.

**Digital Literacy: The 4Cs**

The much-discussed 4Cs (critical thinking, communication, collaboration, and creativity) lie at the heart of what all of us want for our students. Mere replication of information is not enough; we hope that all our learners are moved to action as they consider how today’s information might result in tomorrow’s innovation. This means that students must be adept at gathering information and analyzing it. In addition, they need to apply problem-solving skills to make decisions. All of this happens in the context of human interactions as they communicate and collaborate within and across learning spaces.

**Research**

Student inquiry and research is fueled by digital searches. The days of library card catalog searches are long over. Many of the library skills we learned as students still apply, especially in organizing resources and citing information. But other skills are wholly new, such as locating information digitally within resources, as when students use a keyword search of terms within a document (way better than scrolling pages). Not all research is text based. For instance, science students use probeware to collect and analyze data. Visual arts students gather and analyze photographs, paintings, and sculptures. These and other multimodal research environments are expanding the ways that adolescents are conducting research.

Althea Price’s middle school geography students examined the watershed around their community to understand the impact of proposed development of a new commercial site. “I contacted the county’s environmental impact department and explained that my students might be able to provide some preliminary data for the project,” she explained. Students conducted more conventional research about the locale and consulted documents from the state’s Fish and Wildlife Management offices to understand the flora and fauna on the site.

Using digital cameras, Ms. Price and her students photographed the area and shot video of a small stream running through the property. In addition, they recorded audio field notes of their observations. All of the
Keeping Students Safe

The Alabama Learning Exchange has a lesson for students about identify theft that can be accessed at alex.state.al.us/lesson_view.php?id=29134. In this lesson, students learn to maximize the loss that can come from types of thefts.

I-safe provides information for teacher, parents, and students about Internet safety:

- **RECOGNIZE** techniques used by online predators to deceive.
- **REFUSE** requests for personal information.
- **RESPOND** assertively if you are ever in an uncomfortable situation online. Exit the program, log off or turn off the computer, tell a trusted adult, or call the police.
- **REPORT** to a trusted adult any suspicious or dangerous contact that makes you feel uncomfortable. (www.isafe.org/outreach/media/media_tips)

visual and audio data were geotagged to contextualize the data, and were then compiled into an interactive basemap. This digital basemap was shared with the agency charged with filing an environmental impact study. “Now fast forward two months, and let me tell you my kids were thrilled to see that their geotagged data were used as part of the final report,” she said with a grin. “They got to witness how their learning in turn affects others. Isn’t that what we want for all our students?”

**Problem Solving**

Isn’t this what we want all of our students to be able to do? Unfortunately, in an effort to smooth the learning path, we sometimes remove too many obstacles. Yet without a problem to solve, one fails to get better at problem solving. Students don’t always use technology to resolve problems (sometimes it is as simple as a face-to-face conversation), but at other times we turn to technologies to address a problem. How often, for example, has someone raised a question in a discussion (“What was Ted Williams’s lifetime batting average?”) only to have it answered moments later by a search-savvy friend who knew just where to look?

Many middle and high school students carry a smartphone in their pockets, but are rarely asked to use it. High school English teacher Iris McMahon tries to remember this when a question comes up in class. “You know, 10 years ago we were begging to have a computer for every student. Today we have that, but we tell them not to use their phone. But think about it. They’ve got a computer sitting right there in their backpacks. We just have to be better about how to use it.”

Ms. McMahon teaches Shakespeare as part of her British Literature class, and questions arise all the time. “Boy, do they!” she laughed. “There’s archaic language, unfamiliar social mores, political humor that was contemporary at the time the plays were written, but are lost now. This leads to them regularly being confused.” She noted as an example that they can usually recognize an insult, but occasionally they come across one that they can’t understand. “In Much Ado About Nothing, Beatrice calls Benedick, who she is beginning to like, a ‘clod of wayward marl.’ Now I suppose we could have spent time unpacking that, but instead I asked if someone would look it up on their phone. In 30 seconds, they had their answer,” she said.

Most software programs include a help feature for problem solving, although students may not be practiced at using such supports to resolve issues. “I teach digital animation as part of our graphics design course,” said Paula Taylor. “The program for making stop-motion video is pretty complicated, and when they get stuck they will often turn to me as their first resort.” Ms. Taylor posts a troubleshooting guide on the class learning management system that includes advice on what to do if the images flicker or are blurry, how to address connectivity issues, and how to prevent a shaky camera.

“When they look at me with puppy dog eyes, I ask them if they have consulted the troubleshooting guide. At the beginning of the year, I would say that 9 out of 10 times they didn’t do this,” she said. “But now they’ve gotten into the habit of seeking source information. Most of them now have bookmarked favorite technical sites with user input on common problems. It frees me up to use my time more productively working through those more intractable problems that arise.”

**Communication and Collaboration**

Many teachers host discussion boards and wikis as part of the online component of their course work. In addition, most students have gained familiarity with using web-based collaborative word processing programs like Google Docs. While these communication tools promote collaboration, their functions more often replicate existing tools, albeit in a digital environment. Although important, they alone do not challenge students to engage in the kind of critical thinking needed.
Expanding CCSS-ELA for Digital Literacy

As technologies rapidly unfold, the ways in which educators integrate them into classroom practice will continue to evolve. Drew (2012) proposes that these digital literacy elements be considered as the CCSS-ELA standards evolve:

1. Critically evaluate search tools (Reading: Craft and Structure)
2. Synthesize information and ideas gathered from online searches (Reading: Integration of Knowledge and Ideas)
3. Write in digital environments to exchange information and interact with others (Writing: Range of Writing)
4. Create and participate in online environments (Listening and Speaking: Comprehension and Collaboration)
5. Apply knowledge of digital media structures and language to create, critique, and discuss online texts (Language: Knowledge of Language)

Conclusion

William Gibson was right—the future is already here. The challenge for us as educators is to find ways to keep current with information and communication technologies so that we can integrate them into our curriculum. The task, however, is huge. This is no time to venture out on a solo mission. Professional organizations are more important than ever in this regard. The translation from research to practice is critical and, to be sure, knowledge is built more quickly and efficiently through interactions with others. Consider the ICTs you deployed as you read this article. You may have read it on a screen after downloading it electronically to someone with a shared interest. Efficient and accurate communication of information is essential. And the support we all benefit from through professional organizations like the International Reading Association help us collectively to ensure that innovative literacy practices are not distributed quite so unevenly.
**IRA Resources**


The authors surveyed nearly 1,500 IRA members about their practices regarding the use and integration of information and communication technologies. Participants reported that they had access to the Internet, but not always to the devices needed to use it more consistently. The majority saw ICTs as important for their students, but primarily used it to supplement, rather than drive, instruction. This article is especially informative for technology coordinators as well as school and district technology committee members.


This column explores the idea of using 21st-century mentor texts to guide students in the development of critical literacy. The column focuses on one example from the U.S. presidential election of 2012 to illustrate how teachers might engage students to unpack the socially constructed nature of literacy. The author argues that the changing reading and writing practices of our new literacy landscape require new forms of apprenticeships to help students develop critical lenses to read the world.

ReadWriteThink.org Strategy Guide: Reading Online (Grades 6–12): [www.readwritethink.org/professional-development/strategy-guides/reading-online-30096.html](http://www.readwritethink.org/professional-development/strategy-guides/reading-online-30096.html)

This strategy guide is part of RWT’s Teaching with Technology series. Developed by Suzanne Linder, a high school teacher-leader, this guide includes a brief research base, strategies in practice, and related resources.


This chapter provides an overview of new literacies and discusses how they might be used to support adolescents’ literacy development. It defines the term and discusses how this construct has changed over time. It provides extended examples of two forms of new literacies—blogging and digital storytelling—to reflect how interactivity and multimodality can be implemented across the curriculum. It offers suggestions for further web-based reading about both forms and considers typical challenges related to integrating them in secondary classrooms. Finally, it suggests areas for future exploration by teachers and researchers of the impact of addressing new literacies in the classroom. Questions to spark reflection and discussion are also provided.