ENGAGING ALL STUDENTS IN INTERNET RESEARCH AND INQUIRY

Bernadette Dwyer

Approximately 45% of the world's population is now online (Internet World Stats, 2015). Concerns remain about equality of opportunity in access to digital technologies depending on geographical location (Livingstone & Bulger, 2013), socioeconomic status (Hargittai & Hinnant, 2008; Leu et al., 2015), and diversity of needs (Dalton & Proctor, 2008; Dwyer, 2013b). Nevertheless, we are indeed the connected generation. For example, in the Internet Trends survey, 87% of young people reported that their smartphone "never leaves my side" (Meeker, 2015).

Many of our students are engaging successfully with digital technologies in their out-of-school daily lives (Alvermann, 2008). Many are masterful at creating live stories and connecting on social media like Instagram, Snapchat, and Facebook. Some are skilled at generating, composing, and remixing videos for YouTube. However, research suggests that the prowess attributed to young people as a tech-savvy homogeneous population is misguided and that many of our students are struggling to use the Internet and other digital technologies in complex online environments for academic purposes. In general, students rarely engage in Internet research in a planful manner and adopt a mainly consumerist and minimalist approach in seeking online information. In addition, they have few strategies to locate information online and seldom evaluate the reliability of the information they find. Moreover, many students lack the persistence and resilience to avoid the disorientation experienced by readers in an online environment (Bennett, Matton, & Kervin, 2008; Ito et al., 2009; Leu, Kinzer, Coiro, Castek, & Henry, 2013; University College London CIBER Group, 2008; Williams & Rowlands, 2007). The danger with the "digital natives" assumption is that

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it gives policymakers and educators a misguided impression of the digital capabilities of our students—a "they know more than we do" notion. This suggests a free pass not to create the instructional contexts necessary to integrate technology into the curriculum in meaningful ways or to nurture the skills, strategies, dispositions, and social practices that students need to use the Internet and other digital technologies as tools for literacy and learning.

Digital learning environments offer a myriad of possibilities and scaffolds to support all students through customizable multimodal supports that are flexible and responsive to readers' and writers' needs (Rose & Meyer, 2002). The International Reading Association (IRA, 2009) urged educators to integrate digital technologies into the class curriculum to prepare students for learning in the 21st century. While some teachers are experiencing success at integrating technology into the curriculum in meaningful ways, many are not (Hutchinson & Reinking, 2011). Teachers are struggling to use digital technologies to transform and deepen learning; to challenge and engage students; to nurture student creativity; and to develop skills in communication, critical evaluation, and collaboration. In large part, this is because of a "build it and they will come" approach, a belief that educational improvement will follow merely by investing in technologies in schools without any real vision or clarity about the goals of so doing. Making

technologies available is necessary but not sufficient for meaningful integration into a curriculum to deepen learning. We need to view technology as a tool for literacy and learning. We need to build a curriculum that reflects three elements: the content we are teaching, the pedagogies we are using, and the appropriate use of digital technologies (Mishra & Koehler, 2006).

In this article, I will discuss ways to build instructional contexts that engage and scaffold our students to develop online reading comprehension and Internet inquiry and research skills. First, let's consider the changes to reading when you move from printed page to screen.

The Online Reader as an Assembler, Fixer, Builder, and Responder

Successful online and offline reading share a number of key skills, such as rapid decoding and word recognition to aid reading fluency, and specific strategies like monitoring understanding, identifying and locating information, and evaluating text (Afflerbach & Cho, 2009; Presley & Afflerbach, 1995). However, reading online introduces new challenges for the reader and requires deeper levels of higher order processing skills, strategies, practices, and dispositions to enable students to do the following:

- **Explore:** To navigate and read on the Web

- **Build:** To create and write for the Web
- **Connect:** To participate and collaborate on the Web

(For more details, see the Web Literacy Map cited in Dalton, 2015: https://teach.mozilla.org/teach-like-mozilla/web-literacy/.)

For the last decade, I have been working with teachers and students in classrooms to build online reading comprehension and Internet inquiry skills. Analysis of many hours of captured online screen reading and Internet inquiry activity and observations in these classrooms has led me to consider the online reader using the metaphors of Assembler, Fixer, Builder, and Responder (Dwyer, 2010, 2013a; drawing on Pearson, 2009).

The online reader as an *Assembler* creates unique pathways through a nonlinear, dynamic, multimodal, opportunistic reading information space. Unlike the environment of the printed book, where text is bounded within the covers of the book, the online reader must assemble potential texts to be read while concurrently avoiding distractions like advertisements. In addition, the reader as Assembler must unpack the hidden content in hyperlinks using heightened inferencing skills (Coiro & Dobler, 2007).

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As a *Fixer*, the online reader must display dispositions like flexibility, habits of mind, self-regulation, persistence, and resilience to avoid the cognitive disorientation and overload often experienced in an online environment (Spiro, Coulson, Feltovich, & Anderson, 2004). The online reader as Fixer is involved in strategic, active, metacognitive decision-making processes while making intertextual links (Hartman, 1995) across multiple websites and multiple modes of representation (including text, audio, visual, and video).

As a *Builder*, the online reader needs to activate and fuse a broad range of prior knowledge sources with speed and efficiency in order to gather, sift, update, and synthesize information. These sources include knowledge of online information text structures (e.g., hyperlinks and menus), navigational skills (e.g., activating browser features and navigating across screens), domain and topic knowledge, and world knowledge, often referred to as common sense knowledge. Reading online introduces the possibility of rapidly updating prior knowledge with new knowledge on the hoof in the malleable moments of online research.

Finally, given that anyone can publish to an online forum, the online reader as a *Responder* must act as a gatekeeper, curator, and editor of online information. This calls for heightened levels of critical thinking, critical evaluation, and media literacy skills. The online reader must assess the credibility, authority, reasonableness, believability, and applicability of information as well as the author's agenda in relation to his or her inquiry purpose.

> *"To engage students in online inquiry and research, you need to create authentic, inquiry-based cross-disciplinary units centered on carefully designed and compelling real-world issues."*

Strategies for Teaching Online Reading Comprehension and Internet Inquiry Skills

How can we support students in developing online reading comprehension and the research and inquiry skills they need in a complex online environment? The sections that follow discuss some key principles and instructional contexts to scaffold Internet research and online comprehension skills in the areas of creating authentic inquiry-based learning units, digging deeper with questioning skills, assessing online skills, scaffolding key stages of the Internet inquiry cycle, and encouraging peer-to-peer collaboration.

Create Authentic Online Inquiry Opportunities: Think Globally, Act Locally

In order to engage students in online inquiry and research, you need to create authentic, inquiry-based cross-disciplinary units centered on carefully designed and compelling real-world issues. For example, Ms. Reilly (all names are pseudonyms), a sixth-grade teacher in Ireland, and her students considered global issues related to sustainable uses of natural resources, such as water, air, food, and energy, on the Challenge-Based Learning website (https://www.challengebasedlearning .org/challenges). In class discussions, students reflected on local issues relating to water conservation and subsequently successfully investigated

ways to reduce water consumption in the school. Placing students in the role of problem solver, through effecting change on a local level, can empower and engage students to build new understanding with real-world issues and with real-world audiences (Duke, Caughlan, Juzwik, & Martin, 2012; Harrison, Dwyer, & Castek, 2014).

Dig Deeper With Student Self-Generated Inquiry Questions

When students generate their own questions in an inquiry-based learning unit, their quest for information is more meaningful because it is derived from their current interest and inquisitiveness. However, given that it is teachers, rather than students, who routinely ask questions in class, asking students to generate their own questions can be challenging. Nurturing situational interest through field trips, experiments, and expert visits can spark interest, deepen curiosity, and encourage students to adopt a questioning stance to formulate deeper levels of questions on the inquiry-based unit topic (Guthrie, 2004). Mr. Lane, a fifth-grade teacher, invited a professional bird guide into the classroom to discuss the importance of birds in the ecosystem. Following the visit, the teacher modeled "I wonder," "what if," and "why" questions to promote a metalanguage around different levels of thin (lower order) and thick (higher order) questions, drawing on well-validated

models like the Question–Answer Relationship model (Raphael & Wonnacott, 1985). In small groups, students generated their own wonder questions, such as "Why do birds need feathers?" "How does an owl's wings help him to catch his prey?" and "Why is the corncrake endangered?" In class discussion, Amy noted that with a "thin question, the answer is right in front of you. A thick question makes you wonder and talk lots and search more." Student-led thick (higher order) questions lead to authentic inquiry goals, influence students' subsequent searching behavior, and contribute to online inquiry that builds more conceptual knowledge (Dwyer, 2010).

Creating online share boards where students can safely share ideas in real time both promotes social learning in classrooms and helps students to dig deeper to create meaningful questions to share with others. Digital tools to promote sharing include Noteapp (https://noteapp.com/), to create online sticky notes, and more sophisticated share spaces such as Diigo (www.diigo.com) and Edmodo (www.edmodo.com).

Observe and Analyze: Assess Students' Strengths and Needs

The Internet inquiry cycle includes key stages that are recursive rather than linear in nature (Dwyer, 2010): planning and focusing on the task goal, generating and revising search terms, investigating search results, locating information, critically evaluating information, and communicating information (see Figure 1). Each stage involves a number of skills and strategies (see Figure 2, with suggested digital resources for each stage).
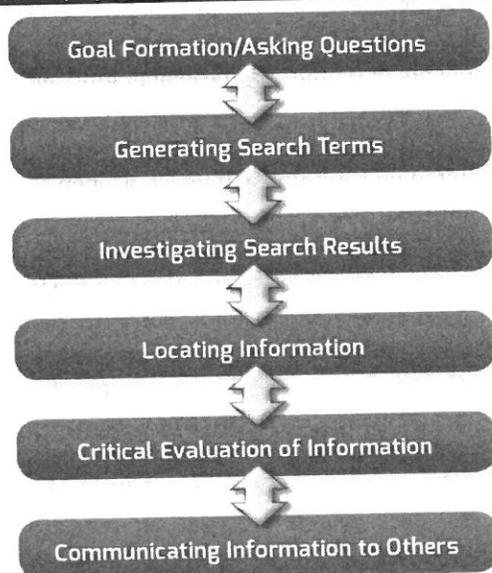
In order to support your students in an online environment, you need to assess their current capabilities in relation to key Internet inquiry stages and skills. You may use informal formative assessment tools as students conduct Internet inquiry. For example, Ms. Ryan, a third-grade teacher in Ireland, uses structured Internet inquiry challenge tasks to observe and assess her students' inquiry skills. She introduced a unit on animals and environmental adaptation by presenting a challenge question: "How do owls hunt at night without bumping into trees?" Student pairs searched on the Internet for 15 minutes to find relevant information. Ms. Ryan observed and recorded the students' online activity with Screencast-o-matic (www.screencast-o-matic.com), a free screen capture software tool that records what is happening on screen in real time.

Ms. Ryan combined her classroom observation with a more detailed analysis of students' online search activity to determine their current strengths and needs in conducting online inquiry throughout the Internet inquiry cycle. This provided a starting point for planning minilessons to support her students. In this case, Ms. Ryan learned that many of the students were successful at generating synonyms to revise search terms. However, they often chose to investigate the first search result displayed, adopting a "snatch and grab" approach. She decided that students required minilessons on how to efficiently skim and scan the search results page. Additionally, students needed help to skillfully investigate both the origin of the information provided in the search result URL and the relevance of the information provided in the search result blurb. Ms. Ryan also used teacher-designed rubrics to encourage self- and peer-assessment of skills and strategies used during Internet inquiry.

Ongoing and periodic informal assessment practices at different stages of the Internet inquiry cycle allow you to monitor the planning, retrieving,

Figure 1   The Internet Inquiry Cycle

Goal Formation/Asking Questions

Generating Search Terms

Investigating Search Results

Locating Information

Critical Evaluation of Information

Communicating Information to Others

Note. From *Using Technology to Improve Reading and Learning* (p. 91) by C. Harrison, B. Dwyer, and J. Castek, 2014, Huntington Beach, CA: Shell Education. Copyright 2014 by Shell Education. Adapted with permission.

Figure 2   Internet Inquiry Cycle: Key Skills and Strategies With Suggested Digital Resources

Internet Inquiry Cycle	Key Skills and Strategies	Digital Resources

Goal Formation/Asking Questions	Asking questions
	  Planning a strategy
	  Anticipating challenges
	  Activating prior knowledge sources
		Concept mapping
		  Webspiration (www.mywebspiration.com)
		  Bubbl.us (https://bubbl.us)
		  Popplet (popplet.com)
		Share board for questions
		  Noteapp (noteapp.com)
		  Edmodo (www.edmodo.com)
		Web literacy map
		  teach.mozilla.org/teach-like-mozilla/web-literacy
		Inquiry-based learning
		  Website examples: galileo.org;
		  .www.challengebasedlearning.org

Generating Search Terms	Generating vocabulary (e.g., synonyms)
	  Monitoring, judging, evaluating, and repairing
		Synonym generation
		  Snappy Words (www.snappywords.com)
		  Visual Thesaurus
		  (www.visualthesaurus.com)

Investigating Search Results	Skimming and scanning results page
	  Navigating and interrogating search results
	  Monitoring and evaluating
		Investigate URL and search result snippet
		  Strategy Tutor from Cast.org (cst.cast.org/cst/auth-login)
		Web monitoring sites for hoaxes
		  Snopes (m.snopes.com)

Locating Information	Determining important ideas
	  Classifying and comparing information
	  Activating online prior knowledge sources
		Locate information
		  Yolink (www.yolinkeducation.com/education)
		  Speech enabled browser, e.g., BrowseAloud
		  (www.browsealoud.com/uk/)
		Annotate and curate information
		  Diigo (www.diigo.com)
		  InstaGrok (www.instagrok.com)

Critical Evaluation of Information	Interpreting information
	  Monitoring and judging relevancy of information
	  Evaluating, corroborating, and verifying information
	  Making connections to self, to other texts,
	  and to the world
	  Critiquing information
		Websites and tutorials
		for critical evaluation
		  Kathy Schrock's Guide to Everything: Critical Evaluation
		  (www.schrockguide.net/critical-evaluation.html)
		  21st Century Information Fluency Project (21cif.com/tools/)
		  Internet Detective (www.vts.intute.ac.uk/detective/)
		  RADCAB (www.radcab.com)

Communicating Information With Others	Summarizing information
	  Synthesizing information
	  Creating a report
	  Remixing information
	  Producing an artifact
	  Communicating information with others
		Collaborative writing platforms
		  PrimaryPad (primarypad.com)
		  Kidblog (kidblog.org/home/)
		Multimodal representation
		  VoiceThread (voicethread.com/products/k12/)
		  Glogster (glogsteredu.edu.glogster.com)
		Communicating with others
		  Wikispaces (www.wikispaces.com)
		  ePals (www.epals.com)
		  iEARN (www.iearn.org)

processing, evaluation, and communication skills and strategies used by your students as they conduct Internet inquiry. The results not only guide your instruction more effectively, but they also help students to monitor their own performance and recognize each other's areas of expertise.

Scaffold Key Stages of the Internet Inquiry Cycle

Analysis of online behavior provides information about where students are in their inquiry process and what kinds of skills, strategies, and dispositions they might need to develop at that phase. For example, students who are *starting out* may need help with generating vocabulary for keyword searches or strategies for skimming and scanning search results. Students who are *stepping up* may need to deepen their skills for how to navigate, locate, curate, and synthesize information presented in multiple modalities across multiple websites.

Figure 3   Online Reciprocal Roles: Navigator, Questioner, and Summarizer

Navigator	Questioner	Summarizer
Which link should we follow?	What are we trying to find out today?	What's the most important information here?
Will we read the blurb under each search result?	How will we pick our keywords? What are our keywords?	Let's skim and scan to see if this website is useful for our question.
Will we scroll down the page?	Are there any other words we could choose for our search term?	What would we tell our friend?

Note. From *Scaffolding Internet Reading: A Study of a Disadvantaged School Community in Ireland* (Unpublished doctoral dissertation), by B. Dwyer, 2010, Nottingham, UK: University of Nottingham. Cited in *Using Technology to Improve Reading and Learning* (p. 150) by C. Harrison, B. Dwyer, and J. Castek, 2014, Huntington Beach, CA: Shell Education. Copyright 2014 by Shell Education. Reprinted with permission.

Finally, students who are *moving on* may require assistance to develop the strategies to critically evaluate online information (see Eagleton & Dobler, 2015; Harrison et al., 2014; Leu, Forzani, & Kennedy, 2015, for specific strategies to support your students).

Encourage Peer-to-Peer Collaboration

Working collaboratively in groups on shared digital devices or platforms during Internet inquiry units permits exchanges of practices and aha moments and allows group members to expand their own individual understanding through discussing, examining, and contesting points of view. A classroom culture that encourages collaboration both shapes and influences how learners make sense of the world around them. However, structuring peer-to-peer collaboration can be challenging in the classroom. Collaboration during Internet inquiry can

be supported through online reciprocal roles such as the Questioner, Navigator, and Summarizer (Dwyer, 2010; Harrison et al., 2014). Students take leadership roles within their groups to pose questions, focus navigational activity, take notes, and synthesize information (see Figure 3 for sample prompt cards). Working with peers allows students to use a comprehensible peer-to-peer language to cascade the expertise and transfer skills during online inquiry (Dalton, 2014).

Collaborative composing platforms such as PrimaryPad (http://primarypad. com/) or VoiceThread (http://voicethread. com/) allow students to build participatory affinity groups (Alvermann, 2009) and to communicate, share, design, and remix ideas during Internet inquiry. Collaboration can also be encouraged across time and space in global communities through literature response blogs (Dwyer & Larson, 2014) and exchange platforms such as ePals

Global Community (www.epals.com) and iEARN (https://collaborate.iearn.org/ spaces).

Final Thoughts: The Role of the Teacher

In this article, I have drawn attention to instructional contexts and key principles to scaffold Internet research and inquiry with students. Working with the Internet and other digital technologies repositions the role of the teacher from the "most knowledgeable other" in the classroom to a co-constructor and co-learner with students. While this represents changes in "ways of thinking, ways of doing, ways of believing" (Young, 2008, p. 352), working in this way with students promotes a mutual interdependence and respect between teacher and student. Do take time to play with the digital tools mentioned in this article, to share ideas in professional learning communities and online discussion forums, and to discuss with colleagues the possibilities for building instructional contexts that integrate these digital technologies in meaningful ways into the curriculum to support and engage your students to develop literacy and learning with the Internet.

[Correction added after online publication on October 30, 2015: A percentage sign was added so that the first line of the article specifies that "Approximately 45% of the world's population is now online."]

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