Teaching Students to Think in the Digital Environment: Digital Literacy and Digital Inquiry

by Barbara Stripling

When I moved from Arkansas to New York City several years ago, I found that one of my biggest challenges was that I just did not listen fast enough. Whole conversations were concluded before I processed the information enough to add a comment. But I learned—new questioning strategies, East Coast vocabulary, the New York City context, and connections between NYC issues and my previous experiences. I learned to listen more strategically, if not faster. These new skills and strategies enabled me to partake of the rich library and education world I have discovered here.

The digital world, much like any new or changing environment, demands an assessment of the situation and development of new ways of thinking or working. School librarians must, therefore, partner with other educators to identify and teach the digital literacy and inquiry skills that will enable all students to be effective digital learners.

"Digital literacy" has been variously defined in the literature, but all definitions agree that it is more than the ability to read and write. Students must be able to gather information from any format and, more importantly, make sense of that information, use it, and communicate it to others.

Digital literacy, itself, is not enough preparation, however, for our students to thrive in today's global, information-driven world. Students must also acquire the skills of digital inquiry: connecting ideas to personal interests and a desire to know, asking questions that probe beyond simple fact gathering, investigating answers from multiple perspectives, constructing new understandings, expressing the new ideas through a variety of formats, and reflecting on both the process and product of learning.

Based on research about constructivist learning and inquiry, I have developed a six-phase model for the inquiry cycle of learning (see Figure 1, page 17) (Stripling 2003).

As can be seen from the model, inquiry is recursive and cyclical, with learners going back and forth between

the phases of inquiry to resolve new questions and complexities as they arise. True inquiry should result in new understandings for learners, but not final answers, because during the process, learners should naturally discover new questions and intriguing areas to pursue in future investigations.

This framework of the inquiry/learning cycle remains the same whether students are using print or digital resources. The characteristics of the digital environment, however, drive the new skills and strategies within the framework that students must develop to become effective 21st-century, digital learners.

Characteristics of the Digital Environment

The digital environment presents both opportunities and challenges to today's learners. Figure 2 (see page 18) suggests some of the yin and yang of the digital world.

Digital Literacy and Inquiry Skills

Given the opportunities and challenges of the digital environment that confront students throughout their digital learning experiences, school librarians must teach digital literacy and inquiry skills at every phase of the inquiry/learning process.

Connect

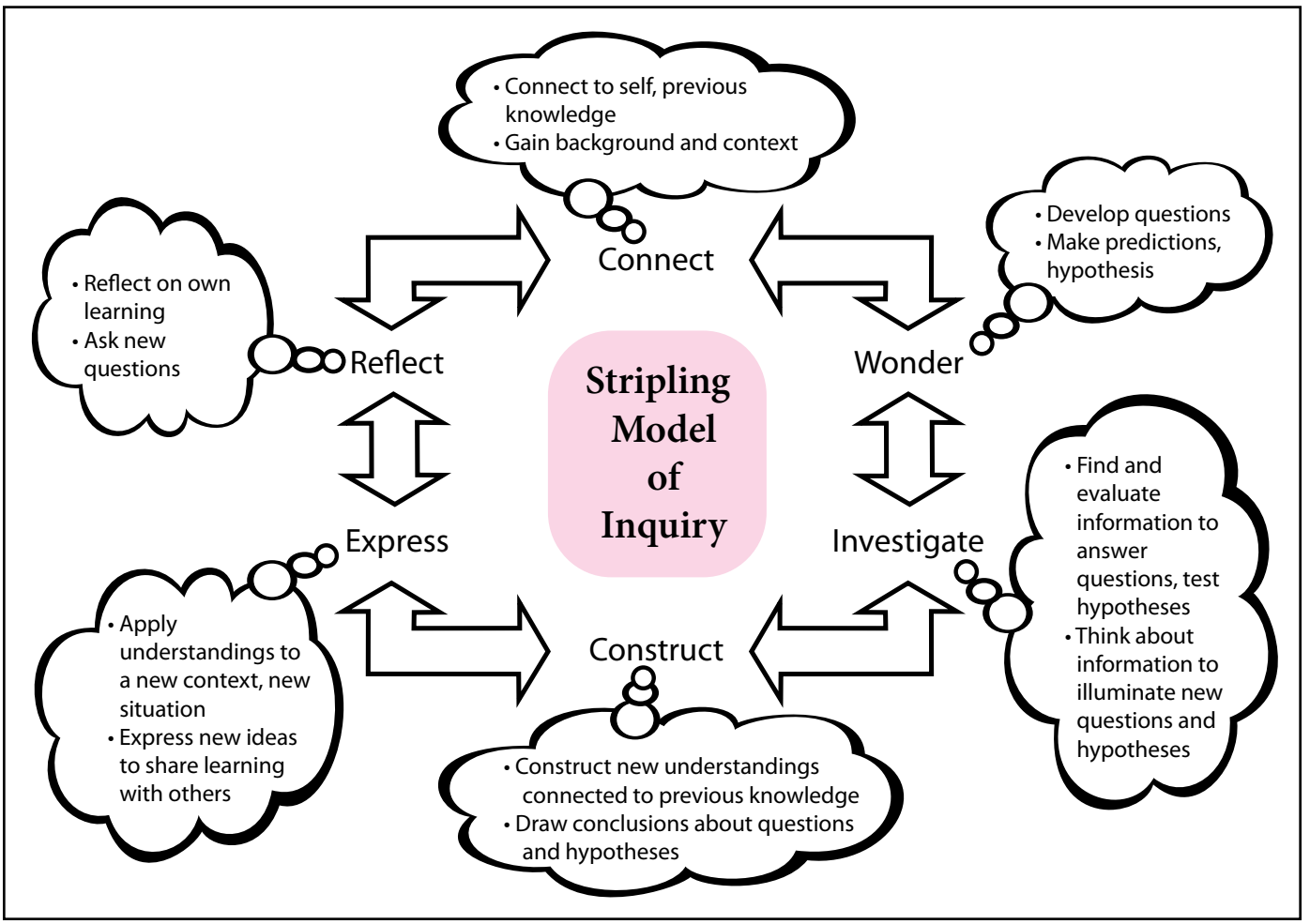
Contextualization. The contextual information (background and overview) needed at the start of any inquiry experience may be difficult to find in the glut of digital information. Online encyclopedias provide general context, topic outlines, specific terms and vocabulary, dates, prominent people's names, and links to definitions and related articles. Students can use overview information to build a list of search terms/vocabulary and to construct schema and cognitive maps to provide contextualization throughout their research.

Focus. Students also have difficulty in maintaining a focus in their inquiry, because they get lost in the multiple small bits of specific information on the Web that are often not connected to larger ideas or themes. The introduction of central themes and big ideas during the Connect Phase helps them maintain focus as they encounter an overabundance of information.

Wonder

Questioning. Students may be provoked to ask higher-level inquiry

Figure 1: Stripling Model of Inquiry



questions if they are confronted with conflicting or surprising evidence. Teachers and librarians can counter the preponderance of descriptive and explanatory information on the Web and scaffold the generation of students' questions by providing provocative and diverse sources as well as teaching students to question the "text."

Investigate

Relational Search Strategies. To help students construct effective search strategies for the Web, librarians need to teach relational thinking rather than hierarchical thinking. Students need to search with specific terms using synonyms, and related concepts, because information is retrieved through links and lateral connections on the Web.

Participatory Organization. The interactive nature of social tools on the Web has produced a related phenomenon of searching called "participatory organization." This occurs when researchers try to overcome the disorganization of the Web by tagging and organizing text and Web sites for their own personal and academic use. They are able to capitalize and build on the tags created by others and find sites that others have deemed helpful.

Sourcing. Sourcing, or determining the authority of sources, is an essential component of digital inquiry. The difficulties of sourcing in the digital environment emerge in the self-publishing world of the Internet. The identity and credentials of the creators of Web-based information are difficult if not impossible to determine on many sites. Because image-intense Web sites are so appealing, a blog may appear as authoritative as a report from the Center for Disease Control. The criteria for evaluating digital sources include authority, purpose, currency, credibility, and perspective.

Corroboration. Corroboration, checking for accuracy and assessing point of view by weighing one source against another, is an important digital inquiry strategy. Students have to learn to challenge and question the information within a source and verify that source by comparing it to information available in other authoritative sources.

Connected Meaning. In the Web environment that favors lateral over linear thinking, students must develop a capacity for connecting meaning between texts, where they link the ideas in one Web site to another, find commonalities and differences among multiple perspectives (Yang 2007), connect new information to their big idea, and find a broad range of related information.

Deep Reading. Deep reading, the reading of text using critical thinking skills to explore the deeper meaning, provides a necessary complement to the connected meaning strategy that leads to breadth rather than depth in information gathering. With such strong pressure from the digital environment to read superficially, students must be taught strategies for critical literacy; they need to learn to question the text, read

Figure 2. Characteristics of the Digital Environment

OPPORTUNITIES	CHALLENGES
Amount of Information	
Information available on practically anything that students want to know Multiple formats and languages Levels from novice to expert	Too much information pressures students toward passive acceptance of whatever they find to avoid an unending search Information accepted if found quickly and easily; little in-depth probing
Organization of Information	
Participatory organization (tagging and organizing text for own personal and academic use) Natural language searching Platform of tagging provided by others	Lack of sequence and hierarchy in information (order has nothing to do with time, place, or even synchrony with researcher's main idea) All information presented with equal importance
Type of Information	
Diverse formats (visual, oral, graphic, video, audio) Diverse types, from personal opinion to research	Specific information with little or no contextualization Lack of general overview information
Access to Information	
Multi-tasking Consolidation of devices—one-stop information access	Pressure for speed Widening digital divide Environment favors access over reflection
Interactive Environment	
Collaboration and shared learning Deepened learning through social interchange of ideas High engagement and participation by all, even the shy or reluctant	Individual voice is lost in group dynamic Ability of individuals to post and publish leading to assumption of authority ("If I said it and it's on the Web, then I must be an expert.")

for analysis, evaluate rather than summarize the text, and read for subtext or implicit meanings (Haas and Flower in Wineburg 2001, 78; Yang 2007).

Media Literacy. Media literacy, the ability to "read" and interpret information presented in visual and oral formats, must be nurtured and taught explicitly. Learners have to develop the skills to counter several dangers: the use of visuals for illustration purposes only; the "graphic seduction" of online visual material resulting in superficial interpretation (Weigel and Gardner 2009); and the positive and negative influence of graphics on critical reasoning (Weigel and Gardner 2009, 38).

Ethical Participation. Ethical participation is difficult for students in today's digital world. The ease with which information can be cut and pasted, the difficulty of tracking down the original author of Web information, and the blurry lines between proprietary and creative commons information result in ethical challenges. Every school should develop a digital citizenship curriculum that is integrated into teaching throughout the school.

Construct

Synthesis. In the hypertext environment, students need to be able to synthesize large amounts of specific bits of information and ideas and weave them into a meaningful whole of substantiated opinions, valid conclusions, and conceptual understanding. Specific strategies must be taught, such as determining the importance of ideas, identifying main ideas and supporting evidence, combining ideas to develop robust arguments, and interpreting ideas in relation to similar and contrasting information.

Finding Patterns and Relationships. Construction of ideas and new understandings in a digital environment requires students to look for patterns and relationships among ideas as they build organizational frameworks and form their own opinions. Online organizational tools can facilitate the thinking process and enable students to collaborate. Librarians must help students discover new connections among ideas rather than mindlessly populating graphic organizer templates.

Development of Own Interpretation or Conclusion. Librarians can teach students strategies to develop their own interpretations and conclusions, such as testing their interpretations against the evidence (Bass and Rosenzweig 1999), applying a decision-making process, and developing a line of argument with points and counterpoints.

Express

Shared Learning. Students must be taught the skills of collaboration to build shared understandings with their peers. New social sharing tools provide templates, tools, and storage space on external servers for students to collaborate during learning and to produce video, audio, graphics, Web sites, and presentations.

Authenticity. The authenticity of digital modes of communication, with application to students' own lives and current world issues, engages and motivates students. The allure of alternative digital forms (e.g., podcasts, wikis), however, may pressure students to present a collage of ideas through a series of links, rather than creating a reasoned, in-depth, coherent whole (Ohler 2009). Librarians can help students create authentic expressions by teaching the skills of digital production and emphasizing the quality of the content.

Creative Thinking. Students can display a high level of creative thinking during the Express Phase as they use digital tools to create their own messages and transform learning from presenting "reports" to creating original and valid presentations.

Reflect

Metacognition and Self-Assessment. The Reflect Phase is about assessing both the process and product of the inquiry. The following criteria for evaluating thinking process skills have been suggested by Richard Paul: clarity, accuracy, precision, relevance, sufficiency, logic, depth, and breadth (Yang 2007). Students must also learn to reflect on the content or product of their learning, assessing how well they clarified concepts and constructed new knowledge.

Role of the School Librarian—Changing the Paradigm

Research on learning in the 21st century is quite clear. Students have to progress beyond being literate about information, and even beyond being able to use information fluently, to being capable of inquiry that generates new understandings. The digital environment presents new opportunities for inquiry-based learning, but it also presents new challenges. School librarians should assert their instructional leadership to guide the administrators, teachers, and students in their schools to 21st-century learning in the digital environment.

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Reflective Questions through the Process of Inquiry

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INQUIRY PHASE: CONNECT

At the beginning of the Connect phase, a student may ask:

- What interests me about this idea or topic?
- What do I already know or think I know about this topic?
- What background information would help me get an overview of my topic?

Before moving to the Wonder phase, a student may ask:

- Do I know enough about the idea or topic to ask good questions?
- Am I interested enough in the idea or topic to investigate it?

INQUIRY PHASE: WONDER

At the beginning of the Wonder phase, a student may ask:

- What intriguing questions do I have about the topic or idea?
- Why am I doing this research?
- What do I expect to find?

Before moving to the Investigate phase, a student may ask:

- Can my question(s) be answered through investigation?
- Will my question(s) lead me to answers that will fulfill my assignment or purpose for research?6

INQUIRY PHASE: INVESTIGATE

At the beginning of the Investigate phase, a student may ask:

- What are all of the sources that might be used?
- Which sources will be most useful and valuable?

- How do I locate these sources?
- How do I find the information within each source?
- How do I evaluate the information that I find?

Before moving to the Construct phase, a student may ask:

- Have I located sources with diverse perspectives?
- Have I found enough accurate information to answer all my questions?
- Have I discovered information gaps and filled them with more research?
- Have I begun to identify relationships and patterns and thoughtfully reacted to the information I found?

INQUIRY PHASE: CONSTRUCT

At the beginning of the Construct phase, a student may ask:

- Have any main ideas emerged from the research?
- Did I find enough evidence to form an opinion or support my thesis?
- What organizational patterns or tools will help me make sense of my information?

Before moving to the Express phase, a student may ask:

- Have I drawn conclusions that are supported by the evidence?
- Have I organized my conclusions and evidence to present them effectively?

INQUIRY PHASE: EXPRESS

At the beginning of the Express phase, a student may ask:

- What type of product or presentation will allow me to present my conclusions and evidence effectively to the intended audience?
- What technology will help me create a product or presentation?
- How will I get help to revise and edit my product?

Before moving to the Reflect phase, a student may ask:

- Have I organized the product/presentation to make my major points and present convincing evidence?
- Does my product/presentation fulfill all the requirements of the assignment?

INQUIRY PHASE: REFLECT

At the beginning of the Reflect phase, a student may ask:

- Is my product/presentation as effective as I can make it?
- How well did my inquiry process go?
- How can I get feedback on my final product to use in my next inquiry project?

Before moving to another assignment or personal inquiry, a student may ask:

- What new understandings did I develop about the topic or idea?
- What did I learn about inquiry?
- What new questions do I now want to answer about the topic or idea?

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