Substantive Searching
Thinking and Behaving
Info-Fluently

By Joyce Valenza

Subject: Information literacy

Grades: 5–12 (Ages 10–18)

Standards: *NETS•S* 3; *NETS•T* II; *NETS•A* II (http://www.iste.org/standards/)

I n my position as a teacher-librarian, I watch students search. Over the past several years, I have grown less satisfied with the results and products of student research, and so have my colleagues. One reason is students' difficulty finding and discerning the best sources to support their research. Settling for what they can find easily, students often have little real idea of what is out there to find.

On a daily basis, in formal and informal ways, I teach students to search. As the online landscape evolved, my own notion of essential searching skills has evolved, too.

I no longer expect students to embrace searching as a science. As a science, it is flawed. The precise searching logic I learned in graduate school—complex search statements resembling mathematical equations with synonyms grouped in parentheses connected by Boolean operators—did not stand the test of time. It did not hold up across emerging search interfaces with their friendly pull-down menus and tabs. And I certainly don't expect students to memorize the many shifting interfaces they are likely to face in a lifetime of information seeking.

Because locating, recognizing, and effectively using information are critical life skills, I expect students to exhibit and embrace several key understandings and larger concepts. I expect them to adopt certain attitudes and behaviors that will serve them their lifetime as information users. These understandings and behaviors resonate across all content areas and across our technology and information literacy standards. They are as useful for creating formal papers as they are for creating thoughtful, interactive media. But in a larger sense, these understandings and behaviors have legs. They give students the power to be better learners for the rest of their lives.
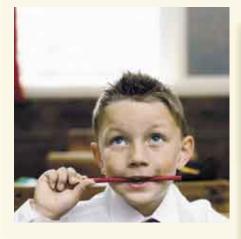
Smart Students Are Not Always the Best Searchers

Why is it that a student who masters such challenges as calculus may not excel at finding information? I've got a few theories.

A know-it-all sense of self-efficacy may present barriers to learning and to seeking the best stuff. The turf on which we ask students to perform academically is the very same turf our students use as their playgrounds and entertainment venues. Though we celebrate student familiarity with the landscape, their transfer of entertainment habits to more serious academic enterprises can present problems.

The Internet has transformed research into a largely independent pursuit. Gone may be the chat a parent would conduct on the car ride to the library or what librarians call the in-person "reference interview," where an information professional intervenes to help a student assess a problem, focus a topic, suggest keywords, suggest a critical book, or recommend the best index or database in which to begin a search. Student independence is something we promote and can celebrate at many points in the research process, but adult intervention is critical. Even the brightest of our 17-year-olds don't know what they don't know (e.g., the keywords associated with a specialized field the historical context for an event, the seminal works or classics in an area of knowledge).

Finally, although teacher-librarians learn searching skills in preservice programs, most classroom teachers do not. As well intentioned as they might be, a large number of educators approach searching without refined knowledge of how to help their students move the best results up to the top of the list, evaluate a works-cited page, guide learners to their search tool options, or gain an awareness of the developmentally appropriate databases available to help students prepare for the research tasks they are

likely to face. And classroom teachers may also not be aware that they have knowledgeable partners, teacher-librarians, who will, every step of the way, help them plan, implement, and assess information-based activities for learners.
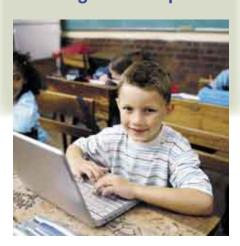
Good Searchers Have Common Abilities and Behaviors

Good researchers not only have specific skills, but also a set of attitudes and behaviors that promote success. In terms of cognitive abilities, the information-fluent student:

- Knows what he or she is looking for
- Realizes he or she has search choices
- Recognizes research holes
- Knows basic strategies for evaluating sources
- Recognizes that searching on the Internet is an interactive, recursive process
- Knows that advanced search screens exist and offer greater searching power
- Knows that there are three main types of searching: keyword, subject/topic, and field searching
- Knows how to think about a query
- Knows when quality matters

Prior Information. It may take some messing around at first, but the info-fluent student has at least some information about the area he or she is researching. This may mean doing some background reading before

Because locating, recognizing, and effectively using information are critical life skills, I expect students to exhibit and embrace several key understandings and larger concepts.

conducting any serious searching. Any thesis-based project requires significant reading and refining before a student can move from topic to question to thesis. The info-fluent student learns to disregard material that does not further his or her question or support his or her thesis.

Search Choices. Once the student has done some background research, he or she must choose where to search for more information. Google rocks, but it is not the only band in town, and it is not always the best place to start. Although it is not likely that a student will recognize the names of more than two or three search tools, the info-fluent student knows that search tools can be organized into clusters or genres, and that different

tools are more effective for different tasks. You may create a search tool page like mine or link to Debbie Abilock's Choose the Best Search for Your Information Need or Laura Cohen's How to Choose a Search Engine or Directory. (**Editor's note:** Find these and other resources on p. 43.)

Among the clusters are:

- Search tools that organize results in helpful ways, such as concept clusters (e.g., Vivisimo) or mind maps (e.g., KartOO)
- Metasearch tools, which search across many search tools at one time (e.g., Ixquick)
- News tools (e.g., Headline Spot, Yahoo! Full Coverage, World News Network)
- Image and media tools (e.g., AP Photo Archive, the Library of Congress's American Memory Collections, Pics4Learning)
- Reference tools such as online dictionaries, quotation databases, encyclopedias, and Today in History sites (e.g., Merriam-Webster Online, World Book, This Day in History)
- Subscription services (e.g., EBSCO-host, GaleNet, WilsonWeb, Facts on File, SIRS, bigchalk)
- Subject-specific search tools (e.g., Scirus, Artchive)
- Portals (e.g., Kathy Schrock's Guide for Educators, Multnomah Homework Center, FirstGov, Internet Public Library)
- Subject directories (e.g., Librarians' Index to the Internet, About.com, Infomine)
- Special tools for children (e.g., Ithaki, Yahooligans!, Searchasaurus, SIRS Discoverer, FirstGov for Kids)

Research Holes. The info-fluent student who is immersed in a topic begins to note the experts and the important books that people cite repeatedly. He or she examines others' bibliographies. Overlooking important people, sources, and concepts would constitute holes in research.

Strategies. The info-fluent student knows that authors' credentials are important, that any cited source ought to be defendable in terms of relevance, timeliness, bias, credibility, accuracy, and reliability. This student knows that free hosting services are likely to raise red flags on works-cited pages. Reliable authors don't usually rely on free services with their ubiquitous advertising. Instead, these authors are typically hosted by museums, universities, and other respected institutions.

The Process. When things don't go well, info-fluent students consider the cause and refine their search strategies. They know a tip or help sheet is readily available within most search tools. They examine and mine their result lists for alternate ideas, words, phrases.
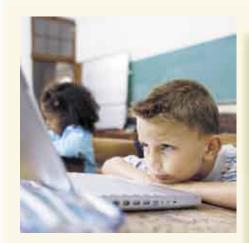
Advanced Searches. The info-fluent student knows that advanced search pages, unlike the general opening search box, allow him or her to limit results by date, by field, for media format, or file format; to more easily use Boolean operators; and to filter problem words, for example, returning only pages that do not contain the word *football* in a search for eagles.

Three Types of Searches. The info-fluent student knows he or she can search in one of three ways (keyword, subject/topic, or field).

Keyword searching allows searchers to combine terms strategically, for instance enclosing phrases in quotation marks to ensure those words stay together (e.g., "vitamin A") or including *and* between words that absolutely need to be included in results.

Topic or subject searching is generally the best strategy when a student is searching one broad concept. Based on a database's controlled vocabulary, searchers can browse through a standardized set of subject terms and subheadings to focus their

Google rocks, but it is not the only band in town, and it is not always the best place to start.

search as suggested by the structure of the database.

In some cases, keywords may be searched within designated fields of a database. For instance, looking for a keyword in a title or abstract, might be more meaningful than looking for that same keyword in an article's full text. Prompts for using keywords and fields successfully are often located in advanced search screens in both subscription databases and on the free Web.

Thinking about Queries. Natural language searching (entering questions as if you were engaging in natural communication) does not give a searcher much power. When a student learns how to construct a query, he or she knows how to formally pose a question to a search box, making use of its syntax, or special language. For instance, "Romeo and Juliet" AND criticism AND Mercutio will return more targeted results than a search for Romeo and Juliet.

Quality. Do I ever do sloppy Google searches? Sure I do, when I am checking on spelling or getting a broad idea of what's out there. But when I know it matters, I create thoughtful queries. I visit specialized databases. I figure out who wrote the documents I find and where they were originally published.

Cognitive abilities won't stick unless they are supported by attitudes and behaviors, habits of mind. The info-fluent student:

- Has a sense of inquiry
- Has a plan
- Has mind tools for organizing materials he or she gathers as well as tools for designing the product
- Is persistent and fussy
- Recognizes when he or she might benefit from consulting an information professional

A Sense of Inquiry. The info-fluent student is curious and develops

exploratory questions out of that curiosity.

A Plan. This student thinks about words. He or she is able to envision a dream document and what words and phrases that document might contain. Time management is key in student planning. Info-fluent students do not back themselves into a time crisis, understanding that good research takes time, and that the process is recursive; it is all about refining, organizing, analyzing, drafting, concluding—about going back.

Mind Tools. The info-fluent student continually looks for information patterns. What buckets does this information fit into? Does it look like a comparison? A chronology? A thesis? A debate? What type of presentation is most likely to be effective?

Persistence and Fussiness. The info-fluent student does not settle for good-enough information, recognizing that the first page of a result list may not contain the best stuff out there. He or she is willing to think about how a search may be improved, refine strategies, and try other search tools. At times, this may mean seeking full text when it is not easily available. If all that appears in a database is an abstract and that abstract is "killer," the info-fluent student will seek the full text, even if it means going to a library, checking another database,

The info-fluent student does not settle for good-enough information.

initiating an interlibrary loan transaction, going to a bookstore, or locating a collection of e-books.

Consulting a Professional. The info-fluent student can put aside any sense of technological arrogance to ask for help. His or her question might have nothing to do with technology. It might, perhaps, involve asking for help brainstorming alternate keywords. It may be asking about potential sources beyond the free Web, the particular experts in a specialized field, or the unique vocabulary of a new area of knowledge.

Teachers Can Encourage Better Searching
What can you do to encourage better information use?

Create Research Challenges. Eliminate reports that merely ask for recall and comprehension. That work—a report on a state or president or planet—is far too easily copied and printed. Ask students instead to explore provocative questions—to compare, analyze,

evaluate, and invent, rather than simply paraphrase.

Evaluate Students' Works-Cited Lists. If you are not comfortable with this task, you can have your school librarian evaluate the list with you. On the high school level, reward the use of scholarly sources. On other levels, reward the use of high-quality sources from reliable databases and journals.

Learn to recognize suspicious URLs. Free hosting services, such as AOL Members or Geocities, and personal sites should raise red flags and inspire questions. "K12" in a URL may tell you that the source may be the product of someone else's sixth grade class.

Examine the "bread crumbs" you find in student citations. Did the student track down the source of the material? If it was found on a database, what was the original source type—a magazine article, encyclopedia, or scholarly journal? With your librarian, decide to what depth you require those bread crumbs to be documented. If you want students to evaluate their sources, then these crumbs are important in determining the quality of the original source.

Any mention of Google, Yahoo, AltaVista, or other general search engines should send a message that the student is referencing the index, not the original source, and has likely avoided energetic research.

What types of sources does the student list? Are they all from popular quick news sources, such as CNN? Was any attempt made to balance resources among books, journals, or general Web sites? Did the student attempt to balance points of view? Did the student use popular, trade, or scholarly journals? Be aware that when you look for balance, a book is a book, whether it appears as an e-book or as a physical volume. An article from *National Geographic* is a magazine article, whether it comes from the shelves or an online database.

Scaffold. Help your students develop organizers for data collection and restructuring. A Venn diagram or a matrix will help students collect data for comparing and contrasting. A time line or flowchart may aid in the analysis of an historic event. A concept map will aid students as they brainstorm subheadings or arguments supporting a thesis.

Create Online Pathfinders with Your Librarian. Pathfinders are blueprints for student research. Focused on a specific project or a particular curriculum, they create a kind of self-service intervention, respecting students' independence while guiding them through the process. Pathfinders may suggest keywords, databases, special search engines, directories, call numbers, and multimedia resources—any special advice necessary for success on a specific project. Project rubrics should heavily value the suggestions of the pathfinder.

Create an Appropriate Search Tool Page for General Student Research on Your Web Site. Do you want students to start with Google? EBSCOhost? Literature Resource Center? ProQuest Historical Newspapers? KidsClick!? Facts.com? World Book? Let them know, and make these tools no more than a mouse click away. On this page, link students to the more powerful advanced search screens of the search engines you'd like them to use.

Ask Students to Annotate Their Works-Cited Lists. Annotations are metacognitive activities that force and value critical thinking and careful selection. In an annotation, the student should consider authors' credentials, relevance of the source to the project, how it compared to other sources, and how it informed his or her knowledge. Include criteria for evaluating annotations in your rubrics.

Use Formative Assessments to Check Student Progress. Collect organizers, outlines, source cards, note cards, tentative thesis statements, and pre-

Examine the "bread crumbs" you find in student citations. Did the student track down the source of the material?

liminary works-consulted pages. It's too late to assess only at the end. Assessing the process throughout the project has the greatest learning value.

This knowledge may have longer legs than calculus.

Resources

Search Tools
Artchive: http://www.artchive.com
Debbie Abilock's Choose the Best Search for Your Information Need: http://www.noodletools.com/debbie/literacies/information/5locate/adviceengine.html
Ixquick: http://www.ixquick.com
Joyce Kasman Valenza's Search Tools Page: http://mciu.org/~spjvweb/searchtip.html
KartOO: http://www.kartoo.com
Laura Cohen's How to Choose a Search Engine or Directory: http://library.albany.edu/internet/choose.html
Scirus: http://www.scirus.com
Vivisimo: http://www.vivisimo.com

News
Headline Spot: http://www.headlinespot.com
World News Network: http://www.worldnews.com
Yahoo! Full Coverage: http://news.yahoo.com/fc/

Image and Media Tools
AP Photo Archive: http://photoarchive.ap.org
Library of Congress' American Memory Collections: http://memory.loc.gov
Pics4Learning: http://www.pics4learning.com

Reference Tools
Merriam-Webster Online: http://www.m-w.com/dictionary.htm
This Day in History: http://www.historychannel.com/today/
World Book: http://www.worldbook.com

Subscription Services
bigchalk: http://www.proquestk12.com
EBSCOhost: http://search.epnet.com/
Facts on File: http://www.facts.com
GaleNet: http://infotrac.galenet.com/
Literature Resource Center: http://www.gale.com/pdf/facts/lrc.pdf
ProQuest Historical Newspapers: http://www.proquest.com/proquest/histdemo/default.shtml
SIRS: http://www.proquestk12.com/
WilsonWeb: http://vnweb.hwwilsonweb.com/hww/login.jhtml

Portals
FirstGov: http://www.firstgov.gov/
Internet Public Library: http://www.ipl.org/
Kathy Schrock's Guide for Educators: http://school.discovery.com/schrockguide/
Multnomah Homework Center: http://www.multnomah.lib.or.us/lib/homework/

Subject Directories
About.com: http://www.about.com
Infomine: http://infomine.ucr.edu/
Librarians' Index to the Internet: http://lii.org/

Tools Especially for Children
Facts for Learning: http://factsforlearning.2facts.com/
FirstGov for Kids: http://www.kids.gov/
Ithaki: http://www.ithaki.net/
KidsClick!: http://kidsclick.org/
Yahooligans!: http://yahooligans.yahoo.com/
Searchasaurus: http://www.epnet.com/school/k12search3.asp
SIRS Discoverer: http://proquest.com/products/pt-product-SIRS-Discoverer.shtml

Searching Tips
21st Century Information Fluency Project Portal: http://21cif.imsa.edu/
Big6 Web Site: http://big6.com/
CyberBee: http://www.cyberbee.com

CyberSmart! Curriculum: http://www.cybersmartcurriculum.org/
Four NETS for Better Searching: http://webquest.sdsu.edu/searching/fournets.htm
Joyce Valenza's Information Literacy Lessons: http://mciu.org/~spjvweb/infolitles.html
KidsClick! Worlds of Web Searching: http://www.rcls.org/wows/
Landmark Project: http://www.landmark-project.com/citation_machine/
Noodle Tools: http://www.noodletools.com
Research 101: http://www.lib.washington.edu/uwill/research101/
University of Albany's Internet Tutorials: http://library.albany.edu/internet/
University of California, Berkeley, Teaching Library Internet Workshops: http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/FindInfo.html
Yahooligans! Teachers' Guide: http://yahooligans.yahoo.com/tg/

Joyce Valenza is librarian at Springfield Township (Pennsylvania) High School, techlife@school columnist for the Philadelphia Inquirer, *a doctoral student at the University of North Texas, and a founding member of ISTE's SIG for media specialists (SIGMS). Publications include* Power Tools Recharged *(American Library Association, 2002),* Super Searchers Go to School *(Information Today, in press), and the video series* Library Skills for Children *(Schlesinger Media, 2003) and* Research Skills for Students *(Schlesinger Media, 2004).*

Doug Johnson edits L&L's *Media Matters column on behalf of ISTE's SIGMS. He has been director of media and technology for the Mankato (Minnesota) Public Schools since 1991. Doug is a veteran author whose works have appeared in books, journals, and magazines and serves on ISTE's board of directors.*