Online Reading Comprehension: Challenges and Opportunities

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In this paper, I will share some of the key things I have learned in my research about the challenges and opportunities encountered when reading for information on the Internet. After defining what I mean by online reading comprehension from a new literacies perspective and how it appears to be different than offline reading comprehension, I will highlight details about four of the biggest challenges for today's learners. These include 1) understanding and becoming proficient with the new literacy skills and practices needed for online research; 2) developing a special kind of digital wisdom that focuses on learning how to learn with the Internet; 3) taking on new roles in a digital culture that expects learners to actively participate and contribute new knowledge as a member of their community; and 4) developing positive attitudes toward using the Internet for academic work.

In the second part of the paper, I will share some examples of how skilled online readers can use the steps of online inquiry to think more deeply about things that interest them; develop a personal voice as they share ideas with others; and work collaboratively to build meaning and new digital products that enable them to make a difference in their world, or matter. Students often tell me how empowered they feel when the things they learn, create, and share with the Internet "matter" to people in the real world outside of their classroom. You can explore the research and resources from this presentation in more depth at http://coiroevidosol.wikispaces.com/

A New Literacies Perspective of Online Reading Comprehension

For several years, I have worked with other members of The New Literacies Research Team here in the United States to better understand what reading on the Internet entails. In our work, we have found that sometimes, students are more literate than their teachers with certain

aspects of using the Internet – especially in terms of using mobile phones and digital media for socializing outside of school. However, much of my research suggests that students require additional skills to be able to read and effectively comprehend information online.

When we think about how best to teach these new skills, it is not enough to put the responsibility on the computer teacher or the librarian. And it is not enough to think that students will develop all of these skills on their own. Instead, I believe it is the responsibility of every reading and writing teacher to find ways to explicitly teach online reading comprehension as an important part of the regular literacy curriculum.

So, now you might be wondering, how does the process of reading comprehension change when you read on the Internet? Our research (Leu, Kinzer, Coiro, Castek, & Henry, 2013) suggests there are at least five ways that reading is different on the Internet, as shown in Figure 1.

First, rather than starting with a book that someone hands you, on the Internet, you often begin with a problem or a question that you type into a search engine, looking for your own texts to learn more or to come up with a solution. As you start looking for texts, there are many more texts to select from than you could find on a shelf in the library, and there are lots of different skills required to use search engines to quickly find what you need.

1. You begin by identifying an important problem.
2. There are new ways of locating information.
3. There are new reasons for critically evaluating information.
4. There are new contexts for synthesizing information that answers your questions.
5. There are new ways of communicating your answers to other people.

Figure 1. How does reading for information change on the Internet?

Once you locate some texts that are relevant, online readers are expected to take on much of the responsibility that editors used to have in printed books. Since anyone with an Internet connection can publish online, it's even more important to make judgments about the quality of the author and the validity of the information. Another way that literacy and learning changes on the Internet is that online readers encounter information in so many different formats (e.g., text, multimedia, images, audio, video). This suggests that new organizational skills and composing practices are needed to synthesize and communicate your message to others in a digital format. Unfortunately, each of these differences presents new challenges for some online readers. Let's take a look at some of these challenges.

Initial Evidence of New Online Reading Comprehension Skills and Strategies

Our new literacies research team has collected data with pretty clear evidence that suggests these online reading skills and strategies are somehow new and different compared to those needed to read and comprehend printed text. In Figure 2, you see a scatterplot of findings from a study we used to measure the relationship between scores on two types of reading assessments (Leu, Castek, Hartman, Coiro, Henry, Kulikowich, & Lyver, 2005). Along the bottom axis, you see the range of scaled scores that 89 seventh grade students received on a state standardized multiple choice comprehension test called the Connecticut Mastery Test (CMT). Along the left axis, you see the range of scores students received on a test of online reading comprehension.

This online reading assessment measured students' ability to locate online information with search engines, critically evaluate the quality of that information, and synthesize and communicate their key findings on a blog. Each of the colored dots represents the relationship between one student's scores on both measures. If offline reading and online reading were the

same, the data points would fall in a positive diagonal line. That is, we would expect a low offline reader to also be a low online reader; an average offline reader to be an overage online reader; and a highly skilled offline reader to be highly skilled online reader.

However, the data points are scattered all over the plot, with virtually no significant relationship between offline and online reading comprehension (r = .19 NS). In fact, the purple dot in the upper left quadrant represents a student who scored the lowest in offline reading, but one of the highest scores in online reading. This surprised us a lot. And, the green dot in the bottom right quadrant represents a reader who received one of the highest scores in offline reading, but one of the lowest scores in online reading. This finding surprised us even more. Together, these findings suggest that something different may be required to read and comprehend information on the Internet than is required to comprehend printed texts.

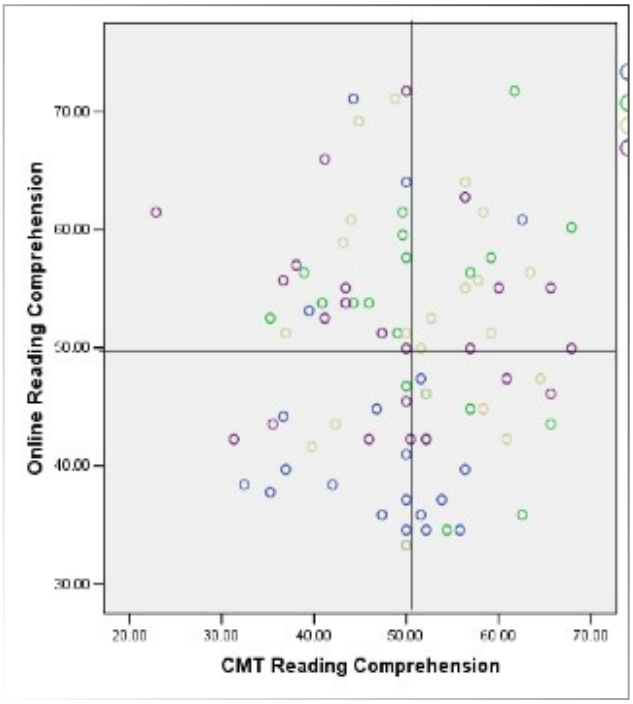


Figure 2. Scatterplot illustrating the correlation between students' scores on a measure of offline reading comprehension (CMT) and online reading comprehension

Additional Evidence of New Online Reading Comprehension Skills and Strategies

Figure 3 shows the results of my dissertation study (Coiro, 2011). In this study, 120 students completed two assessments of online reading and one assessment of offline reading. Participants were 118 ethnically, economically, and academically diverse seventh-grade students (51 males, 67 females) from six middle schools.

For the study, online reading comprehension was assessed through a series of three related information requests. These online information requests were contained within an Internet treasure hunt designed by two fictitious seventh graders, James P. and Natasha R. from Australia, to invite students to use the Internet as part of a cooperative information exchange. Each instrument included 20 open-ended items constructed to measure aspects of reading comprehension while locating, critically evaluating, synthesizing, and communicating online information. The guiding question for the first treasure hunt (ORCA-Scenario I) was "What in the world is carbon monoxide poisoning and why should you be worried about it?" ORCA-Scenario II was framed as James and Natasha's second online science project and required students to learn a few more important things about the respiratory system and the dangers of carbon monoxide poisoning.

Results of a hierarchical regression analysis suggested that, after accounting for students' performance in offline reading comprehension (which predicted 35% of their online reading ability) and their prior knowledge about the topic (which predicted 11% of their online reading ability), 15.4% of the variance in their scores was predicted by these statistically unique aspects of online reading comprehension.

The important point here is that when middle school students read for information on the Internet, online reading skills seem to predict at least 15% above and beyond what they would

typically need to know in order to comprehend printed text. Other studies provide additional evidence that online reading comprehension involves different skills and practices than offline reading comprehension (see Afflerbach & Cho, 2009; Coiro & Dobler, 2007; Hartman, Morsink, & Zheng, 2010; Kingsley, 2010; Coiro, 2011).

Table 1. *Variance in online reading comprehension ability explained by regression of scores on a standardized assessment of offline reading comprehension, a measure of prior knowledge, and an assessment of online reading comprehension*

R^2 Offline Reading Comprehension	Additional R^2 Prior Knowledge	Additional R^2 Online Reading Comprehension	Total R^2
.351*	.074 ^{NS}	.154*	.579*

^{NS} = not significant. ** $p < .05$

In addition to just being new, research also suggests that online reading is much more complex than offline reading. The RAND model of offline reading comprehension (2002) highlights four sets of factors that influence comprehension. These include characteristics of the text, the activity, the reader, and the context. Yet, Hartman, Morsink, & Zheng, 2010) explain how online reading comprehension requires two additional sets of factors, including characteristics of different technologies and different authors (with whom readers interact). This means there are at least six different sets of factors that influence comprehension at each website a reader visits!

Further, because each new click can result in a completely different kind of text and use of technology by a different author that requires different tasks and activities, reading on the

Internet becomes that much more complicated each time the mouse is clicked. These complicated differences are important to think about as more and more students are reading on the Internet for school assignments. We can no longer assume that the students who read well in books will also be the students who read well on the Internet.

What Challenges Do Learners Encounter When They Interact with People and Information Online?

Challenge 1. Developing proficiency with aspects of online reading comprehension

So, what skills do students think are important for being a good online reader? When a higher-performing seventh grade online reader was asked this question, she explained: *"Well, I'd say - concentration…immunity to the rest of the sites once you click on one. And being a good internet searcher - meaning when you know exactly what to click on without having to think twice about it, and when you click on it, it's reliable….I'd say it's about 25% luck, 74% skill, and 1% wit - I really can't understand it all myself but …they mold right into a perfect circle and it works correctly!"*

The key ideas in her explanation suggest that good online readers realize that the same skills and practices that research suggests are important aspects of online reading comprehension are the things they need to be good - locating information efficiently, determining which information is most relevant and also most credible, and then having positive attitudes about online reading (or "wit" as this student calls it) to be flexible and have a sense of humor when things get hard.

Findings from several other studies around the world indicate many students struggle with these same aspects of online reading comprehension such as generating questions (e.g.,

McKenzie, 2005; Rothstein & Santana, 2011); using search engines and navigating web pages (e.g., Henry, 2006; Leu et al, 2005; Walraven et al, 2009), critically evaluating (e.g., Barzalai & Zohar, 2012; Coiro & Coscarelli, 2013; Fabos, 2008; Flanigan & Metzger, 2008; Miller & Bartlett, 2012) and synthesizing information from multiple sources (e.g., Killi, 2012; Rouet, 20006). Typical questions that student struggle with in each phase of online reading are illustrated in Figure 3.

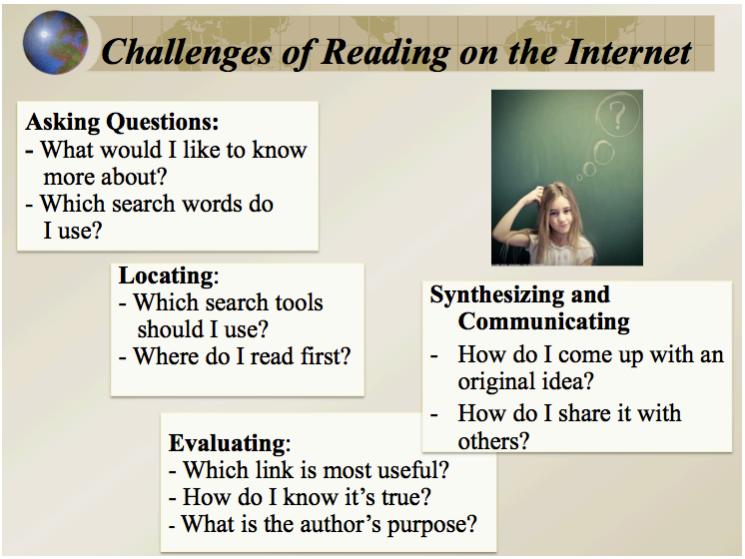


Figure 3. Typical questions students have at each phase of online reading

Just to give you a few more details about what online readers find challenging, consider findings from a recent analysis of student responses on four evaluation items included on the Online Reading Comprehension Assessment (ORCA) (Coiro & Coscarelli, 2013). Open-constructed responses from two sets of four critical evaluation items (a subset of 16 items designed to measure online reading comprehension performance) were compiled from diverse seventh-graders in a representative, two-state, stratified random sample. The sample was

stratified by variables including socioeconomic status, performance on state reading comprehension assessments, and seventh grade enrollment size

These findings show that 18% of 1, 730 students in our diverse sample had difficulty even determining the author of a website. Further, almost 80% of students in our seventh grade sample struggled with each of the other three critical evaluation items, which involved 1) evaluating an author's level of expertise, 2) identifying the author's point of view and one piece evidence that illustrated that point of view, and 3) determining the overall reliability of a website with reasoned evidence to support their decision. (For more details about this study and recommended instructional practices to address these challenges, see http://goo.gl/mgxTGt).

Challenge 2. Developing Digital Wisdom

Other research highlights a second set of learning challenges for students growing up in a digital world. In 2001, Mark Prensky, a popular educational scholar and writer, argued that today's children are more savvy about using technology than adults, because they have grown up in a digital world with technology all around them. He described the younger generation as more savvy "digital natives" and suggested that adults were less savvy "digital immigrants," who were born before most digital technology and trying to figure out how it all works later in life (Prensky, 2001).

However, others (see Bennett, Maton, & Kervin, 2008) debated this idea. These researchers argued that younger learners were indeed more savvy with using digital devices outside of school, but most students greatly overestimated their ability to use digital technologies for academic learning purposes. Since then, Mark Prensky has changed his thinking about digital natives. He has written several books that argue learners of all ages have good ideas to share, but we all need to develop a better digital wisdom that can smartly use technology in many

new situations. Among other things, Prensky (2012a) argues the need to focus our instruction on teaching students how to "learn how to learn" with digital technologies in ways that also make good use of human brainpower.

Challenge 3. Meeting the Demands of a Digital Participatory Culture

Henry Jenkins, a media literacy scholar, describes a third set of challenges in his 2008 white paper titled, "Confronting the Challenges of Participatory Culture: Media Education for the 21st century." Jenkins (2008) argues that today's students can no longer see themselves as passive readers of information. As shown in the slide, students are now expected to use their digital skills for increasingly public roles as media makers, social activists, and contributors to a new knowledge base for their community.

Students are expected to use new technologies to solve problems by working collaboratively, ethically, and in ways that incorporate multiple perspectives. That's a lot of pressure, especially for learners who have limited access to technology outside of school and for those who do not have the support of good teachers to help them learn these digital cultural practices. Jenkins argues that educational policies and teaching practices need to change to better confront the challenges of a digital participatory culture.

Challenge 4. Adjusting to new teaching roles

Finally, before we get to the amazing power of the Internet, a fourth set of challenges for both students and educators involves adjusting to new teacher roles. The most effective teachers of digital literacies work and learn side-by-side with students and they honor the knowledge and experiences students bring from home (Coiro, 2009). In addition, teachers weave in ways of building positive attitudes toward using the Internet for school-related research. This means making time to determine if learners find the Internet valuable and engaging or useless and

frustrating. This also means making time to teach students how their positive (or negative) feelings toward the Internet can actually impact their ability to comprehend information on the Internet.

Research suggests that students who are easily frustrated when they can't find something on the Internet and those who tend to respond with feelings of anger and helplessness do considerably worse when it comes to locating, evaluating, and synthesizing information on the Internet (Coiro, 2012). As educators, we need to think about ways we can support these students and teach them more positive feelings about using the Internet to answer their own questions and solve their own information problems.

What Opportunities Do "Digitally Literate" Learners Encounter When They Interact With People And Information Online?

Now, I hope I haven't frustrated you with so many challenges and left you wondering why we would ever want to focus our teaching on online reading comprehension! The reason is simple – *if* we support students in becoming stronger online readers, the Internet is the perfect place to provide them with *many* exciting opportunities! In the rest of this paper, I will share some ways that skilled online readers can use digital text and tools to think more deeply about topics that interest them, develop a strong personal voice, and work collaboratively in ways that enable them to make a real difference in their communities and perhaps even the world. (To explore these resources on your own, visit http://coiroevidosol.wikispaces.com/).

Opportunities to Wonder and Think Deeply

Mystery photos. Let's begin with ways that the Internet can encourage even the youngest learners to question, wonder, and think more deeply about things. One activity I often

use with students is something called Mystery Photos, like the one shown in the left side of Figure 4. To play the game, ask students to look at the photo and think about what the image might be. Then, think about what evidence in the picture makes them think that. After students have time to talk about their educated guesses, they can visit a website like Jigzone, where they can put together a puzzle of this mystery photo and discover the answer to "What is this?" all by themselves. When they finish the interactive puzzle, they learn that the image is the top part of a crowned crane (see the right side of Figure 4 and the completed puzzle at http://www.jigzone.com/puzzles/C3055D567D1B).

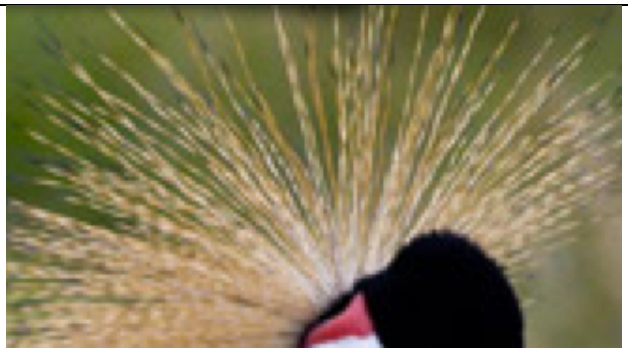
Mystery Photo	Full Image of Photo Revealed
 SOURCE: http://www.sdzsafaripark.org/parkwildlife/crowned_crane.html	

Figure 4. Partial and full images of a crowned crane used in Mystery Photo Activity

After seeing the real picture of a crowned crane, children can meet in small groups to develop some interesting questions they would like to learn more about this animal. Then, they are given time to explore a video and read information about the crowned crane from an age-appropriate San Diego Zoo website called Safari Park (http://www.sdzsafaripark.org/parkwildlife/crowned_crane.html). All of a sudden, without realizing all the literacy skills they are practicing, students become intrigued by this mystery

object and want to read, watch, talk, and share what they've learned with their classmates – which in turns, fosters deeper learning.

Internet inquiry baskets. Once students realize the power of interesting questions, you can continue building a culture of inquiry and wondering with an activity called Internet Inquiry Baskets. Here, children write down all of their questions, one on each card, and put the cards into the basket. At the end of the week (or lesson), the teacher selects a card/question, does some individual research to find information about this question, and comes back to school ready to share with children the steps they took to answer the question.

The point of this activity is not just to send the children to the answers; it's more about teachers modeling and thinking aloud about the strategies they use to use search engines, navigate through websites, and decide which information is most relevant and appropriate for their needs. These websites can be set up in reading and writing centers for children to visit throughout the day. After the teacher models a lesson for the whole class, the child who asked the original question spends time meeting with an adult or peer helper to type up what she learned. The child adds her photo, and her page is published and shared with her classmates, with teachers in the school, or parents at home, or even the local public library.

Figure 5 shows the digital product that four-year-old Justine created, which was published in the class Internet Inquiry Basket journal. At even this young age, children can start to practice important online reading skills like questioning, locating, evaluating, and composing digital texts while participating in their literacy community.

Figure 4. Page from the class journal after Internet Inquiry Basket Activity

Creating digital teaching products. As children get older, the digital products they create can be used to actually teach their friends new things they are learning about in school! For example, take a minute to listen to the homepage video at Club Academia, http://clubacademia.org, a website created by students, for students. In the video, an eighth grader teaches her friends about how to graph points on a number line by comparing each point to positions closer to or further away from a boy she might like. Not only is the student who made the video thinking more deeply about math concepts, she's also building her own personal voice as a teacher (or creative sharer of knowledge)! As you watch the video, consider the important digital literacy skills this student is practicing as she creates and shares this video.

Older students can practice wondering, locating, and synthesizing answers with a 2FerActivity (http://2ferquarterly.org/page/2/). In this activity, students do online research and write a two page analytical essay on a topic of their choice.

Opportunities to develop personal voice

There are also many opportunities for learners to develop their personal voice while developing online inquiry skills. Just a few I shared during my presentation include creating instructional videos and podcasts of how to comment appropriately on a blog (see http://goo.gl/09kFjZ); creating podcasts to practice decoding and fluency skills (see http://hbishop.podbean.com/category/readers-theater/); or, interviewing community members about current news events and publishing their interviews in weekly digital podcasts (see Radio Williow Web at http://mps.mpsomaha.org/willow/radio/shows/Willowcast38.html). The Children's Encyclopedia of Women (http://www2.lhric.org/pocantico/womenenc/womenenc.htm) is a perfect example of how the Internet gives young digital savvy students opportunities to share their new ideas about important women in history while developing a public voice and a new information space on the Internet.

Students can continue to personalize their public voice in forums like Spaghetti Book Club (http://www.spaghettibookclub.org/), where they write and publish their own book reviews, or Teen Ink (www.teenink.com/), where they write, share and critique their own poems, short stories, and other genres of writing.

Opportunities to Collaboratively Build New Knowledge

A third important opportunity the Internet provides is time for students to practice questioning, locating, evaluating, and synthesizing information collaboratively with a partner or in a small group. In this short video of elementary students working together during their online inquiry about ecologically friendly toys (see http://coiroira2013.wikispaces.com/EvanandWilliam), you can see how they build cognitive reading strategies as well as productive social practices for collaborating with a partner while

learning something new. (For more information about this project, visit http://coiroira2013.wikispaces.com/). You can also explore a class collaborative project where students and scientists work together to create projects about animal adaptations with a digital tool called VoiceThread (see https://sites.google.com/a/scc.stanly.edu/voicethread-project/). Scientists, teachers, and students use the VoiceThread tool to interview each other, publish their findings, and share their new knowledge about animals with the global community.

Even in poor rural communities, the Internet provides so many opportunities to learn, share, and build community knowledge. Be sure to later explore the short video to see for yourself how the Internet has changed a community in India as part of Sugata Mitra's Hole in the Wall Project (http://goo.gl/pzXrTv).

Opportunities to Make a Difference

Finally, the last, and probably most important opportunity the Internet provides is a chance for both younger and older students to matter in ways that make a small or big difference in their world. Take, for example, my colleague Renee Hobb's work on her Powerful Voices project (http://powerfulvoicesforkids.com/). Here, young children work collaboratively to employ the Internet, digital tools, and their own human compassion to investigate topics they find important. In one project, you can view a digital cartoon book published by a group of young children as a culminating project after walking by a homeless person sleeping on a park bench.

The group wanted to know how they could help, so the teacher engaged the children in a week-long inquiry process back in their classroom. The teacher conducted lessons in online research, interviewing skills, and digital composition and students worked collaboratively to

publish a multi-page story about ways that people could help meet the needs of homeless people in their community. These young learners really felt empowered by their civic engagement and digital literacy skills!

As children get older, collaborative online projects like Global Schoolnet's Doors to Diplomacy (http://www.globalschoolnet.org/gsndoors/) encourage middle and high school students to conduct research and produce web-based products that teach about the importance of international affairs and diplomacy. Another popular way for students to have their voice heard digitally in ways that matter involves creating short, video-based public service announcements like those you might find at http://studentpsa.com/psa/

All of these experiences help students build the confidence, skills, and experiences they need to be active, digitally savvy global citizens. As the Annual Google Science Fair competition suggests, our job is to prepare students to be curious and caring, read competently in offline and online spaces, and create innovative products that can truly change the world (see https://www.googlesciencefair.com/en/).

So, now we have come full circle. First, you learned about four of the biggest challenges for today's learners and online readers. Then, you learned about the exciting things that students can do once they are digitally competent. There are so many more things to learn about online reading comprehension and I invite you to join me in the journey and to share what you learn with the larger online community. Thank you for the opportunity to share my research with you.

References

Barzilai, S., & Zohar, A. (2012). Epistemic thinking in action: Evaluating and integrating online sources. *Cognition and Instruction*, *30*(1), 39–85.

Bennett, S., Maton, K. & Kervin, L. (2008). The digital natives debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775-786.

Bilal, D. (2000). Children's use of the Yahooligans! Web search engine: I. Cognitive, physical, and affective behaviors on fact-based search tasks. *Journal of the American Society for Information Science*, *51*(7), 646–665.

Bilal, D. (2001). Children's use of the Yahooligans! Web search engine: II. Cognitive and physical behaviors on research tasks. *Journal of the American Society for Information Science and Technology*, *52*(2), 118–136.

Coiro, J. (2007). *Exploring changes to reading comprehension on the Internet*. Unpublished doctoral dissertation, University of Connecticut. Storrs, CT.

Coiro, J. (2009). Promising practices for supporting adolescents' online literacy development. In K.D. Wood and W.E. Blanton (Eds.). *Literacy instruction for adolescents: Research-based practice (pp. 442-471)*. New York, NY: Guilford Press.

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. (2012, April). Digital Literacies: Understanding dispositions toward reading on the Internet. *Journal of Adolescent and Adult Literacy,* 55(7), 645-648.

Coiro, J. & Coscarelli, C. (2013, December). *Investigating criteria seventh-graders use to evaluate the quality of online information*. Symposium presented at the 63rd annual meeting of the Literacy Research Association, Dallas, TX.

Coiro, J., Castek, J., Sekeres, D., & Guzniczak, L. (2014). Comparing third, fourth, and fifth graders' collaborative interactions while engaged in online inquiry. *Journal of Education*.

Castek, J., Coiro, J., Guzniczak, L., & Bradshaw, C. (2012). Examining peer collaboration in online inquiry. *The Educational Forum, 76(4), 479-496*.

Eagleton, M. B., & Guinee, K. (2002). Strategies for supporting student Internet inquiry. *New England Reading Association Journal*, *38*, 39–47.

Fabos, B. (2008). The price of information: Critical literacy education and today's Internet. . In J.Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), Handbook of research on new literacies (pp. 839-870). New York: Lawrence Erlbaum.

Flanagin, A.J., and Metzger, M. (2008) Digital Media and Youth: Unparalleled Opportunity and Unprecedented Responsibility. *In M.J. Metzger & A. J. Flanagin (Eds.) Digital Media, Youth, and Credibility: The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning*. (pp. 5–28). Cambridge, MA: The MIT Press.

Forzani, E. & Burlingame, C. (2012). *Evaluating seventh grade students' ability to critically evaluate online information*. Paper presented at the annual meeting of the Literacy Research Association, San Diego, CA.

Hagerman, M.S. (in progress). *The impact of Online Synthesis Instruction (OSI) on adolescents' ability to construct an integrated understanding of science topics from multiple Internet texts*. (Unpublished Doctoral Dissertation). Michigan State University: East Lansing, MI.

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, NY: Guilford Press.

Henry, L. A. (2006). SEARCHing for an Answer: The Critical Role of New Literacies While Reading on the Internet. *The Reading Teacher*, *59*(7), 614–627.

Jenkins, H. (2010). *Confronting the challenges of participatory culture: Media Education for the 21st Century*. McArthur Foundation.

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. Leu (Eds.), Handbook of research on new literacies (pp.241-266) New York: Lawrence Erlbaum.

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Donald J. Leu, Jr., Charles K. Kinzer, Julie L. Coiro, and Dana W. Cammack. *Theoretical models and processes of reading* (pp. 157 –1613). Newark, DE: International Reading Association.

Leu, D. J, Castek, J., Hartman, D., Coiro, J., Henry, L., Kulikowich, J., Lyver, S. (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. Available online at 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 Cathy Collins Block, Sherri Parris, & Peter Afflerbach (Eds.). *Comprehension instruction: Research- based best practices*. New York: Guilford Press.

Leu, D. J., Jr., Kinzer, C.K., Coiro, J., Castek, J. & Henry, L. A. (2013). New literacies: A dual-level theory of the changing nature of literacy, instruction, and assessment. In R.B. Ruddell & D. Alvermann (Eds.), *Theoretical Models and Processes of Reading*, Sixth Edition, Newark, DE: International Reading Association.

McKenzie, J. (2005). *Learning to question to wonder to learn*. Bellingham, WA: FNO Press.

Miller, C. & Bartlett, J. (2012). 'Digital fluency': Toward young people's critical use of the Internet. *Journal of Information Literacy, 6*(2), 35-55.

Prensky, M. (2001). *Digital natives, digital immigrants*. On the Horizon: MCB University Press. 9(5). 1-6.

Prensky, M. (2012a). *Brain gain: Technology and the quest for digital wisdom*. New York, NY: Palgrave McMillan.

Prensky, M. (2012b). *From digital natives to digital wisdom: Hopeful essays on education*. Corwin Press.

Rothstein D. & Santana. L. (2011). *Make just one change: Teach students to ask their own questions*. Cambridge, MA: Harvard Education Press.

Rouet, J.-F. (2006). *The skills of document use: From text comprehension to web-based learning*. Mahwah, NJ: Lawrence Erlbaum Associates.

Sevensma, K. (2013). *Negotiating new literacies in science: An examination of at-risk and average-achieving ninth-grade readers' online reading comprehension strategies*. (Unpublished Doctoral Dissertation). Michigan State University: East Lansing, MI.

Sutherland-Smith, W. (2002). Weaving the literacy web: Changes in reading from page to screen. *The Reading Teacher, 55,* 662-669.

Walraven, A., Brand-Gruwel, S., & Boshuizen, H. P. (2009). How students evaluate information and sources when searching the World Wide Web for information. *Computers & Education*, *52*(1), 234–246.

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*, 128–162.