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Information Literacy

A Review of the Research

A Guide for Practitioners and Researchers

2nd Edition

David V. Loertscher

Blanche Woolls

Hi Willow Research and Publishing,

2002

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Hi Willow Research & Publishing
312 South 1000 East
Salt Lake City UT 84102

Distributed by LMC Source
PO Box 131266
Spring TX 77393
800-873-3043

ISBN: 0-931510-80-5

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The authors can be contacted at:

School of Library and Information Science
San Jose State University
One Washington Square
San Jose, CA 95192-0029

Email: David – davidl@wahoo.sjsu.edu
Blanche – bwoolls@wahoo.sjsu.edu

Appreciation is expressed to the many persons and organizations that gave their permission to reproduce models and excerpts for this publication.

Closing date for content: November 1, 2001

Suggested Cataloging:

Loertscher, David V.

Information literacy : a review of the research : a guide for practitioners and researchers— 2nd edition. — David V. Loertscher ; Blanche Woolls. — San Jose, Calif. : Hi Willow Research & Publishing, 2002.

1. Information literacy. 2. School library media programs. I. Woolls, Blanche. II. Title.

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Preface to the Second Edition

Like the first edition, this book has two purposes: to review the growing research literature of information literacy of children and teenagers as well as to provide a window to the best resources and ideas available for library media specialists.

In 1984, the authors created and led the first Treasure Mountain Research Retreat, a loose confederation of researchers and practitioners from the school library media field who met to discuss the research of the field. That dialog has continued over the years and the 11th such meeting will be held in 2002.

Like Treasure Mountain, we felt that this book should target both the researcher and the practitioner in an effort to increase the knowledge about information literacy and to encourage both formal and action research. The pace of technological and information environments demands that this field make progress as quickly as possible to assist in the education of a new generation of young people who are in a quite different world than the one their teachers and library media specialists experienced as young learners.

The second edition has scores of new studies added and many new helps, techniques, issues, and models not available a short two years ago. Thus, this publication is a comprehensive look at the research on information literacy both from the field of library media but also from a wide spectrum of fields interested in the same principles such as cognitive psychology, and the various fields of education.

Particularly troublesome was the checking of all the website urls. We can guarantee that they were correct as of Nov. 1, 2001, but not beyond that point. Almost all can be tracked if the searcher is astute at url construction and searching techniques.

The authors are also particularly happy to announce:

Treasure Mountain Online: A Research Seminar

Sponsored by San Jose State University School of Library and Information Science and Hi Willow Research & Publishing, this continuing seminar on the Internet is available world wide to scholars and practitioners who wish to have a continuing dialogue about the research of the school library media center field. You can become a member of this seminar any number of ways:

1. By attending a Treasure Mt. Research Retreat (you will be enrolled automatically), or
2. By contributing one study per year – either as a formal research piece (as a researcher in the field) or as an action research project report in your own library media center, or
3. By enrolling in Treasure Mountain Online as a continuing education student or for a graduate credit from San Jose State University (email David Loertscher for information (davidl@wahoo.sjsu.edu))

The seminary will not just be a posting of the research of the field, but a place to discuss that research with the author and other colleagues, receive research news of the field, communicate with scholars of the field, and to post and receive good ideas for working with children and teenagers.

We encourage all who have research studies, either formal or practical to contact the authors for inclusion of those studies on Treasure Mountain Online.

Preface to the First Edition

¹ Doyle, Christina S.
*Information Literacy in an
Information Society: A
Concept for the Information
Age*. Syracuse University:
ERIC Clearinghouse on
Information & Technology,
1994.

The most recent review of the research concerning information literacy widely available in the United States was that done by Christina Doyle,¹ published in 1994 by ERIC. The authors thought it time that an update of that and other documents needed to be done. Thus this book. It has been designed both for the researcher and the practitioner — written to trace as much of the known research as possible not only from the library media field but to sample the research from sister fields. As such, the book should provide researchers with a review of studies to help them track extant research and to encourage new questions.

For the practitioner, this book has been designed in such a way as to extract from the known research pointers toward best practice. There are summary pages of research, a chapter devoted to “keeping up,” and a chapter of good ideas to put into practice.

In all their digging, the authors have tried to translate what is known into solid suggestions for the field, provided issues to be discussed, and questions yet to be answered. In order to coalesce what is known about information literacy concepts from various educational disciplines, the authors drew heavily upon the two editions of the *Handbook of Research on Improving Student Achievement*² published by Educational Research Service. The authors recommend purchase of these as excellent sources for research and practice. (First edition, 1995, second edition, 2000) ERS, 2000 Clarendon Boulevard, Arlington, VA 22201, 703-243-2100)

² *Handbook of Research on
Improving Student
Achievement*. Arlington,
VA: Educational Research
Service, 1995.

The time is probably ripe for an information literacy summit that would draw researchers and practitioners from a wide variety of fields together to discuss mutual concerns and to explore future directions. Readers who are interested should contact the authors.

The authors intend to keep this publication current. Check <http://www.lmcsource.com> for future updates.

Chapter One Introduction to Information Literacy

³ American Association of School Librarians and Association for Educational Communications and Technology. *Information Power: Building Partnerships for Learning*. Chicago: American Library Association, 1998.

Of all the concepts to attract attention of school library media specialists in the 1990s, the idea of incorporating information literacy as a major role of the modern school library program has gained the most attention. Perhaps excitement, vision, and emphatic proclamation are more fitting words and phrases to describe the new focus. The newest set of national standards; *Information Power*,³ has been written with information literacy as the foundational element of the school library program. Two major elements are helping to drive this interest: constructivism as an educational philosophy and the rise of information technology (principally the Internet).

But what do school librarians mean when they talk about information literacy to teachers and administrators who have never heard of the concept?

Definition of Information Literacy

⁴ Zurkowski, Paul G. *The Information Service Environment Relationships and Priorities*. Washington, D.C.: National Commission on Libraries and Information Science, 1974.

Paul Zurkowski, the president of the Information Industry Association, first used the term “information literacy” in 1974. In a proposal submitted to the U.S. Government,⁴ he described information literates as “people trained in the application of information resources to their work...They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information-solutions to their problems.” (p. 6)

In 1998, *Information Power* said, “Information literacy—the ability to find and use information—is the keystone of lifelong learning. Creating a foundation for lifelong learning is at the heart of the school library media program. Just as the school library media center has moved far beyond a room with books to become an active, technology-rich learning environment with an array of information resources, the school library media specialist today focuses on the process of learning rather than dissemination of information.” (p. 1)

The Concept in Education

⁵International Society for Technology in Education. *National Educational Technology Standards for Students*. Eugene, OR: The Society, 1998. Also available on their website at: <http://www.iste.org>

School library media specialists are not the only ones in education interested in the concept of information literacy. National standards⁵ for educational technology list the principles of wise information use as a priority. Educators interested in school reform, constructivism, problem solving, gifted education, learning styles, content areas such as math or social studies, and educational psychology are all discussing their own brand of information literacy principles under different terminology.

New ideas in education, however, have come under increasing attack by governments and groups proclaiming that achievement as measured by standardized tests is not high enough and that all the talk about reform has not changed practice in a positive direction. The resulting conflict has produced a great deal of rhetoric, new state laws demanding accountability, and new standards of testing. The debate does not seem to be at an end as a new millennium begins.

Nonetheless, school library media specialists are suddenly realizing that because of expanding information resources and the technology to access it, the world has changed. Gone are the days of access to a few books and magazines located through the card catalog or the printed periodical index. In the last ten years, the speed at which schools are becoming wired, computer networks created, and classrooms and libraries retrofitted creates many “where to next?” questions.

Libraries have always played an important role in basic literacy and in scholarship. Now school library media specialists see themselves poised to deliver information tools into the hands of students and teachers in such a way that the very nature of education will change — at least it must, if the billions spent on technology are to make a difference.

Looking at the Ideal Information Literate Student

Restating the goal, *Information Power*⁶ says: “Helping students flourish in this learning community is the central concern of student-centered library media programs. The goal is to assist all students in becoming active and creative locators, evaluators, and users of information to solve problems and to satisfy their own curiosity. With these

⁶American Association of School Librarians and Association for Educational Communications and Technology. *Information Power: Building Partnerships for Learning*. Chicago: American Library Association, 1998

abilities, students can become independent, ethical, lifelong learners who achieve personal satisfaction and who contribute society as a whole.” (p. 2-3)

Another way to view this goal for students is to contrast the vision of the information literate student with subject understanding. In the following graphic, those students in the upper right quadrant are best prepared for life-long learning and in subject understanding. All other young people in the other three quadrants are at risk in an information-rich world.

Information Literacy Skills

Subject Understanding

Poor

Good

Good	Students know how to learn but are shallow in their subject knowledge.	Students are in the best position to learn.
Poor	Students are in trouble.	Students soak up content but lack investigative skills.

The Ideal in Practice

The vision of the type of student we want is well known, but is there a school or a place to visit where information literacy is woven successfully into the fabric of learning? In 1998, the AASL Library Media Program of the Year Award sponsored by the Follett Library Resources Company chose Hunterton High School in Flemington, New Jersey as a winner. This committee wrote after investigating the school:⁷

“We found the library media staff and program to be a world-class partner with teachers in the creation of exemplary educational experiences preparing students for the age of

⁷ The Library Media Program of the Year Award for 1998, an American Association of School Librarians’ committee for 1998 was chaired by David V. Loertscher who wrote the letter at the right. The letter was reprinted in: Batz, Linda and Harlene Rosenberg. “Creating an Information Literate School: Information Literacy in Action.” *NASSP Bulletin*, vol. 63, no. 605, March, 1999, p. 68-71.

information. We observed:

- Students who are confident learners in an information and technology-rich environment.
- Students who are serious and creative learners and who value their high school experience as a meaningful and worthwhile life experience.
- Students who are both comfortable and creative using a wide variety of technology tools to assist them in learning.
- Teachers who actively plan with the library media professionals to design and carry out information and technology-rich learning activities.
- Teachers who understand an intelligent use of the full range of opportunities that technology provides to enhance learning experiences.
- Teachers who create their own materials using technology to enhance student learning.
- Library media professionals and support staff who create a comfortable environment in which great educational experiences can thrive.
- Library media professionals who are experts at collaborating with teachers in the planning and execution of effective learning activities.
- Library media professionals and staff who help all students to develop themselves as human beings and as competent information users.
- Information technologists who have designed and implemented a magnificent information infrastructure that supports a world-class education as an integrated school with the library media program.
- Administrators with a clear vision of a quality 21st century education and the leadership skills to bring it to fruition.
- Administrators who understand the critical role that the library media center plays in a quality educational experience.
- An information infrastructure that uses both decentralized and centralized learning technologies to make the library media center a ubiquitous entity in every learning space in the school.
- As a committee, we wish that every library media specialist, teacher, and administrator in the nation could experience the exemplary way a library media center can contribute to the building of the nation's young people to face the challenges and opportunities of the information age. Your program explodes the myth that 'it doesn't take money to create a quality education,' and an equally devastating myth that 'access to the Internet is the only information tool students and teachers need.'"

While it would not be wise for everyone to descend on a single school to probe its successes and find its shortcomings, there should be in every school, students, teachers, and administrators who approximate the behavior described at Hunterton. If there is not, test the ideas of information literacy described in this book and probe their effects on competence

Chapter Two Stages of the Research Process

The Research Process as a Whole

At this writing, it has been approximately a decade since the leaders in the school library media field introduced the concept of information literacy to the profession in an attempt to encourage practitioners to go beyond the library skills useful in the print world. As “movements” go in the world of education, school library media specialists have been quite interested in this new idea because they deal with children and teenagers every day who are trying to cope with the information-rich and technology-rich environments becoming ever so ubiquitous.

How are we doing at decades end? How prepared are young people to thrive in a data-rich and information-driven society?

Sharon Coatney, a past president of the American Association of School Librarians and a model elementary school library media specialist reported after giving “Power Learner Surveys” to her third-grade children that they exuded confidence about their ability to do “research” – because Sharon has taught them the stages of research and helped them to have fun and be excited about their projects. Sharon realizes that they are still beginners and that, when asked, they overestimate their ability as researchers.

Schacter,⁸ and others studying 5th and 6th graders as they searched the Internet to complete assignments on complex problems “overestimated how well they were doing.”

Adam Weiss, a Library Media Teacher in Pacifica, California looked at scores of schools that had participated in an AASL Power Learner survey in 2000. After entering hundreds of student Power Learner questionnaires on all grade levels and looking at corresponding adult estimations of student expertise, he came away with the preliminary notion that:

- Children overestimate their expertise in doing research but as they get older, they rate themselves lower in middle school and lower yet in high school (perhaps they are becoming more realistic about their abilities as

⁸ Schacter, John, Gregory Chung, and Aimee Dorr. “Children’s Internet Searching on Complex Problems: Performance and Process Analyses. *Journal of the American Society for Information Science*, vol. 49, no. 9, 1998, p. 840-49.

they begin to understand the complexities of the research process).

- At the same time, adults who work with children, early, and late teen years have a growing sense that young people are becoming better and better as they practice using information literacy models and doing more and more research.

⁹ Kühne, Brigitte. "The Barkestorp Project: Investigating School Library Use." *School Libraries Worldwide*. vol. 1, no. 1, 1995, p. 13-27.

Kühne⁹ reported a three-year study in the city of Kalmar Sweden where students and teachers were introduced to library research using an information literacy model. Across time, she concluded that "on the whole more students worked better and more effectively this way than they usually did, as many teachers witnessed." (p. 18)

¹⁰ Grover, Robert, Carol Fix and Jacqueline McMahon Lakin, eds. *The Handy Five: Planning and Assessing Integrated Information Skills Instruction*. Scarecrow Press, 2001. See the review of their research in chapter 8: p. 83-98.

Grover¹⁰ and others did a major study in ten Kansas schools where they were testing the implementation of the Kansas "Handy 5" model of information literacy. They followed research projects at elementary, middle school and high school levels after offering professional development to the library media specialists who would be involved. Their findings worthy of indepth study included some of the following:

- Use of an information literacy model had an impact on low-achieving students.
- Use of the model taught students higher order thinking skills (in the opinion of both library media specialists and teachers).
- The model provided an effective excuse for library media specialists to collaborate with teachers.
- The model forced library media specialists to go beyond the provision of information into the learning and assessment parts of the model.
- Students were over-confident of their research skills.

¹¹ While the reader can find these sentiments in almost any study in this research review, one example is: Fidel, Raya, Rachel K. Davies, Mary H. Douglass, Jenny K. Holder, Carla J. Hopkins, Elisabeth J. Kushner, Bryan K. Miyagishima, and Christa D. Toney. "A Visit to the Information Mall: Web Searching Behavior of High School Students." *Journal of the American Society for Information Science*. vol. 50, no. 1, 1999, p. 24-37.

Certainly none of the researchers consulted in this research review were happy with what they found. All were critical of the search sophistication of young people, found them lacking, found too little adult support, and found that even though adults were present, these people lacked sophistication.¹¹

^{11a} Lenhart, Amanda, Maya Simon and Mike Graziano. *The Internet and Education: Findings of the Pew Internet & American Life Project*. Released Sept. 1, 2001. Find at the Pew Internet & American Life Project, (<http://www.pewinternet.org>) under "Our Reports" and then filed by date.

For many teenagers, this may not be a concern. The Pew Internet & American Life Project^{11a} does a number of studies connected with how the Internet is being used by all age groups. In a study

done in Sept. 2001, they found that 73% of youth ages 12-17 use the Internet (the gap continues to narrow each year). Of those 73%, 94% of them reported that the Internet helps them with schoolwork, and 71% said they use the Internet as the major source for their most recent major school project or report. And 58% said they used web sites specifically for their school or for a particular class. Such reports are both positive and negative. At least we could say 58% were being “guided” to “quality” sites, but that still leaves 36% who were at the mercy of the entire Internet.

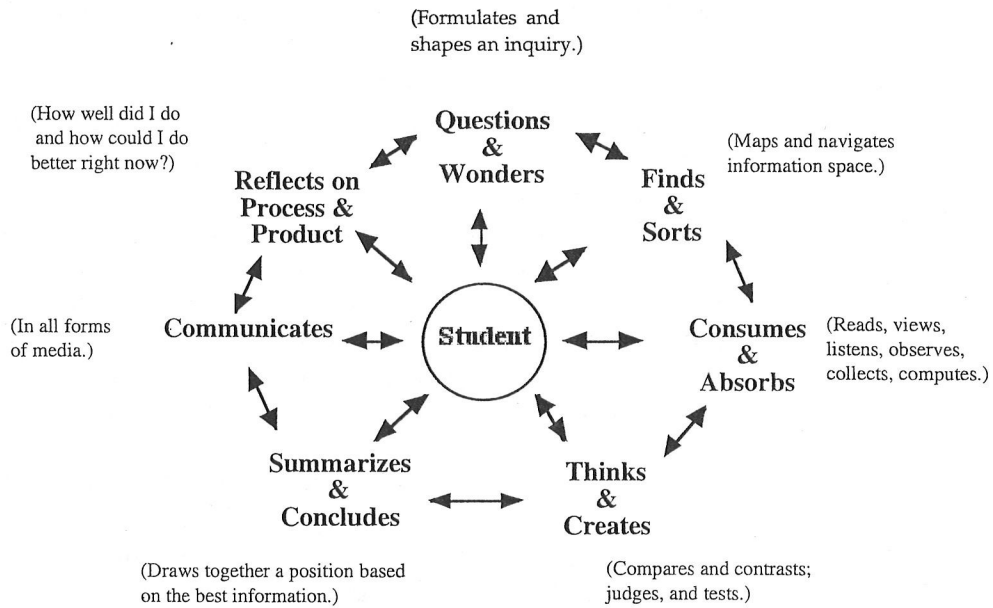
While such first impressions deserve much more formal research investigation, it is interesting to look at studies probing the research expertise of incoming college freshman. After a decade of emphasis on teaching the research process in K-12, are young people prepared? Geffert and Christensen¹² surveyed 521 incoming students at St. Olaf College in Minnesota, about their attitudes, opinions and knowledge about research. Some of their questions were designed to “test” some aspects of their actual knowledge of library research. The researchers found:

¹² Geffert, Bryn and Beth Christensen. “Things They Carry: Attitudes Toward, Opinions About, and Knowledge of Libraries and Research Among Incoming College Students.” *Reference & User Services Quarterly*, vol. 37, no. 3, Spring, 1998, p. 279-89.

- Students were overconfident in their research abilities as demonstrated by what they actually could do.
- That overconfidence may affect students’ willingness to pay attention to bibliographic instruction.
- The number of high school librarian “talks about research” did not seem to make a difference.
- Students did do better if they reported that they enjoyed research and had actually written research papers in high school.

Certainly, the tracking of young people who have a steady diet of research and information literacy instruction seems in order. Kuhlthau has done that with selected students from her original studies, but much more work needs to be done.

Chapter two is divided into seven sections following the various stages of the research process illustrated in the model below. Each stage gives a review of the research from library and information science, a review of research from various curricular areas, possible applications from the research and finally, a one-page handout summarizing the section for use in workshops and inservice education.



Questions and Wonders: Formulates and Shapes an Inquiry

[Pursues information related to personal interests (*Information Power*)]

Introduction: Stimulating curiosity and formulating good and realistic questions are often a first step in the research process. However, students may return to this step again and again as they reformulate or reshape their question during the research process. Giving learners a choice in a range of questions or topics promotes interest. If the questions are formulated properly, the task will be challenging, but realistic for the developmental level of the learner and the capability of the information system.

¹³ Melissa Gross has published several articles based on her preliminary and major research on imposed questions. Two of the published articles include: Gross, Melissa. "Pilot Study on the Prevalence of Imposed Queries in a School Library Media Center." *School Library Media Quarterly*, vol. 35, no. 3, Spring, 1977, p. 157-66. Gross, Melissa. "Imposed Queries in the School Library Media Center: a Descriptive Study." *Library & Information Science Research*, vol. 21, no. 4, 1999. p. 501-21.

¹⁴ Flowerday, Terri and Gregory Schraw. "Teacher Beliefs About Instructional Choice: A Phenomenological Study," *Journal of Educational Psychology*, vol. 92, n and no. 4, Fall, 2000, p. 634-45.

¹⁵ Kuhlthau, Carol Collier. *Seeking Meaning: A Process Approach to Library and Information Services*. Norwood, NJ: Ablex, 1993, p. 42-44.

¹⁶ Todd, Ross J. "Transformational Leadership and Transformational Learning: Information Literacy and the World Wide Web." *NASSP Bulletin*, March, 1999, p. 4-12, citing their study: McNicholas, C., and R. Todd. "New Kids on the Box: Is It Worth the Investment?" *Scan*, November, 1996

From Library Media Research: Melissa Gross,¹³ seeking to provide some baseline data, studied children as they entered school and begin to interact with the information bank in the school library. She found they do so in kindergarten and first grade from a basis of curiosity about their own questions and interest, but by the time they are in sixth grade, questions imposed by adults dominate their information seeking motivation.

Flowerday and Schraw¹⁴ interviewed 36 teachers to examine what, when, where and to whom teachers offer choice to students as they explore topics. Choice was an important element to all teachers, but many imposed a variety of controls based on age, ability, and prior knowledge. Teachers exercised this control as a part of their management style and experience over time.

Kuhlthau¹⁵ showed that during this stage of the research process, students feel uncertain as they try to understand an assignment and have trouble focusing on shaping what is to be done. They are beginning with a problem someone else has imposed rather than one they have created for themselves.

McNicholas and Todd¹⁶ in their research "suggest that students' difficulties with searching the Web are compounded by poorly designed research tasks." (p. 9)

Thus if we think of two-year-olds and their curiosity about the world, we are not surprised with their "still-curious" attitude as Kindergartners. Some retain this curiosity throughout life and become inventors, developers, idea fountains and creators. Most encounter teachers who want them to learn what the standards, the curriculum, or the state demands rather than what they are interested in as individuals. Thus students come to the library with

assignments, some of which have some latitude of choice, others with very little flexibility. With varying amounts of understanding of the assignment and motivation to do it, library media specialists may not be impressed with a student's question formulation, their motivation, or with the teacher's ability to construct good questions.

Research from Other Disciplines:¹⁷

¹⁷ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

General Education: Delegating some control to students for learning goals stimulates learning gains. (I: 2.6, II: 2.6) In addition, Craig¹⁸ found that students faced with choice in a high-tech learning environment needed time and coaching to become comfortable in an "inquiry" mode.

The Arts: Using good questioning techniques helps students set a direction for their work. (I: 3.4)

The Sciences: Systematic problem solving beginning with understanding the problem enables students to more frequently solve the problems correctly. (I: 9.8)

The Social Studies: Teach questions explicitly but in the context of content knowledge. (I: 10.4)

¹⁸ Craig, Dorothy Valcarcel. "Learner in Charge: Student Inquiry and Technological Literacy." *Proceedings of the National Educating Computing Conference, San Diego, CA*. (ERIC, ED419496), 1998.

Application: The research is sparse in an area that is so critical to the research process. When questions are imposed on students, adults need to ascertain whether the questions are doable given the information sources available, whether they are realistic given the background knowledge and developmental level of the students, and whether the task at hand will engender interest. The research indicates that teachers and library media specialists should spend time developing good questions and assist students as they face uncertainty in trying to understand the question or problem at hand. It is not enough to turn students loose in the library and just say: do a report on something that interests you; yet neither does it seem right to assign something so narrow that student interest and creativity are squelched.

In an inquiry-based approach, the adults guide students in the selection and formulation of questions from a range of possibilities knowing that strong support during this part of the process is critical. Such a method assumes that the student is creative and "wants to know" things on a wide variety of topics. In a standards-based approach, the state standard provides the outline of contents all students will master regardless of native interest or ability.

No matter the approach, much student behavior can be predicted from the question itself — whether students will be able to just cut and clip information they find to satisfy the assignment, how much students will have to “think” about the information they find, and what type of product they are likely to prepare. Good questions are more likely to produce better learning.

Undesirable Questions are:

- Those for which no answer can be found in the available library resources but where teacher expectation is high.
- Those that require many students to use a very limited number of information resources.
- Those for which the exact information is available in reference sources (unless copying is the object of the lesson).
- Those that overwhelm the information technology in the time available.
- Those beyond the abilities of the students to answer.

Better Questions:

- Cause students to think.
- Encourage comparison, contrast, analysis, and verification.
- Engage student interest.
- Require comparison of information from a variety of sources.

¹⁹ McKenzie, Jamie. *Beyond Technology: Questioning, Research and the Information Literate School*. Bellingham, WA: FNO Press, 2000. (<http://fno.org>) See chapter three.

McKenzie¹⁹ has created a “Questioning Toolkit” to assist in the creation of research questions. His list includes:

- Essential Questions
- Subsidiary Questions
- Hypothetical Questions
- Telling Questions
- Planning Questions
- Organizing Questions
- Probing Questions
- Sorting and Sifting Questions
- Clarification Questions
- Strategic Questions
- Elaborating Questions
- Unanswerable Questions
- Inventive Questions
- Provocative Questions
- Irrelevant Questions
- Divergent Questions
- Irreverent Questions

²⁰ Ciardello, Angelo V.
 "Did You Ask a Good
 Question Today?
 Alternative Cognitive
 and Metacognitive
 Strategies." *Journal of
 Adolescent and Adult
 Literacy*, vol. 42, no. 3,
 November, 1998, p.
 210-19.

Ciardello²⁰ lists a number of other strategies to be used with students in helping them develop good questions:

Ciardello's Question Types¹

Memory questions

Signal words; who, what, where, when

Cognitive operations: naming, defining, identifying, designating, yes or no responses

Examples:

- Naming: What is a synonym for democracy?
- Defining: Where is the 38th parallel in Korea?
- Identifying: Who is Andrew Jackson?
- Designating: When did the 21st century officially begin?
- Yes or no: Are 18-year-olds allowed to vote in the U.S.

Convergent thinking questions

Signal words/short question stems: Why, how, in what ways?

Cognitive operations: Explaining, stating relationships, comparing and contrasting

Examples:

- Explaining: Why was U.S. President Andrew Johnson impeached?
- Stating relationships: How was the invasion of Grenada a modern day example of the Monroe Doctrine in action?
- Comparing and contrasting: In what ways was the anti-apartheid movement in South Africa similar to the civil rights movement in the United States.

Divergent thinking questions

Signal words/short question stems: Imagine, suppose, predict; If...then..., How might..., Can you create..., What are some possible consequences...

Cognitive operations: predicting, hypothesizing, inferring, reconstruction

Examples:

- Predicting: What predictions can you make regarding the budget surplus in the year 2000?
- Hypothesizing: How might life have been different in the United States if the South had won the Civil War?
- Inferring: What are some possible consequences of the fall of communism in Eastern Europe?
- Reconstructing: Can you create a new amendment granting equal rights to women?

Evaluative thinking

Signal words/short question stems: defend, judge, justify/What do you think..., What is your opinion?

Cognitive operations: Valuing, judging, defending, justifying choices

Examples:

- Valuing: How do you feel about abortion for teenagers?
- Judging: What do you think of capital punishment for drug dealers?
- Defending: Why did you vote for Bill Clinton?
- Justifying choices: Why would you prefer to live in the suburbs?

Questions and Wonders” Summary Chart

Research suggests:

- Children come to school naturally curious but lose it if teachers don't encourage it.
- Encouraging students to form their own questions has a positive impact on learning.
- Students are likely to face the task of creating questions with uncertainty.

Theory and practice suggest:

- The quality of the question is the best predictor of student performance.
- Questions requiring low-level thinking encourage copying and regurgitating answers.
- The best way to improve student projects is to reformulate the question.
- Good questions engage student interest.

Generic information skills to integrate:

- The difference between good questions and poor ones.
- What is a solvable question in the time frame we have?
- Narrowing a topic; broadening a topic; adjusting a topic.

Ideas to test:

- What happens to your students' projects when you spend more time on helping them develop good questions?
- Do your students begin to respond positively when they help formulate higher-level questions?

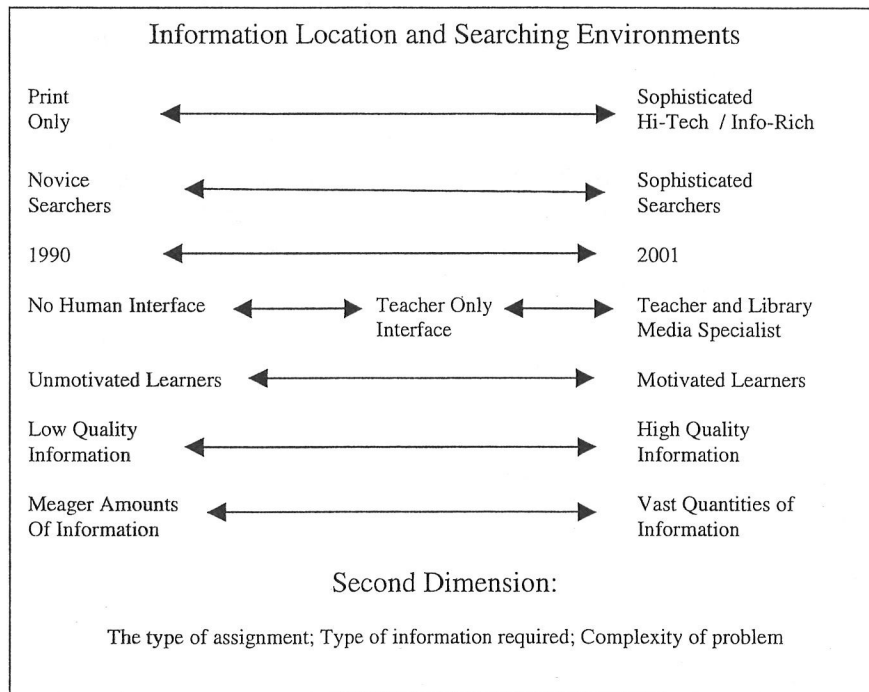
Finds and Sorts: Maps and Navigates Information Space

[Accesses information efficiently and effectively (*Information Power*)]

Introduction: When a young person faces an information system such as a library catalog, an index, a database, or the Internet, one would hope that the right materials or information would be delivered no matter the age, maturity level, cultural or language background. In the past decade, the array of information sources has expanded both in numbers and in complexity. Student-friendly information systems are still works in progress. The question is whether students will be able to find the right information for the right purpose at the right time even though they may be drowning in it.

From Library Media Research: A growing number of studies examine student searching behavior, particularly within online catalogs.²¹ The problem is that various continuums have begun to appear affecting the research including when it was done, the type of information environment studied, and the research technique. Thus it is difficult to pool all of the research studies into a holistic finding. Consider the continuums and the second dimension:

²¹ A readable research review done in 2000 was: Brock, Elana. "Children's Search Engines from an Information Search Process Perspective." *School Library Media Online*, vol. 3, 2000. (<http://www.ala.org/aasl/SLMR/vol3/childrens/childrens.html>)



Thus it is difficult to pool all the research since a single study will be on several of the continuums at various positions. It is as if some giant spreadsheet needs to be constructed noting where a study lies in relation to others. Nevertheless, individual studies are instructive and give hints in a complex world.

Numerous early studies of children's behavior and strategies of using automated catalogs began to appear in the late 1980s and early 90s.

²² Solomon, Paul. "Children, Technology, and Instruction: A Case Study of Elementary School Children Using an Online Public Access Catalog (OPAC)." in: "Current Research" column, *School Library Media Quarterly*, vol. 23, no. 1, Fall, 1994, p. 43-53.

Paul Solomon²² notes the high rate of search failure among children because most software interfaces in 1994 automated catalogs seem to be designed according to a "one-size-fits-all" mode, and that size does not fit children particularly well. Other studies probing the same topic were listed and reviewed briefly in the "Current Research" column of which the Solomon research report was a part. Remember, however, that these studies were conducted with early search engines that were, for the most part, adapted from adult search engines.

²³ Large, Andrew, Jamshid Beheshti, and Alain Breuleux. "Information Seeking in a Multimedia Environment by Primary School Students." *Library & Information Science Research*, vol. 20, no. 4, p. 343-76.

As mid-1990s approached, search engines were starting to improve for children. Large, Beheshti, and Breuleux,²³ in a review of the research for their own investigation, found that more and more studies were reporting that children were having success in retrieval systems even as low as first grade as long as the searching was uncomplicated. Several of these later studies are reported in their review. Students, however, don't always prefer electronic searching to its manual print-oriented counterpart. Troxel²⁴ found that middle schoolers did not prefer electronic catalogs to manual ones in their first year of operation of the automation system. (However, remember that this study was done with searchers accustomed to the print index environment.)

²⁴ Troxel, Steven Richard. "Middle School Library Catalog Access: A Comparison Between Electronic and Manual Catalog Systems (information retrieval). Ph.D. dissertation, University of Virginia, 1996.

After reviewing numerous studies before 1996, Nahl and Harada²⁵ did their own study with secondary students in six schools. They tested the ability of students to interpret and construct search statements in a pre-search activity. They measured both accuracy of search statements and took a self-confidence measure. Students achieved scores averaging 60 percent correct. Those who reported high confidence had significantly higher scores. They also noted that adequate content knowledge in the subject area was crucial to successfully use the index. They recommended a

²⁵ Nahl, Diane and Violet H. Harada. "Composing Boolean Search Statements: Self-Confidence, Concept Analysis, Search Logic, and Errors." *School Library Media Quarterly*, vol. 24, no. 4, Summer, 1996, p. 199-206.

variety of approaches to teach the complexity of searching and warned against the idea that “one time” instruction was sufficient.

²⁶ Walter, Virginia A., Christine L. Borgman, and Sandra G. Hirsh. “The Science Library Catalog: A Springboard for Information Literacy.” In: “Current Research” column, *School Library Media Quarterly*, vol. 24, no. 2, Winter, 1996, p. 105-110.

As catalogs evolved from print to electronic, Walter, Borgman, and Hirsh²⁶ examined children’s searching skills as they queried The Science Library Catalog (a catalog designed with a search engine specifically for children). They found that children are able to use both browsing modes and keyword systems in automated library catalogs. If the topic was simple and straightforward, the children had success, but complexity, spelling, and vocabulary problems created barriers. They also noted that age, gender, and computer experience had minimal effect on children’s ability to use the catalog, but that age might be a factor in keyword systems.

²⁷ Kuhlthau, Carol Collier. *Seeking Meaning: A Process Approach to Library and Information Services*. Norwood, NJ: Ablex, 1993, p. 63.

In 1993, Kuhlthau²⁷ reported that “students perceive the task of the search process as primarily to gather information even in the early stages of vague, unfocused thinking...that users need guidance and counseling...for moving on to the next stage.”

²⁸ Kafai, Yasmin and Marcia J. Bates. “Internet Web-Searching Instruction in the Elementary Classroom: Building a Foundation for Information Literacy.” *School Library Media Quarterly*, vol. 25, no. 2, Winter, 1997, p. 103-111.

Kafai and Bates²⁸ used a hook to engage elementary school students in searching for information connected to the curriculum on the Internet. Under the guise that students were preparing search guides for other students, students being taught by graduate students in the UCLA library school learned to surf the web. One of the major findings was that younger students (fourth grade and below) are capable of locating information on the web but are uncritical of the content they find. While the students enjoyed the finding of the information, particularly if they found something like a picture of a human leg chewed by a shark, they were reluctant to write annotations for the sites they discovered.

²⁹ Hirsh, Sandra G. “Children’s Relevance Criteria and Information Seeking on Electronic Resources.” *Journal of the American Society for Information Science*. vol. 50, no. 14, 1999, p. 1265-83.

Hirsh²⁹ studied ten motivated and interested students doing research on a sports hero. These young people were in information-rich and technology-rich environments. Yet she said: “The students in this study, who were computer-savvy, bright, and informed library users, did not assess the relevance of the information they found according to how authoritative, accurate, or truthful the information was. Students were trusting of the information they found and did not think to question the source of the information, the qualifications of the author, and the accuracy of the facts.”(p. 1281)

³⁰ Fidel, Raya, Rachel K. Davies, Mary H. Douglass, Jenny K. Holder, Carla J. Hopkins, Elisabeth J. Kushner, Bryan K. Miyagishima, and Christa D. Toney. "A Visit to the Information Mall: Web Searching Behavior of High School Students." *Journal of the American Society for Information Science*. vol. 50, no. 1, 1999, p. 24-37.

³¹ Davis, Philip M. and Suzanne A. Cohen. "The Effect of the Web on Undergraduate Citation Behavior 1996-1999." *Journal of the American Society for Information Science and Technology*, vol. 52, no. 4, 2001, 309-14.

³² Kuhlthau, Carol Collier. "Learning in Digital Libraries: An ISP Approach." *Library Trends* vol. 45, no. 4, 1997, p. 708-24

³³ Kuhlthau, Carol Collier. "Accommodating the User's ISP: Challenges for Information Retrieval Systems Designers." *Bulletin of the American Society for Information Science*. vol. 25, no. 3, 1999, p. 1-7. (<http://www.asis.org/Bulletin/Feb-99/kuhlthau.html>)

³⁴ Bilal, Dania. "Children's Use of the Yahoo!igans! Web Search Engine: I: Cognitive, Physical, and Affective Behaviors on Fact-Based Search Tasks." *Journal of the American Society for Information Science*, vol. 51, no. 7, 2000, p. 646-65. and Bilal, Dania. Children's Use of the Yahoo!igans! Web Search Engine: II. Cognitive and Physical Behaviors on Research Tasks." *Journal of the American Society for Information Science and Technology*. vol. 52, no. 2, 2001, p. 118-36.

³⁵ Hirsh, Sandra G. "Children's Relevance Criteria and Information Seeking on Electronic Resources." *Journal of the American Society for Information Science*, vol 5 no. 14, 1999, p. 1265-83.

³⁶ For a comparison of search engines for children, see: "How the Search Tools Compare," *T&L Magazine*, March 15, 2001. (http://www.techlearning.com/db_archive/archives/TL/200103/picksmonth2.html)

³⁷ Broch, Elana. "Children's Search Engines from an Information Search Process Perspective." *School Library Media Research Online*. vol. 3, 2000. (<http://www.ala.org/nasl/SLMR/vol3/childrens/childrens.html>)

Fidel³⁰ and her research team also looked at motivated high school students who were being introduced to Internet searching to do several assignments over a period of a few weeks. The research team concluded that "to be effective in school systems, both students and teachers, as well as librarians, require training." (p. 36)

No studies were located looking at student citations to see how they have changed over time and across information environments, but if they are like their older college cousins, Davis and Cohen³¹ noticed the expected shift away from books toward electronic and Internet sources but also noted that only 18% of the URLs cited by students could be found after the papers were turned into the teacher. One might label this as the "disappearing research base" – or, the "Internet ate my references."

All studies in this research review worried about the ability of children to sort through vast quantities of information to find the essential sources or the best from the resources. As Kuhlthau notes in her writing, when faced with abundance,³² a young person must arrive at a conclusion at some stage of the research process that enough is enough.³³ Concentration by researchers might be given to examining the characteristics of young people who are doing well in information-rich environments and their habits as they find and sort information for their interests and their assignments.

By 2001, search engines for young people were far from achieving excellence, as Bilal³⁴ in his study of Yahoo!igans noted and Hirsh³⁵ found, but work on Internet search engines was proceeding rapidly.^{36,37} While Spearman³⁸ reported fourth and fifth grade teachers as refusing to teach information skills because they did not feel students capable of that complexity, Dresang³⁹ was saying that "children have demonstrated their comfort level with far more complexity than adults thought possible or appropriate." (p. 649)

³⁸ Spearman, Rhonda Greenley. *Elementary Educators Use of the Internet and the Application of Information Literacy Skills to Student Use of the World Wide Web*. Ed.D. dissertation, The University of Tennessee, 2000 (DAI-A 61/11, p. 4352, May 2001.)

³⁹ Dresang, Eliza T. "Influence of the Digital Environment on Literature for Youth: Radical Change in the Handheld Book." *Library Trends*, vol. 45, 1997, p. 639-63.

⁴⁰ Internet search engines designed for children include:

Lycos Safety Net

<http://personal.lycos.com/safetynet/safetynet.asp>

Disney Internet Guide

<http://www.disney.go.com/park/bases/kidsbase/today/flash/index.html>

Ask Jeeves For Kids

<http://www.askkids.com/>

Yahooligans

<http://www.yahooligans.com/>

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Children's Search Engines

http://www.searchenginewatch.com/links/Kids_Search_Engines

⁴¹ Large, Andrew, Jamshid Beheshti, and Alain Breuleux. "Information Seeking in a Multimedia Environment by Primary School Students." *Library & Information Science Research*, vol. 20, no. 4, p. 343-76.

⁴² Brown, Gavin. "Locating Categories and Sources of Information: How Skilled Are New Zealand Children?" *School Library Media Research*, vol. 4, 2001 (http://www.ala.org/aasl/SLSLR/vol4/newzealand/newzealand_main.html)

⁴³ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

⁴⁴ Schacter, John, Gregory Chung, and Aimee Dorr. "Children's Internet Searching on Complex Problems: Performance and Process Analyses." *Journal of the American Society for Information Science*, vol. 49, no. 9, 1998, p. 840-49

One might conclude that if we could only perfect search engines for children,⁴⁰ then all our problems would be over — no need for librarians any more.

One major Canadian study agrees that for the time being, the human interface is still required between children, young adults, and the world of information systems. Large, Beheshti, and Breuleux⁴¹ asked, "Do children constitute a distinct user group for information retrieval systems? [Our] research supports the conclusion...that children are indeed a distinct group...On the one hand, they demonstrate an enthusiasm, confidence and dexterity in interface manipulation that would be the envy of many an adult...At the same time, they lack sophistication in language manipulation and search strategy formulation...Despite these conclusions,...children cannot be seen as a homogeneous group (any more than other age groups)." (p. 370-71)

The three Canadian researchers then make a major observation: "Certainly, this research does not suggest that students intuitively acquire skills in information strategy formulation simply by amount of time spent at the computer. The students had not been given prior instruction in information retrieval within their curriculum. As is all too common in Quebec, the school does not have a professional librarian...the results of the searches clearly demonstrate the importance of such training if students are to be effective in information retrieval." (p. 367) To really put it in perspective, a recent New Zealand study⁴² looking at children in a mediocre print-only environment and no librarian, found that "unguided" children are poor researchers.

Research from Other Disciplines:⁴³

From General Education: Schacter⁴⁴ and others found that after five months of experience with Internet searching, 5th and 6th graders searched more successfully when the task was vague and abstract than when it was specific and concrete. Only 2 out of 32 students found documents that correctly addressed the information needed for well-defined tasks.

From Science: Concept mapping, the schematic diagrams of concepts arranged in a hierarchical order linked by words, affect achievement and attitude. (I: 9.5) [The presumption here is that as students approach information systems they need to understand concepts to be able to formulate appropriate search terminology, particularly in Boolean search mode.]

From Health Education: Increased access to one of the most powerful tools in history, the Internet, only reinforces the importance of the classroom

teacher in training students to access information, and then evaluate the accuracy and validity of the source. (II: 5.5)

Application: Traditionally, students would be faced with a card catalog, *The Reader's Guide to Periodical Literature*, and a few reference books to search. The advent of hundreds of print and electronic information systems including the Internet, each with its own search engines or indexing systems, and with a variety of sophistication levels, challenges library media specialists and teachers to help children learn generic rather than specific tool searching skills. For example, they need to be able to search for magazine articles in a wide variety of periodical indexes both print and electronic, not just *The Reader's Guide*.

Two approaches seem feasible: First, equip students with the searching skills they need to successfully retrieve information from commercial information systems. The second would be to modify those information systems to make it easier for students to find the information they need. In the first process, library media specialists and teachers teach search strategy, terminology, Boolean searching, search engines, patience, adaptability, and flexibility. In the second, the library media specialist would bookmark appropriate Internet sites, add subject headings to the library catalog, add cross references, create quick search guides, and even create databases of FAQ's connected to specific sources when student frustration is anticipated. In the creation of portals, library media specialists would look not only for appropriate search engines but also meta-search engines that would search across a number of databases and perhaps would coach the searcher if too much or too little were delivered.

At the millennium, it appears that the human interface between information systems and young people is still critical, that expert navigation skills are not intuitive. One reason the human interface may be essential is the very nature of multi-media, interactive, and dynamic information systems. Technology seems to reward the searcher's tendency to follow hyperlinks, take side trips, explore, and investigate. It is extremely easy to begin a quest and two hours later find yourself surfing far from the area of first intention. Young people need to learn discipline and persistence during a searching task since it is so easy to get off target.

One might argue that allowing students to surf and hyperlink enhances interest and motivation, taking learners into uncharted and fascinating worlds. Both techniques, exploration and disciplined searching, are likely to produce both desirable and undesirable behaviors. Channeling inquiry and research directions into productive search strategies is an exciting frontier for teachers and library media specialists. As Evan Farber⁴⁵ concludes in his informative essay on the history of

⁴⁵ Farber, Evan Ira. "Bibliographic Instruction, Briefly," in: *Information for a New Age*. Englewood, CO: Libraries Unlimited, 1995. P. 23-34.

bibliographic instruction in academic libraries: "even as knowledgeable and efficient as computers are likely to get, it's unlikely they'll ever provide the eye contact, the reassurance, the friendly words that some users will always need." (p. 34)

Another challenge for the searcher is to make judgments about the information retrieved from any information system. The first judgment is for relevance and the second is a judgment about the quality of information. Numerous efforts have appeared in the literature to bring the issue of sorting information to end up with a small pool of trusted sources. For example, Fritch and Cromwell⁴⁶ have created a model asking the searcher to evaluate:

⁴⁶ Fritch, John W. and Robert L. Cromwell. "Evaluating Internet Resources: Identity, Affiliation, and Cognitive Authority in a Networked World." *Journal of the American Society for Information Science and Technology*. vol. 52. no. 6, 2001, p. 499-507.

- Content of the document for authority and credibility
- Author authority and credibility
- Institutional authority and credibility
- Affiliation authority and credibility

Young people faced with a list of hundreds of documents based on a one-word search obviously need assistance. What documents will they use? How could they refine their research terminology to produce fewer and more relevant documents? When is enough enough? How do they behave when faced with overload? How do they cope with the frustration of finding and sorting? What are the characteristics of young successful searchers and sorters? These are just a few of the questions needing research attention.

Even though more studies have been issued in the finding/sorting area have been published during the past several years, practitioners are probably still ahead of the researchers. They watch as young people start interacting with newer forms of technology and see them try to deal with the results of their searches. Analytical and reflective experience with learners is a must as the information pool and technological world deepens.

“Finds and Sorts” Summary Chart

Research suggests:

- Search engines for young people are improving but still present a major obstacle.
- Children are resourceful in using search engines for uncomplicated queries but lack the language skills needed for search strategy formulation.
- Students need content knowledge before they can develop search terminology.
- Young people do not seem to develop sophisticated searching skills intuitively, requiring, at this point, a human interface to achieve success.

Theory and practice suggest:

- A role remains for a library media specialist as an essential interface between humans and information systems.
- Specific guidance in accessing information (how to use this index) is giving way to more generic searching guidance (how to search a variety of indexes while searching the topic in question).
- Searching can predominate the time students have in doing research, leaving little time for information use, communication and reflection. This should not always be the case. There are times to stress navigational skills and other times to eliminate the finding time and give the information immediately.
- The level of search ocomplexity can be increased as children mature.

Generic information skills to integrate:

- Teach system navigation skills (how to get in, move around, search, and exit).
- Teach subject searching, Boolean logic, and good query formulation.
- Encourage persistence and adaptability across various information systems.
- Teach discipline in the face of distraction when in multimedia environments.
- Help students focus on the research process rather than on just information gathering.

Ideas to test:

- When you teach a skill using various types of print and electronic sources, do students make improvements over time and across various subject topics? Or, do you have to start over every time as the same group approaches a new searching problem?
- Try discussing the advantages and disadvantages of various search engines with young people until they get in the habit of comparing various systems and strategies.
- During a variety of projects, analyze the amount of time that students are spending in locating information. If this time is predominant in the research process, then streamline the search time for students. When you do so (such as just giving them the information), do students actually become engaged in the “using and communicating steps” of the research process?

Consumes and Absorbs: Reads, Views, Listens, Observes, Collects, Computes, and Understands

[Appreciates literature and other creative expressions of information (*Information Power*)]

⁴⁷ Kafai, Yasmin and Marcia J. Bates. "Internet Web-Searching Instruction in the Elementary Classroom: Building a Foundation for Information Literacy." *School Library Media Quarterly*, vol. 25, no. 2, Winter, 1997, p. 103-111.

⁴⁸ Beers, Kylee. "Listen." *School Library Journal*, vol. 44, no. 9, April, 1998, p. 30-35.

⁴⁹ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

⁵⁰ Aikman, Carol C. and Machael F. O'Hear. "Main Idea: Writers Have Always Used It." *Journal of Adolescent & Adult Literacy*, vol. 41, no. 1, November, 1997, p. 190-95.

⁵¹ Burns, Bonnie. "Changing the Classroom Climate with Literature Circles." *Journal of Adolescent & Adult Literacy*, vol. 42, no. 2, October, 1998, p. 124-29.

⁵² Faust, Mark A. and Nancy Glenzer. "I could read those parts over and over: Eighth Graders Rereading to Enhance Enjoyment and Learning with Literature." *Journal of Adolescent & Adult Literacy*, vol. 44, no. 3, November, 2000, p. 97-100.

⁵³ Barton, Paul E. *Raising Achievement and Reducing Gaps: Reporting Progress Toward Goals for Academic Achievement: A Report to the National Education Goals Panel*. Washington, D.C., National Education Goals Panel, 2001. (http://www.negp.gov/issues/publication/negpdocs/negprep/rpt_barton/barton_paper.pdf) Also see: National Center for Education Statistics. "Reading Highlights: The Nation's Report Card 2000," NCES, 2001. (<http://nces.ed.gov/nationsreportcard/>)

Introduction: The presumption is that students actually spend time reading, viewing, and listening to the materials they find. Such is often not the case. The pressure of a deadline, lack of interest, language difficulty, or the difficulty of the materials or information retrieved may discourage time spent actually consuming and absorbing what they find.

From Library Media Research:

Kafai and Bates⁴⁷ found a direct relationship between what children actually prefer when they must interact with a web site. Because of their familiarity with television, they wanted quality audio, video and heightened interactivity. They wanted high visual content and short, simple text. They liked children's artwork and photographs, and they had low tolerance for long download times.

Beers⁴⁸ reports success getting students actually engaged in reading by using audiobooks. Success with non-readers and English learners was particularly rewarding.

Research from Other Disciplines:⁴⁹

General Education: "More than 130 studies support the obvious idea that the more students study, other things being equal, the more they learn...Time alone, however, does not suffice"...a curricular focus is essential. (I: 2.3)

Language Arts: "Extensive reading of material of many kinds, both in school and outside, results in substantial growth in the vocabulary, comprehension abilities, and information base of students." (6a.1) Students should be taught that during the reading process, they should recognize main ideas since writers of nonfiction have for 200 years used this technique in their writing style. (See Aikman and O'Hear⁵⁰) Burns⁵¹ reminds teachers that students who have a choice in what they read will be more engaged in actually reading beneficial materials. In a small study of eighth graders doing a literature unit, Faust and Glenzer⁵² found that teens actually enjoyed rereading material the same way they would watch a movie over and over. The second time through, students discovered the meaning of Marcel Proust's quote: "The real journey of discovery consists not in seeking new landscapes but in having new eyes." The most extensive research on reading is done by the U.S. Federal government. Known as the NAEP Report,⁵³ or the nation's reading report card, In the March, 2001 report, the government concluded that:

- States are generally making more progress in mathematics achievement than in reading.
- Good readers are getting better at the same time weak readers are losing ground.
- During the 1990s, fourth grade students made more improvement in mathematics achievement than in reading
- States have not generally reduced the achievement gap between top and bottom quartiles or between white and minority students.
For teachers and librarians, this means that students doing research will have to be furnished with materials in a broader spectrum of reading difficulty than just a few years ago since fewer will be able to understand the textbook or research materials at or above grade level.

⁵⁴ Mayer, Robert H. "Connecting Narrative and Historical Thinking: A Research-Based Approach to Teaching History." *Social Education*, vol. 62, February, 1998, p. 97-100.

⁵⁵ Otten, Evelyn Holt. "Using Primary Sources in the Primary Grades." ERIC Digest, ED 419 773. See at: http://www.ed.gov/databases/ERIC_Digests/ed419773.html

⁵⁶ Van der Molen, Juliette H. Walma and Tom H.A. van der Voort. "Children's Recall of the News: TV News Stories Compared with Three Print Versions." *ETR&D*, vol. 46, no. 1, 1998, p. 39-52.

⁵⁷ Rittschof, Kent A. and Raymond W. Kulhavy. "Learning and Remembering from Thematic Maps of Familiar Regions." *ETR&D*, vol. 46, no. 1, 1998, p. 19-38.

⁵⁸ Barton, Keith C., and Linda S. Levstik. "'Back When God Was Around and Everything': Elementary Children's Understanding of Historical Time." *American Educational Research Journal*, vol. 33, Summer, 1996, p. 419-54.

⁵⁹ Kozma, R. B. "The Influence of Media Upon Learning: The Debate Continues." *School Library Media Quarterly*, vol. 22, no. 4, Summer, 1994, p. 233-40

⁶⁰ Jonassen, David H., ed., *Handbook of Research for Educational Communications and Technology*. New York: Macmillan, 1996.

Oral Communication: "Students who are provided with instruction in listening skills and opportunities to practice listening demonstrate improvement in listening as well as in speaking, reading, and learning." (I: 6b.2)

Physical Education: "Time spent practicing specific skills, sport, and fitness content leads to the development of skillful and fit movers." (I: 8.1)

Social Studies: Mayer⁵⁴ says that "History needs to be presented to students as a simple coherent narrative so they can discern a causal chain of events." (p. 97) National standards are also encouraging social studies teachers to consider primary source material as a regular part of the information they work with. (See Otten⁵⁵)

Media Studies: Much research has reported the impact of various media attributes on learning. That is, do pictures help students understand text? Does motion and color contribute to learning? Much of this research has been in search of the most effective delivery mechanism such as video learning versus textbook reading, but no one superior type of media has ever emerged. However, media characteristics do help learners master content. For example, Van der Molen and Van der Voort⁵⁶ found that children remember news stories better when the visuals of television accompany the text. Thus, if students were merely to read a news story about a town devastated by a tornado, they would remember much more if that narrative were accompanied by aerial shots of the town taken from a helicopter tour of the devastation. The researchers stress that this is true when the media itself commands more of a student's attention. Similar findings indicate that even in the world of text, presentation of data is learned more rapidly when converted from tables to graphs, pictures, maps, or models. (See Rittschof and Kulhavy⁵⁷). Barton and Levstik⁵⁸ studied children using archival photographs and found that "even the youngest children made some basic distinction in historical time." As the children matured they were able to develop a significant body of understanding of historical chronology when they used pictures. (See p. 416, 419.) The impact of media upon learning continues to be studied. Interested researchers should consult Kozma⁵⁹ for developing questions and theories, and the *Handbook of Research for Educational Communications and Technology* (Jonassen⁶⁰) for comprehensive coverage.

Application: Students need to take the time and teachers need to build in the time to actually read, view, listen, observe, collect, and compute using the materials and information they have located. Absorption takes time, and if thoughtfully done, requires hard work and discipline. Student interest in a topic is a powerful motivator to actually consume.

Some high schools have extended engagement time by going to a block schedule and lengthening class time from 45 minutes to 90 minutes or more. Thus, students on the block schedule have more time when they come to the library media center to get fully engaged in the research process beginning, doing, and completing projects before the merciless bell rings. In elementary schools with flexibly scheduled library media centers, teachers have the opportunity to spend blocks of time for research as appropriate to the project at hand.

In addition, the selection of what to read, view, or hear is critical, since the format, the media characteristics, or the interactivity will affect how much is learned within the time allotted to the activity. And since reading levels in a typical class are more diverse than ever, a wider variety of reading materials at different levels will need to be furnished.

Techniques for increasing student interaction with materials and information may include:

⁶¹ Hynd, Cynthia R. "Teaching Students to Think Critically Using Multiple Texts in History." *Journal of Adolescent & Adult Literacy*, vol.42, no. 6, March, 1999, p. 428-36.

- Making sure students have a background knowledge of a topic before they attack multiple sources of information on the topic. (see Hynd⁶¹)
- Using viewing and listening together as a class activity (to guide attention, for discussion, and for reflection).
- Providing sustained silent reading time using the materials on the topic.
- Having students write a journal as they consume.
- Requiring note-taking.
- Requiring reading as a prelude to discussion.
- Helping students find materials and information that is interesting to them and on their level.
- Booktalking or mediataalking.
- Minimizing finding time and emphasizing consumption time.

As they interact with a wide variety of materials, students need to be taught how to skim, scan, and search for the main ideas so that they spend their precious consuming time efficiently. This needs to happen in print materials but also in other types of media.

Library media specialists might encourage students to take notes during their reading, viewing, and listening, but other techniques such as concept mapping and discerning text structure hold great promise for using the reading time more efficiently. For example, to help students to skim and scan first, then read for some time, then note take or concept map are very effective tools. Several of these ideas are explored further in chapter four.

“Consumes and Absorbs” Summary Chart

Research suggests:

- Students must have time to consume the information they find.
- The quality of materials students use across a wide variety of media is an essential factor in how much they will absorb.
- Various media attributes (sound, motion, color, audio, graphical representations) can and do accelerate learning and engage interest.
- Techniques such as ascertaining text structure and creating concept maps helps in comprehension as reading, viewing, and listening is taking place.

Theory and practice suggest:

- An essential element in instructional planning is to provide the time and furnish the quality instructional materials students need.
- Quality materials are expensive and are wasted unless students actually use them.
- Media have the potential to enhance learning, but they can also confuse, distract, mislead, and waste precious time.

Generic information skills to integrate:

- Teach students how to approach materials through skimming, scanning, and main idea identification across all media.
- Help students know when to skim, absorb, study, enjoy, or slow down and think their way through the information.

Ideas to test:

- Schedule reading/viewing/listening time for students during a research project. What impact does this have on the quality of the products students produce?
- If students have usually only had a textbook chapter to assist them in understanding a body of material, add to this source a carefully chosen item or a mix of materials in various formats and then help the students take the time to absorb the information. Are student projects and learning improved?
- Compare the difference in understanding between students who just read and those who skim and scan, concept map, or take notes. Which group does better? What individuals grasp the central ideas?

Thinks and Creates; Compares and Contrasts; Judges and Tests

[Evaluates information critically and competently; Strives for excellence in information seeking
(Information Power)]

Introduction: The notion that young people would evaluate and then critically and creatively process the information and materials they find is perhaps the core of the research process. It is the higher level thinking skill of analysis; it is building a mental model. It is the point at which deep learning, not surface learning occurs. It could be considered the apex of the research process, its *raison d'être*. Do children and teenagers naturally possess a critical and creative capacity? Can it be taught, particularly in information-rich environments?

From Library Media Research: In the Kafai and Bates⁶² study cited earlier, graduate students in the UCLA library school helped elementary students learn to surf the web. One of the major findings was that younger students (fourth grade and below) are capable of locating information on the web but are uncritical of the content they find. This finding demonstrates a connection between critical thinking and mental maturity.

⁶² Kafai, Yasmin and Marcia J. Bates. "Internet Web-Searching Instruction in the Elementary Classroom: Building a Foundation for Information Literacy." *School Library Media Quarterly*, vol. 25, no. 2, Winter, 1997, p. 103-11.

⁶³ Vandergrif, Kay E. "Critical Thinking Misfired: Implications of Student Responses to *The Shooting Gallery*." *School Library Media Quarterly*, vol. 15, no. 2, Winter, 1987, p. 86-91.

⁶⁴ Fitzgerald, Mary Ann. "Evaluating Information: An Information Literacy Challenge." *School Library Media Research*. Vol. 2, 1999. (<http://www.ala.org/aasl/SLMR/vol2/evaluating.html>)

Vandergrif⁶³ reminds us that literary works can be used to help develop critical thinking skills – that even though a librarian's principal use of literature is to entertain and build enjoyment, it is quite natural to discuss issues and ideas both popular and unpopular.

Fitzgerald⁶⁴ did a fine review of the research in 1999 looking at how and when young people evaluate information they encounter. Her techniques with learners are worth studying and have become much more important as students shift from a textbook-lecture environment into an information-rich one. Factors affecting how much a learner might THINK ABOUT what is being read or consumed would include:

- Metacognition (thinking about one's own thinking)
- Goals and motivation (the reader's purpose)
- Disposition (the attitude of being disposed to consider in a thoughtful and perceptive manner)
- Signals (specific thoughts that launch the evaluation process, a recognition that something may be wrong with the information)
- Deliberation (reflection on what will resolve doubt)
- Decision (judgment of a course to take)

In addition, there would be contextual factors including:

- Problem structure (whether the new information coming in is useful in solving the problem at hand)
- Processing depth (whether the learner is really concentrating/using all their power of focus)
- Time (the time to consider the new information carefully enough to use it)

Research from Other Disciplines:⁶⁵

⁶⁵ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

⁶⁶ Hughes, Claire Elizabeth. *A Comparative Study of Teaching Critical Thinking Through Persuasive Writing to Average, Gifted and Students with Learning Disabilities*. Ph.D. dissertation, The College of William and Mary, 2000 (DAI-A61/05, p. 1797, Nov 2000)

⁶⁷ Mayer, Robert H. "Connecting Narrative and Historical Thinking: A Research-Based Approach to Teaching History." *Social Education*, vol. 62, February, 1998, p. 97-100.

⁶⁸ Kuhlthau, Carol. "Learning in Digital Libraries: An Information Search Process." *Library Trends*, vol. 45, no. 4, Spring, 1997, p. 708-22. The Bruner reference is: Bruner, Jerome. *Actual Minds, Possible Worlds*. Cambridge, MA: Harvard University Press, 1986.

Health Education: "Instruction that increases students' ability to analyze and critically examine the health messages promoted in the media and culture helps them make informed health choices." (I: 5.5, II: 5.5)

Language Arts: "Instruction that emphasizes discussion and analysis rather than rote memory contributes most effectively to development of students' thinking abilities." (I: 6a.7) Hughes⁶⁶ found that an intense period of instruction in critical thinking abilities to determine the difference between fact and opinion benefited all types of students ranging from gifted, to those with learning disabilities.

Mathematics: "Focusing instruction on the meaningful development of important mathematical ideas increases student learning." (I: 7.1) "Teaching that incorporates students' intuitive solution methods can increase student learning, especially when combined with opportunities for student interaction and discussion." (I: 7.7) Giving students both an opportunity to discover and invent new knowledge and an opportunity to practice what they have learned improves students achievement. (II: 7.4)

Physical Education: "Students who are challenged to think about movement make better decisions about when, where, and under what conditions to use the skill, strategy, or concept to enhance performance." (I: 8.3, II: 8.3)

Science: "Using analogies in the teaching of science results in the development of conceptual understanding by enabling the learner to compare something familiar to something unfamiliar." (I: 9.3, II: 9.3) "The use of student-generated and teacher-generated concept maps for teaching science concepts results in improved student achievement and more positive student attitudes." (I: 9.5, II: 9.5) "Using computer simulations to represent real-world situations enables students to become more reflective problem solvers and to increase their conceptual understanding." (I: 9.6, II: 9.6) "Using computers to collect and display data from science experiments enables students at the secondary level to understand science concepts and learn to use science process skills." (I: 9.7, II: 9.7) "Using discrepant events (occurrences in nature that are at odds with students' current thought) in science instruction results in cognitive conflict that enhances students' conceptual understanding." (I: 9.12, II: 9.12)

Social Studies: "Students will better learn and use critical thinking skills and strategies if these skills and strategies are taught explicitly in the context of content knowledge and with attention to their appropriate applications." (I: 10.4, II: 10.4) "Students taught in thoughtful classrooms, with atmospheres that promote higher-order thinking, will find social studies to be challenging and engaging." (I: 10.1, II: 10.1) "Student use of computer technology as a part of carefully planned instruction can contribute to student interest and motivation and to the attainment of social studies objectives. (I: 10.8, II: 10.8) (see also Mayer's⁶⁷ review of research)

General Education Theory. Translating the ideas of Jerome Bruner, Kuhlthau⁶⁸ says of this stage in the research process: "Interpreting involves creating. The interpretive task of 'going beyond the information given' is a

⁶⁹ Baumert, Jurgen, Robert H. Evans, and Helmut Geiser. "Technical Problem Solving Among 10-Year-Old Students as Related to Science Achievement, Out-of-School Experience, Domain-Specific Control Beliefs, and Attribution Patterns." *Journal of Research in Science Teaching*, vol. 35, no. 9, p. 987-1013.

⁷⁰ Sinatra, Richard C. "Teaching Learners to Think, Read, and Write More Effectively in Content Subjects." *The Clearing House*, vol. 73, no. 5, May/June, 2000, p. 266-73.

⁷¹ Tan, Seng Chee. "The Effects of Incorporating Concept Mapping into Computer Assisted Instruction." *Journal of Educational Computing Research*, vol. 23, no. 2, 2000, p. 113-31.

⁷² Feldhusen, John F. "Creativity, Teaching and Testing for." In: *The International Encyclopedia of Education*. 2nd ed. Tarrytown, NY: Pergamon, 1994, p. 1178-83.

⁷³ Torrance, E. Paul. "Teaching Creative and Gifted Learners." In: Wittrock, Merlin c., ed. *Handbook of Research on Teaching*. 3rd ed. New York: Macmillan, 1986, p. 630-47.

⁷⁴ Cramond, Bonnie. "The Coincidence of Attention Deficit Hyperactivity Disorder and Creativity." See her paper at: <http://hornioexplore.org/adhd.htm>

⁷⁵ Armstrong, Thomas. "To Empower! – Not Control! A Holistic Approach to ADHD." See at: <http://www.thomasarmstrong.com/articles/empower.htm> also his book: Armstrong, Thomas. *ADD/ADHD: Alternatives in the Classroom*. ASCD, 1999.

central concept in Bruner's work. Information is interpreted to create what Bruner calls 'products of mind.' This mysterious capacity to interpret and create is at the core of what it means to be human. Interpreting is based on personal constructs built from past experience. In this highly individual process, students make connections between information in various sources, extend their own ideas, and create something new for themselves." (p. 722) Baumert, Evans and Geiser⁶⁹ strongly recommend that if children are going to be tested on interpreting data (as is the case for many tests in science) rather than just recall of science facts, then children will need to be given many opportunities to practice the interpretation of data they encounter from scientific instruments [or, we would add, from various data-rich information sources they will encounter in the library and online]. The three researchers noted a major increase in technical problem solving when the 10-year-olds they were studying had a lot of practice in data interpretation.

Study Skills. Sinatra⁷⁰ reviews the research associated with specific skills that assist students to comprehend what they are reading:

- Text structure (ascertaining the logical flow of ideas and patterns in text)
- Concept mapping (graphical representations of main ideas)
- Teaching-style shift (having the teacher coach students in the discovery of main ideas)

Tan⁷¹ found that some form of concept mapping combined with other techniques is very effective in the amount learned.

Gifted Education. For several decades, researchers in gifted education have looked at the gifted child and wondered if creativity, a trait associated with giftedness, could not only be recognized but enhanced. Creativity is often equated with "creative problem solving" - a topic studied in gifted education by Feldhusen⁷² and others. (See his model in chapter six). Torrance⁷³ has reviewed the progress of teaching creativity concluding that creativity can be enhanced by direct teaching but that the value of pull-out programs of gifted education has not been demonstrated.

Attention Deficit Hyperactivity Disorder (ADHD) Children exhibiting attention deficit have been observed to be very creative even though they present behavior problems in school. Cramond⁷⁴ has documented some of the research connected with these children as has Armstrong. In an article about creativity and children, Thomas Armstrong,⁷⁵ a noted researcher and speaker, notes:

Every child is a genius. That doesn't mean that every child can paint like Picasso, compose like Mozart, or score 150 on an I.Q. test. But every child is a genius according to the original meanings of the word "genius"...Each child comes into life with wonder, curiosity, awe, spontaneity, vitality, flexibility, and many other characteristics of a joyous being...Unfortunately, there are strong forces working at home, in the schools, and within the broader culture, to stifle these genius qualities in children. Many children grow up in homes which put an active damper on the qualities of genius. Factors in the home like poverty, depression and anxiety, pressure on kids to grow up too soon, and rigid ideologies based on hate and fear, actively subdue

the qualities of genius in childhood such as playfulness, creativity, and wonder. Schools also put a damper on childhood genius through testing (creativity can't thrive in an atmosphere of judgement), labeling of kids as learning disabled or ADD, boring teachers, and regimented curriculum. Finally, the broader culture, especially mass media, represses the genius in our children through its constant onslaught of violence, mediocrity, and repugnant role models. The good news is that there is much that a teacher or parent can do to help children reawaken their natural genius... (quote from <http://www.thomasarmstrong.com/articles/geniuses.htm>)

Application: Numerous techniques of good teaching try to focus the student and force the student to confront ideas and process them. Asking good questions, creating concept maps, requiring comparison or contrast, working in small groups on a conceptual problem, and using computer simulations and databases are but a few good ideas. Library media specialists who concentrate on helping students locate information but do not participate in the higher-order thinking activities miss the best part of the learning process. Knowing what materials and information stimulate student thinking and learning, what activities use those materials to good advantage, and which activities appeal to various types of learners must be in the repertoire of the effective library media specialist.

⁷⁶ Nahl-Jakobovits, Diane and Leon A. Jakobovits. "Bibliographic Instructional Design for Information Literacy: Integrating Affective and Cognitive Objectives," *Research Strategies*, vol. 11, Spring, 1993, p. 73-88. Halpern, Diane F. *Critical Thinking Across the Curriculum*. Mahwah, NJ: Lawrence Erlbaum Associates, 1997.

Various authors⁷⁶ have itemized the skills that might be covered at this point in the research process:

- Evaluating evidence.
- Recognizing distortion and oversimplification.
- Distinguishing between fact and opinion.
- Identifying hidden assumptions.
- Recognizing bias, logical fallacies, and irrelevance.
- Assessing the adequacy of documentation.
- Distinguishing between scholarly and popular approach.
- Evaluating different perspectives.
- Learning how to challenge assumptions.
- Separating truth from falsehood.
- Understanding an abstract.

In addition to these, *Information Power*⁷⁷ adds ideas about:

- Comparing and contrasting information.
- Recognizing comprehensive information.
- Recognizing point of view.
- Knowing why inaccurate and misleading information leads to faulty conclusions.
- Recognizing accurate information.

⁷⁷ American Association of School Librarians and Association for Educational Communications and Technology. *Information Power: Building Partnerships for Learning*. Chicago: American Library Association, 1998. Standard 2, p. 14-18.

“Thinks and Creates” Summary Chart

Research suggests:

- Children come into the world with natural thinking and creative abilities.
- Parents, teachers, and our society suppress much of the natural creativity possessed by children.
- Creativity can be reawakened in both children and adults through direct teaching.
- Thinking can be enhanced by the using concept maps of various kinds as learners encounter important ideas so that they compare, contrast, judge and test across the information sources.

Theory and practice suggest:

- All children should be encouraged to use their natural creative talents.
- The principles of constructivism and information literacy can be excellent tools in fostering the creative spirit.
- It is very easy to suppress the creative spirit by using regimented activities, exacting assignments, tight expectations, and rigid rules.

Generic information skills to integrate:

- Openly discuss with students the art of creativity within the general parameters of assignments, quests, or engaging problems.
- Put in place with the help of learners, rubrics that encourage creativity making sure each learner understands what creativity means.

Ideas to test:

- What happens when questions, quests, assignments, and engaging programs are constructed in such a way that students are expected to be creative?
- What happens in a library activity when the teacher, the library media specialist, and someone knowledgeable about the creative process actually teach a lesson about the creative process?
- What kinds of rewards and recognition of creativity not only stimulate individual students but groups of students as well?

Summarizes and Concludes: Draws Together a Position or Makes a Decision, or Applies What They Have Learned Based on the Best Information

[Uses information accurately and creatively (*Information Power*)]

Introduction: Deep learning, critical thinking, and analysis lead students to synthesis: a time of concluding or decisionmaking; a time to take a stand or build a supportable opinion. Hopefully the young learner can base these decisions on a thorough analysis of the information collected. Summarizing and synthesis, the coalescing of what is known or believed, is not easy for anyone, particularly students, who may prefer to take the easy way out and copy down what someone else has concluded or decided.

Developing an informed opinion or arriving at a conclusion based on evidence and logic is a foundation stone of the scientific method. The modern scientific age is based on this system of truth-making. But the scientific method is not necessarily the only way individuals and societies use to establish “fact or a right answer.” Students may struggle to accept some conclusions that conflict with their own system of values or the values of their religion, their culture, family, or traditions. They may ask which system of sense-making should be trusted.

Certainly, long-held theories and knowledge about outer space, seem to crumble with every picture the Hubble telescope takes. Young people need to be introduced to the scientific method because so many systems in the world are based upon it. They should also realize that it is not infallible. As they mature, they should understand various systems of sense-making as they learn to function in their professions and their personal lives.

In school, opportunities to test out or try to apply learning in a “laboratory” setting might help the learner try their theories before all the realities of life descend upon them. But like the football field, it’s what happens during the game that demonstrates the results of study and preparation. Even children discover that very seldom is there re-play.

From Library Media Research: McGregor and Streitenberger⁷⁸ have conducted several studies watching students as they extract information from various sources and then transcribe that information into their finished project. They find that when students receive very little guidance they tend to copy a great deal

⁷⁸ McGregor, Joy and Denise Streitenberger. “Do Scribes Learn? Copying and Information Use.” in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 307-27.

from original sources rather than paraphrase or synthesize the ideas they find. When the teacher reminds students not to plagiarize, the researchers found that students copied less but that it was still present in their final products. Teaching students how to extract information and do it ethically is still a challenge. Another problem is to help teachers and students frame inquiry so that synthesis rather than regurgitation of ideas is the central focus of the quest.

⁷⁹ Large, Andrew, Jamshid Beheshti, and Alain Breuleux. "Information Seeking in a Multimedia Environment by Primary School Students." *Library & Information Science Research*, vol. 20, no. 4, p. 343-76.

⁸⁰ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

⁸¹ Friend, Rosalie. "Teaching Summarization as a Content Area Reading Strategy." *Journal of Adolescent & Adult Literacy*, vol. 44, no. 4, December 2000/January, 2001, p. 320-29.

⁸² Millet, Courtney Porteous. *The Effects of Graphic Organizers on Reading Comprehension Achievement of Second Grade Students*. Ph.D. dissertation, University of New Orleans, 2000. (DAI-A61/04, p. 1277, Oct 2000)

⁸³ Shaw, Priti, Richard E. Mayer, and Mary Hegarty. "Graphs as Aids to Knowledge Construction: Signaling Techniques for Guiding the Process of Graph Comprehension." *Journal of Educational Psychology*, vol. 91, no. 4, 1999, p. 690-702.

⁸⁴ Baron, Jonathan and Rex V. Brown, eds. *Teaching Decision Making to Adolescents*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1991.

Large, Beheshti, and Breuleux⁷⁹ make an identical observation from their research. As they examined student projects, they found that "In some cases, entire sections were copied word for word from the CD-ROM into the assignment. (p. 364)

Research from Other Disciplines:⁸⁰

Health Education: "Instruction that enhances student's goal-setting and decision-making skills will contribute to their ability to make positive health decisions." (I: 5.3) "Students who understand their own values and those of others can associate values with positive and productive courses of action." (I: 5.4)

Language Arts: Activities that enable students to apply meaning-making skills and strategies such as summarizing, questioning, and interpreting contribute to improved reading comprehension and written composition. (II: 6a.4) Friend,⁸¹ who was teaching college freshman who had failed writing placement tests, taught summarization principles to one group and not another. The rate of passing on the second test was significantly greater for the directly taught group. Millet⁸² found that teaching graphic organizers to second graders actually improved their comprehension.

Psychology: Shaw, Mayer and Hegarty⁸³ did a number of studies with young people using various graphical displays such as bar charts and line graphs. They reported a wide variety of learning based on key principles of constructing understandable graphs, and they recommend ways to use these techniques to stimulate summarization and sense-making.

Application: Both teachers and library media specialists should be able to teach decision-making based on evidence and opinion formulation built both on logic and evidence (see Baron and Brown⁸⁴). A pluralistic and multicultural society also demands sensitivity to values even when current evidence dictates otherwise. However, students need to learn to defend their conclusions and decisions as a part of sense making and awareness of consequences to themselves, their class, their school, family, and society.

Library media specialists might provide a wide range of literature, film, and other media showing the consequences of good and poor decisionmaking both from an historical perspective and from contemporary society. They might also directly teach the consequences of plagiarism and other ethical issues in an information society.

In recent years, many teachers have discovered PowerPoint as a tool for students to use as a summarization and presentation tool. Used well, learners do have to think, summarize, and learn to present large ideas in a few words. Some have overdone this tool so much that it is often referred to as “death by PowerPoint.”

Another common tool helps students collect data and then summarize that data to interpret it. We refer to graphing and charting. Students can gain benefit twice in the research process from this technique – first, in the creation of a graph, and second, as they present and have to interpret the graph for others. Since graphs and charts are such a common part of academic achievement tests, such interpretive and construction principles are important skills to learn.

“Summarizes and Concludes” Summary Chart

Research suggests:

- Children need help to realize that they must summarize and make decisions rather than just copy what someone else has concluded.
- Direct teaching of summarization skills just prior to that task, makes a positive difference.

Theory and practice suggest:

- Children and teens can use such useful tools such as PowerPoint, mind mapping, graphing and charting programs and other data handling techniques now available, profitably to summarize, conclude, and decide, based on a collection of evidence and data manipulation.

Generic information skills to integrate:

- Summarization
- Synthesis
- Decisionmaking
- Taking a side based on evidence
- Coalescing ideas
- Forming a supportable position
- Taking a stand
- Use of technology tools to summarize, group, graph, chart, or analyze.

Ideas to test:

- Have students gather information in preparation for decisionmaking, then create an activity to chart the decisionmaking process, and finally make a decision or several decisions, as a group, based on the evidence.
- Using the topic being researched, have students assemble note cards containing quotes from various sources. Model the summarization process using the notes they have written. Then pass the task to the students. Critique several examples as a groups. Discuss which examples come closest to true synthesis and why.
- After a data collection phase of the research, demonstrate the use of technology tools to summarize, group, graph, chart, or analyze. Examine the results for both the correct use of the tool and the soundness of the conclusion made from the data analysis. Did the learners improve?

Communicates: In All Forms of Media

[Seeks for excellence in knowledge generation (*Information Power*)]

Introduction: Traditional forms of reporting include worksheets, reports, research papers, and oral reports. In the world of multimedia and technology, a vast array of communications technologies become available from digital photography, databases, video, to Internet sites. That students should and could communicate in a variety of media formats is not an automatic assumption either by teachers or library media specialists. However, the idea does seem plausible even if its implementation is problematic.

⁸⁵ Kuhlthau, Carol Collier. *Seeking Meaning: A Process Approach to Library and Information Services*. Norwood, NJ: Ablex, 1993, p. 56-61.

From Library Media Research: Kuhlthau⁸⁵ reports that as students complete the search process (in many minds, the completion of the project), they progress from a state of confusion to confidence [at least until they get their grade].

⁸⁶ Burdick, Tracey. "Snakes and Snails and Puppy Dog Tails: Girls and Boys Expressing Voice in Information Research Projects." *Journal of Youth Services in Libraries*, vol. 11, no.1, Fall, 1997, p. 28-36.

Burdick⁸⁶ also notes that in communications about their research, both boys and girls might experience the expression of "voice" (a clear expression of oneself) rather than repeat what others know about a topic. This seems particularly important to adolescent girls in their development of self-image.

Research from Other Disciplines:⁸⁷

⁸⁷ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

The Arts: "Among special education students, production experience in the arts (such as singing, playing, drawing and painting, active, and dancing) enhances motivation and self concept and improves attitude toward school." (I: 3.16, II: 3.16)

Language Arts: "Stressing the processes of composing (planning, drafting, revising, sharing, and publishing) contributes to improved competence in writing." (I: 6a.8, II: 6a8)

Oral Communication: "Students who are provided with experiences to help overcome anxiety about oral communication demonstrate improved coherence and confidence when giving a speech and in other oral communication situations." (I: 6b.4, II: 6b.4)

Social Studies: "Students who participate actively in the local community as part of the social studies curriculum, performing tasks with real consequences, tend to have a greater sense of social responsibility, increased moral development, enhanced self-esteem, more positive attitudes toward adults, and improved skills and knowledge directly related to the experience." (I: 10.9, II: 10.9)

Application: The challenge to help provide the skills to communicate in various technologies as well as conventional ones opens opportunities for a trainer of trainer model, tutorials, group instruction, as well as individual assistance. Students will not only need to know how to operate the equipment, but how to transform what they know and have discovered into an intelligent message. They need to understand that in major corporate presentations, graphic elements are essential for almost every point made.

Students should know that their projects will be assessed on content first, use of technology second.

They also need to understand that presentation techniques enhance content delivery—such techniques as:

- Pace of presentation.
- Interest catching techniques; use of drama.
- Logic of arguments and defensible ideas.
- Use of humor.
- Clarity of ideas.
- Accuracy of facts and evidence.

Such matters are best communicated in the form of a rubric so that students can plan their presentations to demonstrate what they know and are able to do.

“Communicates” Summary Chart

Research suggests:

- The act of communicating has intrinsic benefits for learners.
- Benefits to individuals as they effectively communicate their findings or create their product include an increase in confidence, the discovery of “voice,” improvement of competence, and addition to their experience.

Theory and practice suggest:

- Students who learn to communicate in various forms of media learn the tool skills of production in that media, e.g., word processing, video taping, digital photography, editing, or oral speaking skills.

Generic information skills to integrate:

- Students who have a choice in the form of communication they will use are more motivated to try new things and learn the tool skills they need.
- The excitement of producing a challenging or fun product can have backward motivational effects – causing students to read more widely, work harder, and learn more so that the end result is better.
- Just-in-time tool skill instruction (learning a computer graphics package when the product requires a graph) is preferable to teaching tool skills in the abstract.
- Creation of a product is an opportune time to teach systems thinking, problem solving, creativity, patience, and hard work.
- Good presentation techniques can communicate the results of hard work and sound research but cannot mask inadequate preparation of poor research.

Ideas to test:

- To increase motivation in a topic, try one of two things: 1) change the nature of the question or problem posed, or 2) change the nature of the end product. Experiment with both techniques to bring variety into educational experiences. What results are achieved for various types of teachers and learners?
- Create opportunities for young people to communicate their projects, products, or findings, far beyond the classroom through direct or virtual performance. What impacts do you see upon learning and teaching?

Reflects on the Process and Product: How well did I do and how could I do better right now?

Introduction: Rather than have only adults assess student learning, young people need to build in a reflection point or self-assessment at each stage of the research in order to build a sense of personal empowerment, or in other words, to take command of their own learning. The process of completing authentic assessment through a variety of strategies has gained considerable attention in the past decade over the traditional strategies of objective tests and multiple choice tests that concentrate on factual knowledge.

From Library Media Research: The subject of assessment of learning is a broader topic than information skills but library media specialists are anxious to know the effects of their interventions on student learning. In 1994, Carol Kuhlthau, Goodin and McNally⁸⁸ published a collection of articles entitled *Assessment and the School Library Media Center*. Several of the articles in that collection deserve mention.

⁸⁸ Kuhlthau, Carol Collier, M. Elspeth Goodin and Mary Jane McNally. *Assessment and the School Library Media Center*. Englewood, CO: Libraries Unlimited, 1994.

⁸⁹ Madaus, George F. and Ann G. A. Tan. "The Growth of Assessment." in: Kuhlthau, Carol Collier, M. Elspeth Goodin and Mary Jane McNally. *Assessment and the School Library Media Center*. Englewood, CO: Libraries Unlimited, 1994, p. 1-24.

⁹⁰ Neuman, Delia. "Alternative Assessment: Promises and Pitfalls." in: Kuhlthau, Carol Collier, M. Elspeth Goodin and Mary Jane McNally. *Assessment and the School Library Media Center*. Englewood, CO: Libraries Unlimited, 1994, p. 67-75.

⁹¹ Jackson, Mary M. "Library Information Skills and Standardized Achievement Tests." in: Kuhlthau, Carol Collier, M. Elspeth Goodin and Mary Jane McNally. *Assessment and the School Library Media Center*. Englewood, CO: Libraries Unlimited, 1994, p. 25-32

Madaus and Tan⁸⁹ and Neuman⁹⁰ reviewed the history of the assessment movement in the educational field and the conflict between the behaviorist and constructivist camps to discover what a student knows when an inquiry method is used. They want to know how to test more than surface learning of factual or computational knowledge.

Jackson⁹¹ looked at popular national tests such as the Iowa Test of Educational Development to ascertain whether information skills were being tested. She found that none of the tests attempted to assess the process of narrowing or broadening a topic; computerized information retrieval skills, development of a thesis, development of a search strategy, or ordering the steps in a search strategy. She concluded that other means of assessment such as portfolio compilations, oral recitations, and professional judgment would be more appropriate for measuring student success in the research process.

Numerous other authors in the Kuhlthau collection introduced school library media specialists to the movement of authentic assessment utilizing such techniques as portfolios, performances, the diagnostic interview, the questionnaire, observation, personal

contact, and reflection tools such as learning logs, progress logs, and process logs.

⁹² Stripling, Barbara. "Practicing Authentic Assessment in the School Library." in: Kuhlthau, Carol Collier, M. Elspeth Goodin and Mary Jane McNally. *Assessment and the School Library Media Center*. Englewood, CO: Libraries Unlimited, 1994, p. 103-20.

Stripling⁹² published her REACTS model of assessment describing measures that a researcher could be held responsible for throughout each stage of the research process. These measures would include:

- recalling,
- explaining,
- analyzing,
- challenging,
- transforming, and
- synthesizing.

⁹³ Harada, Violet H. "Building Understanding of the Information Search Process Through Student Journal Writing." In: *Inspiring Connections: Learning, Libraries & Literacy: Proceedings of the Fifth International Forum on Research in School Librarianship, 30th Annual Conference of the International Association of School Librarianship, Auckland, New Zealand, 9-12 July 2001*. Seattle Washington, IASL, 2001 (dist. by LMC Source at <http://www.lmcsource.com>), p. 91-105.

If we watch learners across the entire research task, Kuhlthau predicts that it will be a roller coaster ride of stress and doubt all the way to confidence. Harada⁹³ presents a very useful technique for looking across the entire research experience by having the learner/researcher and the adult helpers keep a journal from beginning to end of the experience. She then analyzes each student's experience, coding it for both cognitive and affective factors (how deeply the students are thinking and their attitudes along the way). Harada analyzed novice 5th and 6th grade researchers and says:

They initially possessed bits and pieces of conceptual knowledge about the information search process; however, through the process of journal writing, the majority were able to demonstrate increased cognitive and metacognitive understanding of the information search process. To varying degrees, they were able to assess what they viewed as strengths and weaknesses that affected their learning. Nonetheless, it should be noted that the ability to verbalize their own mental processes was a formidable challenge for most of the students; and that they must have sustained opportunities to monitor their own comprehension. Personal feelings and emotions were readily explored and expressed as trusting relationships were built in the journal communication. Students openly shared their difficulties and frustrations because the journal was not seen as an evaluative tool. They felt safe to take risks and to experiment with form, style, and voice. (p. 103-4)

Just as fascinating as the progress was for children who were forced to monitor their own progress through the research was the adult perception about what was happening:

For the instructors, journal writing revealed variations in students' perceptions of the information search process that were not readily

apparent during their whole class interactions. Through their journals, all students were simultaneously engaged in translating and personalizing knowledge.

Rather than relying only on gut intuitions about students' needs and performances, both instructional teams indicated that studying student journal responses supplied them with critical data on which to base informed judgments. The journals afforded them valuable ongoing assessment of actual student comprehension of the information search process and helped them refine their intervention strategies.

In short, the study substantiated for these teams the importance of promoting understanding of the information search process itself rather than concentration on the product alone. While these findings were not generalizable since the contexts were very specific; the researchers hope that the insights presented might encourage other school teams to replicate aspects of this study in their own settings. (p. 104)

Thus, the adults were beginning to learn that their own general perceptions of what is going on during the research process should not be trusted, since analysis of student journals "held so many surprises and helped the adults adjust during the research time and gain experience for future groups." While journal keeping was a very time consuming task, it becomes evident that both teachers and library media specialists need to develop research-monitoring techniques. Harada looked at novices, but what would we learn from intermediate and advanced researchers?

⁹⁴ *Handbook of Research on Improving Student Achievement*. Arlington, VA: Educational Research Service. First edition, 1995, second edition, 2000. (reference numbers refer to sections in the book such as I: 3.6 means the first edition (1995) section 3.6; II:3.6 means the second edition (2000) section 3.6)

⁹⁵ Beeth, Michael E. Linda Cross, Christy Pearl, Janice Pirro, Kara Yagnesak, and Janette Kennedy. "A Continuum for Assessing Science Process Knowledge in Grades K-6." (<http://unr.edu/homepage/crowther/eise/beethetal.htm>)

⁹⁶ Colorado State Library and Adult Education Office and Colorado Educational Media Association. "Rubrics for the Assessment of Information Literacy: A Companion to the Information Literacy Rubrics for School Library Media Specialists." In: California School Library Association: *From Library Skills to Information Literacy: A Handbook for the 21st Century*. 2nd. ed. San Jose, CA: Hi Willow Research & Publishing, 1997, p. 131-42.

Research from Other Disciplines:⁹⁴

The Arts: "Providing immediate feedback to individuals, whether performing alone or in a group, is superior to delayed, group, or no feedback in promoting skill development in all areas of the arts." (3.2)

Language Arts: "Assessments should measure what teachers teach and what students learn." (6a.12)

Science: Beeth⁹⁵ and company in an assessment project for science in an elementary school report the successful use of rubrics measuring process knowledge in science very similar to information literacy rubrics.

Tools from the school library media field. Two major assessment tools of student performance done in the form of rubrics have appeared in the literature. The first was created in Colorado by the Colorado State Library and the Colorado Educational Media Association in 1996.⁹⁶ It was published

nationally for the first time in: *From Library Skills to Information Literacy*. This instrument judges any student information-based product using five target indicators:

1. The student as a knowledge seeker;
2. The student as a quality producer;
3. The student as a self-directed learner;
4. The student as a group contributor; and,
5. The student as a responsible information user.

The rubric is formed using these indicators in four levels of attainment: In Progress, Essential, Proficient, and Advanced.

⁹⁷ Grover, Robert, Jacqueline McMahon Lakin and Jane Dickerson. "An Interdisciplinary Model for Assessing Learning." in: Lighthall, Lynne and Ken Haycock, eds., *Information Rich but Knowledge Poor? Emerging Issues for Schools and Libraries Worldwide*. Seattle, WA: International Association of School Librarianship, 1997, p. 87-96. See also: Grover, Robert, Carol Fox, and Jacqueline McMahon Lakin, eds. *The Handy 5: Planning and Assessing Integrated Information Skills Instruction*. Scarscrow, 2001.

The second major assessment tool was published in 1997 by the Kansas Association of School Librarians Research Committee using an AASL research grant.⁹⁷ It has been revised and is being published in 1999 under the title "Handy 5 Integrated Problem Solving Model." The idea is for teacher and library media specialist to use the rubric as the planning for an instructional unit progresses so that the potential to succeed in each of the five following areas is achievable for each student:

- Assignment
- Plan of action
- Doing the Job
- Product Evaluation
- Process Evaluation

Students are expected to achieve at least a "3" rating (benchmark or mastery) on each part of the assessment if the learning experience is considered successful. Recognition of excellence is possible with a "4" rating. The rubric is also designed to be used in conjunction with an information literacy model and was guided by The Big Six™ model structure as it was created. The full rubric can be seen on the next page.

Kansas Association of School Librarians Rubrics for the Handy 5 Integrated Assessment Model

Assignment	Plan of Action	Doing the Job	Product Evaluation	Process Evaluation
4-Demonstrates through, complete understanding of assignment/problem	4-Chooses highly effective strategies to fulfill the assignment	4-Implements the plan of action in a highly effective manner	4-The product reflects the student's thorough, complete understanding of the problem	4-Evaluates the problem-solving process (steps 1-4) in a highly effective manner
3*-Demonstrates a substantial understanding of assignment/problem	3*-Chooses effective strategies to fulfill the assignment	3*-Implements the plan of action in an effective manner	3*-The product reflects the student's substantial understanding of the problem	3*-Evaluates the problem-solving process (steps 1-4) in an effective manner
2-Demonstrates a partial/incomplete understanding of assignment/problem	2-Chooses moderately effective strategies to fulfill the assignment	2-Implements the plan of action in a moderately effective manner	2-The product reflects the student's partial/incomplete understanding of the problem	2-Evaluates the problem-solving process (steps 1-4) in a moderately effective manner
1-Demonstrates a misunderstanding or serious misconception of the assignment/problem	1-Chooses ineffective strategy/ies to fulfill the assignment	1-Implements the plan of action in an ineffective manner	1-The product reflects the student's misunderstanding or serious misconception of the problem	1-Evaluates the problem-solving process (steps 1-4) in an ineffective manner
NA-Not applicable/nothing available	NA-Not applicable/nothing available	NA-Not applicable/nothing available	NA-Not applicable/nothing available	NA-Not applicable/nothing available

* = benchmark or mastery
3/99

⁹⁸ Norris, S. P. and R. H. Ennis. *Evaluating Critical Thinking*. Pacific Grove, CA: Midwest Publications Critical Thinking Press, 1989.

Using Ennis and Norris⁹⁸ critical thinking elements, Blanche Woolls built a rubric to demonstrate what a learner might know at beginning, intermediate, and advanced levels of the six elements:

- Clarity
- Advanced Clarity
- Basis
- Inference
- Interaction
- Employing Fallacy Labels

Clarity

- (Focusing on a question)
- Beginning: Student is able to identify a problem.
- Intermediate: Student is able to propose an hypothesis.
- Advanced: Student is able to judge if the hypothesis is acceptable.
- (Analyzing arguments) Note: This may have some overlap with the above.
- Beginning: Student finds a variety of statements to answer the question.
- Intermediate: Student finds statements identifying arguments that are not explicitly stated.
- Advanced: Student is able to determine relevance of statements.
- (Asking appropriate, clarifying questions)
- Beginning: Student is able to analyze the amount of information found.
- Intermediate: Student is able to analyze if enough information has been located to prepare the report.
- Advanced: Student has sufficient background knowledge to continue.

Advanced Clarity

- (Defining terms)
- Beginning: Student understands where to locate definitions.
- Intermediate: Student can determine the “best” definition from those in source.
- Advanced: Student can expand the existing definition with examples.
- (Identifying assumptions)
- Beginning: Student can point out assumptions an author has stated.
- Intermediate: Student can state assumptions that author has made but not stated.
- Advanced: Student can describe assumptions that author might have used.

Basis

- (Judging credibility)
- Beginning: Students check credibility of content, only.
- Intermediate: Students check credibility of content and sources.
- Advanced: Students check credibility of assumptions made from stated facts in content.
- (Observation)
- Beginning: Student is able to take credible notes.
- Intermediate: Student is able to observe information sources and incorporate new findings into report.
- Advanced: Student is able to transfer observations from previous experience or to transfer learning to other areas of the curriculum.

Inference

- (Deducing and judging deductions)
- Beginning: Student is able to judge cause and effect.
- Intermediate: Student is able to analyze whether necessary conditions are satisfied.
- Advanced: Student is able to interpret double negatives in sentences.
- (Inducing or inductive inference)
- Beginning - advanced: Student is able to generalize and infer to hypotheses that are supposed to explain the facts. Does smoking cause cancer?
- (Making value judgments)
- Beginning: No plausible alternatives
- Intermediate: Deciding on an action.
- Advanced: Recognizing the consequences of decisions.

Interaction

- Interacting with others in discussions, presentations, debates, and written pieces:
- Beginning: Student participates in discussion.
- Intermediate: Student leads discussion.
- Advanced: Student plans discussion.

Employing Fallacy Labels

- Beginning: Student detects errors in statements of fact.
- Intermediate: Student detects errors in assumptions and hypotheses.
- Advanced: Student revises assumptions and hypotheses.

Other Assessment Techniques: Library media specialists and teachers might be impressed that during the learning process, students exhibit enthusiasm, excitement, well behaved attention, answer questions, and are busy. According to Resnick,⁹⁹ these characteristics do not necessarily guarantee that effective thinking is occurring but the following signposts have additional evidence of critical thinking:

- The path of action is not fully specified in advance.
- The total path is not 'visible' from any single vantage point.
- Multiple solutions with costs and benefits are provided rather than unique solutions.
- Nuanced judgment and interpretations are involved.
- Application of multiple criteria is in evidence, some in conflict with one another.
- Not everything bearing on the task at hand is known.
- Students must self-regulate the thinking process rather than allow another to set the steps for the solution.
- Students find meaning out of apparent disorder.
- Higher order thinking requires considerable mental work.

Woolfs¹⁰⁰ in her Treasure Mountain VI paper reviews a wide variety of other assessment techniques:

- Use commercial tests covering some aspects of critical thinking.
- Create your own tests using good testing practices.
- Use multiple choice tests that have been constructed specifically to measure critical thinking.
- Use self-assessment so that students start comparing their own work against a framework of good research practices.
- Use performance/presentation measures.
- Have students use checklists as they prepare their products.
- Do interviews.
- Have students use writing to evaluate their thinking.
- Evaluate the quality of the resources students choose to collect their information.
- Do a portfolio assessment.
- Do direct observation of the learning process.
- Teach and then observe student's questioning techniques.
- Evaluate the ability to formulate a search strategy.
- Evaluate the evaluation itself.

Other valuable contributions to the creation of assessment criteria and measurements include the work of Paul and Nosich,¹⁰¹ Brookfield,¹⁰² Baron, and Halpren.¹⁰³

An interesting technique of assessment, Jones, Rua, and Carter¹⁰⁴ propose an assessment model for science teachers applicable to

⁹⁹ Resnick, L.B. *Education and Learning to Think*. Washington, D.C.: National Academy Press, 1987, p. 37

¹⁰⁰ Woolfs, Blanche. "Assessment Methods: On Beyond Craver: A Project in Process." in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 14-57.

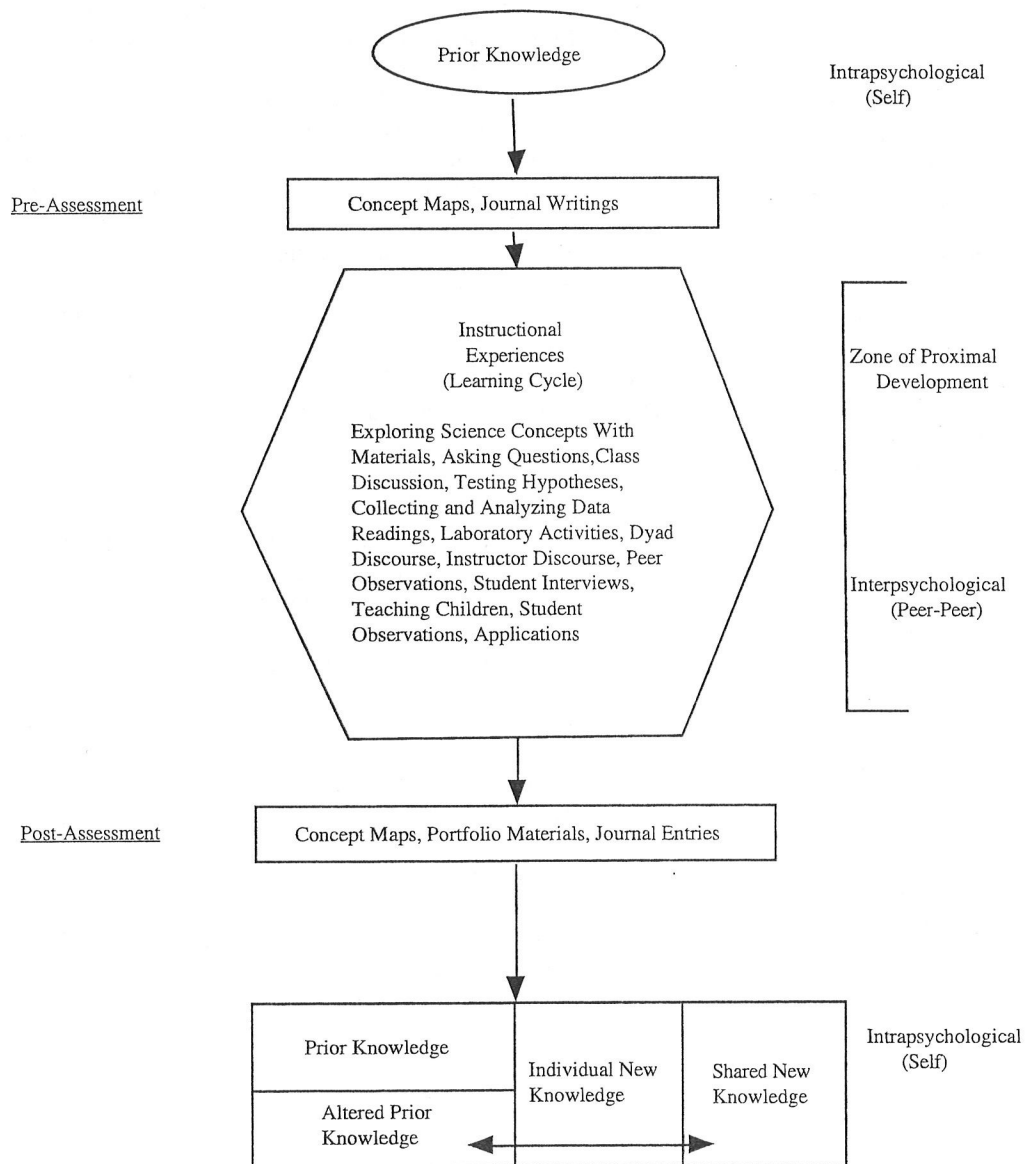
¹⁰¹ Paul, R. and G. M. Nosich. "A Model for the National Assessment of Higher Order Thinking." Santa Rosa, CA: Foundation for Critical Thinking, 1992. ED 353 296.

¹⁰² Brookfield, S. D. *Developing Critical Thinkers: Challenging Adults to Explore Alternative Ways of Thinking and Acting*. San Francisco: Jossey-Bass, 1989.

¹⁰³ Halpren, D. F. "Assessing the Effectiveness of Critical Thinking Instruction." *JGE: The Journal of General Education*, vol. 42, p. 238-54, 1993.

¹⁰⁴ Jones, M. Gail, Melissa J. Rua and Glenda Carter. "Science Teachers' Conceptual Growth Within Vygotsky's Zone of Proximal Development." *Journal of Research in Science teaching*. Vol. 35, no. 9, 1998, p. 967-85

any subject area where concepts are an important element in the teaching unit. Before the unit gets underway, they do a pre-assessment based on prior knowledge consisting of concept maps and journal writings. Then after the instructional experience, they do a post-assessment consisting of concept maps, journal writings plus a portfolio. The figure below shows their assessment model.



Overview of Assessments and Instructional Experiences

Application: No other topic in education has garnered as much attention in the United States as has assessment. Achievement scores are published locally, state-wide, and nationally with loud proclamation of analysis, hand wringing, and criticism. Library media specialists are just now beginning to realize that they have a stake in how well students score on tests. They want to take credit for contributing to achievement but have little experience in adjusting their programs to make a notable and measurable difference.

The first step is to understand assessments that are currently used in the school, what they measure, and what is likely to affect those measures. That knowledge comes not just from observation, but from participating in the assessment process when educational projects interface the library media center and the collection. For example, understanding how to create and apply rubrics, will affect what information literacy skills are taught. Should the assessment process be a measure only of a single dimension of a student's knowledge and capability, library media specialists might seek not only to help students in that dimension but across others, taking a broader view of education.

Library media specialists for decades participated only marginally skill-based reading programs, opting instead to help young people learn the love of reading. That conscious choice, fortunately, has become one of the most powerful factors in contributing to academic achievement, since avid readers inevitably score high on tests.

Understanding assessment techniques and participating in the assessment process should enhance observational skills to the point where the library media specialist instinctively diagnoses learning difficulties and prescribes ideas, materials, and engaging activities from the world of information and technology. Few people in the school are in a better position than the library media specialist to see the big picture of school-wide assessment and its impact upon students and teachers. That knowledge can be very painful at times, but it can lead to actions that can enhance current practices, and also broaden them.

At this juncture, there does not seem to be any one right way to teach, learn, or assess learning. The wonderful thing about library media centers and their materials and information technology is that they can fill in the gaps for students and teachers who are not performing well in any classroom.

“Reflects” Summary Chart

Research suggests:

- Assessment techniques currently used are often only uni-dimensional pictures of what students know and are able to do.
- A wide variety of newer assessment techniques provide new possibilities to measure student understanding and performance.

Theory and practice suggest:

- Library media centers with their rich information and technological environment stand ready to enhance the ability and knowledge of every learner.
- Library media specialists who understand the big picture of learning and assessment are in a strong position not only to diagnose “learning illness” but to prescribe alternatives pointing to a variety of cures.

Generic information skills to integrate:

- Seeing repeated failure of students to match expectations, students should be offered a variety of ways of using library media centers to become “power learners.”

Ideas to test:

- Discovering student failure with important concepts or performance, prescribe and carry out activities that have broader appeal to the interests and learning styles of every student in the group. Assess with the teacher what really happens to student competence.
- Conduct reflective sessions with groups and individuals, trying to understand the research process as a whole. Have students help design ways of using information and technology to enhance learning. As they reflect on the process and the product, what impact does this have on how they behave in future projects? What can you do to streamline the organization to enhance success?

Chapter Three

Issues in Information Literacy

As library media specialists develop further expertise in teaching information literacy, issues or threads begin to emerge across the various stages of the process. In this section, we deal with a few of the issues being defined in various research studies.

Information Overload

Information overload in adults has been studied since the 1970s in both the fields of psychology and education. A number of popular adult books such as *Information Anxiety* by Richard Saul Wurman and *Data Smog* by David Shenk have popularized the problem. As the information pool deepens for young people, the inevitability of information overload looms. Few studies have been conducted about this phenomenon with children, but Akin's¹⁰⁵ article in *School Library Media Quarterly* is the first of many likely to come.

¹⁰⁵ Akin, Lynn.
"Information Overload and Children: A Survey of Texas Elementary School Students." *School Library Media Quarterly Online*, at <http://www.ala.org/aasl/SLMC/overload.html>

Akin asked fourth and eighth graders if they had ever experienced information overload, their feelings about it, and how they coped with it when they were doing library research. She found younger students to be more frustrated and angry than older students. This might be due to the attempt by younger students to pick and choose among all the information sources whereas the older students simply omitted/ignored the flood or filtered it (selective attention). Obviously, a great deal of work needs to be done in this area and library media specialists need to develop strategies for helping students as they face large volumes of information spewing from information systems, particularly the Internet where there is no quality control.

¹⁰⁶ Limberg, Louise.
"Model School Libraries: Tools or Threats? Reflections on a Development Project in Sweden." *School Libraries Worldwide*, vol. 5, no. 1, 1999, p. 49-65.

In a study with children in Sweden, Limberg¹⁰⁶ described a model school library demonstration project in six elementary schools. Teachers were encouraged to switch emphasis from the textbook/lecture method to an emphasis on multiple information sources in the school library and on the Internet. One major barrier was language since much of the Internet is still in English. However, dealing with information sources produced its own set of problems. According to Limberg:

The evaluation showed that students found the selection of relevant information complicated. They had difficulties in distinguishing "what was important, since most of it was not important" (student

wording). The richness of information in literature, periodicals, and databases gave rise to complicated selection procedures. They experienced overload of irrelevant or “unimportant” (student wording) information. Students’ relevance criteria seem to have been often uncertain, and often dependent of their prior subject knowledge. (p. 56)

Limberg also observed conflict that multiple sources vs. controlled information sources (textbook/lecture) caused among teachers. Some questioned casting students into a sea of frustration when in the same amount of time, students could be given a controlled and focused information stream in the classroom.

School library media specialists have often equated a good collection with size as long as selection criteria provided quality. With the opening of the Internet, garden-hose-size information flow is replaced by fire-hose-streams and students find themselves overwhelmed.

Perhaps less is more. Time-honored selection criteria for building the pool of information may still be a teacher's and a student's best friend. That is, quality is to be preferred over quantity. Budget constraints have always encouraged this stance and seem destined to continue that limited role. Many school library media specialists are finding that electronic pathfinders as an interface between assignment and massive electronic data resources is one promising solution. The message seems to be: “Start here, then venture all you like.” Kuhlthau¹⁰⁷ urges library media specialists to assist students to recognize when they have “enough” information (usually not the first information encountered).(p. 716)

¹⁰⁷ Kuhlthau, Carol.
“Learning in Digital
Libraries: An Information
Search Approach.”
Library Trends, vol. 45,
no. 4, Spring, 1997, p.
708-24.

A good deal of research needs to be conducted in probing how much information and how fast that information can be delivered as a factor in maximizing learning. Amount and speed of flow studies also need to factor in the deepening information pool as it satisfies learning style and information literacy skill.

Attitudes and Motivation

If young people are to survive in the information-rich world, they need to develop their natural intellectual curiosity and to learn how to develop positive information seeking and exploration habits. Motivational strategies to develop work habits and deal

with frustration and information overload are tools library media specialists can use to help develop life-long learners.

Hirsh¹⁰⁸ studied ten students who were doing reports on sports figures in an information-rich environment where they had good computer support. These young people were highly motivated but Hirsh was unimpressed with their discrimination of quality. Instead, these researchers gravitated toward “interesting” information sources.

Carol Kuhlthau¹⁰⁹ studied the attitudes and feelings of confidence throughout the research process. Students exhibited a wide variety of feelings, from poor to strong self-confidence. The variations in attitude were included as a part of her model shown in chapter six.

Havener and Latrobe,¹¹⁰ in their Treasure Mountain VI paper, reported investigating students engaged in research and related their experiences to a variety of psychosocial theories including alienation theory, gratification theory, knowledge gap theory, resilience theory, dynamic social impact theory, and social cognitive theory. They found elements from all six theories operational during students’ experiences as they struggled to develop self-regulatory skills in the learning process. They encouraged library media specialists to recognize these struggles and extend assistance and encouragement throughout the process.

Ruth Small,¹¹¹ the recipient of the Highsmith Research Award from AASL, is concerned that little attention is being paid to motivational issues in the information literacy effort, even when a widely accepted goal of education is to develop intrinsically motivated life-long learners who want to learn and actually enjoy the learning experience. After exploring numerous motivational theories, particularly the ARCS Model of Motivational Design, she studied middle school learners during library research instruction and found that librarians used many informational (verbal praise) motivators and fewer satisfaction-related ones.

Thus, library media specialists seem to be using attention-focusing strategies with early teens. Small recommends that satisfaction strategies such as natural consequences, positive consequences and equity may have more long-lasting effects. She expects to test these notions further.

¹⁰⁸ Hirsh, Sandra G. “Children’s Relevance Criteria and Information Seeking on Electronic Resources.” *Journal of the American Society for Information Science*, vol. 50, no. 14, 1999, p. 1265-83.

¹⁰⁹ Kuhlthau, Carol C. “Implementing a Process Approach to Information Skills: A Study Identifying Indicators of Success in Library Media Programs.” *School Library Media Quarterly*, vol. 22, no. 1, Fall, 1993, p. 11-18.

¹¹⁰ Havener, W. Michael and Kathy Latrobe. “Understanding the Information-Seeking Behavior of High School Honors Students: Insights from Psychosocial Theories.” in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 84-99.

¹¹¹ Small, Ruth V. “Designing Motivation into Library and Information Skills Instruction.” *School Library Media Quarterly Online*, at <http://www.ala.org/aasl/SLMQ/small.html>

also:
Small, Ruth V. “Motivational Aspects of Library and Information Skills Instruction: The Role of the Library Media Specialist.” in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 201-22.

also:
Small, Ruth V. and Marilyn P. Arnone. “Arousing and Sustaining Curiosity: Lessons From the ARCS Model.” *Training Research Journal*, vol. 4, 1998/1999, p. 103-16.

also:
Small, Ruth V. “An Exploration of Motivational Strategies Used by Library Media Specialists During Library and Information Skills Instruction.” *School Library Media Research* <http://www.ala.org/aasl/SLMR/vol2/motive.html>

¹¹² Dembo, Myron H. and Martin J. Eaton. "Self-Regulation of Academic Learning in Middle-Level Schools." *The Elementary School Journal*, vol. 100, no. 5, 2000, p. 473-90.

¹¹³ Friel, Linda de Lyon. "Interventions That Facilitate the Information Research Process with Low-Achieving Freshmen Using Kuhlthau's Six-Stage Model." in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 126-92.

¹¹⁴ Rekrut, Martha D. "Collaborative Research." *Journal of Adolescent & Adult Literacy*, vol. 41, no. 1, September, 1997, p. 26-34.

¹¹⁵ McGregor, Joy H. "Cognitive Processes and the Use of Information: a Qualitative Study of Higher-Order Thinking Skills Used in the Research Process by Students in a Gifted Program." in: Kuhlthau, Carol Collier, M. Elspeth Goodin and Mary Jane McNally, eds. *School Library Media Annual 1994*. Englewood, CO: Libraries Unlimited, 1994, p. 124-33.

¹¹⁶ Garland, Kathleen. "The Information Search Process: A Study of Elements Associated with Meaningful Research Tasks." in: Morris, Betty J., Judith L. McQuiston and Cecile L. Saretzky. *School Library Media Annual 1995*. Englewood, CO: Libraries Unlimited, 1995, p. 171-83. also published in *School Libraries Worldwide*, vol. 1, no. 1, 1995, p. 41-53.

Dembo and Eaton¹¹² broaden the concept of motivation into "self-regulation" or independent learners or self-motivated learners. In their study and review of other research, they examine motivation, methods students use to learn, management of time, control of their physical and social environment surrounding their study space, and the control of the quality of their performance. Their review and commentary is worth exploration as library media specialists try to coach young people to become independent learners.

Working With Specific Groups of Students

More and more research is being aimed at probing how various students react when information literacy models are applied in specific situations with a specific group of learners. Examples include:

Low Achieving Students

Linda Friel¹¹³ finds that the Kuhlthau model can be very successful with low achieving freshman if the library media specialist conducts a "warmth seminar" and provides constant nurturing and encouragement throughout the research experience.

Rekrut¹¹⁴ found, in her own analysis and numerous anecdotal reports, that collaborative research is a particularly effective technique with low achievers and that the role of the library media specialist is crucial. She warns, however, that there needs to be a balance between time spent finding sources and actually using them; too much time spent on location created frustration.

Gifted Students

McGregor¹¹⁵ studied a group of gifted high school students in Canada in 1993 who were completing a library research assignment. She was not impressed with these students' process approach to their information problem. She said: "Students do not instinctively operate in a metacognitive manner." Instead, they operated intuitively without awareness of process, but they did seem to operate at all levels of Bloom's Taxonomy in their rush to create an assigned product." (p. 131)

High School Students in General

In a 1992-93 study of high school students doing research assignments in the Holt High School Library in Lansing, Michigan, Garland¹¹⁶ found that student satisfaction during the research process supported the earlier Kuhlthau research findings.

Elements related to satisfaction with the research process included student choice of topic within the confines of the subject matter, group work, topics clearly related to course content, clear communication by teachers of goals and the means of evaluation, and attention to intermediate steps as well as to the final product.

Students Studying Specific Topics

Todd¹¹⁷ studied how a group of teenage girls processed several rounds of information concerning drugs. He found that in-depth work by librarians and teachers to understand how cognitive change happens, giving students a chance to evaluate the process of learning, and provision of a wide variety of information sources could well mean a greater quality of life for adolescents coping with realistic questions.

Julien¹¹⁸ surveyed nearly 400 Canadian adolescents and interviewed 30 of them as they were seeking for career information. She found that 40% of the youth did not know where to go for help, and 38% felt they had to go too many places to seek what they needed. "This lack of clarity led many adolescents to feel anxious and overwhelmed by the decisions they made. Even when offered assistance, some respondents reported they did not know what questions to ask." (p. 47) Library media specialists might take note of the 60/40 ratio as a benchmark in local projects. Should we always expect 40% of the students to start and then remain "wanderers?"

Gender

Studies concentrating on problem solving, research, and subjects such as science and math and computer knowledge were probed to see if gender seemed to be an issue. Adamson¹¹⁹ found that when students were given an equal opportunity to create a science project that "elementary boys and girls show equal competence and engagement in science." (p. 854)

In the area of mathematics, Fennema and Carpenter¹²⁰ conducted a longitudinal study of gender differences. "No gender differences were found in the ability to solve any problems except for the superior performance of boys on the extension problems in grade three. However, significant differences in problem-solving strategies were found in all grades. Girls tended to use concrete solution strategies like modeling and counting, and boys tended to use more abstract solutions strategies that reflected conceptual understanding." (p. 4) Noddings,¹²¹ however, raises an interesting

¹¹⁷ Todd, Ross J. "Meeting Drug Information Needs of Adolescents." in: Lighthall, Lynne and Ken Haycock, eds., *Information Rich but Knowledge Poor? Emerging Issue for Schools and Libraries Worldwide*. Seattle, WA: International Association of School Librarianship, 1997, p. 97-108. also, Todd, Ross J. "Utilization of Heroin Information by Adolescent Girls in Australia: A Cognitive Analysis." *Journal of the American Society for Information Science*. vol. 50, no. 1, 1999, p. 10-23.

¹¹⁸ Julien, Heidi E. "Barriers to Adolescents' Information Seeking for Career Decision Making." *Journal of the American Society for Information Science*. vol. 50, no. 1, 1999, p. 38-48.

¹¹⁹ Adamson, Lauren B., et al. "Doing a Science Project: Gender Differences During Childhood." *Journal of Research in Science Teaching*, vol. 15, no. 8, 1998, p. 845-57.

¹²⁰ Fennema, Elizabeth and Thomas P. Carpenter. "New Perspectives on Gender Differences in Mathematics: An Introduction." *Educational Researcher*, vol. 27, no. 5, June-July, 1998, p. 4-21.

¹²¹ Noddings, Nel. "Perspectives from Feminist Philosophy." *Educational Researcher*, vol. 27, no. 5, July, 1998, p. 17-18.

¹²² Burdick, Tracey A. "Success and Diversity in Information Seeking: Gender and the Information Search Styles Model." *School Library Media Quarterly*, vol. 24, no. 1, Fall, 1996, p. 19-26.

¹²³ Volman, Monique. "Gender-Related Effects of Computer and Information Literacy Education." *Journal of Curriculum Studies*, vol. 29, no. 3, 1997, p. 315-28.

¹²⁴ Walster, Dian. "Bilingual Students and Information Literacy Skills: An Urban Middle School Tale." in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 348-60.

point: "Why do we see it as a problem if young women are less interested than young men in mathematics? Why *don't* we see it as a problem if young men are less interested than young women in early childhood education, nursing elementary teaching, and full-time parenting?" (p. 18)

In Burdick's¹²² study at a large university laboratory school, students kept search journals. While their actions were more similar than different, boys were less likely to ask for help. "Both girls and boys made frequent trips to the university and public libraries on their own and with their classes, but they rarely used the school library media center." (p. 21) Topics chosen for research showed the most rigid gender distinction. Girls chose topics about either males or females and boys chose only topics about males. In the category, "feelings," some girls lacked confidence and felt anxious although the confidence scale on the Process Survey showed no statistically significant differences between sexes. Girls were more optimistic when they started and less certain at the end, while boys were more likely to state that they were confident as they completed their projects. Two points were made. "Girls who are overly concerned with doing an information-seeking project 'right' may need encouragement to take intellectual risks, while many girls may need reassurance that they are capable, for example. Those boys who browse in the library media center without asking for help might welcome the approach of a professional offering assistance." (p. 26)

Volman¹²³ found that boys were more interested and less afraid of computers but girls caught up quickly when given instruction. It was suggested that teachers need to take prior knowledge of skills of students into consideration.

Bilingual Students

Walster reminded the Treasure Mountain VI audience that bilingual students present a great challenge not only to teachers but also to library media specialists as these students encounter the information society. Walster asked three questions as she studied middle school students engaged in quests for information:

- How can we assure that non-English speaking and reading students will have the same access to information skills training and practice as other students?
- How can we develop appropriate strategies and techniques for working with bilingual and monolingual students when we have limited bilingual or English as a Second Language training?

- How will we as a profession address the real and substantive problems associated with evaluating/assessing the information literacy skills of bilingual or monolingual students?

After her observations, Walster¹²⁴ had a number of recommendations for the library media specialist, a few of which are given here:

- Work closely with bilingual teachers in the school.
- Have materials in appropriate languages and appropriate dialects of common languages.
- Recognize cultural and social meanings associated with the entire learning process.
- Be aware of the hidden language demands made on English learners throughout the entire information seeking process and make compensation for them.

¹²⁵ California School Library Association. *From Library Skills to Information Literacy: A Handbook for the 21st Century*. 2nd ed. San Jose, CA: Hi Willow Research & Publishing, 1997.

Recognizing the extensive needs of the English learner in California schools, the California School Library Association¹²⁵ revised its *From Library Skills to Information Literacy* manual into a new edition that integrates concerns, strategies, and advice for adults working with English learners during the research process. Interested readers are referred to that publication as the most extensive coverage of the problem yet to appear in the literature.

Multicultural

¹²⁶ Hall, Patrick Andrew. "The Role of Affectivity in Instructing People of Color: Some Implications for Bibliographic Instruction." *Library Trends*, vol. 39, no. 3, Winter 1991, p. 316-26.

Patrick Andrew Hall,¹²⁶ an African American librarian extracted from both research and extensive experience some major advice for working with people of color on information literacy. In the abstract of his "must read" article, he says:

In the area of pedagogical methods and their applications in teaching people of diverse cultural backgrounds, many curriculum models have been proposed by the academic community. Instructional models emphasizing a cultural specific orientation have been the most prolific. The underlying logic driving this approach has been the well founded belief that when we instruct people of color, it becomes important that we familiarize ourselves with their cultural experiences, and develop a pedagogy that is sensitive to cultural diversity. I work to place an instructional addendum to the cultural specific model. What is germane in regard to pedagogy and ethnic minorities is not so much how, or even what, we teach. But the more intangible qualities of personal rapport and empathy play a vital role within the pedagogical paradigm. For those busying themselves with the issue of effective bibliographic instruction, the relationships developed inside and outside the classroom, or what is termed "affectivity" (Kleinfeld,¹²⁷ 1983, p. 13), are perhaps the best pedagogy. [This advice comes] from personal experiences as both a

secondary and college instructor who has taught such diverse groups as Yupik Eskimos, Cheyenne Indians, Mexican Americans, Javaro Indians of Ecuador, and Black Americans.

¹²⁸ Lindsey, Martha Ann (Marti). *A Constructivist Study of Developing Curriculum to Teach Internet Information Literacy to Navajo High School Students*. Masters thesis. Prescott College, 2000. (MAI 39/02, p. 309, Apr 2001)

Lindsey¹²⁸ found effective techniques of working with Navajo high school students when teaching effective information literacy skills:

- Culturally relevant content
- Wholistic learning
- Choice in projects
- Visual learning
- Personal relationships between teachers and students
- Developing feelings of competence
- Teaching essential information to
- Functioning in dominant society
- Giving opportunities to work cooperatively

Equity

Numerous studies, both ongoing and baseline studies point to the inequity of the distribution of up-to-date computer equipment, materials, and print resources to children and teachers. The technology race is costing the American taxpayer billions of dollars with no end in site because of the continuous need to computer software and hardware.

States such as California with its digital high school grants (rotating every school in the state through a massive technology upgrade project) and providing each school library with \$28 for each student for materials are examples of state-wide projects to increase access to technology and information. Other states are funding licensing fees for basic electronic information sources for every child in the state.

The issues of equity are legion and research needs to track the best solutions to problems as they develop:

- Is equity even possible in a diverse society with decentralized funding and taxing authority?
- Will this society continue to fund technology as they find out that spending is constant rather than a one-shot initiative?
- Will the society who has never funded print libraries consistently and fully be willing to fund technological information systems that are much more expensive?
- Can technology become cheap enough, and fast enough, considering the upgrade requirements to build the ubiquitous access everyone assumes possible?

- What really constitutes equity? (A computer in every classroom? Every classroom hooked to the Internet? Every school and public library connected to the Internet and having a networked automation system?)

Conflict Between Behaviorist and Constructivist Approaches

¹²⁹ Gordon, Carol A. "Is Fish a Vegetable? A Qualitative Study of a Ninth-Grade Research Project." *School Library Media Quarterly*, vol. 24, no. 1, Fall, 1996, p. 27-33.

A teacher who employs behaviorist techniques in the classroom where the learning environment is closely structured and monitored knows exactly what students are to learn, how the learning is to occur, and what information students will use to master content. As Gordon¹²⁹ observes after her research on ninth-grade students, "[This] model of learning is prescriptive, specific to group rather than individual needs, and the student is clearly not in charge. When the scene shifts to the library media center, the learners, confronted by countless choices, are expected to direct their own learning. This change of scene dramatically shifts the expectations of both students and teachers. In the minds of students and teachers, research is not integrated, although library media specialists use an 'integrated approach.'" (p. 33)

For teachers and library media specialists who prefer behaviorist strategies, careful planning before the library experience is essential. The exact materials, the required interaction, and the outcome of the research will be critical if educational objectives are to be met.

Library media specialists can expect this sharp change of pace from classroom to library and from rigid structure to the freedom of the inquiry mode. When students come to the library with almost no preparation in the inquiry mode of learning, both the teacher and the library media specialist can expect confusion and resistance and will have to work together to alleviate stress. During collaborative planning, the library media specialist should understand beforehand the teaching style used by the teacher partner and encourage pre-preparation of students in the classroom before they come to the library media center.

Teachers who already employ the constructivist notions of inquiry or problem-based learning in the classroom will find a much smoother transition between their own teaching space and the bustling learning-lab atmosphere of the library media center. Students who are accustomed to developing their own questions

and pursuing these questions in a wide variety of information sources will find the library media center an exciting atmosphere and a natural extension of their home and classroom “libraries.”

While teachers with a constructivist bent are natural potential partners in collaborative planning, teachers with a wide variety of teaching styles can and do benefit from an information-rich, technology-rich working environment. To presume that learners can or should operate only in a single type of learning environment would be a mistake. Learners will encounter a wide variety of teaching styles throughout their lives. They might as well learn to become flexible and adapt to those styles early in their education.

Library media specialists are likely to experience an “instructional shift syndrome” every day as students come into the library media center. Some groups come and immediately become engaged and busy learners. Others are lost and often vent their frustration through misbehavior. By having a wide variety of strategies to help students adapt quickly from one environment to another, the library media specialist will promote the notion that the library media center is a true learning laboratory.

The Standards Movement and Inquiry

In the past several years, testing of “academic achievement” has become paramount and linked to state standards. Most states have adopted standards which are presumably being tested by whatever state-adopted testing instruments are in place. Many states say to teachers: “We don’t care what methods you use to teach as long as the standards are met and the students score high.” Many teachers have panicked and have reverted to “teaching to the test” and “direct teaching,” meaning that they try to keep their students on task every minute of the time they have allocated. In the extreme cases, the library media center becomes an annoyance or a distraction to the real teaching. Inquiry, problem-based, or constructivist notions may receive a bad name simply because these ideas are time-consuming to create with dubious outcomes or benefits. In a heightened atmosphere of pressure and tension, what is the role of information literacy? Will teacher trust the idea that process learners score high? Do process learners score high? Does the time taken up teaching process pay dividends in score points per minute invested? The research is not in about these important issues.

Adult Expertise and Information Literacy

The essential nature of a human interface in an information-rich environment as a coach and a guide presumes that there are many adults who are already competent in the new information world and already possess superior skills of locating and sorting information.

¹³⁰ Tallman, Julie I. And Lyn Henderson. "Constructing Mental Model Paradigms for Teaching Electronic Resources." *School Library Media Research Online*. Vo. 2, 1999. (<http://www.ala.org/aasl/SLMR/vol2/mental.html>)

¹³¹ Thomas, Margie Jean Klink. *School Library Media Services and the Integration of the Vocational Education and Academic Curricula in Three Florida High Schools: A Comparative Case Study*. Ph.D. dissertation, The Florida State University, 2000. (DAI-A61/07, p. 2503, Jan 2001)

¹³² The and Mihal Bibi: "Patterns of Information Seeking Among Israeli 12th Grad High School Students Writing Final Research Papers." In: *Inspiring Connections: Learning, Libraries & Literacy: Proceedings of the Fifth International Forum on Research in School Librarianship, 30th Annual Conference of the International Association of School Librarianship, Auckland, New Zealand, 9-12 July 2001*. Seattle Washington, IASL, 2001 (dist. by LMC Source at <http://www.lmcsource.com>), p. 248-65.

¹³³ Henri, James. "Thinking and Informing: A Reality-Check on Class Teachers and Teacher Librarians." In: *Inspiring Connections: Learning, Libraries & Literacy: Proceedings of the Fifth International Forum on Research in School Librarianship, 30th Annual Conference of the International Association of School Librarianship, Auckland, New Zealand, 9-12 July 2001*. Seattle Washington, IASL, 2001 (dist. by LMC Source at <http://www.lmcsource.com>), p. 119-28.

Tallman and Henderson¹³⁰ wondered about the adults in children's lives, wondering if adults had the mental models adequate to deal with the far reaches of the online world. In their study, when adults discovered that their mental models were incorrect or needed to shift, some made a successful transition mentally, but others did not. The information guides and coaches needed training and retraining themselves to function effectively.

Another problem with teachers is their awareness level of potential electronic information sources even when a library media specialist is present. Thomas¹³¹ found that vocational education teachers in four comprehensive high schools were not often familiar with major databases and spent little time in planning to incorporate information literacy skills. The mere installation of an extensive information-rich environment did not yield immediate results even when the faculty had been involved in the planning.

Yitzhaki and Bibi¹³² found that senior high school students in Israel doing their final major research paper received very little guidance from adults in doing the project and almost no instruction in the use of library resources. Perhaps they were being left alone to see how sophisticated they were as they were about to graduate, but the researchers were not impressed by these students' reported use of information sources, technology, or libraries. Thus, the human interface may be present, but does the learner take advantage of it?

In an interesting Australian study, Henri¹³³ asked 91 teachers who were taking a foundations course to become a library media specialist, to track their progress through a major research project. To gather the data, he used questionnaires, self-efficacy rating, diaries, drafts, thinking logs, and think-aloud protocols. Henri concludes:

The study indicates that teachers demonstrate much of the impoverished information behaviour shown by senior school students that has been identified by other studies. On the other hand, teachers do demonstrate a more robust use of higher order thinking skills than portrayed by senior students. The study confirms the reliability of Kuhlthau's ISP particularly in terms of the affective cycle of uncertainty through certainty. The study also demonstrated that teachers are vague on issues of focus and closure. Like students, teachers see the information task as one of finding the right answer rather than one of finding a good answer.

The study suggests that caution should be taken in expectations that teacher librarians are equipped to role model good informing practice and act as role models for class teachers. It suggests that in writing about the role of the teacher librarian in developing an information literate school community it is important to distinguish between qualified and unqualified teacher librarians. What this study demonstrates is that unqualified teacher librarians are no better equipped to employ an information model than are their classroom colleagues. Whether or not qualified teacher librarians are equipped to act as informing mentors remains to be tested. (p. 127-28)

¹³⁴ Moore, Penny. "Primary School Children's Interaction with Library Media: Information Literacy in Practice." In Shoham, Snunith and Moshe Yitzhaki. *Education for All: Culture, Reading and Information: 27th International Conference of the International Association of School Librarianship, Ramat-Gan, Israel, July 5-10, 1998*. IASL (dist. by LMC Source (<http://www.lmcsource.com>), p. 121-31)

Moore¹³⁴ did a study in Australia where teachers were attempting to teach information literacy skills without a library media specialist. She watched children in various stages of the research process and then mused that children's understanding of the task at hand was a function of how well the teacher explained the task. She said: "Teachers were surprised by the sophistication of children's thinking in some cases and dismayed by lack of skills in others, but all emerged with a clear understanding of the need to address information problem solving skills explicitly in the classroom...The most compelling aspect of the study for some of the teachers was the change they observed in children's learning outcomes." (p. 131) Yet Moore was not impressed with the ability of any of the teachers who had had an inservice about information literacy to deliver good instruction.

Questions that come to mind in this area are:

Are adults gaining proficiency as the information world becomes more complex and in higher-tech environments?

Are library media specialists becoming models in information location, retrieval, and use in the high-tech environment?

Will young people actually want, accept, or seek the guidance of an adult interface?

Will Teachers Teach Information Literacy and Replace the Need for School Library Media Specialists?

Penny Moore in New Zealand and Ray Doirin in Nova Scotia Canada in interviews with the authors¹³⁵ expressed dismay of the likelihood that in many countries and in many schools there would never be a trained library media specialist. What then for the teaching of information literacy? Both felt their attention

¹³⁵ Interviews conducted by David V. Loertscher during the summer of 2001 in New Zealand and by telephone to Canada.

turning to training teachers to teach information literacy. And yet, the question had already arisen, “Well, if teachers can do it, then it is one more piece of evidence that we really don’t need to hire a professional library media specialist.” The world over, specialists carve out a territory, protect it, seek legal protection, set up “credentials” or licenses, and create a language just technical enough that the lay person cannot understand it. Therefore, the world has need to hire me because of my specialization. Nurses, medical doctors, firefighters, plumbers, *ad infinitum* all do this. What game shall library media specialists play? Is it better to have nothing (a school without information literacy instruction because there is no professional) or the little bit a “trained” teacher can deliver integrated into everything else they must do?

Consuming and Absorbing What?

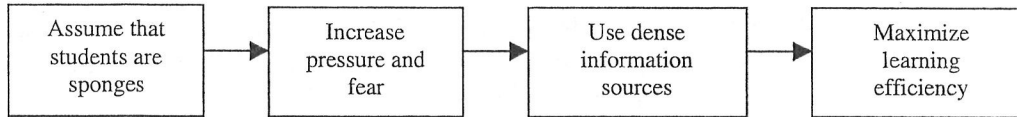
In chapter two of this book, a section was devoted to that part of the research process in which learners actually interact with materials to absorb information at rates ranging from slow and methodical to rushed absorption. The question is what materials should the learner use to maximize learning rate during consumption?

The library media community has had a slogan for many years to guide the practice of choosing materials. This slogan adapted to today’s information world would read:

<p>Give the right information to the right learner at the right time, in the right format, and in the right amount.</p>
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Both teachers and library media specialists are under tremendous pressure to prepare learners to take achievement tests. This pressure mandates that time be used more efficiently during the entire school day. Instead, numerous teachers shift toward teaching test-taking skills as student scores become more and more front-page news.

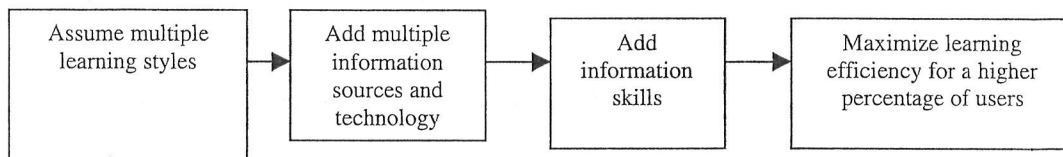
Teachers are also tempted to pour faster as they try to fill the heads of their students with enough facts to score high. Get down to business! Libraries and technology are frills! Use the following model:



Under this approach, if students fail, wash them out to the low-level jobs in the community. This system is common in many prep schools and universities where only students that have sponge minds are allowed to remain in school.

Both state and national governments, however, do not accept this reasoning. They are asking that all students achieve at higher levels simply because there are not enough low-level jobs left in fast-paced economies. Teachers reply that the quality of student is going down as the expectations to achieve are raised. Pop culture pressures, broken homes, increased student cultural diversity, and lack of literacy and skills in English are all overwhelming pressures downward.

Library media specialists and educational technologists are posing the following solution to the problem:



The promise of instructional technology for many years has been: if you use a variety of multimedia materials (and now materials from high tech information sources) you will increase the amount learned per minute.

¹³⁶ Reynolds, P. Lee and Sonya Symons. "Motivational Variables and Children's Text Search." *Journal of Educational Psychology*, vol. 93, no. 1, p. 14-22.

Reynolds and Symons,¹³⁶ both psychologists affirm what the benefits of an information-rich environment, particularly when children have choices of what to use to complete a task. In their words, "Children who were given a choice of books to search were faster at locating information and they used a more efficient search strategy than did children who were not given a choice of books." (p. 20 These researchers cite other studies noting the benefits of choice and variety over single-source information sources such as textbooks. Children in this study were extracting

¹³⁷ Reilly, David H. "The Pace of

facts only. At least variety was stimulating some interest even when the task was low-level.

Thus some questions:

- What materials maximize the rate of learning?
- What media will teach content at the highest rate given time constraints?
- What media/materials will help learners increase the absorption rate of learning? (See Reilly¹³⁷ for a discussion of other factors to consider and Troseth and DeLoache¹³⁸ for problems to confront.)

Using this logic, a refocused set of selection criteria is used to build and increase information resources. A preliminary list might include:

- Information density to match learning ability
- Structure of the information to assist efficient scanning
- Engagement of multiple senses (print, visual, auditory, tactile)
- Level of abstraction matching learner ability
- Quality material matching literacy levels
- Accurate portrayal of diverse cultural backgrounds
- High interest materials

Reviews in commercial selection tools don't usually analyze the usefulness of an item as much as its literary and technical qualities. It is not easy to carefully craft a learning-focused collection.

During the collaborative planning process, teachers and library media specialists must focus on identifying what knowledge and which skills are worth acquiring. What are the core understandings? What knowledge is worth knowing? Knowing the central elements allows the library media specialist to find a variety of materials and technologies that will meet the needs of every student, not just those who can successfully read the textbook with understanding or the student who can absorb oral language instruction.

Focusing students during consumption time

A second challenge as students spend time reading, viewing, listening, or interacting with media is to assist them in making the best use of their time. Most teachers do this by encouraging students to take notes, underline, or make mental notes of important ideas as they consume the information. In multi-media environments, teachers may prepare students before the

interaction to notice certain main ideas. They may stop the experience at critical points for reflection. They may use both discussion and reflection time at the conclusion of the experience. Teachers do not automatically encourage good consumption strategies with their students. Instead, library media specialists might provide inservice on this topic as the variety of new media, technology, and amount of information increases.

The library media specialist as diagnostician

As the pressure to succeed with a higher percentage of learners increases, the library media specialist must adopt the stance of a diagnostician. During the collaborative planning phase of instructional planning, the following prescriptive advice might be given:

- This media / that material / this experience, seems to work best with this type of learner.
- If the material and technology are not enhancing learning at an acceptable pace, let's try something else, since we have a range of choices.
- Let's teach students techniques of focusing attention and extracting of information to make engagement time more productive.
- For a break in the pace, edutainment products may work if attention-getting techniques and density of information delivery is worth the time invested.

Academic Achievement and Information Literacy

In the new world of information and technology, a major question is clearly emerging:

<p>Does a deep information pool in multiple formats</p> <p>+</p> <p>Information literacy skills</p> <p>=</p> <p>Increased academic achievement?</p>
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¹³⁹ Neuman, Delia.
"Learning and the Digital
Library." *Library Trends*,
vol. 45, no. 4, Spring,
1997, p. 687-707.

Delia Neuman¹³⁹ in a recent article questions this by comparing what we know about the problem from the field of information studies and instructional technology. She says:

There are few doubts about the potential of the digital library for providing unprecedented access to information and ideas. There are numerous doubts, however, about the potential of this rich and still mysterious venue for providing an optimal environment for learning. In fact, the very strengths of the digital library—its limitless information, variety of formats, affordance of

unconstrained navigation, and support for combining material in myriad ways—are the sources of these uncertainties in formal learning environments. We know little enough about how to foster higher-level learning with “traditional” collections of print and nonprint materials. How, then, can we foster such learning in the vast and untracked terrain of the digital library? (p. 687-88)

She concludes:

Optimizing the learning potential of the digital library for the children in our schools will require the best thinking from all the disciplines that contribute to our understanding of how children learn. The challenges as well as the opportunities, like the digital library itself, are virtually unlimited and only beginning to be explored. (p. 705)

¹⁴⁰ Todd, Ross J. “Integrated Information Skills Instruction: Does It Make a Difference?” in: “Current Research.” *School Library Media Quarterly*, vol. 23, no. 2, Winter, 1995, p. 133-39. Other studies of the impact of information literacy are included in the research column within the pages cited.

Three recent studies illustrate this new frontier for research: Todd,¹⁴⁰ in a study of 14-year-old low achievers doing a science investigation in Australia, found that integrated information skills instruction appeared to have a significant positive impact on students’ mastery of prescribed science content and on their ability to use a range of information skills to solve particular information problems.

¹⁴¹ Bingham, Janice Elizabeth Mann. “A Comparative Study of Curriculum Integrated and Traditional School Library Media Programs. Achievement Outcomes of Sixth-Grade Student Research Papers.” Ed.D. dissertation, Kansas State University, 1994.

Bingham¹⁴¹ also looked at the effect of a curriculum integrated library media program compared to a traditional library program. She constructed a model social studies research paper and used this model to judge the products of the two groups. Scoring was significantly higher for students who had been taught using the integrated method.

¹⁴² Hara, Katsuko. “A Study of Information Skills Instruction in Elementary School: Effectiveness and Teachers’ Attitudes.” Ph.D. dissertation, University of Toronto, 1996.

also
Hara, Katsuko. “A Comparison of Three Methods of Instruction for Acquiring Information Skills.” *Educational Research*, vol. 39, no. 3, Winter, 1997, p. 271-85.

Hara¹⁴² compared the effectiveness of library skills taught in three modes: integrated, isolated, and no instruction, to children in grades four through six. Across the grade levels, the integrated approach was most effective when testing research process skills. Teachers in the study expressed enthusiasm for the teaching of these concepts.

The three studies indicate a major target for new research. One would expect that integrated information literacy skills are superior to isolated skills because the research in other areas of education report the same finding any time skills and content are merged. The Todd, finding, however, needs to be probed numerous times. Does learning process skills also affect the amount of content absorbed? That is, does the understanding of how research is created, executed, and communicated facilitate the learning of science content?

One could argue that by understanding the research process, students begin to see subject knowledge in patterns as various isolated facts are put together to form concepts. Using other terms, understanding process may in fact help develop more sound mental models of concepts and content.

The Cut and Clip Mentality; or, The Ethical Use of Information

As access to more and more information has become commonplace, so has the occurrence of plagiarism until library media specialists often refer to youthful researchers and the “cut and clip generation.” An Internet site exists where teachers can submit student work for checking plagiarism against a huge bank of original sources. Generally, we might place blame for the problem on adults rather than children, adults because adults provide assignments that lead directly to or actually encourage copying. Neither do teachers or library media specialists equip students with the tools to recognize other people’s work as they build ideas ethically on top of other ideas.

McGregor and Streitenberger¹⁴³ have conducted several studies watching students as they extract information from various sources and then transcribe that information into their finished project. They found that when students receive very little guidance they tend to copy a great deal from original sources rather than paraphrase or synthesize the ideas they find. When the teacher reminded students not to plagiarize, the researchers found that students copied less but that it was still present in their final products.

Wilson’s¹⁴⁴ technique of battling plagiarism is to do intensive inservice with teachers about the problem and teach them how to teach note-taking skills to their students the notion that notetaking forces students to think about and summarize rather than just copy.

¹⁴³ McGregor, Joy and Denise Streitenberger. “Do Scribes Learn? Copying and Information Use.” in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI. San Jose, CA: Hi Willow, 1997.* p. 307-27.

¹⁴⁴ Wilson, Dianne. “Addressing Plagiarism Through Improved Notetaking,” In: *Inspiring Connections: Learning, Libraries & Literacy: Proceedings of the Fifth International Forum on Research in School Librarianship, 30th Annual Conference of the International Association of School Librarianship, Auckland, New Zealand, 9-12 July 2001.* Seattle Washington, IASL, 2001 (dist. by LMC Source at <http://www.lmcsource.com>), p. 21730.

Chapter Four Promising Techniques

As with most disciplines, there are always more good ideas than there are thoroughly researched concepts. The area of information literacy is no exception. Based on anecdotal practice and theory, the published literature of education and of school library media centers contains many worthwhile guiding principles, practices, examples, pilot projects, and ideas to try. As with many fields, theory is ahead of practice. (See James Carey's¹⁴⁵ article that details this gap.) This chapter reviews a number of substantive ideas worthy of consideration and testing in local situations.

¹⁴⁵ Carey, James O.
"Library Skills,
Information Skills, and
Information Literacy:
Implications for Teaching
and Learning." *School
Library Media Quarterly*,
1998. See at:
[http://www.ala.org/aasl/S
LMO/skills.html](http://www.ala.org/aasl/S
LMO/skills.html)

¹⁴⁶ Kuhlthau, Carol.
"Learning in Digital
Libraries: An Information
Search Process
Approach." *Library
Trends*, vol. 45, no. 4,
Spring, 1997, p. 708-24.

¹⁴⁷ *Handbook of Research
on Improving Student
Achievement*. Arlington,
VA: Educational
Research Service, 1995.
(reference numbers refer
to sections in the book)

¹⁴⁸ Singhanayok,
Chanchai and Simon
Hooper. "The Effects of
Cooperative Learning and
Learner Control on
Students' Achievement,
Option Selections, and
Attitudes." *ETR&D*, vol.
46, no. 2, 1998, p. 17-33.

¹⁴⁹ Morrison, Heather.
"Information Literacy
Skills: An Exploratory
Focus Group Study of
Student Perceptions."
Research Strategies, vol.
15, no. 1, 1997, p. 4-17.

¹⁵⁰ Rekrut, Martha D.
"Collaborative Research."
*Journal of Adolescent &
Adult Literacy*, vol. 41,
no. 1, September, 1997, p.
26-34.

Cooperative Learning

Building projects and problems for group solution is one of the most popular teaching strategies both to help young people experience the process as well as to grapple with subject matter. Numerous studies report the effectiveness of this strategy, particularly the work of Kuhlthau.¹⁴⁶ (see p. 717)

According to the ERS research summary Handbook I, cooperative learning as an instructional activity appears to increase both subject knowledge and group skills. (see Handbook, I: 2.9¹⁴⁷) According to Singhanayok and Hooper,¹⁴⁸ this seems to be true both for low achievers and high achievers. However, to be most effective, students must be trained in group processes. By adding a third component, the teaching of the research process as group process, the idea is to increase competency in the research process, group skills, and subject knowledge simultaneously. The technique uses an efficiency technique commonly known as "integration."

Morrison¹⁴⁹ reports the success of using focus groups with groups of six students (early undergraduates) as a technique to build awareness of information literacy and to provide the academic library staff with a sense of what skills seem to be the most important.

Drawing upon numerous reports of student collaborative research for younger learners, Rekrut¹⁵⁰ outlines a list of successful practices, particularly with low achievers:

- Try a variety of grouping practices when students are doing research.
- Have students research topics that engage them even if they have a narrow range of choice.
- Give students choice within specific guidelines to help control content coverage.
- Provide instruction in summarizing prior to beginning any research. This helps students avoid plagiarism, sharpens their sense of what constitutes a main idea and its significant details, and enhances recall.
- Be aware of the dynamics of each group and guide or steer as necessary. Discussion of the responsibilities of working with others prior to beginning research can help students share the work of their project equally, and equally reap the rewards of its successful completion.
- Show students correct citation early in the research.
- Place the research process within the context of instruction, rather than isolated from it.
- Make research findings public, rather than something seen only by the teacher.
- Help students become metacognitively aware of themselves as researchers. (p. 31-32)

Cultivating Habits of Mind

¹⁵¹ Thompson, Loren J.
Habits of Mind. Lanham,
MD: University Press of
America, 1995.

Loren J. Thompson,¹⁵¹ in his book *Habits of Mind* (popular in the Coalition of Essential Schools group) presents the idea that all content teaching should have as its core the teaching of reasoning skills. Much of what he includes is the teaching of logic systems and the building of knowledge using strict rules of evidence. Each learner, he says, should be a problem solver who has the following five characteristics:

- A positive attitude.
- A concern for accuracy.
- The ability to break the problem into smaller parts.
- Restraint to avoid guessing.
- A willingness to be active in the problem solving process. (p. 131)

Thompson supports the use by students of a systematic strategy which he says will not always produce right answers, but it will generate the right questions that will lead to appropriate solutions. These questions will include:

- Can the problem be defined?
- What do we want to achieve?
- What do we know about the problem?
- What don't we know that may be important?
- What assumptions can we make?
- Can the problem be divided into logical parts and which critical thinking skills can be used to solve each part? (p. 131-32)

Constructivist Strategies

The philosophical concept of constructivism has become the foundation of the new national standards, *Information Power*. This educational philosophy with ties back to John Dewey needs to be known and understood thoroughly by every library media specialist trying to implement a program in line with the national guidelines. Simply stated, a constructivist teacher becomes a “guide on the side” vs. the “sage on the stage” with a behaviorist philosophy. Both philosophies work toward the same ends but use very different strategies. Constructivism requires the student to gain control of learning; behaviorism requires the student to trust the teacher’s direction.

Constructivist ideas and school libraries are natural partners because an information-rich laboratory supports “choice.” Behaviorist assignments tend to send all users after very narrow information targets often overtaxing library resources in a few topical areas but ignoring the vast potential of other resources.

Constructivist ideas are now so deeply woven into the professional literature of school libraries, that it is difficult to find any articles with a behaviorist bent. This trend has been in the making for about a decade. There is a major gap between the professional literature and school library practice. School reform philosophy (heavily constructivist) has been dominating the educational literature as well, but schools and teachers have been slow to adopt the shift.

Stripling,¹⁵² in a major article, reminded the profession that the entire framework of information literacy is connected to the constructivist notion of learning theory. Creating a Thoughtful Learning Cycle model (See chapter six.), Stripling shows the relationship between the personal understandings of students and the inquiry process, the content information, and the assessment of that understanding. She notes that prior learning affects new learning, that learning involves both content and process, that learning is social, and that learning is deeper when supported by a learning framework.

The framework Stripling discusses is very much alive in the educational restructuring movement. The Coalition of Essential Schools,¹⁵³ one of the major players in reform, encourages

¹⁵² Stripling, Barbara K. “Learning-Centered Libraries: Implications from Research.” *School Library Media Quarterly*, vol. 23, no. 3, Spring, 1995, p. 163-70.

¹⁵³ Summarized in Gordon, Mark W. “Location vs. Reflection: School Librarians, Student Thinking and the World Wide Web.” in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI. San Jose, CA: Hi Willow, 1997.* p. 213-19.

teachers to focus students on the process during any type of inquiry activity with questions such as:

- How do you know what you know? What's the evidence? Is it credible?
- What viewpoint are you hearing, seeing, reading? Who is the author? Where is she/he standing? What are his/her intentions?
- How are things connected to each other? How does "it" fit in? Where have you heard or seen this before?
- What if...? Supposing that...? Can you imagine alternatives?
- What difference does it make? Who cares? (see Gordon, p. 214)

¹⁵⁴ Tastad, Shirley A. and Norma Decker Collins. "Teaching the Information Skills Process and the Writing Process: Bridging the Gap." *School Library Media Quarterly*, vol. 25, no. 3, Spring, 1997, p. 167-69.

Tastad and Collins,¹⁵⁴ in their observation of a middle school writing center, feel that students will not attempt to build habits of mind and see information query as a process unless the teacher is using a constructivist approach to learning. They feel that teachers using a lecture method of instruction are very unlikely to encourage any process concepts in their pupil's behavior. Their research showed that when a writing center was set up to encourage personal inquiry methods, it immediately conflicted with the teaching strategies of any teacher using the behaviorist model.

¹⁵⁵ Lunenburg, Fred C. "Constructivism and Technology: Instructional Designs for Successful Education Reform." *Journal of Instructional Psychology*, vol. 25, no. 2, June, 1998, p. 75-81

Few teachers are either totally behaviorist or constructivist in their teaching style. (For a description of a constructivist teacher, see Lunenburg.¹⁵⁵) The library media specialist should be able to recognize a teacher's philosophy on a continuum between the two extremes and be able to build a solid interface of LMC activities that enhance that teaching style. Conflict can be avoided if both the library media specialist and the teacher recognize openly what may be causing a difference in point of view and concentrate on what works.

Integration of Information Skills into Content Instruction

¹⁵⁶ Choi, Jeong-lm and Michael Hannafin. "The Effects of Instructional Context and Reasoning Complexity on Mathematics Problem-Solving." *ETR&D*, vol. 45, no. 3, 1997, p. 43-55.

The benefits of contextualization in skill instruction is well known as a technique to increase the ability to handle complexity and transfer in almost all areas of education. For example, Choi and Hannafin¹⁵⁶ note this result in mathematics problem solving. However, they also note that students may prefer non-context skill teaching if that is what they are used to in the classroom. Students may know their addition facts by rote memorization but are confused when they meet addition in a story problem.

¹⁵⁷ Leckie, Gloria J. and Anne Fullerton. "Information Literacy in Science and Engineering Undergraduate Education: Faculty Attitudes and Pedagogical Practices." *College & Research Libraries*, vol. 60, no. 1, January, 1999, p. 9-29.

The current generation of children in the United States have had more instruction in library science concepts than any other generation, yet academic librarians are not impressed with the product they are getting as entering students. Leckie and Fullerton¹⁵⁷ discuss this stance in their polling of college faculty who have low expectations of early undergraduates but higher ones for juniors and seniors in college.

Should we expect that young people, understanding the concept of an index, might be able to search an index whether print or electronic, whether in science or social studies, and do so with some semblance of independence? Certainly library media specialists have taught the lesson "parts of a book" well over the years as a generic skill that works across publishers, topics, and printing formats. So we have a track record.

Teaching generic yet integrated library skills (now information literacy) is a concept alive and well but it has yet to appear in most library instruction manuals published in the popular library press. There seems to be confusion about what constitutes "integration." Knowing that a teacher is covering polar bears in the classroom, some library media specialists plan a lesson on polar bears in the library and pronounce that "integrated" even when no real planning with the teacher has taken place except to know the topic. Little can be expected from cursory planning. Integration of information literacy is still a frontier for a profession desperately wanting status in the educational process.

One of the most promising techniques is to use already existing curricular ideas popular in educational disciplines. These techniques rise from time to time and become popular in the literature and often become the focus of inservice education in a school. Consider the following matches made in heaven.

<p>Matches Made in Heaven: Curricular Ideas Ripe for Information Literacy Integration</p> <p>Social Studies</p> <ul style="list-style-type: none"> ➤ Jurisprudential Teaching ➤ Critical Thinking ➤ Concept Development <p>Science</p> <ul style="list-style-type: none"> ➤ Scientific Method ➤ Learning Cycle Approach ➤ Real-Life Situations <p>Health</p> <ul style="list-style-type: none"> ➤ Critical Analysis of Health Information <p>Language Arts</p> <ul style="list-style-type: none"> ➤ Extensive Reading ➤ I-Search ➤ Exposure to a Range of Literature ➤ Critical Reading/Writing Skills <p>Oral Communication</p> <ul style="list-style-type: none"> ➤ Listening Skills ➤ Media Literacy <p>Mathematics</p> <ul style="list-style-type: none"> ➤ Focus on Meaning ➤ Problem Solving <p>Foreign Language</p> <ul style="list-style-type: none"> ➤ Comprehensible Input <p>Arts</p> <ul style="list-style-type: none"> ➤ Understanding Culture Through the Arts
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Helping Students and Teachers Develop Their Own Research Model

¹⁵⁸ Hill, Janette R. and Michael J. Hannafin. "Cognitive Strategies and Learning from the World Wide Web." *ETR&D*, vol. 45, no. 7, 1997, p. 37-64.

Hill and Hannafin¹⁵⁸ studied four learners intensively in an open-ended research environment. They soon discovered that each student approached research differently and with varying degrees of success. Those who could think through the process of

research while doing it had a higher rate of success. They concluded that learners need a support structure to succeed.

¹⁵⁹ Herring, James E. Anne-Marie Tarter and Simon Naylor. "Theory into Practice: Using the PLUS Model to Teach Information Skills and Support the Curriculum in a Secondary school." In: Howe, Eleanore, ed. *Developing Information: Key to the Future: Papers Presented at the Fourth International Forum on Research in School Librarianship and Proceedings of the 29th Annual Conference of the International association of school Librarianship, Malmo, Sweden, August 6-10, 2000*. IASL (Dist. by LMC Source at <http://www.lmcsource.com>), p. 111-18.

Teaching students a research model such as the Big Six, introduces them to a problem solving and research process model. Herring,¹⁵⁹ for example, found that students did well using his PLUS model. But that model is not their own. The model belongs to someone else and while the learner may be able to adapt to that strategy, it does not increase their own sense of being in command of their own learning.

Power Learners, those in command of their own learning style, should be able to articulate their own problem-solving strategy. They would be able to defend their own model when compared to others they encounter.

Learners, particularly younger ones should realize that whatever model they adopt, the shape and content of that model are likely to shift as they mature in their own learning style and ability. The research to date indicates that few learners would be conscious enough of their own learning style to verbalize it without guidance. Like "habits of mind statements," learners might be able to recite something like:

- I am a Power Learner;
- I know my own learning style;
- I am a problem solver.
- In the world of information technology, I...
- (their own model)

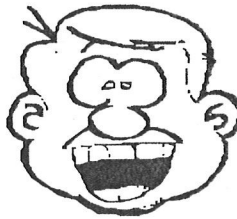
¹⁶⁰ Loertscher, David. *Reinvent Your School's Library in the Age of Technology*. 2002 ed. San Jose, CA: Hi Willow Research & Publishing, 2002.

Adults recognize that learners, no matter the age, will be at different stages in their ability to understand and perform inside an information literacy model. Loertscher¹⁶⁰ has written about this, dividing learners of all ages into three easily-remembered categories: beginners, intermediate, and advanced as illustrated in the following graphic: (p. 44)



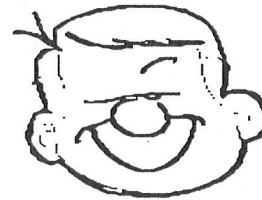
Beginners

- Frazzled
- Lost
- Can't pick a topic for research
- Can't find information
- Desperately needs help
- Needs help constantly
- Distracted
- Uninterested



Intermediate

- Self-starting
- Still a roller-coaster experience
- Needs support
- Has moments of insight
- Interested
- Somewhat systematic
- Will take advice



Advanced

- Independent learner
- Knows where to go and how to get there
- Asks advice to monitor progress

¹⁶¹ Anderson, J. R. *Cognitive Science and Its Implications*. New York: W. H. Freeman, 1980.

J.R. Anderson¹⁶¹ describes three stages that learners pass through in developing skills from beginning to advanced.

- **The Cognitive Stage** – The learner knows enough about the skill to perform it in at least some crude approximation, a rehearsal. (Here the learner would be imitating one of the accepted research models.)
- **The Associative Stage** - The learner is able to talk through the process while performing the skill. Misunderstandings and skill mistakes are corrected at this stage. (Here learners would be formulating their own model as they talk themselves through the process).
- **The Autonomous State** – The learner experiences ongoing, improvement in performance that can continue indefinitely. (The learner would be able to describe the model and let it evolve as they evolved as a researcher.)

Collaborating with the I-Search Process

¹⁶² Macrorie, Ken. *The I-Search Paper*. Portsmouth, NH: Heinemann, 1988.

Macrorie¹⁶² created the I-Search Process - a very popular method now widely adopted by college and high school English teachers to help students write research papers. The system is very similar to the research process models in the library media field, and any teacher using the Macrorie model would instantly recognize the

similarities. Nowhere in Macrorie's book does he describe the sequence of his model in a succinct format in its entirety, but the following is the sense of his method:

1. Let a topic choose you.
2. Search for information
 - Find experts or authorities and listen carefully and not useful ideas
 - Know a lot about your topic before you interview people
 - Ask for advice on the very best information sources
3. Test the information from both experts and other sources.
4. Write the paper
 - What I knew and did not know about the topic before I started.
 - Why I'm writing this paper.
 - How I did my search (story of the hunt).
 - What I learned or did not learn.
5. Edit the paper

Using the Schedule and Time to Advantage

¹⁶³ Van Deusen, Jean Donham and Julie I. Tallman. "The Impact of Scheduling on Curriculum Consultation and Information Skills Instruction, Part One: The 1993-94 AASL/Highsmith Research Award Study." *School Library Media Quarterly*, vol. 23, no. 1, Fall, 1994, p. 17-25.

Van Deusen and Tallman¹⁶³ examined the relationship between scheduling students into the library media center and how information skills instruction was performed. They found that when library media specialists in elementary schools used a mixture of flexible schedule and fixed schedule, information skills were integrated more often, particularly when the principal's expectation of integrated skills was high.

Generally, library media specialists in elementary schools have found themselves imprisoned by strict schedules where they are providing planning periods for teachers. While some have tried the Van Deusen and Tallman solution above, others have so many students to meet each week that teaching without collaboration is the regimen for almost the entire day. Thus scheduled classes continue to be the major deterrent to collaborative planning and integrated information literacy skills in the elementary school. Further research and experimentation needs to be done if the elementary library media program is to take its place as a major factor either in academic achievement or in information literacy.

¹⁶⁴ Loertscher, David V. and Blanche Woolls. "Block Scheduling: A Look at the Research." *Knowledge Quest*, vol. 27, no. 4, 1999 p. 35-38.

In secondary school, the use of block scheduling has created a new frontier for libraries. As the school abandons the eight-period day in favor of the four-period 90-minute schedule, library media specialists suddenly find their opportunities, role, and potential affected instantly. Loertscher and Woolls¹⁶⁴ reviewed the research from education supporting the benefits of the block schedule on

various subject departments in the schools. They found much of it to be descriptive in nature (here is how we do it right) and other studies showing both positive and negative effects. Almost no research has been done on its effects on the library media program.

Library media specialists experiencing the block schedule find that as they experiment with using it, some definite advantages begin to develop:

- More time to engage in the research process during a library period.
- Using the increased time to reach every student in the group.
- Higher engagement in researching a topic before the period ends.
- More time to integrate information literacy skills into the topic at hand.
- Time to get to more parts of the information literacy model than just location of information.
- Increased quality of student productions because there is more time to work on them.
- Better use and citation of information sources because students are not so hurried.

¹⁶⁵ Small, Ruth V. "Block Scheduling" *School Library Media Research* (published as a part of "The Best of ERIC" collection, 2000. (http://www.ala.org/aasl/S_LMR/eric_main.html))

¹⁶⁶ Kuhlthau, Carol C. "Implementing a Process Approach to Information Skills: A Study Identifying Indicators of Success in Library Media Programs." *School Library Media Quarterly*, vol. 22, no. 1, Fall, 1993, p. 11-18.

As with the elementary school, there is still much documentation and probing of a variety of block scheduling patterns if optimum practice is to be described and documented. Small's¹⁶⁵ article on block scheduling and research related to it is recommended reading.

Building a Collaborative Planning Role

In a case study report, Kuhlthau¹⁶⁶ made the following comments: "This study indicates that successful implementation of the process approach to information skills calls for a shared philosophy of learning. It requires development of an instructional team and a break with the traditional concept of one teacher to one classroom. It requires a commitment to developing skills for living, working, and participating in changing technological society. It demands highly competent educators who instruct, guide, coach, and assess students and who design and redesign programs to enhance the learning process." (p. 18)

Like the concept of "integration of library skills instruction," the term "collaboration" is interpreted many different ways. To some, if the teacher teaches the content and the library media specialist the information literacy skill, the division of labor

constitutes collaboration and integration. This is turn teaching, rather than team teaching. In this model teachers learn no information literacy skills and library media specialists learn no science, social studies or other subject content.

True collaboration would seem to dictate other practices. When flour, sugar, chocolate and other ingredients collaborate properly, the result is a chocolate cake. Likewise true collaboration produces an amalgamation of content, technology skills, and information literacy to produce an exciting learning experience coached by a teacher/ library media specialist team. In this scenario, the class is being guided by two professionals who are trying to maximize achievement both in content and in mastering information literacy and technology skills. When students have a hard time separating who is teacher and who is library media specialist, true collaboration has occurred.

Library media specialists who accept the challenge of collaboration and perform as a teacher across many curricular topics become the smartest professionals in the school. There is no other person who understands the curriculum, the quality of teaching, the impact of technology on learning, or the impact of information literacy upon learning as well. These are the professionals honored as “teacher of the year.”

Teaching Text Structure¹⁶⁷

Because students do much of their reading of content in expository text, teachers of reading have been concerned that even when a reader might read fiction smoothly and with comprehension, that skill does not always translate to reading expository text. A great deal of professional literature is aimed at “reading in the content areas” and covers such skills as:

- using format features and organizational aids (title pages, tables of contents, indexes, etc.)
- using internal text structure (headings and subheadings, lists, text boxes, graphs, tables, marginal notes)
- skimming and scanning techniques
- identifying the main idea
- outlining and notetaking
- being a critical reader (see Moody)

Salembier¹⁶⁸ has created a technique known as SCAN and RUN to help students build a technique for absorbing text:

¹⁶⁷ A summary of the work in text structure with an attendant bibliography into the literature is: Moody, Regina. “Consider the Source.” in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 115-25.

¹⁶⁸ Salembier, George B. “SCAN and RUN: A Reading Comprehension Strategy that

S = Survey headings and turn them into questions
 C = Capture the captions and visuals
 A = Attack boldface words
 N = Note and read the chapter questions
AND
 R = Read and adjust Speed
 U = Use word identification skills such as sounding it out, looking for other word clues in the sentence, or breaking words into parts for unknown words
 N = Notice and check parts you don't understand and reread or read on

Concept Mapping

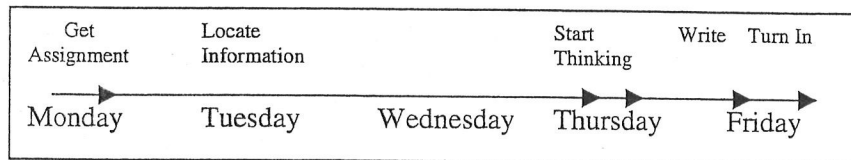
The technique of graphically representing a flow of ideas has been popularized as an outgrowth of outlining which the previous generations of students were taught so carefully in their language arts courses. The computer program *Inspiration* and its child-oriented version: *Kidspiration* have become very popular with students and teachers. Concept mapping can be used to record and organize brainstorming sessions, build mind maps of prior knowledge, and to extract main ideas from information sources.

Many sources describe and detail the use of concept mapping with children and teenagers across a wide variety of curricular areas and there are a number of teacher guides published with sample maps. Sinatra categorizes the types of maps as follows:

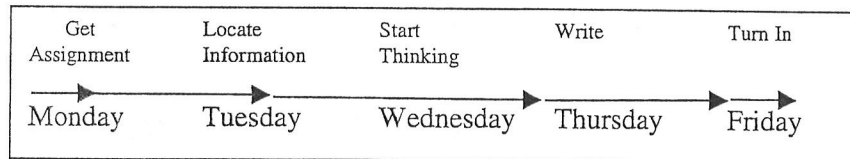
- Sequence Map; Steps-in-a-Process Sequence Map
- Topic Development Map (also called Spider Map)
- Classification Map
- Comparison/Contrast Map; Same/Different Map
- Cause and Effect Maps; Chain of Events Pattern; Many Causes to One Effect Pattern; Major Event to Outcomes Pattern
- Persuasion Maps; Persuasion by Arranging Reasons; Persuasion by Rational Argument; Persuasion by Point/Counterpoint

Pacing Learners Through the Research Process

Both teachers and library media specialists find that many learners do not pace themselves very well through the research process to either be effective or efficient in their work. A common scenario of the time spent on a research assignment might look something like:



It is quite common for “library time” to be taken up almost totally with the finding of information with little time given to instruction in the actual use of the information such as information organization, summarization, or communication. By requiring a different schedule, learning might be increased. For example:



Such a schedule would require a condensed version of finding and sorting information that could be planned in advance by the teacher and the library media specialist for topics that require a maximum of reading, thinking, reasoning, and summarization time.

Providing a High-Quality Information Environment

For a century, school library media specialists have scratched, scraped, improvised, begged for, and built a high-quality print environment with whatever resources they could extract from principals, school boards, states, and the federal government. In the world of the Internet, turning the switch on means access to a billion web sites, 95% of which are worthless and many of which cannot be located through any search engine.

Building library portals or home pages has been one of the most promising ways that library media specialists are attempting to attract students to their own high quality collection of print and electronic resources as opposed to students automatically gravitating to the morass of the Internet. In fact, this trend may indeed be one of the most important guarantees that a library media program has to stay alive in the 21st century. That is, the general public may well be willing to pay for a “safe and high quality information network” as opposed to just turning kids loose in the world of the Internet. For progress in this area, check Peter Milbury’s <http://school-libraries.net> on which thousands of school library media center homepages are indexed.

A second major trend is the provision of a core of high quality databases by the states to all the citizens in their states. These core collections allow the library media specialist to integrate that core set into their own portal and then add other databases particularly relevant to the curriculum of the school. A few of the states who have already done this are: Indiana, North Carolina, and Pennsylvania..

Doing Your Own Action Research

School library media specialists who turn an investigative eye upon themselves and their program to strengthen information literacy do their teachers and students a favor.

Notice how Wannaiassa Hills Pimary School¹⁶⁹ in Australia set up their self-investigation:

¹⁶⁹ “Wannaiassa Hills Information Skills Project Action Research Paper.” (<http://www.whps.act.edu.au/WHISP/Teacher.html>) Accessed Sept. 2000.

The focus of our project developed from the concerns many teachers at Wannaiassa Hills Primary School had about students’ abilities to carry out research work for assignments and projects. The impact of computer use by children doing project work was highlighting a trend towards uncontrolled plagiarism. There was a growing suspicion that the children’s understanding of the research process was obscure and uncertain. What support was occurring at home during their ‘project work’? We wanted to explore these issues and develop a means of addressing our concerns effectively.

After developing these and several other questions, the library media specialist and a few other teacher/researchers develop questionnaires for parents, teachers, and students. They collect sample photos as evidence and interview students and teachers. They apply the information literacy model they teach to their own

research design as they define, locate, select, organize and present. And they conclude:

- It is apparent from all the parties surveyed there is a genuine need and interest in Information Literacy Skills being taught across the school.
- By implementing the recommendations made, the committee feels confident the concerns of teachers and parents will be addressed. Through the implementation of the whole school information literacy program, the needs of the students will be met.
- Evidence of the effectiveness of teaching information skills as part of the classroom program (Year 4), and demonstration of particular information skills (key words), even at early childhood level, show they can support students successfully with their projects.
- One of the most valuable skills educators can teach students in an age of information overload is how to use information effectively, appropriately and efficiently.
- *Let's do it properly.*

These professionals use the information literacy research process model not only to examine their own program but capture the attention of their school and community. It would be difficult to imagine a better way.

The Principal's Role in Information Literacy

Numerous studies in education have probed the leadership and tone a principal sets in a school. Campbell¹⁷⁰ studied the impact of the principal on the implementation of information skills in both an urban and a rural high school in Connecticut. In both cases, the principal had a positive affect as a vision builder, planner, and as a problem-coping/monitoring facilitator.

Numerous other studies in the library media field have probed the general effect of the principal's leadership and the success of the school library media program, noting that without positive support, it is very difficult to establish any type of quality library media program. One recent example is Gehlken's¹⁷¹ study of three South Carolina Blue Ribbon secondary schools. In all cases, the principal's support was a critical factor in the success of a quality library media program. A second example with the same finding was Lumley's¹⁷² study of an elementary library media program in Kansas. There, the principal and key teacher-leaders played a major role as the library media program evolved from a traditional to a flexibly-scheduled place of learning. Cathleen Yetter¹⁷³ corroborated this same finding in five elementary and two junior high school settings in Washington as did Oberg, Hay and Henri¹⁷⁴

¹⁷⁰ Campbell, Barbara Stehman. "High School Principal Roles and Implementation Themes for Mainstreaming Information Literacy Instruction." Ph.D. dissertation, The University of Connecticut, 1994.

¹⁷¹ Gehlken, Vivian Seiber. "The Role of the High School Library Media Program in Three Nationally Recognized South Carolina Blue Ribbon Secondary Schools." Ph.D. dissertation, University of South Carolina, 1994.

¹⁷² Lumley, Arvina Marie. "The Change Process and the Change Outcomes in the Development of an Innovative Elementary School Library Media Program." Ph.D. dissertation, Kansas State University, 1994.

¹⁷³ Yetter, Cathleen L. *Resource-Based Learning in the Information Age School: The Intersection of Roles and Relationships of the School Library Media Specialist, Teachers, and Principal*. Unpublished doctoral dissertation. Seattle University, 1994.

¹⁷⁴ Oberg, Dianne, Lyn Hay, and James Henri. "The Role of the Principal in an Information Literate School Community." *School Library Media Research*, vol. 3, 2000.

¹⁷⁵ Todd, Ross J.
 "Transformational Leadership and Transformational Learning: Information Literacy and the World Wide Web." *NASSP Bulletin*, March, 1999, p. 4-12. drawing attention to: Ryan, S. "The Impact of Transformational Leadership on Primary School Libraries. Three Case Studies." *Scan*, vol. 2, 1997, p. 133-39.

in Australia. And finally, Todd¹⁷⁵ explains an Australian study done by Ryan of three elementary school principals demonstrating their transformational leadership in building a rich information environment.

In an unpublished study of New York City principals, David Loertscher had a group of district library supervisors rate the acceptance and vision of the school principal and the ability of library media specialists to carry out a successful library media program as part of a Library Power demonstration project. One would suspect that a visionary principal and the strong library media specialist produced the best programs, and they did. However, not one strong library media specialist could overcome a lack of vision on the part of the principal. Since that study, Loertscher has been giving the following advice: "If you as a library media specialist have a principal who lacks the vision, you can do one of three things: convert that person, get rid of that person, or find a new school with a good one."

Chapter Five Good Ideas and Resources for Keeping Current

Keeping Current

- Check *School Library Media Quarterly Research* (formerly *School Library Media Quarterly* and *School Library Media Quarterly Online*) regularly for new articles. This is the refereed research journal of the American Association of School Librarians and many articles deal with information literacy. Articles cited in *Information Power 98* are being loaded on this site. See it at <http://www.ala.org/aasl/SLMR/index.html> and <http://www.ala.org/aasl/SLMO/index.html> (if these URLs fail, check under the AASL main web page at <http://www.ala.org/aasl.html>).
- The International Association of School Librarianship conducts annual conferences and publishes proceedings of each conference. Each set of proceedings contains numerous research papers. The proceedings are available yearly from LMC Source (PO Box 720400, San Jose, CA 95172) Their journal *School Libraries Worldwide* also contains numerous research articles.
- The Treasure Mountain Research Retreat is a loose configuration of scholars and practitioners from the school library media field and meets irregularly. Nine conferences have been held thus far and proceedings are a rich source of research about the field. To get your name on the mailing list, contact David Loertscher at davidl@wahoo.sjsu.edu.
- Treasure Mountain Online: A Research Seminar is an addendum to the Treasure Mountain Research Retreat. Scholars and practitioners from around the world can share and discuss research and ideas. See p. v for details.
- *Knowledge Quest*, the journal of the American Association of School Librarians check this source for research on a variety of issues related to the field.
- Read Jamie McKenzie's web-based Zine *From Now On* at <http://fromnowon.org/> on a regular basis. Jamie's articles and links cover a range of topics from information literacy to educational technology.
- The periodical *Teacher Librarian* (formerly) *Emergency Librarian* reviews research on school libraries each issue.
- Search EBSCO Host free of charge for articles about libraries at <http://www.epnet.com/>
- ASCD (Association for Supervision and Curriculum Development) is an international organization providing professional development in curriculum, supervision, and information services to the teaching profession. Its books, newsletters, and periodical *Educational Leadership* are excellent sources for the latest ideas in educational thought.

- “Dave’s List of Professional Publications” is a service of David Loertscher at the LMC Source Website (<http://lmcsource.com>) that lists and reviews new professional publications in the field. Check under the subject heading “information literacy” for recent publications listed by year.
- Check Keith Lance’s Fast Facts mini-studies on both school and public libraries from the Colorado State Library (See at http://www.lrs.org/html/fastfacts/fast_facts_1998.html.) From this page, you can examine studies for previous and later years.
- The American Library Association has published online the “Information Literacy Community Partnerships Toolkit,” a project of Nancy Kranich’s initiative for her 2000-01 presidential term. It contains a wide variety of materials, planning guides, and information about creating a community coalition designed to carry out a mutually beneficial project which could be any aspect of improving information literacy community-wide or any other broad-based goal.

Helps for Teachers and Library Media Specialists

From Library Science

- Breivik, Patricia Senn. *Student Learning in the Information Age*. Phoenix, AZ: Oryx Press for the American Council on Education, 1998. Breivik explores the idea of resource-based learning and information literacy as the foundation of the constructivist ideas she promotes in higher education. She cites many examples of colleges and universities using this approach and the library professionals supporting them.
- Gradowski, Gail, Sloranne Snaveley, and Paula Dempsey. *Designs for Active Learning: A Sourcebook for Information Education*. Chicago: Association of College and Research Libraries, 1998 (available from the American Library Association). After years of interest in bibliographic instruction in academic libraries, the Teaching Methods Committee of ACRL brought together a major compilation of ideas, forms, techniques, and lessons from around the country. This collection is the best transformation into practice of the concept of information literacy as that term is understood. It is still top-heavy in its treatment of information location, but most activities do focus students on evaluating the information they locate. It is valuable for the secondary school library media specialist as an idea source.
- McKenzie, Jamie. *Beyond Technology: Questioning, Research and the Information Literate school*. FNO Press, 2000. (<http://fno.org>) An outstanding collection of McKenzie columns dealing with the teaching of information literacy by the teacher and/or the library media specialist.

Overviews and Background Building

- Egan, Kieran. *The Educated Mind: How Cognitive Tools Shape Our Understanding*. Chicago: The University of Chicago Press, 1997. For a good review of the philosophic underpinnings of education, Egan provides both a

tracing of ideas about education and proposes methods of creating deep understanding. Her view from the cognitive perspective fits nicely into the notions librarians have about building skill in information literacy. Chapter eight, "Some Implications for Teaching" describes principles of building the understanding of the research process in student's minds.

- Joyce, Bruce R. and Emily F. Calhoun. *Creating Learning Experiences: The Role of Instructional Theory and Research*. Alexandria, VA: Association for Supervision and Curriculum Development, 1996. As a prelude to the integration of information skills into various teaching methods and styles, Joyce and Calhoun classify numerous teaching strategies into four different families of ideas: the information-processing family, the social family, the personal family, and the behavioral systems family. This source is good background reading to prepare the library media specialist to diagnose a teacher's teaching style and then to integrate the various information literacy skills to enhance that teaching style.

- Thornburg, David D. *Brainstorms and Lightning Bolts: Thinking Skills for the 21st Century*. San Francisco, CA: The Thornburg Center (<http://www.tcpd.org>), 1998. Thornburg's ideas for creating a thinking environment in a school is explained in thirteen inservice-like explanations with appended thinking activities for the individual reader or groups. Many information literacy topics are inserted in Thornburg's strategies. Library media specialists should understand and appreciate the approach of this extremely popular speaker in education circles.

- Spitzer, Kathleen L. with Michael B. Eisenberg and Carrie A. Lowe. *Information Literacy: Essential Skills for the Information Age*. Syracuse, NY: ERIC Clearinghouse on Information & Technology, 1998. This volume collects models, examples, documents, timelines, standards and other resources for K-12 and higher education. Information literacy programs in a few schools and districts are highlighted as examples.

Manuals and Guides from other fields

- Armstrong, Thomas. *7 Kinds of Smart: Identifying and Developing Your Multiple Intelligences*. Plume, 1999. Armstrong is very good at developing practical applications of Gardner's theories for use in the classroom.

- Barzun, Jacques and Henry F. Graff. *The Modern Researcher*. 5th ed. New York: Harcourt, 1992. Still a classic, this volume reminds us about the rules of good research and the tradition of scholarship and convincing writing.

- Bennis, Warren and Patricia Ward Biederman. *Organizing Genius: The Secrets of Creative Collaboration*. Addison-Wesley, 1997. Why do some groups produce greatness and others falter? Case studies and practical ideas for group excellence.

- Booth, Wayne C., Gregory G. Colomb and Joseph M. Williams. *The Craft of Research*. Chicago: University of Chicago Press, 1995. More recent than Barzun, this manual, designed for the college student or the adult, covers the basic elements of asking questions, making supportable claims, preparing

intelligible reports, and doing research in an ethical manner. A good source for preparing information literacy lessons for more advanced students. Researchers should pay particular attention to the bibliographical essay beginning on p. 265 that lists numerous background sources from a wide variety of disciplines about rhetoric and the research process.

- Berkaman, Robert I. *Find It Fast: How to Uncover Expert Information on Any Subject—Print or Online*. 4th ed. New York: Harper, 1997. An example of field-specific (in this case, business) guides to doing research, this very readable guide provides numerous tips that can be used by advanced learners for using libraries, contacting experts, government sources, evaluating the information found, and using a research process to complete a project.
- Brandt, Ron. *Powerful Learning*. ASCD, 1998. A short but excellent guide to the principles needed to build excellence into learning experiences.
- Carr, Judy F. and Douglas E. Harris. *Succeeding with Standards: Linking Curricula, Assessment, and Action Planning*. ASCD, 2001. Standards-based learning plans for those new to the concept.
- Gardner, Howard. *The Disciplined Mind: What All Students Should Understand*. Gardner's latest book of wisdom and exploration on how we learn.
- Jones, Beau Fly, Claudette M. Rasmussen, and Mary C. Moffitt. *Real-Life Problem Solving: A Collaborative Approach to Interdisciplinary Learning*. Washington, D.C.: American Psychological Association, 1997. Using the constructivist philosophy and information literacy techniques familiar to library media specialists, this book describes an approach to interdisciplinary learning in which students and teachers investigate open-ended, authentic problems that have clear relevance both to themselves and to the larger community. Covers both the theory and practical ideas.
- Lambert, Nadine M. and Barbara L. McCombs, eds. *How Students Learn: Reforming Schools Through Learner-Centered Education*. Washington, D.C.: American Psychological Association, 1998. Covers current research on how students learn and presents the theoretical perspectives and reesearch findings of leading authors in educational psychology.
- Langer, Ellen J. *The Power of Mindful Learning*. Addison-Wesley, 1997. An important book about learning.
- Marzano, Robert J., Debra J. Pickering and Jane E. Pollock. *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement*. ASCD, 2001. A magnificent volume that helps prepare learning experiences that are effective.
- Morgan, Norah and Juliana Saxton. *Asking Better Questions: Models, Techniques and Classroom Activities for Engaging Students in Learning*. Pembroke, 1994. One of the best books available to help create good questions for student research.

- Pearce, Charles R. *Nurturing Inquiry: Real Science for the Elementary Classroom*. Heinemann, 2000. Chock full of ideas, forms and techniques of inquiry and easy to use to integrate information literacy and the scientific method.
- Rose, Colin and Malcolm J. Nicholl. *Accelerated Learning for the 21st Century*. Dell, 1997. An excellent “pop read” on how to learn. Particularly good for adults and even teens who are interested in learning what “information literacy” (not their term) is all about. In addition, there are two helpful works on the same topic:
 - Meier, Dave. *The Accelerated Learning Handbook*. McGraw-Hill. 2000.
 - Russell, Lou. *The Accelerated Learning Fieldbook: Making the Instructional Process Fast, Flexible, and Fun*. Jossey-Bass, 1999.
- Sharma, Martha B. and Gary S. Elbow. *Using Internet Primary Sources to Teach Critical Thinking Skills in Geography*. Greenwood Press, 2000. A superb manual for teaching information literacy using higher-level questions and projects.
- Silver, Harvey, Richard W. Strong and Matthew J. Perini. *So Each May Learn: Integrating Learning Styles and Multiple Intelligences*. ASCD, 2000. Practical suggestions based on Gardiner’s theories.
- Sternberg, Robert J. and Louise Spear-Swerling. *Teaching for Thinking*. Washington, D.C.: American Psychological Association, 1996. Describes ways to enhance student thinking as problem solving and constructivist principles come into the center of a teacher’s style of teaching. Both theory and practice are covered.
- Strong, Richard W., Harvey F. Silver, and Matthew J. Perini. *Teaching What Matters Most: Standards and Strategies for Raising Student Achievement*. ASCD, 2001. Concentrates on the latest trends for standards-based learning including many ideas for process-based learning.
- Wiggins, Grant and Jay McTighe. *Understanding by Design*. ASCD, 1998. One of the best instructional design books on the market and often used as a text for library media specialists. Accompanying materials for this popular book are available from the publisher.
- Weinstein, Claire Ellen and Laura M. Hume. *Study Strategies for Lifelong Learning*. Washington, D.C.: American Psychological Association, 1998. Through many activities, examples, and ideas based on research, Weinstein and Hume offer a treasure trove of ideas for studying smart vs. studying hard.
- Zimmerman, Barry J., Sebastian Bonner, and Robert Kovach. *Developing Self-Regulated Learners: Beyond Achievement to Self-Efficacy*. Washington, D.C.: American Psychological Association, 1996. Describes how teachers can incorporate the guiding principles library media specialists know or are beginning to understand into classroom practice. Covers sound psychological

principles to help students become the “power learners” (confident learners) in a world of information.

- Zorfass, Judith M. with Harriet Copel. *Teaching Middle School Students to Be Active Researchers*. ASCD, 1998. Cock full of solid ideas to incorporate both in the library and in the classroom.

Manuals and guides from the library media field

- California School Library Association. *From Library Skills to Information Literacy: A Handbook to the 21st Century*. 2nd ed. San Jose, CA: Hi Willow Research & Publishing, 1997. This handbook provides both the theory and examples of presenting integrated information skills in both behaviorist and constructivist teaching modes. Emphasis is given to working with English learners.
- Donham, Jean, Kay Bishop, Carol Collier Kuhlthau, and Dianne Oberg. *Inquiry-Based Learning: Lessons from Library Power*. Linworth, 2001. Essays written by scholars and case study researchers of the Library Power project about their findings about learning and young people.
- Michael Eisenberg and Bob Berkowitz materials. Much of the success of teaching information literacy to students in schools is due to the popularization of The Big Six Skills™ of Eisenberg and Berkowitz. Both authors do extensive speaking engagements, and have published books, videos, and have a listserv. See the list of materials available at: <http://www.big6.com> See also Linworth Publishing (<http://www.linworth.com>) who publishes many materials linked to the Big Six model.
- Ercegovac, Zorana. *Information Literacy: Search Strategies, Tools & Resources for High School Students*. Linworth, 2001. Covers only the searching and recording part of information literacy, but that very well.
- Grover, Robert, Carol Fix and Jacqueline McMahan Lakin, eds. *The Handy Five: Planning and Assessing Integrated Information Skills Instruction*. Scarecrow Press, 2001. The Kansas model for information literacy is presented here complete with rubrics, research in its use, and sample lessons.
- Heller, Norma. *Information Literacy and Technology Research*. Libraries Unlimited, 2001. Examples of full units of instruction from various disciplines with full information literacy components. Good for analyzing how an integrated unit is planned, executed and evaluated.
- Iannuzzi, Patricia, Charles T. Mangrum II, and Stephen S. Strichart. *Teaching Information Literacy Skills*. Needham Heights, MA: Allyn & Bacon, 1999. This manual has tear-out instant lessons for middle and high school teens on information, locating and using materials, using reference sources, interpreting visual information, using the Internet, evaluating information, writing a research paper, and making oral presentations. To integrate these

lessons, library media specialists would have to retype each lesson with a topical focus, but some are generic enough to focus on any topic. What makes this manual unique is that an information literacy test is provided on a disk with five free trials to test whether students have acquired research skills. Using the tests with large groups requires a license. The same authors have also written *Teaching Study Skills and Strategies in Grades 4-8* and *Teaching Study Skills and Strategies in High School* issued by the same publisher.

- “Information Literacy,” a theme issue of *NASSP Bulletin*, March, 1999, edited by Ken Haycock, contains numerous articles targeted at principals and library media specialists concerning various issues surrounding the development of *Information Power* (1998) and the implementation of information literacy programs in school libraries.
- Lathrop, Ann and Kathleen Foss. *Student Cheating and Plagiarism in the Internet Era*. Libraries Unlimited, 2000. An in-depth examination of the topic with lots of handouts for use with teachers and students as the cut and clip generation tries to survive in a too-easy copy world.
- Jones, Debra. *Exploring the Internet Using Critical Thinking Skills*. New York: Neal-Schuman, 1998. One of a new generation of information literacy skill-based lesson manuals that actually incorporate thinking into the lessons. If the librarian adapts the printed lessons so that they integrate with the topics being studied, then this manual comes closer than most to the ideal.
- Jukes, Ian, Anita Dosaj, et. al. *Net Savvy: Information Literacy for the Communication Age*. Spokane, WA: The Net Savvy/InfoSavvy Group, 1998. (<http://www.tcpd.org/jukes/jukes.html>) An excellent introduction and planning manual for linking information literacy concepts in the creation of collaboratively-planned learning experiences. Concrete examples and forms are provided for practice, including grade-level checklists for information literacy skills planning.
- Rankin, Virginia. *The Thoughtful Researcher: Teaching the Research Process to Middle School Students*. Libraries Unlimited, 1999. A manual with many ideas, activities, and examples for the middle school library media specialist and teacher.
- Ryan, Jenny and Steph Capra. *Information Literacy Toolkit: Grades Kindergarten-6; and Grades 7 and Up*. American Library Association, 2001. Both guides come closer than most in the teaching of the information literacy process in its entirety rather than just concentrating on information searching.
- Seamon, Mary Ploski and Eric J. Levitt. *Web-Based Learning: A Practical Guide*. Linworth, 2001. Web Quests have become a major tool to help school library media specialists get their foot in the door to collaborative planning and information literacy. This volume provides guidance and samples on how to get started and create quality learning experiences.
- Small, Ruth V. and Marilyn P. Arnone. *Turning Kids on to Research: The Power of Motivation*. Libraries Unlimited, 2000. Numerous practical ideas for

creating interest in research topics to help increase the amount learned during the process.

- Stanley, Deborah B. *Practical Steps to the Research Process for High School*. Libraries Unlimited, 1999. Tips for teaching complete with forms, lessons, and other materials. Covers almost all the steps of the research process. See also her: *Practical Steps to the Research Process for Middle School*. Libraries Unlimited, 2000.
- Stripling, Barbara and Judy Pitts. *Brainstorms and Blueprints*. Englewood, CO: Libraries Unlimited, 1988. This earlier publication served to introduce many in the profession to information literacy and still has much sound advice.
- Wee, Patricia Hacheten. *Independent Projects Step by Step: A Handbook for Senior Projects, Graduation Projects, Culminating Projects*. Scarecrow, 2000. Gives guidance to students and for those assisting them on how to structure and carry out the major projects some students are required to do as culminating experiences of their education.
- Wray, David and Maureen Lewis. *Extending Literacy: Children Reading and Writing Non-Fiction*. Routledge/Falmer, 1997. Based on the Wray EXIT model illustrated elsewhere in this book, Wray and Lewis integrate information literacy into the idea of teaching advanced reading skills. An interesting approach from the UK.

State manuals and publications

A number of states have taken the initiative to publish their own manuals or state standards for information literacy. Some examples arranged by date include:

1993

- Wisconsin Educational Media Association (WEMA). "Information Literacy: A Position Paper on Information Problem-Solving." 1993. Available at: <http://www.marshfield.k12.wi.us/wema/infolit.html>

1994

- Colorado Educational Media Association. *Model Information Literacy Guidelines*. 1994.

1995

- Kentucky Department of Education *Online II: Essentials of a Model Library Media Program*. 1995.
(<http://www.kde.state.ky.us/oet/customer/online2/online2.asp>)

1996

- Colorado State Department of Education. *Rubrics for the Assessment of Information Literacy*. 1996 (ED 401 899) and *Model Information Literacy Guidelines*. Available at:
http://www.cde.state.co.us/index_search.htm

- Utah State Department of Education. *Library Media/Information Literacy Core Curriculum for Utah Secondary Skills*. 1996.
(http://www.uen.org/cgi-bin/bebsq/lessons/c3.hts?core=98course_num=6512)

- Washington Office of the Superintendent of Public Instruction and Washington Library Media Association. *Essential Skills for Information Literacy*. (<http://www.wlma.org/Literacy/esintro.htm#esbench>)

1997

- California School Library Association. *From Library Skills to Information Literacy: A Handbook to the 21st Century*. 2nd edition. Hi Willow Research & Publishing, 1997. Also: *Information Literacy Guidelines for Kindergarten Through Grade 12*.
(<http://ctap.fcoe.k12.ca.us/ctap/Info.Lit/infolit.html>)

- Texas State Library & Archives Commission. *School Library Programs Standards and Guidelines for Texas*. The Library, 1997. Available at:
(<http://www.tsl.state.tx.us/ld/schoollibs/standards.html>)

- Massachusetts School Library Media Association. *Standards for School Library Media Centers in the Commonwealth of Massachusetts*. 1997.
(<http://www.doe.mass.edu/mailings/1997/lmstandards.html>)

1998

- Wisconsin Department of Public Instruction. *Wisconsin's Model Academic Standards for Information and Technology Literacy*. The Dept., 1998. Available at: <http://www.dpi.state.wi.us/dpi/dltcl/imt/itls.html>.

1999

- Illinois School Library Association. *Linking for Learning*. 1999.

- North Carolina: North Carolina Standard Course of Study: for Information Skills, revised: 1999-00.
(<http://www.dpi.state.nc.us/Curriculum/index.html>)

- Georgia Learning Connections. Quality Core Curriculum Information Literacy Skills Index (Draft) (<http://www.glc.k12.ga.us/qstd-int/inside.htm>)

- Alabama Department of Education. Office of Technology Initiatives. *Literacy Partners: A Principal's Guide to an Effective Library Media Program for the 21st Century*. The Dept., 1999.
(<http://www.alsde.edu/documents/61/LiteracyPartnersHdbk.pdf>)

- Pennsylvania Department of Education. *Pennsylvania Guidelines for School Library Information Programs*. The Dept.: 1999.

- Ohio Educational/Library Media Association (OELMA). *Quality Library Media Programs: Information Power for Ohio Schools*. Published in: *Ohio Media Spectrum*, vol. 50, no. 4, Winter, 1999, p. 1-97. also: "INFOhio DIALOGUE Model for Information Literacy Skills,"
(<http://www.infohio.org/about/id.htm>)

- Missouri Department of Elementary and Secondary Education. *Standards for Missouri School Library Media Centers*. 1999.

(<http://www.dese.state.mo.us/divimprove/curriculum/standards/lmcstand.htm>)

- Maine Association of School Librarians. Various publications dealing with school library media center and information literacy. Check the main website and their publications.

(<http://www.maslibraries.org/index.html>)

- Massachusettes School Library Media Association. *MSLAMA State Standards*. 1999.

(<http://www.mslma.org/mslmapages/mslmastandards.html>)

2000

- Minnesota Educational Media Association. *Minnesota Standards for Effective School Library Media Programs 2000*. The Association, 2000.

(<http://cfl.state.mn.us/library/mnschoolstandards.pdf>)

- Maryland State Department of Education. *Standards for School Library Media Programs in Maryland*. 2000.

(<http://www.mdk12.org/share/standards/statemed.pdf>)

- Rhode Island Department of Education Board of Regents. "School Library and Information Literacy Framework." Rhode Island Educational Media Association, 2000.

(<http://www.ri.net/RIEMA/infolit.html>)

- Pennsylvania Department of Education. *The Pennsylvania School Library Information Specialist Tool Kit for Implementing Information Literacy in Schools*. The Department, 2000.

2001

- Hawaii Teacher Standards Board. "Professional Standards: School Librarians Performance Standards: Draft Edition." 2001

(<http://www.htsb.org/standards/libintro.html>)

- Montana Office of Public Instruction. *The Montana Library and Information Skills Model Curriculum Guide*. 2001.

(<http://www.opi.state.mt.us/PDF/Librarycurric.pdf>)

- Oregon Educational Media Association. *Information Literacy Guidelines: 2001*.

(http://www.oema.net/OEMA_InfoLit_Guidelines.html)

2002

- North Dakota Department of Public Instruction. "Media/Technology Literacy."

(<http://www.dpi.state.nd.us/standard/content.shtm>)

Sample School and School District Efforts:

- Mankato (Minnesota) Schools “Information Literacy Curriculum Guidelines (<http://www.isd77.k12.mn.us/resources/infocurr/infolit.html>)
- Bellingham Schools (Washington) Course Outline: Information Literacy and the Net” (<http://www.bham.wednet.edu/literacy.htm>)
- Nueva School (California) “The Building Blocks of Research: An Overview of Design, Process and Outcomes.” (<http://nuevaschool.org/~debbie/library/research/il/infolit.html>)

Sample Documents Higher Education

- Ithaca College Library (New York) *ICYouSee: T is for Thinking: The ICYouSee Guide to Critical Thinking About What You See on the Web.* (<http://www.ithaca.edu/library/Training/hott.html>)

Sample International Documents

- United Kingdom: *The Primary School Library Guidelines.* The Library Association, 2000. (http://www.la-hq.org.uk/directory/prof_issues/primary.html)
- Australia: Moore, Penny. *Towards Information Literacy: One School's Journey.* (Kit) New Zealand Council for Educational Research, 2000. (<http://www.nzcer.org.nz>)

Sample U.S. National Documents

- National Board for Professional Teaching Standards. *Library Media Standards: for Teachers of Students Ages 3-18+.* The Board, 2001. (<http://www.nbpts.org>). Library media specialists seeking national certification should be familiar with this publication. With its integrated information literacy component throughout the document.

Web pages

- Try Debbie Abilock's web page at <http://www.nueva.pvt.k12.ca.us/~debbie/library/research/research.html> for her helpful guidance to students in becoming independent, self-motivated and disciplined learners in the information literacy process.
- Prince Edward Island (Canada). “Building Information Literacy: Strategies for Developing Informed Decision-Makers and Independent Lifelong Learners.” (<http://www.edu.pe.ca/bil/>) Lots of good materials, but of particular interest is the “Building Plans” section. Here teachers and library media specialists are provided a unit planning tool that integrates learning standards and information literacy standards easily into lesson plans. A great idea to test and modify as needed.

- UC Santa Cruz Library Starter Kit at:

<http://bob.ucsc.edu/library/ref/instruction/skit/>

A good example of extensive help for students in an academic library. Contains a virtual library tour, a guide to constructing a research paper, online courses for using various tools, guides to subject tools, and lists of classes and workshops for more help.

Policies and Plans

¹⁷⁶ Haycock, Ken and Geoff Jopson. "Propositions for Information Technology: Planning for Success." *Teacher Librarian*, vol. 26, no. 3, January/February, 1999, p. 15-20.

- Many schools and school districts have technology plans, but not many link technology, learning, and information literacy. A sample of a visionary plan is that adopted by the West Vancouver (British Columbia, Canada) school board.¹⁷⁶ This plan contains:

- a statement of beliefs
- student learning goals
- social issues
- learning issues
- clarification of roles and responsibilities
- integration of information delivery systems (see Haycock and Jopson)

Questions and wonders

- Jacobs, Heidi Haynes. *Mapping the Big Picture*. Alexandria, VA: Association for Supervision and Curriculum Development, 1997. Jacobs provides a very good source to help learn to write "essential questions" and map the curriculum at any grade level.
- Web Quests is a technique for developing engaging questions for students K-12 using the Internet as a major information resource. See the site at: <http://edweb.sdsu.edu/webquest/webquest.html>. Also see the Pacific Bell web site titled "Filamentality" that helps teachers or library media specialists design Web Quests. See it at: <http://www.kn.pacbell.com/wired/fil/>

Finds and Sorts

- Borne, Barbara Wood. *100 Research Topic Guides for Students*. San Francisco, CA: Greenwood Press, 1996. Wood has prepared 100 sample pathfinders for students on topics spanning the curriculum. Pathfinders, or guides for finding resources in the library media center and beyond, have been quite popular in the past and are now becoming common on school library media center web pages. Before major units, the library media specialist can call up the pathfinder and make changes reflecting collections and Internet sites and then reload the pathfinder on the web site.
- Wyman, Steven et al. *User and System-Based Quality Criteria for Evaluating Information Resources and Services From Federal Websites: Final Report*, June, 1997. ED 409 020. Check out the instruments used to evaluate presentation, content, and the technical and policy issues of these sites. This would be adaptable for students and inservice for adults.

- Houghton, Janaye M. and Robert S. Houghton. New York: Houghton. *Decision Points: Boolean Logic for Computer Users and Beginning Online Searchers*. Englewood, CO: Libraries Unlimited, 1999. Packed with forms, guides, and suggestions for Boolean Searching, this source can be a good starting place for teaching what Boolean logic is all about. Both for the beginner and advanced searchers, the exercises generally suggest topics to research that interest upper elementary and teens. Library media specialists would be wise to transform the searches suggested into the topics of class assignments so that the instruction becomes integrated.
- Teachers and library media specialists looking for materials to teach Internet safety may find some useful ideas in the lessons presented in *Internet Coach for Net Safety: Lesson Plans for Teaching Students about Internet Safety*. Evanston, IL: Northwestern University/Evanston Research Park, 1998. (<http://www.apte.com>)

Consumes and Absorbs

- Resistance to actually reading or consuming information may not only be a sense of reluctance on the part of the learner, but may be due to a lack of skill in attacking information. Library media specialists should peruse the study skills literature for ideas that both they and the teachers can use to help students spend substantial time and effort engaged in actual information consumption. One good resource with forms and teaching ideas is: Irvin, Judith L. and Elaine O. Rose. *Starting Early with Study Skills: A Week-by-Week Guide for Elementary Students*. Needham Heights, MA: Allyn and Bacon, 1995. Irvin and Rose cover ideas for preparing students to read, promoting active reading, promoting active listening, and taking useful notes during the process.
- A second helpful manual from the study skills literature is: Frender, Gloria. *Learning to Learn: Strengthening Study Skills and Brain Power*. Nashville, TN: Incentive Publications, 1990. Packed with forms created for students, the numerous ideas for reading, and note-taking are quite adaptable to local situations. Frender also covers areas such as time management and test-taking skills for students.

Thinks and Creates

- One publisher to keep an eye on is Midwest Publications (P.O. Box 448, Pacific Grove, CA 93950) for their manuals on critical thinking. Their Building Thinking Skills series, while a little dated (1980s) provide numerous reproducible exercises to make young people rethink what they are doing.
- Ayan, Jordan. *Aha! 10 Ways to Free Your Creative Spirit and Find Your Great Ideas*. Three Rivers Press, 1997. Ayan presents a number of ways to look into yourself and discover that you are a creative person. He then provides ten strategies to develop that creativity as a part of everyday life:
 - Connect with people.
 - Design an enriching environment.

- Get out of your box through travel.
- Be sparked by play and humor.
- Expand your mind thorough reading.
- Take up the arts.
- PowerThink your challenges.
- Release your alter conscious.
- Connect with your creative soul.

• Chaffee, John. *Thinking Critically*. 6th edition. New York: Houghton, 2000. This critical thinking textbook used in many college classes contains lots of ideas and exercises for advanced researchers. Also serves as a good introduction for adults

• Chaffee, John. *The Thinker's Way: 8 Steps to a Richer Life: Think Critically; Live Creatively; Choose Freely*. New York: Little, Brown, 2000. A cross between a book about critical thinking and a life self-help book, Chaffee explores eight ideas to create a life philosophy:

- Think critically.
- Live creatively.
- Choose freely.
- Solve problems effectively.
- Communicate effectively.
- Analyze complex issues.
- Develop enlightened values.
- Think through relationships.

• Gelb, Michael J. *How to Think Like Leonardo da Vinci: Seven Steps to Genius Every Day*. Delacorte Press, 2000. In a book written for the popular adult press, Gelb outlines seven major principles for developing the creativity needed in today's world:

- **Curiosita**—An insatiably curious approach to life and an unrelenting quest for continuous learning.
- **Dimostrazione**—A commitment to test knowledge through experience, persistence, and a willingness to learn from mistakes.
- **Sensazione**—The continual refinement of the senses, especially sight, as the means to enliven experience.
- **Sfumato** (literally “Going up in Smoke”)—A willingness to embrace ambiguity, paradox, and uncertainty.
- **Arte/Scienza**—The development of the balance between science and art, logic and imagination. “Whole-brain” thinking.
- **Coprolita**—The cultivation of grace, ambidexterity, fitness, and poise.
- **Connessione**—A recognition of and appreciation for the interconnectedness of all things and phenomena. Systems thinking. (p. 9)

• Halpern, Diane. *Critical Thinking Across the Curriculum*. Mahwah, NJ: Lawrence Erlbaum Associates, 1997. Halpern's chapter on creative thinking (p. 242-60) is an excellent review of the entire process for the adult seeking a succinct overview of the topic with a list of practical strategies to try.

• Inspiration (computer software) for Mac or PC. Inspriation Software, Inc., 1997 (<http://www.inspiration.com>) This computer-based visual learning tool helps students and adults organize their thinking. Concept maps, webs, plans, graphical organizers and outlines are easy to make to help clarify thinking, deepen understanding of concepts, increase retention, develop organizational skills, and tap creativity. Can be used with groups of students during brainstorming or planning sessions to organize the ideas of the group.

• Michalko, Michael. *Thinkertoys*. San Francisco, CA: Ten Speed Press, 1991. A great volume for introducing creative thinking containing many kinds of ideas, puzzles, exercises. Lot's of fun to read and a good idea book for work with teens.

• Michalko, Michael. *Cracking Creativity: The Secrets of Creative Genius*. San Francisco, CA: Ten Speed Press, 1998. Michalko continues his exploration of creativity as he gives advice and practice exercises for seeing what no one else is seeing and thinking what no one else is thinking. His chapter titles are instructive in and of themselves:

- Knowing how to see
- Making your thoughts visible [mind mapping]
- Thinking fluently
- Making novel combinations
- Connecting the unconnected
- Looking at the other side
- Looking in other worlds
- Finding what you're not looking for
- Awakening the collaborative spirit

• Michalko, Michael. *Thinkpak: A Brainstorming Card Deck*. San Francisco, CA: Ten Speed Press, 1994. This card set is used by groups or individuals during problem-solving to take a fresh look at a system. You draw cards at random from a deck and they ask you to SCAMMPERR through one of nine techniques to do reanalysis:

- Substitute something.
- Combine it with something.
- Adapt something to it.
- Magnify or add to it.
- Modify it.
- Put it to some other use.
- Eliminate something.
- Rearrange it.
- Reverse it.

• Nosich, Gerald M. *Learning to Think Things Through: A Guide to Critical Thinking Across the Curriculum*. Prentice-Hall, 2001. A manual for teachers to help understand the Nosich standards of critical thinking and how to engage students in this type of thinking no matter the subject matter. Recommended for the library media specialist who wants to learn the basic elements of

critical thinking and how to teach it. Nosich's seven standards of critical thinking (in chapter 4) are:

- **Clearness** – Is the thinking clear? Is this clear in my mind? Am I saying this clearly?
- **Accuracy** – Is the thinking accurate? Are the statements accurate, true?
- **Importance, Relevance** – Does the thinking focus on what is important? How relevant, central, important is the thinking for the problem at hand?
- **Sufficiency** – Has this been reasoned out sufficiently? Have I reasoned this out enough to decide the issue reasonably?
- **Depth and Breadth** – Has this been reasoned out deeply enough? Have I taken adequate account of underlying theories, explanations, and the complexities of the problem? Have I reasoned this out broadly enough? Have I taken adequate account of other related issues, other perspectives on the problem, other aspects of the context?
- **Precision** – Is the thinking precise? Is the reasoning detailed enough?

• Paul, Richard and Linda Elder. *Critical Thinking: Tools for Taking Charge of Your Learning and Your Life*. Prentice Hall, 2001. Two experts in the field of critical thinking join forces to create a guide for thinking straight. Note how close to information literacy models they are when they present questions (p. 54) you can ask yourself as you analyze your thinking:

- What is my fundamental purpose?
- What is the key question I am trying to answer?
- What information do I need to answer my question?
- What is the most basic concept in the question?
- What assumptions am I using in my reasoning?
- What is my point of view with respect to the issue?
- What are my most fundamental inferences or conclusions?
- What are the implications of my reasoning (if I am correct)?

• Sorenson, Juanita S., Lynn R. Buckmaster, Mary Kay Francis, and Karen M. Knauf. *The Power of Problem Solving: Practical Ideas and Teaching Strategies for any K-8 Subject Area*. Allyn and Bacon, 1996. Contains an excellent overview of problem solving strategies and then presents hundreds of ideas across the disciplines.

• Sternberg, Robert J. and Louise Spear-Swerling. *Teaching for Thinking*. Washington, D.C.: American Psychological Association, 1996. An excellent manual with exercises for the teacher and library media specialist to study as they prepare to work with students on critical thinking.

¹⁷⁷ Hayes, D. E. "Helping Students GRASP the Knack of Writing Summaries." *Journal of Reading*, vol. 34, 1989, p. 536-39. See also Rekrut's summary of the GRASP method in: Rekrut, Martha D. "Collaborative Research." *Journal of Adolescent & Adult Literacy*, vol. 41, no. 1, September, 1997, p. 26-34.

Summarizes and Concludes

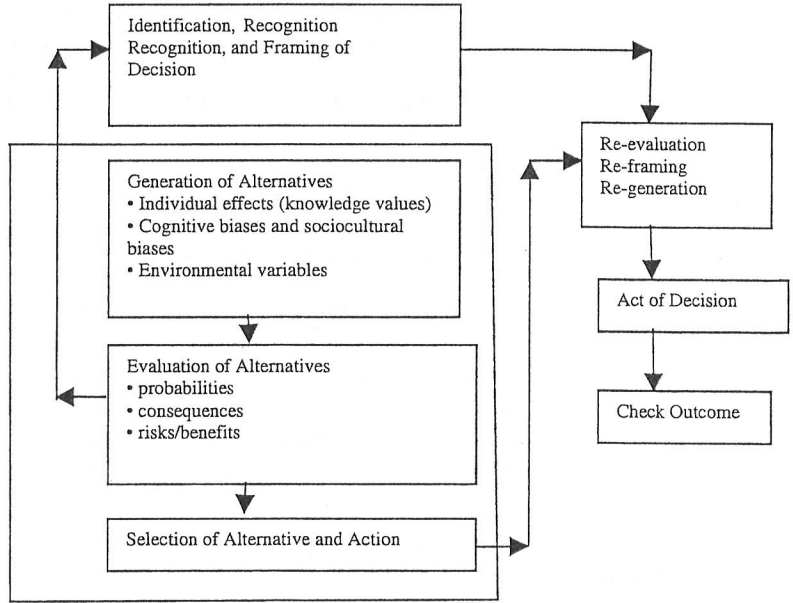
• Hayes¹⁷⁷ presents a practical method for teaching students to summarize instead of plagiarize. Known as the GRASP method (Guided Reading And Summary Procedure), the technique includes six steps:

- Preparing students for summarizing by clarifying its purposes.
- Providing guided practice with selected examples.
- Organizing the recalled information into sentence form.
- Use the rules for summarization:
- Include only important information,
- Compress information by combining it, and
- Add words or phrases that are needed to provide clarity and coherence.

• During the summary phase of the research process, students may be making decisions based on the information they have collected.

Halpern¹⁷⁸ presents a multiprocess model of decisionmaking in information-rich environments. Each of the boxes represents a stage with feedback loops indicating a repetition of a step as needed. (p. 190)

¹⁷⁸ Halpern, Diane F. *Critical Thinking Across the Curriculum: A Brief Edition of Thought and Knowledge*. Mahwah, NJ: Lawrence Erlbaum Associates, 1997.



- Context**
- social factors (e.g. group approval)
 - type of decision
 - technical/personal
 - importance

Reflects on Process and Product

• Brandt, Ron, ed. *Assessing Students Learning: New Rules, New Realities*. ASCD, 1998. This book with an accompanying CD-ROM is a thorough source on the topic of assessment experts from many areas of the curriculum and from many national associations. The CD links the reader in to hundreds of resources on assessment and to a website at ASCD that is kept current with the latest on assessment. An important resource both library media specialists, teachers, and curriculum personnel.

- Educators in Connecticut's Pomperaug Regional School District 15. *A Teacher's Guide to Performance-Based Learning and Assessment*. Alexandria, VA: Association for Supervision and Curriculum Development, 1996 is one of the best introductory manuals for the classroom teacher on building rubrics to assess instruction and has excellent examples.
- Kuhlthau, Carol Collier, ed. *Assessment and the School Library Media Center*. Englewood, CO: Libraries Unlimited, 1993. While somewhat dated, Kuhlthau's book is a good collection of articles for an introduction to the topic and to techniques.
- Lewin, Larry and Betty Jean Shoemaker. *Great Performances: Creating Classroom-Based Assessment Tasks*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998. This manual gives dozens of practical examples of measuring what students both know and are able to do in a wide variety of content areas and grade levels. The authors cover measurement techniques through content, visual representations, written work, oral presentations, and large-scale projects or performances. While concentrating on the assessment, the volume is useful in planning the entire educational experience.
- Washington Library Media Association. "Technology Rubrics." (<http://www.wlma.org/Literacy/rubricsources.htm>) Its many sample rubrics can be used to evaluate student projects.
- University of Maryland University College. "Assessment of Information Literacy Skills." An extensive web site built for the college level but with a great deal of information about assessment in general and in how to apply assessment techniques to information literacy. A comprehensive and excellent resource with many bibliographies.
(http://www.umuc.edu/distance/odell/irahe/arc/info_lit.html)

Helps for Parents

- Eisenberg, Michael B. and Robert E. Berkowitz. *Helping with Homework: A Parent's Guide to Information Problem-Solving*. Syracuse, NY: ERIC Clearinghouse on Information & Technology, 1996. Eisenberg and Berkowitz created a book that translates the Big Six Model into a process parents can use to help children learn while doing school-related homework and assignments. The book explains the Big Six and the Super Three stages in information problem solving, explains how technology can help in finding and using information, and gives tips for assisting with assignments in a wide variety of common homework subjects.
- Britton, Zachary. *Safety Net*. Eugene, OR: Harvest House Publishers, 1998. A discussion of popular software programs designed to block problem websites and pornography.
- Hughes, Donna Rice with Pamela T. Campbell. *Kids Online: Protecting Your Children in Cyberspace*. Grand Rapids, MI: Fleming H. Revell (a

Division of Baker Book House), 1998. One of a growing number of resources for parent's worried about pornography, loss of privacy, unscrupulous vendors, and misinformation, Hughes provides guidance to parents on using and supervising the Internet in the home. She advocates not signing an acceptable use policy at school unless it is very clear that librarians are taking measures to protect children. She says: "I believe that librarians, as information providers in the community, must accept their responsibility to protect children from exposure to material that in any other media would be considered illegal for children to access (i.e., obscenity, child pornography, and material harmful to minors). Furthermore, when libraries refuse to accept this responsibility, I believe they should give full disclosure to parents about the potential risks posed to children by unrestricted Internet access at the library." She advocates newer tools to the building of access to quality information sites on the Internet rather than using inefficient blocking software. Librarians should be aware of the solutions Hughes advocates.

Resources for Steps of the Research Process for Young People

Overviews

- Elliott, Rebecca S. and James Elliott. *Painless Research Projects*. Hauppauge, NY: Barrons, 1998.
- Brynie, Faith Hickman. *Painless Science Projects*. Hauppauge, NY: Barrons, 1998.

Both books, written for middle school/high school, are illustrated research guides. Probably not something students would read from interest, but they certainly provide a no-nonsense approach to research that can be used by teachers and library media specialists to formulate lessons and suggest an approach.

- Haisman, Gilbert. *SWOT: Study Without Tears: For University, Polytechnic and Secondary Students*. New Zealand Council for Educational Research, 2001. (<http://www.nzcer.org.nz>) A handy research guide for secondary students worth acquiring from New Zealand.

- Heiligman, Deborah. *The New York Public Library Kid's Guide to Research*. New York: Scholastic, 1998 contains simple explanations of the research process. A good source to find simple language for teaching as well as a simple guide for upper elementary children.

- Hughes, Sandra. *Research Process Helper*. (<http://www3.sympatico.ca/sandra.hughes/sandra.hughes/research/default.htm>) Sandra has created a full research guide for upper elementary through high school on the web. It contains many helps, guides, recommendations, forms, and planning tools for doing a research project from beginning to end. Students can click on any aspect of the process and receive immediate help. A teacher manual is also linked to the guide.

- Meltzer, Milton. *Case Closed: The Real Scoop on Detective Work*. Orchard Books, 2001. Not a style manual, but a nonfiction fun read about how detective work works. A good read for students interested in research, investigations, and fascinating uncoveries.

- *Scholastic Explains Writing Homework*. New York: Scholastic, 1998 is an excellent introductory picture resource for the research process for the early grades. Full pages in color cover single topics such as brainstorming, how to write a book report or a biography, and tips on grammar.
- Swanson, Diane. *Nibbling on Einstein's Brain: The Good, the Bad, & the Bogus in Science*. Annick Press, 2001. An excellent guide for both students and adults in doing a science project utilizing the scientific method with much overlap of information literacy guidelines. Upper elementary through high school.
- Venolia, Jan. *Kids Write Right!: What You Need to Be a Writing Powerhouse*. Tricycle Press, 2000. A style manual and tip guide designed for the elementary and middle school.

Tools

Some software tools are particularly useful in the research process. Library media specialists should master each of these major tools so they can teach both students and faculty their use. Always be on the lookout for other useful packages/techniques.

- “PowerPoint” – for summarization and presentation
- “Inspiration” and/or “Kidspiration” is a tool for brainstorming or recording main ideas in graphic organizer format.
(<http://www.inspiration.com>)
- Graphic organizers: Learning Network. “Pintables: Graphic Organizers.”
(<http://teachervision.com/lesson-plans/lesson-6293.html>)
- Causal Mapping: graphically shows relationships and causation in science
(<http://cilt.berkeley.edu/synergy/causalmap/>)
- Word processing software: Investigate software templates for word processing packages that help students format their references in line with official style manuals such as Chicago or MLA.
 - NoodleBib – (<http://www.noodletools.com/noodlebib/>)
 - Citation Machine
(http://landmark-project.com/citation_machine/)
- Webpage construction software editors such as “Dreamweaver,” Netscape Composer, Geocities, etc.
- Databases with search engines: Engines that have easy-to-use online assistance and instructions in searching.
- “Filamentality:” webquest creation tool:
(<http://www.kn.pacbell.com/wired/fil>)

- “Noodle Tools:” has online help software for students doing a research project (<http://www.noodletools.com/>)
- “Keeboo:” creates “books” online for storing and retrieving information. Windows only.
(<http://www.keeboo.com/enu/b2c/kbc/index.htm>)
- “SenseMaker:”¹⁷⁹ This software tool helps students figure out the relationships that exist between a number of different Web resources as they investigate pieces of Internet evidence.
(<http://www.kie.berkeley.edu/sensemaker/>)
- “TrackStar:” Provides helps for teachers in creating lessons
<http://trackstar.scrtec.org/>
- “Backflip:” Creates a permanent directory of favorite web sites
(<http://www.backflip.com/login.ihtml>)
- “Tapped In:” Offers excellent professional development for teachers, library media specialists and other folks.
(<http://www.tappedin.org/>)
- “TourMaker:” software creates online instructional packages for students or teachers or library media specialists.
(<http://www.tramline.com/>)

¹⁷⁹ See an article describing SenseMaker use: Bell, Philip. “Using Argument Representations to Make Thinking Visible for Individuals and Groups.” 1998? (<http://www.kie.berkeley.edu/people/vuppo.html>)

Finds and Sorts

- The Winsor School, Boston, MA: The Virginia Wing Library: “Evaluating Internet Resources: A Checklist for Students.” While many schools have online support, this example of a checklist for evaluating information on the web with practice sites available. Many schools have such online helps. This is an example of a straightforward, serious one.
(<http://www.winsor.edu/library/evalstud.htm>).
- Trinity College, Western Australia. “Study Skills Webquest.”
(<http://www.students.trinity.wa.edu.au/library/library/study/skills.htm>), an example of a pop-site for teaching study skills in an attempt to make it interesting and fun. May be a trend.

Bernie Dodge’s “Seven Steps Toward Better Searching” uses seven tricks for searching AltaVista using the sentence: **My plump starfish quickly lowered Lincoln’s tie.** Using each word as a clue, students know when to use the -, +, lower case, etc. in their searching.
(<http://edweb.sdsu.edu/webquest/searching/sevensteps.html>)

See also Bernie Dodge’s “Specialized Search Engines and Directories” containing an excellent list for varying types of information a student might need with URLs for easy linking.
(<http://edweb.sdsu.edu/webquest/searching/specialized.html>)

Thinks and Creates

- “History Matters.” Is for young people having trouble creating graphic organizers. The examples for kids on this website are spectacular.
(<http://home.earthlink.net/~tsdobbs/go/go.html>).
- Infinite Innovations Ltd. “Innovation House.” Is an example of a commercial site designed to teacher brainstorming and creative thinking using a creative technique. Would this technique work with your students?
(<http://www.infinn.com/innovationhouse.html>)
- Learning Network. “Pintables: Graphic Organizers.” Provides many excellent printer friendly graphic organizers of all types that can be printed out for student use. Excellent. Check out other student friendly tools and resources on this commercial site.
(<http://teachervision.com/lesson-plans/lesson-6293.html>)
- Reed, Kathy. *Data & Graphing: Activities for Every Month*. (Grades one and two). Ideal School Supply, no date. Published in this version for grades 1-2, there is also a grades 3-4 version teaching young people to collect data and then create graphs and charts. It is excellent for teaching data handling techniques as part of the information literacy process.
- Swinburne, Stephen R. *Lots and Lots of Zebra Stripes: Patterns in Nature*. Homedale, PA: Boyds Mill Press, 1998. This picture book for young learners gets them started to see patterns such as zebra stripes or spider webs. A great conversation starter to identify patterns in information sources and materials such as: books have authors, maps use symbols, there are patterns in the way books are shelved.
- Williams, Valerie and Tina Cohen. *Graphing Across the Curriculum*. Scholastic, 1995. has many teaching tips for kids to manipulate data.

Communicates

- “Kids Report” A biweekly publication produced by K-12 students as a resource of other K-12 students. It is an ongoing, cooperative effort of 12 classrooms from around the United States. Teachers assist and provide support; however students select and annotate all resources included in every issue of the KIDS Report.” See at: <http://scout.cs.wisc.edu/scout/KIDS/>
- *Once Upon a Fairy Tale: Four Favorite Stories Retold by the Stars*. Viking, 2001. This fascinating idea that can be used by students. In this book, four favorite fairy tales are retold and then read on an accompanying CD by such stars as Minnie Driver, Steven Spielberg, Barbara Streisand, Martha Stewart, Hugh Grant, Glenn Close, Robin Williams and Bruce Willis among others. The idea is this. Take any story, event, tragedy, or issue, and show students this book followed by the assignment to recreate the topic as an interesting piece of literature either fiction or nonfiction. After several groups or individuals retell the story from various perspectives and from various experience bases, the whole can then be evaluated.

- Smith, Charles R. Jr. *Rimshots: Basketball Pix, Rolls, and Rhythms*. New York: Dutton Children's Books, 1999. An inner-city African American basketball player writes short essays, poems, and sound bites about the game and life using the page as a piece of graphic art. A unique and appealing idea for writing and communicating sense and feeling through print. Particularly good as an idea starter for teenage communicators.
- Smith, Charles R. Jr. *Short Takes: Fast-Break Basketball Poetry*. New York: Dutton Children's Books, 2001. A second volume of pictures and poetry in a very interesting juxtaposition provides a good report idea for the visual generation to analyze and then create their own.
- Waters, Kate. *Giving Thanks: The 1621 Harvest Feast*. Scholastic, 2001. A great idea for an illustrated report – particularly for a group project. In this book, we see the first Thanksgiving day, but on each page, the story is told from two points of view: an Indian child and a Pilgrim child.
- Williams, Marcia. *Tales from Shakespeare*. Crystal Lake, IL: Candlewick Press, 1998. A picture book in cartoon format contains not only the cartoons telling the story of various Shakespeare plays, but with marginal cartoons commenting on the action. This is a great idea starter for reports to be delivered in cartoon format.

Chapter Six For the Researcher

¹⁸⁰ Cooke, Michael James. "Information Skills for the Modern World: Can the School Library Cope?" in Jaya, Suban, Selangor Darul Eshan, eds. *The School Library: Centre for Life-Long Learning: Proceedings for the 18th Annual Conference, 22-26 July 1989, International Association of School Librarianship*. IASL, 1990. ERIC_NO: ED324033

¹⁸¹ Marland, Michael. *Information Skills in the Secondary Curriculum: The Recommendations of a Working Group Sponsored by the British Library and the Schools Council*. London: The British Library, 1981. See at <http://www.hinchbk.cambs.sch.uk/original/big>

Models of Information Literacy – A Timeline

Of the many models that have appeared in the literature in the past 20 years, a few have gained substantial acceptance in the field. The following twelve models are presented in order of the year they were first published in the school library media literature.

The British Model, 1981 (now known as The Nine Step Plan)

Cooke¹⁸⁰ traces the emergence of information literacy models for librarians to work done in Great Britain and published by Michael Marland¹⁸¹ in his 1981 book entitled *Information Skills in the Secondary Curriculum*. The nine steps to research formed the basis of much work done in that country and around the world:

The Nine Step Plan

1. WHAT DO I NEED TO DO?
(formulate and analyze need)
2. WHERE COULD I GO?
(identify and appraise likely sources)
3. HOW DO I GET TO THE INFORMATION?
(trace and locate individual resources)
4. WHICH RESOURCES SHALL I USE?
(examine, select and reject individual resources)
5. HOW SHALL I USE THE RESOURCES?
(interrogate resources)
6. WHAT SHOULD I MAKE A RECORD OF?
(recording and sorting information)
7. HAVE I GOT THE INFORMATION I NEED?
(interpreting, analyzing, synthesizing, evaluating)
8. HOW SHOULD I PRESENT IT?
(presenting, communicating)
9. WHAT HAVE I ACHIEVED?
(evaluation)

Stripling and Pitts Research Process Model, 1988

¹⁸² Stripling,
Barbara K. and
Judy M. Pitts.
*Brainstorms and
Blueprints.*
Englewood, CO:
Libraries Unlimited,
1988.

The Stripling/Pitts model¹⁸² gained wide acceptance upon publication. It guided students through each stage of creating a research paper, but at each stage, the student was asked to reflect upon what had just been done.

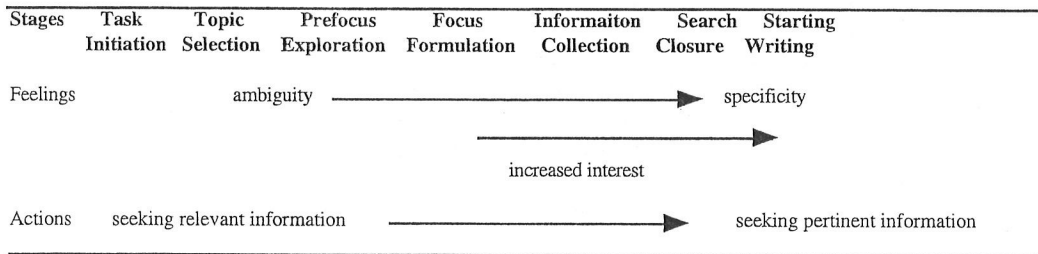
Stripling and Pitts Research Process Model

- Step 1:** Choose a broad topic.
- Step 2:** Get an overview of the topic.
- Step 3:** Narrow the topic
Reflection Point: Is my topic a good one?
- Step 4:** Develop a thesis or statement of purpose
Reflection Point: Does my thesis or statement of purpose represent an effective, overall concept for my research
- Step 5:** Formulate questions to guide research.
Reflection Point: Do the questions provide a foundation for my Research?
- Step 6:** Plan for research and production.
Reflection Point: Is the research / production plan workable?
- Step 7:** Find / Analyze / Evaluate sources.
Reflection Point: Are my sources usable and adequate?
- Step 8:** Evaluate evidence / Take notes / Compile bibliography.
Reflection Point: Is my research complete?
- Step 9:** Establish conclusions / Organize information into an outline.
Reflection Point: Are my conclusions based on researched evidence?
Does my outline logically organize conclusions and evidence?
- Step 10:** Create and present final product.
Reflection Point: Is my paper / project satisfactory?

The Kuhlthau Model of the Search Process, 1989

¹⁸³ Kuhlthau, Carol C. "Information Search Process: A Summary of Research and Implications for School Library Media Programs." *School Library Media Quarterly*, vol. 22, no.1, Fall, 1989, p. 19-25.

In 1989, Kuhlthau published her Search Process Model¹⁸³ based upon a major research project done in high schools with students engaged in research. This model not only became popular with the library media profession but by 1997 was used in a number of library schools as a text showing how users face the research process not only as organized or disorganized investigators, but also their confidence level at various stages of their research.



Model of the Information Search Process

also:
 Kuhlthau, Carol C. "The Process of Learning from Information." *School Libraries Worldwide*, vol. 1, no.1.
 also:
 Kuhlthau, Carol. *Seeking Meaning: A Process Approach to Delivery and Information Service*. Norwood NJ: Ablex Publishing, 1993.

Eisenberg and Berkowitz The Big Six Skills, 1990

The Eisenberg/Berkowitz Big Skills model¹⁸⁴ won instant attention because of its simplicity and ease of use by a wide cross section of the field. It is by far, the most well known model in the field and is being taught widely to students as a guide for their research.

The Big Six Skills™ Approach

1. Task Definition: (determining the purpose and need for information)
 - 1.1 Define the problem.
 - 1.2 Define the information requirements of the problem.
2. Information Seeking Strategies: (examining alternative approaches to acquiring the appropriate information to meet defined needs)
 - 2.1 Determine the range of possible resources.
 - 2.2 Evaluate the different possible resources to determine priorities.
3. Location and Access: (locating information sources and information within sources)
 - 3.1 Locate sources (intellectually and physically).
 - 3.2 Find information within resources.
4. Use of Information: (using a source to gain information)
 - 4.1 Engage (e.g., read, hear, view) the information in a source.
 - 4.2 Extract information from a source.
5. Synthesis: (integrating information drawn from a range of sources)
 - 5.1 Organize information from multiple sources.
 - 5.2 Present information.
6. Evaluation: (making judgments based on a set of criteria)
 - 6.1 Judge the product (effectiveness).
 - 6.2 Judge the information problem-solving process (efficiency).

Source: Eisenberg, Michael .B., and Robert .E. Berkowitz. *Information Problem Solving: The Big Six Skills Approach to Library & Information Skills Instruction*. Norwood, N.J.: Ablex, 1988.

¹⁸⁴ Eisenberg, Michael B. and Robert E. Berkowitz. *Information Problem-Solving: The Big Six Skills Approach to Library and Information Skills Instruction*. Norwood, NJ: Ablex, 1990.

also

Eisenberg, Michael B. and Robert E. Berkowitz. *Curriculum Initiative: An Agenda and Strategy for Library Media Programs*. Norwood, NJ: Ablex, 1990.

also

Eisenberg, Michael B. and Robert E. Berkowitz. *Helping with Homework: A Parent's Guide to Information Problem-Solving*. Syracuse, NY: ERIC Clearinghouse on Information & Technology, 1996.

California School Library Association Information Literacy Model, 1994

¹⁸⁵ California School Library Association. *From Library Skills to Information Literacy: A Handbook for the 21st Century*. 2nd edition. San Jose, CA: Hi Willow Research and Publishing, 1997.

The California model¹⁸⁵ was published in a major guide that not only explained the model but gave many clear suggestions for incorporating it into a wide variety of instructional systems and content areas. A second edition, published in 1997, incorporated major suggestions and guidance for teaching information literacy to English learners, among others.

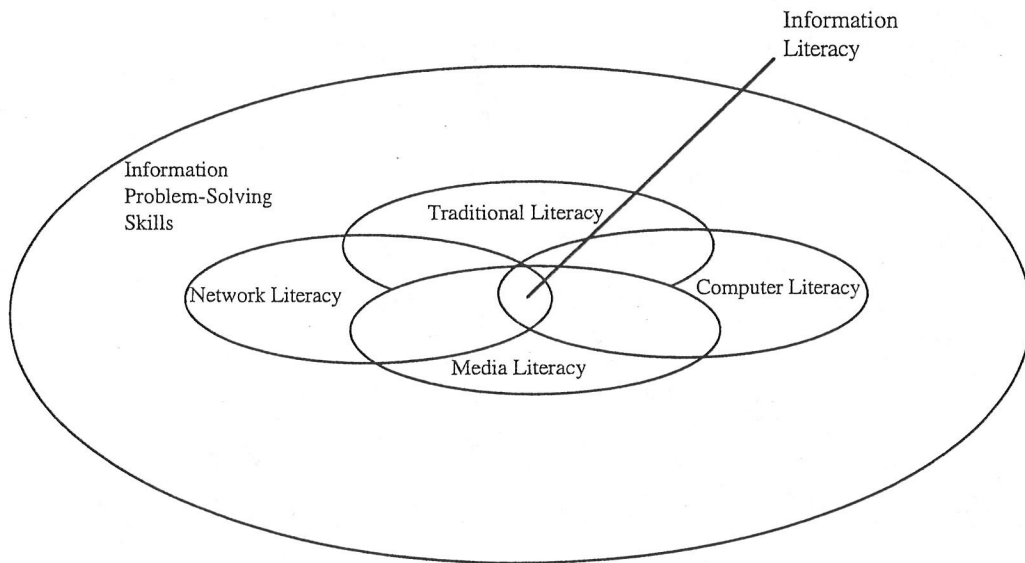
The CSLA Information Literacy Model

Searcher's Thinking	Search Process	Instructional Strategies
Why do I need information?	Explore/identify the need for information.	Begin journal to track the search process. Brainstorm/cluster/discuss/map. Quickwrite.
What is the problem, topic or question?	Formulate the central search question.	Create possible questions. Continue journal at each step.
What do I already know about this problem/ topic/question? What must I find out?	Relate the question to prior knowledge. Identify key words, concepts, and names.	Quickwrite. Brainstorm/cluster/ map. Use general information sources for background.
Where can I find the information I need? Are there people I can ask? Is the information in my classroom or library media center? Are there resources in my community?	Identify potential resources. How accessible is each?	Brainstorm possible resources. Cluster resources by type, location, etc. Create checklist of resources: How appropriate is each?
How do I get started? What are some key words/topics/ideas? Where do I go first?	Develop general strategies to organize the search.	Develop key word and Boolean search strategies.
What resources can I find? Which can I use?	Locate and explore previously identified resources.	Interview people. Go to libraries, Museums, information centers. Collect resources. Observe/experience/read.
How shall I use/search these resources? How will I find the information I need? What strategies should I use?	Select the most useful resources for further exploration and formulate specific strategies for using them.	Develop search strategies. Use information retrieval/location/ research skills.
What information will help me?	Search for relevant information in these resources.	Read and view.
What should I record? What is important? How could I record it? How could I arrange it?	Evaluate, select, and organize information.	Cluster ideas into subtopics. Use outlining and notetaking skills.
Have I found the information I need? Should I look further?	Analyze information retrieved; Determine its relevance; interpret, Infer, and synthesize.	Review information to see if it meets original needs.
How will I use/present the information? Who is my audience? In what form could I use/present it? How can I structure it?	Determine how to use/present/ communicate information. Organize information for intended use.	Consider options for presenting information. Make needed decisions. Solve original problems. Develop written, visual, oral, multimedia or other media.
How have I done?... In my opinion? ...according to others? What knowledge have I gained? What skills have I learned? What could I improve and how?	Use information. Evaluate results. Evaluate process.	Review the product. Review the search process journal. Review with teacher, family, peers. Plan changes for next project.

¹⁸⁶ McClure, Charles R. "Network Literacy: A Role for Libraries?" *Information Technology and Libraries*, vol. 13, no. 2, June, 1994, p. 118.

McClure's Information Literacy Typology

In 1994, Charles R. McClure a scholar in library and information science published his model¹⁸⁶ showing the relationship between the various interpretations of literacy and the new concept of information literacy. His model sees information literacy in the realm of problem-solving skills and shows how information literacy is the means to an end.

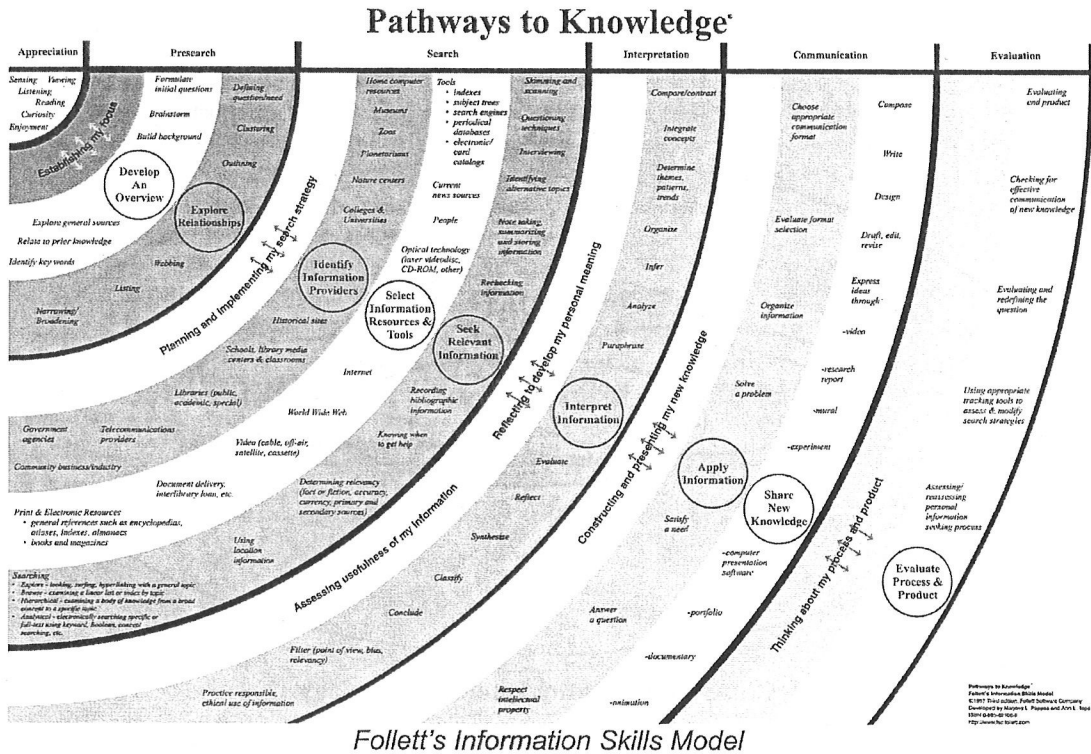


McClure's InformationLiteracy Typology

¹⁸⁷ Pappas, Marjorie L. and Ann Tepe. "Follett Information Skills Model." in: *Teaching Electronic Information Skills*. 3 binders: K-5; 6-8; 9-12. McHenry, IL: Follett Software Company, 1995.

Pathways to Knowledge Information Skills Model, 1995

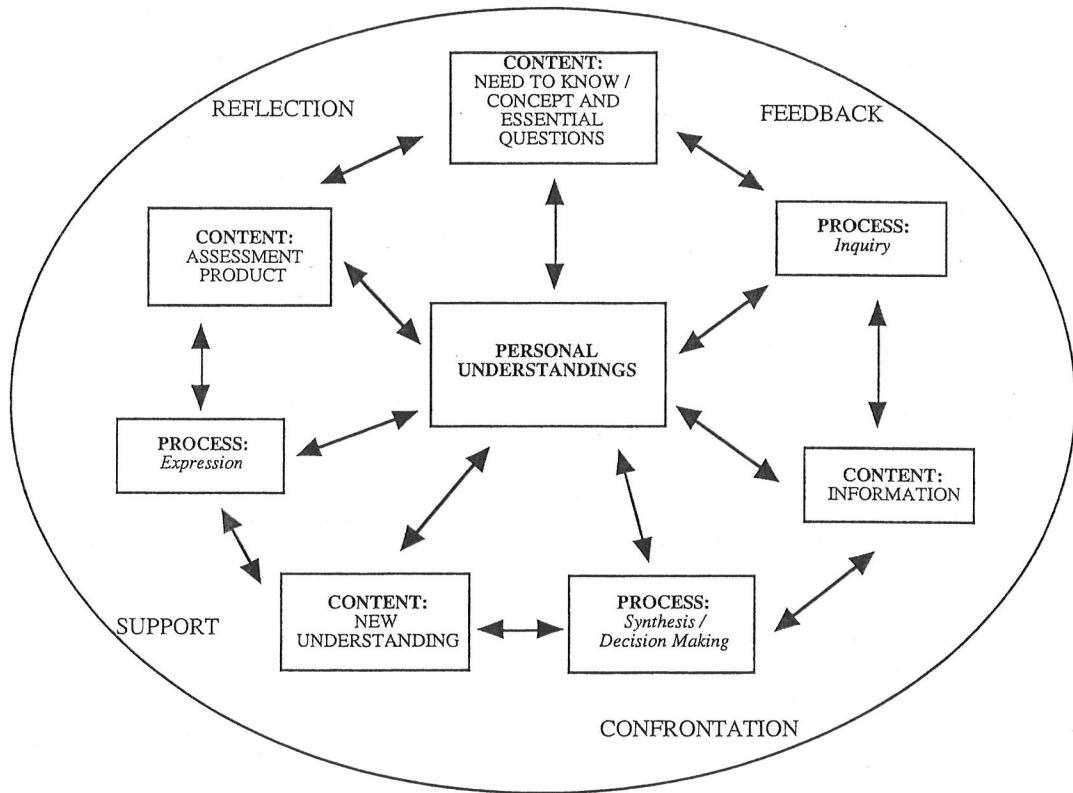
Teaming with the Follett Software Company, Pappas and Tepe created an elaborate double-page rendition of information literacy¹⁸⁷ complete with recommended strategies, forms of expression, and methods of teaching and learning embedded in the model. The model was published in three sizable binders containing numerous full length units of instruction as demonstrations for how to apply the model.



Stripling's Thoughtful Learning Cycle

¹⁸⁸ Stripling, Barbara.
 "Learning-Centered
 Libraries: Implications
 from Research."
*School Library Media
 Quarterly*, vol. 27, no.
 3, Spring, 1995, p.
 163-70.

In 1995, Barbara Stripling further developed her concept model¹⁸⁸ published earlier with Judy Pitts. Barbara drew heavily on the constructivist concept of how students learn.



Thoughtful Learning Cycle

¹⁸⁹ Association for Teacher-Librarianship in Canada. *Student's Bill of Information Rights*. 1995. Available at:
<http://www.atlc.ca/AboutATLC/studrigh.htm>

The ATLC Student's Bill of Information Rights

The Association for Teacher-Librarianship in Canada (ATLC) created a Bill of Rights¹⁸⁹ for students in 1995.

ATLC Student's Bill of Information Rights

Our students face an information-rich future in which change will be one of the few constants of their life experience. Their ability to adapt and fulfil their individual potentials will require them to be life-long learners and independent decision-makers.

We believe that all students should have the opportunity to:

- Master the skills needed to access information in print, non-print and electronic sources.
- Understand and master effective research processes and reporting skills.
- Develop the ability to evaluate, extract, synthesize and utilize information from a variety of sources and media.
- Utilize data and information to expand their own knowledge base.
- Explore the creative use of information.
- Develop an understanding of our Canadian cultural heritage and history, as well as cultures and histories of other societies.
- Enhance their own self-knowledge through developing a love of reading.
- Explore the values and beliefs of others by reading world literature.
- Think critically, and make decisions based on personal needs and values as well as upon factual evidence, and
- Actively participate in decisions about their own learning.

Information is a vital component in the development of critical thought and independent decision-making, and, consequently, access to the ever-increasing body of available information is vital to the development of students' potentials.

We believe that all students should have the right to:

- access a wide range of print, non-print and electronic learning resources at an
- appropriate level;
- explore materials expressing a variety of opinions and perspectives; and
- freely choose reading, viewing and listening materials for recreational and study purposes.

Association for Teacher-Librarianship in Canada, 1995.

AASL and AECT Information Literacy Standards for Student Learning, 1996¹⁹⁰

Extensive work done by a joint committee of AASL and AECT resulted in the development of these nine information literacy standards upon which the national guidelines for school library media programs in 1998 were based.

INFORMATION POWER The Nine Information Literacy Standards for Student Learning

Information Literacy

Standard 1: The student who is information literate accesses information efficiently and effectively.

Standard 2: The student who is information literate evaluates information critically and competently.

Standard 3: The student who is information literate uses information accurately and creatively.

Independent Learning

Standard 4: The student who is an independent learner is information literate and pursues information related to personal interests.

Standard 5: The student who is an independent learner is information literate and appreciates literature and other creative expressions of information.

Standard 6: The student who is an independent learner is information literate and strives for excellence in information seeking and knowledge generation.

Social Responsibility

Standard 7: The student who contributes positively to the learning community and to society is information literate and recognizes the importance of information to a democratic society.

Standard 8: The student who contributes positively to the learning community and to society is information literate and practices ethical behavior in regard to information and information technology.

Standard 9: The student who contributes positively to the learning community and to society is information literate and participates effectively in groups to pursue and generate information.

¹⁹⁰ Excerpted from Chapter 2, "Information Literacy Standards for Student Learning," of *Information Power: Building Partnerships for Learning*. Copyright © 1998 American Library Association and Association for Educational Communications and Technology. The standards were first published widely in 1996.

The Plus Model

¹⁹¹ Herring, James E.
 "Information Skills and
 the Internet." In:
*Exploiting the Internet
 as an Information
 Resource in Schools.*
 Library Association
 Publishing, 1999.
 (chapter three)

James E. Herring¹⁹¹ published his PLUS model in the U.K. in 1996. It sought to incorporate the key elements of previous models while adding emphasis on thinking skills and self evaluation.

The PLUS Model

Purpose

- Cognitive skills in identifying existing knowledge
- Thinking skills such as brainstorming or concept
- Skills in identifying information resources

Location

- Locational skills such as the ability to find information in library catalogues, books, journals, CD-ROMs and online information resources
- Selection skills in assessing the relevance of information resources
- IT skills in using electronic sources such as the Internet

Use

- Reading skills including the ability to skim and scan information resources to find relevant information or ideas
- Interactive skills including the ability to understand what is being read, viewed or listened to and the ability to relate this to existing knowledge
- Selective skills including the ability to select the appropriate information and reject information in the context of the purpose identified for using a particular information resource
- Evaluation skills including the ability to evaluate information and ideas in relation to aspects such as the currency of the information or ideas, the author and any possible bias in the text
- Recording skills including the ability to take note in a systematic way which relates to understanding and purpose
- Synthesis skills including the ability to bring together related ideas, facts and information about a topic and relating this to existing knowledge
- Writing or presentation skills including the ability to write an essay or report or project in a well structured, logically ordered manner which uses the information and ideas found to good effect.

Self-evaluation

- Self evaluation skills including the ability to reflect on the processes involved in assignment-related work and to identify areas of improvement in the effective use of information resources in the future.

The Exit Model

¹⁹² Wray, David and M. Lewis. *Extending Literacy: Reading and Writing Non-Fiction in the Primary School*. Routledge, 1997.

Working in the United Kingdom, David Wray¹⁹² developed the Exit Model in 1997 for working with young people as they worked with text structure and building on the work of Marland and the British Model cited earlier.

EXIT: Extending Interactions with Text

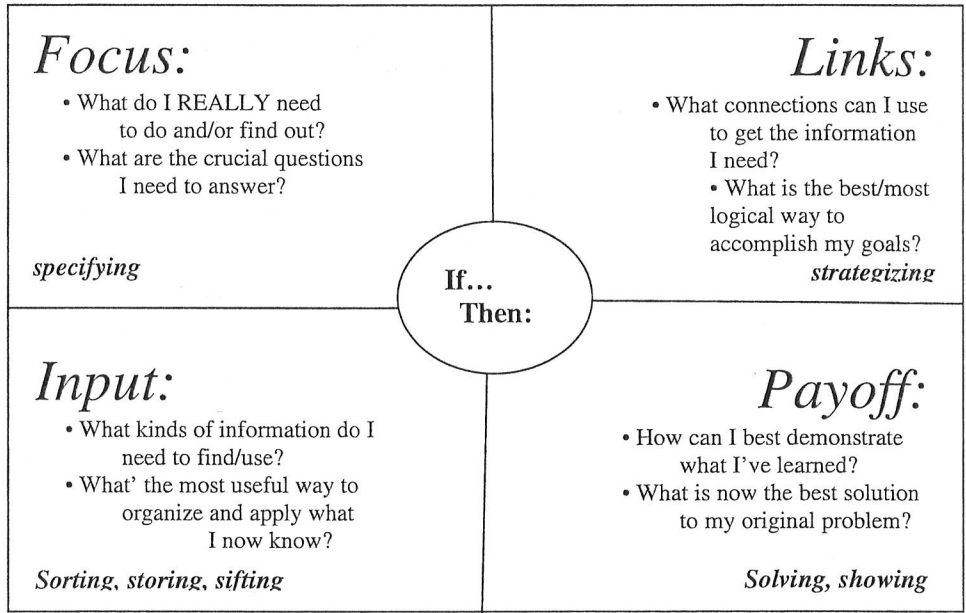
Process Stages	Questions
1. Activation of previous knowledge	1. What do I already know about this subject?
2. Establishing purposes.	2. What do I need to find out and what will I do with the information?
3. Locating information.	3. Where and how will I get this information?
4. Adopting an appropriate strategy.	4. How should I use this source of information to get what I need?
5. Interacting with text.	5. What can I do to help me understand this better?
6. Monitoring understanding.	6. What can I do if there are parts I do not understand?
7. Making a record.	7. What should I make a note of from this information?
8. Evaluating	8. Should I believe this information?
9. Assisting memory.	9. How can I help myself remember the important parts?
10. Communicating information.	10. How should I let other people know about this?

Several other models developed by Wray include “The Four States of Research Skills” and “Extending Interactions with Texts: The EXIT Model” are available from the author at D.J.Wray@warwick.ac.uk

The FLIP It! Model

In 1997, Alice Yucht published her FLIP It! Model for use by students doing research in her library and published it nationally.

^{192a} Yucht, Alice H. *FLIP It! An Information Skills Strategy for Students Researchers*. Linworth, 1997.



The Netsavvy Model

¹⁹³ Jukes, Ian, Anita
Dosaj, et.al. *Net Savvy:
Information Literacy
for the Communication
Age*. Spokane, WA:
The Net
Savvy/InfoSavvy
Group, 1998.

By 1998, the Netsavvy Group, headed by Ian Jukes and Anita Dosaj had reduced the information literacy model¹⁹³ to six steps all beginning with the letter A:

- | |
|--|
| <p style="text-align: center;">The Netsavvy Information
Skills Stages</p> <ol style="list-style-type: none">1. AWARENESS2. ASKING3. ACCESSING4. ANALYZING5. APPLYING6. ASSESSING |
|--|

¹⁹⁴ International Society for Technology in Education. *National Educational Technology Standards for Students*. Eugene, OR: The Society, 1998. Also available on their website at: <http://www.iste.org>

The ISTE National Educational Technology Standards for Students

Also in 1998, the International Society for Technology in Education published the first of its set of national standards for educational technology.¹⁹⁴ Their standards are as follows:

ISTE National Educational Technology Standards for Students

The most effective learning environments meld traditional approaches and new approaches to facilitate learning of relevant content while addressing individual needs. The resulting learning environments should prepare students to:

- Communicate using a variety of media and formats.
- Access and exchange information in a variety of ways.
- Compile, organize, analyze, and synthesize information.
- Draw conclusions and make generalizations based on information gathered.
- Use information and select appropriate tools to solve problems.
- Know content and be able to locate additional information as needed.
- Become self-directed learners.
- Interact with others in ethical and appropriate ways. (p. 2)

INFOhio DIALOGUE Model for Information Literacy Skills

¹⁹⁵ Byerly, Greg and Carolyn S. Brodie. "INFOhio DIALOGUE Model for Information Literacy Skills," 1998. (<http://www.infohio.org/about/id.htm>)

For a major initiative on information literacy in the state of Ohio, Greg Byerly and Carolyn S. Brodie¹⁹⁵ developed a model in 1998 that has been used in scores of workshops around that state with school library media specialists:

INFOhio DIALOGUE Model for Information Literacy Skills

Define

Explore/Identify the need for the information

- Identify the assignment
- Focus on the topic

Determine the basic question

- Brainstorming
- Class/Student participation

Initiate

"Distressing Ignorance"

- Assignment is due tomorrow
- This will affect my grade
- I really want to know!

Assess

Identify Keywords, concepts, and possible resources

Consider information literacy skills

"Tapping prior knowledge" and "Building background"

Locate

Identify possible sources of information

Develop a *search strategy*

- Library OPACs vs. Electronic databases vs. Web sites

Locate and retrieve available resources

Organize

Identify the best and most useful information sources

Evaluate the information retrieved

- Analyze, arrange, categorize, examine, generalize, group, interpret, infer, integrate, select, synthesize, and ...think

Guide

Search log or journal

Student assistance and review

- "Collaborative grouping!" and "Cooperative learning!"

Educator assistance and review

Use

Determine presentation format

Present results

Evaluate

Evaluate the project/results

Evaluate the process

Assess the teaching and learning

Research Reviews

Antecedents of Current Models

¹⁹⁶ American Association of School Librarians. *Standards for School Library Programs*. Chicago: American Library Association, 1960, p. 18-19.

¹⁹⁷ Kuhlthau, Carol Collier. *Information Skills for an Information Society: a Review of the Research*. Syracuse, NY: ERIC Clearinghouse on Information Resources, 1987.

¹⁹⁸ Doyle, Christina S. *Information Literacy in an Information Society: A Concept for the Information Age*. Syracuse University: ERIC Clearinghouse on Information & Technology, 1994.

¹⁹⁶ Bruce, Christine Susan. *Information Literacy: A Phenomenography*. Unpublished doctoral dissertation, The University of New England (Australia), 1996. also published as: Bruce, Christine. *The Seven Faces of Information Literacy*. Adelaide, Australia: AUSLIB Press, 1997.

²⁰⁰ Doyle, Christine. "Information Literacy by Christine Doyle." Kern County Superintendent of Schools: The Learning Center. (accessed 2001) ([http://kcsos.kern.org/tlc_resources/stories/storyReader\\$26](http://kcsos.kern.org/tlc_resources/stories/storyReader$26))

²⁰¹ Zurkowski, Paul. *The Information Service Environment Relationships and Priorities*. Washington, D.C.: National Commission on Libraries and Information Science, 1974. ED 100 391.

²⁰² Eleanor Howe lists other documents issued by the British Library during this period in: Howe, Eleanor B. "Integrating Information Technology Into and Across the Curriculum: A Short Course for Secondary Students." in: Lighthall, Lynne and Ken Haycock, eds., *Information Rich but Knowledge Poor? Emerging Issues for Schools and Libraries Worldwide*. Seattle, WA: International Association of School Librarianship, 1997, p. 75-86.)

²⁰³ Markless, S. and P. Lincoln, eds., *Tools for Learning*. London: British Library, 1986. also Irving, Ann. *Study and Information Skills Across the Curriculum*. London: Heinemann, 1985. also Carter, C. and J. Monaco. *Learning Information Skills*. London: British Library, 1987.

To say that information literacy is new in the school library media field is not exactly true. Frances Henne, writing in the 1960 *Standards for School Library Programs*,¹⁹⁶ foresaw librarians integrating library skills instruction into classroom content and said the ultimate goal was the "synthesis of information, the extension of knowledge, the analysis and solution of problems, thinking, reflection, the satisfaction of curiosity, the development of trust, or the derivation of pleasure." The profession at large ignored Henne's foresight. Instead, the predominant themes of library skills instruction from the 1960s to the 1990s concentrated on the finding and locating of information plus the orientation to the library as a place.

Three reviews of the history of the information literacy movement were found in the literature. Kuhlthau's¹⁹⁷ was published first in 1987 followed by Doyle,¹⁹⁸ in 1994 and most recently by Bruce in 1996.¹⁹⁹ Doyle's²⁰⁰ original review was revised for the Internet and is available through the California Kern County Learning Center.

As stated earlier, the earliest use of the term "information literacy" is traced to a proposal written in 1974 by Paul Zurkowski²⁰¹ for the National Commission on Libraries and Information Science. This report proposed the achievement of a universal information literacy goal by 1984. Much excitement had arisen during the 1960s concerning the development of computer information systems and the exponential rise of an information-based society. By 1983, the *Nation at Risk* report was promoting the concept of a learning society.

This early work was part of a project initiated by the British Library Research and Development Department²⁰² and resulted in many important publications, particularly the work of Ann Irving (see Markless and Lincoln²⁰³) that reached the United States with her consultative work in the Treasure Mountain Research Retreat # 2.

²⁰⁴ Hughes, Carolyn S. "Teaching Strategies for Developing Student Thinking." in: *Information Literacy: Learning How to Learn*. Chicago: American Library Association, 1991, p. 33-36. (also in *School Library Media Quarterly*, vol 18, no. 1, Fall, 1986 issue)

Hughes²⁰⁴ worked with Rankin to develop a model in 1986 in some work done with the Association for Supervision and Curriculum Development using the following seven steps:

- Plan;
- Gather information;
- Organize information;
- Analyze information;
- Extend and expand;
- Synthesize and create;
- Evaluate and apply.

Using the work of Piaget, Taba, and Ehrenberg, Hughes also created a developmental structure of thinking skills and process model.

Hughes Developmental Structure of Thinking Skills and Processes

As content of increasing difficulty extends from concrete to representational and onto abstract, the following thinking skills and processes are activated:

- Solve Problems
- Inquire (make decisions and anticipate)
- Conclude
- Infer: Attributes, Meaning, Relationships
- Order
- Classify
- Form concepts
- Group
- Compare/contrast
- Recall
- Observe

²⁰⁵ Kulleseid, Eleanor R. "Extending the Research Base: Schema Theory, Cognitive Styles, and Types of Intelligence." in: *Information Literacy: Learning How to Learn*, Chicago: American Library Association, 1991, p. 41-48. (also in *School Library Media Quarterly*, vol. 18, no. 1, Fall, 1986 issue)

In 1986, Eleanor R. Kulleseid²⁰⁵ did a summary of research in reading and developmental psychology with implication for practice. At that time, she was introducing the field to cognitive theories not well known in the library media world and that would become the basis of much of the work of information literacy as a process of inquiry learning.

²⁰⁶ Mancall, J.C., Shirley Aaron and Sue Walker. "Educating Students to Think: The Role of the School Library Media Program." *School Library Media Quarterly*, vol. 15, no. 1, Fall, 1986, p. 18-27.

Mancall, Aaron, and Walker²⁰⁶ published a major article in 1986 entitled "Educating Students to Think: The Role of the School Library Media Program." Their concept described a program that would help students develop thinking skills. They pointed to research on how children and adolescents process information and ideas and gave practical implications for developing information skills in various curricular areas.

²⁰⁷ Hall, N. *Teachers, Information and School Libraries*. Paris: UNESCO, General Information Programme, 1986. ED 275 342.

²⁰⁸ Kuhlthau, Carol Collier. *Information Skills for an Information Society: a Review of the Research*. Syracuse, NY: ERIC Clearinghouse on Information Resources, 1987.

²⁰⁹ Washington Library Media Association. *Information Skills Curriculum Guide: Process, Scope and Sequence*. Olympia, WA: Washington State Department of Education, 1997. ED 288 554.

²¹⁰ American Association of School Librarians and Association for Educational Communications and Technology. *Information Power*. Chicago: American Library Association, 1988.

²¹¹ Craver, Kathleen W. "Critical Thinking: Implications for Research." in: *Information Literacy: Learning How to Learn*. Chicago: American Library Association, 1991, p. 13-18. (also in *School Library Media Quarterly*, vol. 18, no. 1, Fall, 1989 issue)

²¹² Kuhlthau, Carol C. "Information Search Process: A Summary of Research and Implications for School Library Media Programs." in: *Information Literacy: Learning How to Learn*. Chicago: American Library Association, 1991, p. 19-25. (also in *School Library Media Quarterly*, vol. 18, no. 1, Fall, 1989)

²¹³ American Library Association Presidential Committee on Information Literacy. *Final Report*. Chicago: ALA, 1989. (available on the AASL *Electronic Library*), also in: *Information Literacy: Learning How to Learn*. Chicago: American Library Association, 1991.

Interest in information literacy was, by this time, gaining momentum around the world. This international interest was boosted by the publication of the United Nations' guidelines for the training of teachers in the integration of libraries and information skills into the curriculum. Hall²⁰⁷ recommended that all teachers be trained in information skills and that the school library concentrate on delivering these skills to students.

Carol Kuhlthau²⁰⁸ published the extremely important document, *Information Skills for an Information Society: A Review of Research* in 1987 encouraging school library media specialists to carve out the emerging concept of information literacy as a foundational element of their program. That same year, the Washington Library Media Association²⁰⁹ published one of the first state guides to information skills. They used a 12-step system to diffuse the research process and published a scope and sequence chart for K-12 education listing where each of the skills should be presented and finally mastered.

The 1988 national guidelines for school library media programs, *Information Power*,²¹⁰ declared that the mission of the school library media center is "to ensure that students and staff are effective users of ideas and information," and urged the library media specialist to become a key participant in the learning process.

In the Fall of 1989, Kathleen Craver²¹¹ published a synthesis article summarizing research studies concerning critical thinking and their implication for library work. She urged the field to become interested in this area of research and to know how to improve the ability of students to find, to synthesize, and to apply information in everyday situations.

In the same issue of *School Library Media Quarterly*, Carol Kuhlthau²¹² published for the first time in the AASL literature, her own summary of cognitive research and her information literacy model.

One of the most significant documents was a statement on information literacy published by the American Library Association²¹³ on January 10, 1989. Known simply as the *Final Report*, the document became the basis of much of the discussion about information literacy in both school and academic libraries around the world. After the emergence of this document, Patricia Breivik, the chair of the committee established the National Forum for Information Literacy. The purpose of the Forum was to

popularize the need for information literacy across many organizations and disciplines.

²¹⁴ Turner, Philip M. "Research Reviews from the Treasure Mountain Research Retreat." in: Smith, Jane Bandy. *School Library Media Annual, 1990*. Englewood, CO: Libraries Unlimited, p. 139-53.

²¹⁵ Wisconsin Educational Media Association and the American Association of School Librarians. "Information Literacy: A Position Paper on Information Problem Solving, 1993." (http://www.ala.org/aasl/positions/ps_infoit.html)

²¹⁶ Colorado Department of Education. "Model Information Literacy Guidelines." Denver, CO: State Library and Adult Education Office. Unpublished Paper, 1994. (available on the AASL *Electronic Library*)

²¹⁷ Behrens, Shirley J. "A Conceptual Analysis and Historical Overview of Information Literacy." *College & Research Libraries*, vol. 55, July, 1994, p. 309-322.

²¹⁸ Doyle, Christina S. *Information Literacy in an Information Society: A Concept for the Information Age*. Syracuse, NY: ERIC Clearinghouse on Information & Technology, 1994.

²¹⁹ Jansen, Bernard J. and Udo Pooch. "A Review of Web Searching Studies and a Framework for Future Research." *Journal of the American Society for Information Science and Technology*. vol. 52. no. 3, 2001, p. 235-46.

²²⁰ Bruce, Christine. *The Seven Faces of Information Literacy*. Adelaide: Auslib Press, 1997.

In September of 1989, the first Treasure Mountain Research Retreat was convened in Park City, Utah. (See Turner)²¹⁴ Since that time, five other such retreats have occurred. This gathering of school library media researchers and practitioners has provided an increase in the intelligent discussion of research findings and a look toward the future of this profession. At the 1989 meeting, Kathleen Craver reviewed the research related to critical thinking. Carol Kuhlthau also provided a look into her research on the information search process; Barbara Stein provided a glimpse into the world of cognitive learning styles; and Michael Eisenberg reviewed the research in the area of library and information skills.

In 1993, the Wisconsin Educational Media Association²¹⁵ published a major document on information literacy that was adopted and published by AASL as a position paper. This paper outlined seven basic elements of the research process: defining the need for information; initiating the search strategy; locating the resources; accessing and comprehending the information; interpreting the information; communicating the information; and evaluating the product and process. The following year, the state of Colorado²¹⁶ issued their *Model Information Literacy Guidelines* that gained national attention.

Also in 1994, Behrens²¹⁷ summarized the history of the concept of information literacy from its early inception in the 1970s into the 1990s. Her extensive bibliography, excellent for the researcher, traces the concept in the professional literature of library and information science.

In 1994, a second major summary of the literature was published by Christina Doyle²¹⁸ in her ERIC monograph, *Information Literacy in an Information Society: A Concept for the Information Age*. In this document, she reviewed the evolution of the concept of information literacy and demonstrated its relevance in national education goals and curricular concerns.

One of the better research reviews of web searching regardless of age level was published by Jansen and Pooch²¹⁹ who definitely feel that web searching is enough different from any other type of searching that focusing on its unique features.

A major re-analysis of the theoretical foundation of information literacy was done by Christine Bruce in 1997.²²⁰ Titled *The Seven*

221 *A Progress Report on Information Literacy: An Update on the American Library Association Presidential Committee on Information Literacy: Final Report. March, 1998.* Association of College and Research Libraries, 1998. (<http://www.ala.org/acrl.html>)

222 Aspen Institute. Form on Communications and Society. *Information Literacy: Advancing Opportunities for Learning in the Digital Age.* The Institute, 1999. (<http://aspensinstitute.org/publication/s1/pdfs/infolit.pdf>)

223 O'Connell, Judy and James Henri. "Information Literacy: Teacher's Perspectives of the Information Process." in: Lighthall, Lynne and Ken Haycock, eds., *Information Rich but Knowledge Poor? Emerging Issue for Schools and Libraries Worldwide.* Seattle, WA: International Association of School Librarianship, 1997, p. 125-36.

224 Wilson, Kay. "Information Skills: The Reflections and Perceptions of Student Teachers and Related Professionals." in: Lighthall, Lynne and Ken Haycock, eds., *Information Rich but Knowledge Poor? Emerging Issue for Schools and Libraries Worldwide.* Seattle, WA: International Association of School Librarianship, 1997, p. 63-74.

225 Loertscher, David V. "All that Glitters May Not Be Gold" *Emergency Librarian.* vol. 24, November/December, 1996, p. 21-25.

226 Brock, Kathy Thomas. "Developing Information Literacy Through the Information Intermediary Process: A Model for Teacher-Librarians and Others." *Emergency Librarian.* vol. 22, no. 1, September-October, 1994, p. 16-20.

Faces of Information Literacy, Bruce applied a relational model to information literacy education and research as opposed to the traditional behaviorist model.

In March of 1998, the ALA "Final Report" from 1989 was updated as *A Progress Report on Information Literacy*²²¹ spotlighting what had been done in the preceding nine years and making recommendations for future initiatives. That same year, the Aspen Institute²²² published the proceedings of their conference on information literacy with major recommendations.

Elaboration on Information Literacy Models

O'Connell and Henri²²³ adapted earlier information literacy models from an Australian perspective by showing the core activities of the information process as central flanked by the stages of critical thinking and the basic elements of literacy. Their emphasis is to create a model that has meaning to teachers who are most closely linked to learners. Across the world, Wilson²²⁴ also reported that teachers should, but do not possess their own mental model of information literacy.

Loertscher²²⁵ redrew the popular models with the student at the center, emphasizing that what was lacking in many of the models was the need for students to spend a great deal of time consuming the information they find by reading, viewing, and listening. Too many students, according to Loertscher, do not feel they should spend time consuming; they jump over this step IMMEDIATELY after information location as they rush toward product creation.

Kathy Brock²²⁶ published an elaboration on other previously published models that combined a number of factors from simply instructing in the model to coaching throughout the model, to facilitating a self-directed student.

Information Search & Use Process	INSTRUCTING	COACHING	FACILITATING
<p>Phase 1 Defining the Problem</p>	<ul style="list-style-type: none"> ➤ Build awareness of ISU Process. ➤ Introduce & model strategies for selecting, developing, & refining a topic for formulating research questions. 	<ul style="list-style-type: none"> ➤ Monitor & provide feedback as students practice brainstorming, clustering, & webbing techniques in cooperative learning settings. 	<ul style="list-style-type: none"> ➤ Help students select topics independently. ➤ Suggest sources for topic overview. ➤ Consult as students develop authentic topics & research questions.
<p>Phase 2 Developing Information-Seeking Strategies</p>	<ul style="list-style-type: none"> ➤ Introduce information sources. ➤ Model development of search strategy. 	<ul style="list-style-type: none"> ➤ Provide guidance as students identify, expand, limit, & combine terms to develop search strategies in practice settings. 	<ul style="list-style-type: none"> ➤ Suggest specific resources for student topics. ➤ Help students develop individual search strategies.
<p>Phase 3 Locating Information</p>	<ul style="list-style-type: none"> ➤ Demonstrate retrieval of citations from indexes & databases, location of sources in media center, & location of information in sources. ➤ Discuss access to sources outside the media center. 	<ul style="list-style-type: none"> ➤ Give directions as students practice retrieving citations, locating sources, & using scanning & skimming techniques to find information in a controlled setting. 	<ul style="list-style-type: none"> ➤ Assist as students locate information independently. ➤ Provide access to outside resource.
<p>Phase 4 Gathering & Assessing Information</p>	<ul style="list-style-type: none"> ➤ Discuss criteria for evaluating relevance, reliability, & adequacy of information. ➤ Demonstrate strategies for taking notes. ➤ Explain rights & responsibilities of information use. 	<ul style="list-style-type: none"> ➤ Monitor & provide feedback as students apply criteria for evaluating & selecting or rejecting information using practice data in cooperative learning settings. 	<ul style="list-style-type: none"> ➤ Consult as students assimilate, evaluate, select or reject, & record information independently. ➤ Help students determine copyright compliance and obtain clearances as needed.
<p>Phase 5 Synthesizing Information</p>	<ul style="list-style-type: none"> ➤ Introduce and model strategies for organizing information, identifying relationships, and drawing conclusions. ➤ Describe format options for communicating results. 	<ul style="list-style-type: none"> ➤ Give guidance as students practice strategies for organizing and synthesizing information in cooperative settings. 	<ul style="list-style-type: none"> ➤ Help students organize and synthesize information independently. ➤ Consult as students plan presentation of results. ➤ Help students obtain and use required resources.
<p>Phase 6 Evaluating and Refining Results</p>	<ul style="list-style-type: none"> ➤ Discuss criteria for evaluating product and process. ➤ Discuss how evaluation may suggest revisions. 	<ul style="list-style-type: none"> ➤ Provide direction as students apply criteria and suggest revisions using practice data in cooperative learning settings. 	<ul style="list-style-type: none"> ➤ Provide feedback as students evaluate process and products. ➤ Consult as they make revisions.

Intermediary-Directed ----- Student Directed

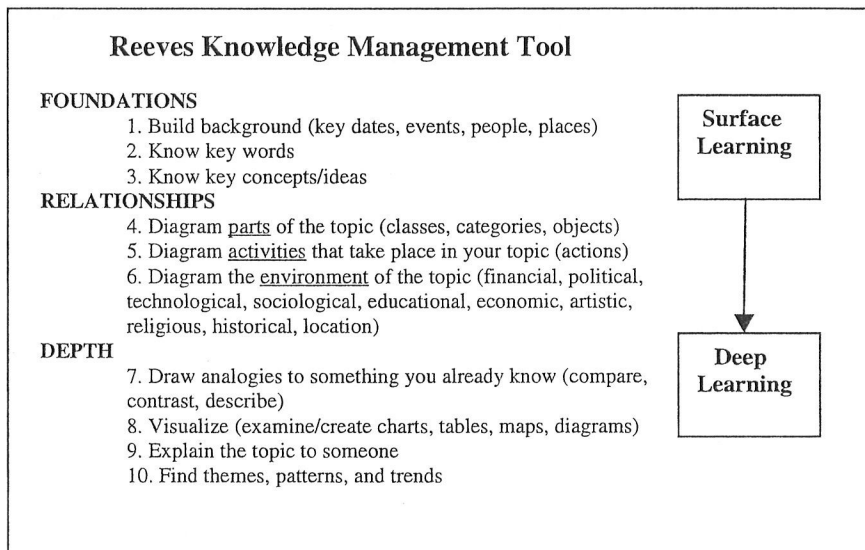
Related Models And Applications

Numerous experts from related fields of cognitive psychology, education, and educational technology have been working with constructivist ideas and putting forth their conceptions of how students can benefit from information literacy-related thinking. While the following models do not exhaust all the models currently available in the literature, major works are cited here.

From Cognitive Psychology

²²⁷ Reeves, Wayne. *Cognition and Complexity*. Lanham, MD: Shoestring Press, 1996. also Loertscher, David V. and Wayne Reeves. "Deepening Our Knowledge of Young People in the Expanding Information Environment: A Model for Field Research." In: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 361-76.

In a study of cognition and complexity, Reeves²²⁷ proposed a model by which a student might plan to attack a subject about which the student knows very little. He advocates that teaching a student the model directly could help a student assess whether progress is being made from surface learning to deep learning. The model known as the Reeves Knowledge Management Tool consists of ten steps in three major levels:



Architecture

²²⁸ von Wodtke, Mark. *Mind over Media: Creative Thinking Skills for Electronic Media*. New York: McGraw-Hill, 1993. also: von Wodtke, Mark. "Thinking Skills for the Electronic Information Age: Applying Mental Capacity." in: Kuhlthau, Carol Collier, M. Elspecth Goodin and Mary Jane McNally, eds. *School Library Media Annual 1994*. Englewood, CO: Libraries Unlimited, 1994, p. 54-62.

Mark von Wodtke,²²⁸ an architect in environmental design, published an important book to be used by beginning architects and also an article in *School Library Media Quarterly* concerning the use of high powered information tools in the thinking process. In putting the mind in the driver's seat over media, von Wodtke posits the following principles:

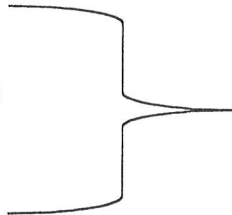
- **Mind over Media:** People can learn more than which buttons to push. They can learn to work interactively using electronic media.
- **Navigating:** People can learn to navigate in information environments.
- **Mapping Media Space:** People can develop cognitive maps of media space - the information environment they are working in.
- **Visualization:** People can develop models to visualize the realities they are working with.
- **Creative Thinking:** People can learn to use their creative capacity when working electronically.
- **Collaboration:** People can learn and work collaboratively in the emerging electronic information environments.
- **A Mind Primer:** Students can begin to learn creative thinking skills at an early age.

Educational Technology

²²⁹ McKenzie, Jamie. "Making WEB Meaning." *Educational Leadership*. vol. 54, no. 3, 1996, p. 30-32. also McKenzie, Jamie. "The Research Cycle Revisited." *FromNowOn*, vol. 7, no. 2, October, 1997. See at: <http://www.fromnowon.org/oct97/research.html>
also:
McKenzie, Jamie: "The Information Literate School Community." *FromNowOn*, vol. 8, no. 1, September, 1998. See at: <http://www.fromnowon.org/sep98/infolit.html>

Jamison McKenzie,²²⁹ who was Director of Technology and Media for the Bellingham Public Schools, Bellingham, Washington, is now a full time consultant and well-known speaker and author of a provocative web journal. His Research Cycle Model, published in 1996 is designed to help students deal with information they find on the Internet. The model is as follows:

- Questioning
- Planning
- Gathering
- Sorting and Sifting
- Synthesizing
- Evaluating
- Reporting



Students work through the cycle repeatedly during a project to gain INSIGHT.

²³⁰ Fitzgerald, Mary Ann. "Misinformation on the Internet: Applying Evaluation Skills to Online Information." *Emergency Librarian*, vol. 24, no. 3, January-February, 1997, p. 9-14.

Library Science

Several authors warn about major problems in accessing and using electronic information. Fitzgerald²³⁰ lists numerous problems affecting the quality of information gained from using the Internet. She then lists nine skills needed to effectively evaluate electronic information:

1. Adopt critical consciousness for all Internet interaction.
2. Establish prior knowledge through wide browsing, searching and reading.
3. Distinguish between fact and opinion.
4. Evaluate arguments.
5. Compare and contrast related pieces of information from different sites, sources and search engines.
6. Evaluate the reliability of online sources.
7. Identify and detect bias.
8. Learn to interpret the conventions of the Internet.
9. Examine assumptions.

²³¹ Bennett, Neville, Elisabeth Dunne and Clive Carre. "Patterns of Core and Generic Skill Provision in Higher Education." *Higher Education*, vol. 37, o. 1, 1999, p. 71-93.

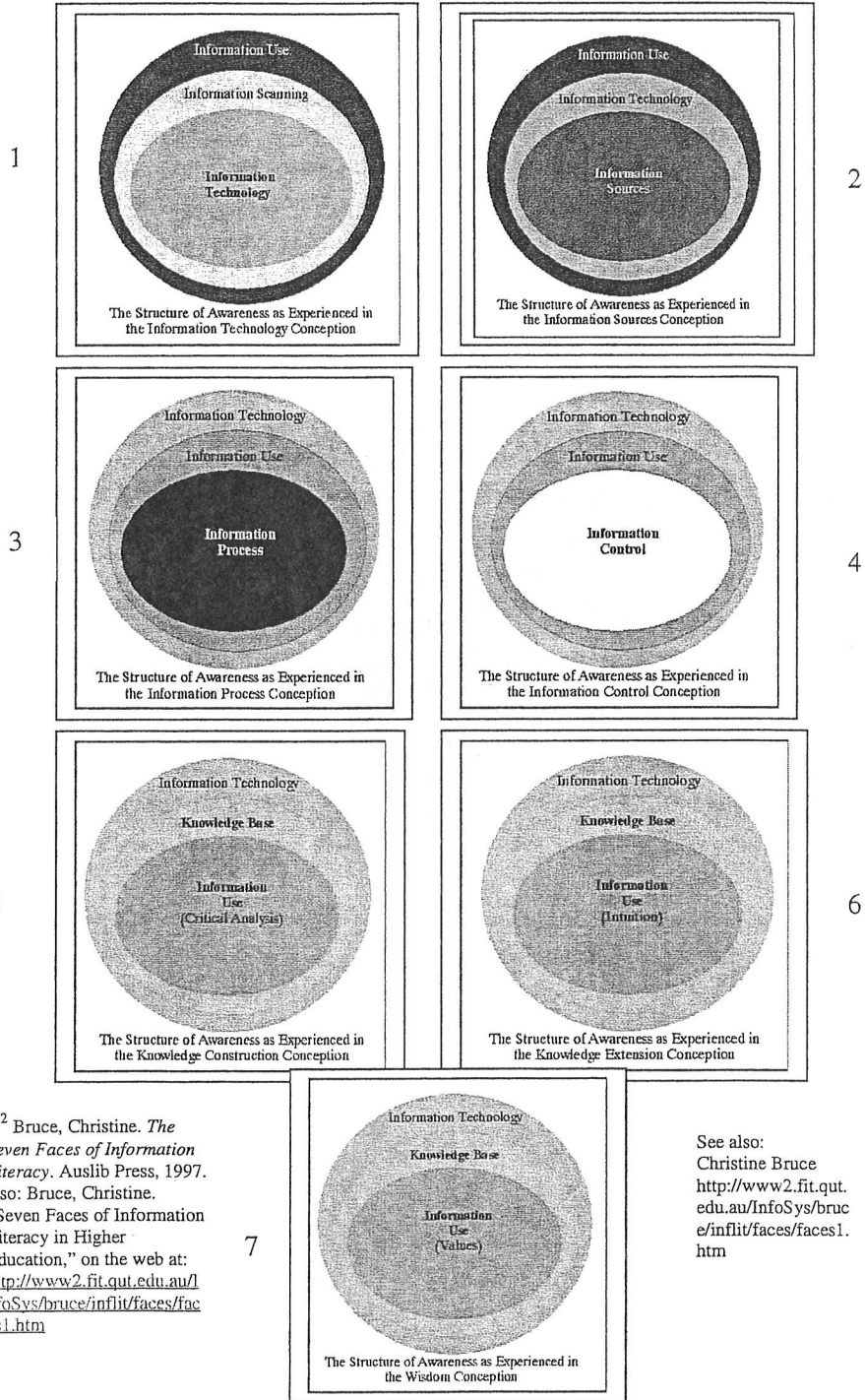
Higher Education

Bennett²³¹ proposes a concise model of key skills for students in higher education. These are quite adaptable to younger persons as they operate in information-rich and technology-rich environments:

<p style="text-align: center;">Management of Self</p> <p>Manage time effectively. Set objectives, priorities and standards. Take responsibility for own learning. Listen actively with purpose. Use a range of academic skills. Develop and adapt learning strategies. Show intellectual flexibility. Use learning in new or different situations. Plan/work towards long-term goals. Purposefully reflect on own learning. Clarify with criticism constructively. Cope with stress.</p>	<p style="text-align: center;">Management of Information</p> <p>Use appropriate sources of information. Use appropriate technologies. Use appropriate media. Handle large amounts of information. Use appropriate language and form. Interpret a variety of information forms. Present information competently. Respond to different purposes/contexts and audiences. Use information critically. Use information in innovative and creative ways.</p>
<p style="text-align: center;">Management of Others</p> <p>Carry out agreed tasks. Respect the views and values of others. Work productively in a cooperative context. Adapt to the needs of the group. Defend/justify views and actions. Take initiative and lead others. Delegate and stand back. Negotiate. Offer constructive criticism. Take the role of chairperson. Learn in a collaborative context. Assist/support others in learning.</p>	<p style="text-align: center;">Management of Task</p> <p>Identify key features. Conceptualise ideas. Set and maintain priorities. Identify strategic options. Plan/implement a course of action. Organize sub-tasks. Use and develop appropriate strategies. Assess outcomes.</p>

Bruce²³² created a fresh new way of looking at and researching information literacy. To appreciate its contribution, the cited article should be consulted.

Seven Faces of Information Literacy in Higher Education

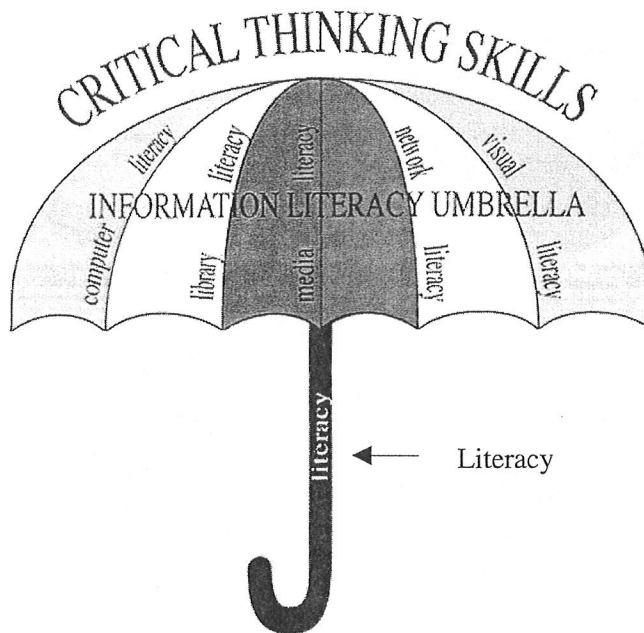


²³² Bruce, Christine. *The Seven Faces of Information Literacy*. Auslib Press, 1997. also: Bruce, Christine. "Seven Faces of Information Literacy in Higher Education," on the web at: <http://www2.fit.qut.edu.au/infoSys/bruce/inflit/faces/faces1.htm>

See also:
Christine Bruce
<http://www2.fit.qut.edu.au/infoSys/bruce/inflit/faces/faces1.htm>

²³³ Breivik, Patricia Senn.
“Information Literacy and Lifelong Learning: The Magical Partnership.” In: Appleton, Ken, Colin Macpherson and Debbie Orr. *Lifelong Learning Conference: Selected Papers from the Inaugural International Lifelong Learning Conference, Yeppoon, Queensland, Australia, 17-19 July 2000*. Lifelong Learning Conference Committee, Central Queensland University, Rockhampton, Queensland, Australia, 2000, p. 1-6.

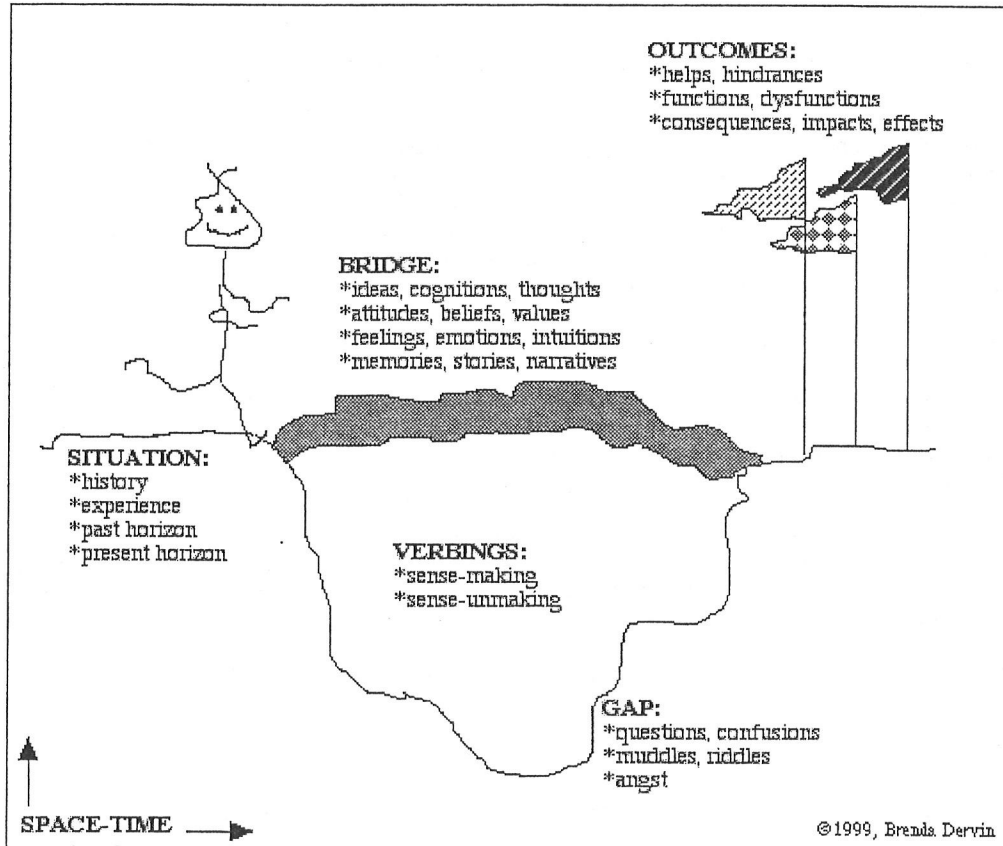
Breivik²³³ sees information literacy portrayed as a literacy umbrella “where basic literacy is the handle and the various aspects of information literacy abilities are the spokes. A person thus equipped is well prepared for whatever challenges and changes arise in their careers or personal lives.”



Communication

²³⁴ Dervin, Brenda. "On Studying Information Seeking and Use Methodologically: The Implications of Connecting Metatheory to Method." *Information Processing and Management*, vol. 35, 1999, p. 727-750. also: Dervin, Brenda and M. Frenette. "Applying Sense-Making Methodology: Communicating Communicatively with Campaign Audiences." In: Rice, R. and C.K. Atkin. *Public Communication Campaigns 3rd*. ed. Sage, 2001. p. 69-87.

Brenda Dervin's²³⁴ Sense-Making Model is well known and cited often in library and information science literature. Below is an illustration of her model followed by principles from the model. Readers interested in pursuing Dervin's model should consult her web page in addition to the major articles cited in the footnote. (<http://communication.sbs.ohio-state.edu/sense-making/default.html>)



Dervin's Sense-Making Theory of Communication

SITUATIONS ----- GAPS ----- USES

Sense-making studies usually include two or more of the following:

- SITUATIONS: The time-space contexts at which sense is constructed.
- GAPS: The gaps seen as needing bridging, translated in most studies as “information needs” or the questions people have as construct sense and move through time-space.
- USES: The uses to which the individual puts newly created sense, translated in most studies as information helps and hurts.

Sense-making research rests upon certain core assumptions and concepts (edited selections):

A. Perception of reality is not complete nor constant but discontinuous at least in part and filled with gaps across time-space.

A1. Reality, itself, is neither complete nor constant but discontinuous at last in part and filled with gaps across time-space.

B. Information is not external to humans and does not exist independently of people but is a product of human observation.

C. Information is a product of human observing rooted in times-places and procedures. Sometimes information is treated in such a way that it takes on the status of “facts” – i.e. informational statements with assumed to be accurate representational qualities vis-à-vis reality. The test of such statements is ultimately their pragmatic utility. All such statements must be treated humbly because they are always subject to change based on both epistemological and ontological differences across time-space.
Information is a product of human observation.

D. Information seeking and use are activities that people undertake to construct and create sense.

E. People use their own and others' observations to construct personal pictures of reality that guide their behavior. Sometimes humans use their conscious and unconscious capacities to act collectively to make pictures which obtain value as pictures held collectively. Such pictures must be seen as subject to change and contest.

F. Sense-making behavior is responsive to changing conditions.

F1. When people's personal situations are highly constrained by external forces, people's personal sense-making becomes more predictable by various across time-space non-situational measures such as demography.

G. Sense-making behavior is situationally dependent and somewhat predictable on the basis of those situations.

H. Sense-making focuses on discovering how people construct personal sense.

I. There is utility in having individuals share their observations about the sense they are constructing.

²³⁵ Eisenberg, Michael B. and Doug Johnson. "Computer Skills for Information Problem-Solving: Learning and Teaching Technology in Context" *ERIC Digest* EDO-IR-96-04, Syracuse, NY: Clearinghouse on Information & Technology, March, 1996. See also their article: "Computer Literacy and Information Literacy: A Natural Combination." *Emergency Librarian*, vol.23, no. 5, May-June, 1996, p. 12-16.

²³⁶ Penrod, J.I. and J. V. Douglas, "Information Technology Literacy: A Definition." in: Kent, Allen, ed. *Encyclopedia of Library and Information Science*, vol. 40, p. 76-107.

Computer Literacy and Information Literacy

Eisenberg and Johnson²³⁵ took the elements of the Big Six Model and created a checklist for the needed computer skills at each level of the model. For example, for the task definition stage, learners should be able to use e-mail, desktop conferencing and idea generating software to help define an information problem. Their checklist covers a full spectrum of technical skills, and any learner mastering the list would be considered a technology expert.

Penrod and Douglas²³⁶ define information technology literacy as the ability to:

- Operate and communicate with technological devices;
- Understand how subsystems fit together to form systems or networks;
- Understand documentation and how to utilize applications software;
- Understand the basic jargon or terminology of information technology;
- Solve problems through the use of technology;
- Identify and use alternate sources of information; discuss the history and future of information technology; and
- Have some insight into the ethical and human impact issues of information technology.

Media Literacy

A cousin to information literacy, media literacy, seeks to build critical thinking as young people interact with the mass media. The easiest way to keep up in this field is to consult two important web sites that seem to keep up with the movement and provide numerous links to events, publications, ideas, and trends:

- Center for Media Education, Santa Monica, CA <http://www.medialit.org/index.html> The U.S. perspective on the issue linking with GPL in Nebraska to provide various video materials as well as materials on its own, bibliographies, and guides for various groups.
- Media Awareness Network <http://www.media-awareness.ca/eng/> is a Canadian site that is rich with many suggestions for teachers, students, parents, and community groups who are working with children to understand media influences in society.

British teachers are encouraged to incorporate media literacy into their primary education. One way of doing this is to have children answer questions after viewing various types of messages:

- Who is communicating and why?
- What type of text is it?
- How is it produced?
- How do we know what it means?
- Who receives it and what sense do they make of it?
- How does it PRESENT its subject? (see Bazalgette²³⁷)

²³⁷ Bazalgette, C. *Primary Media Education: A Curriculum Statement*. London: British Film Institute and the DES National Working Party for Primary Media Education, 1989.

²³⁸ Pappas, Marjorie L. and Ann E. Tepe: "Media, Visual, Technology and Information: A Synthesis of Literacies." in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI*. San Jose, CA: Hi Willow, 1997. p. 328-47.

²³⁹ Tyner, Kathleen. *Literacy in a Digital World: Teaching and Learning in the Age of Information*. Mahwah, NJ: Lawrence Erlbaum Associates, 1998.

Pappas and Tepe,²³⁸ in their Treasure Mountain VI paper, urge library media specialists to go beyond the current research process models to embrace media/visual literacy and technology literacy under the same umbrella; to recognize that students must and do take their information not only from print but from what they see, hear, and experience, and that much of that information is now coming electronically through various technological devices which demand navigational facility.

One of the best books published recently on media literacy is that by Kathleen Tyner,²³⁹ entitled *Literacy in a Digital World: Teaching and Learning in the Age of Information*. She reviews the history of traditional literacy and information literacy, proposing that media literacy be an essential topic taught to all students.

²⁴⁰ Minneapolis Public Schools. *Information Media and Technology Content Standards*. Minneapolis, MN: Minneapolis Public Schools, 1996. Table 5.

As an example of what she feels is central to media literacy, the Minneapolis Public School standards²⁴⁰ entitled *Information Media and Technology Content Standards* are cited. Notice what children ages 5-9 should be able to do:

Information Media and Technology Processing, Ages 5-9

3.1 Students apply research techniques using a variety of information media.

- Define and choose a topic that is from a single subject area.
- Formulate questions and seek answers from diverse perspectives.
- Understand main idea.
- Organize information for reports (e.g., graphic organizers).
- Gather, sort, manipulate, and store data in a variety of ways (e.g., use computer to create a database).
- Cite sources (e.g. within text).
- Ask questions and critique the results of other students' work.

3.2 Students identify, analyze, interpret and evaluate the content of information media, including the mass media, from diverse perspectives

- Analyze real, realistic, and unreal content from various viewpoints.
- Recognize works by authors, illustrator, nonprint media creator.
- Recognize main idea, details, sequencing, cause and effect, inference in content.
- Compare the same topic from a variety of cultural perspectives.

3.3 Students analyze unique properties of design of various information media, including the mass media

- Analyze and interpret the influence of audio in nonprint information media (e.g., sound effects).
- Analyze and interpret the influence of visuals and special features in print information media (e.g., graphics).

3.4 Students analyze ways in which information media, including the mass media, reflect/influence diverse cultures.

- Identify contributions to information media and technology by many people in various cultures throughout history.
- Establish criteria to distinguish best information media to suit purposes.
- Evaluate impact of time spent daily on mass media and entertainment technologies.
- Recognize motive and appeal of persuasive mass media messages.

Critical Thinking

In the last 20 years, many in education and government have called for developing young people and adults who think critically. The process, described by Russell²⁴¹ in 1960 is:

²⁴¹ Russell, cited in: E. d'Angelo. *The Teaching of Critical Thinking*. Philadelphia, PA: Gruner, 1971, p. 6.

Attitude + Knowledge + Thinking Skills = Intelligent Thinking

One of the most important theorists of the critical thinking field is Robert H. Ennis. His critical thinking model is often quoted in the educational literature and looks at critical thinkers from two perspectives; the disposition of the thinker and the ability of the thinker. Ennis²⁴² lists 12 abilities of the thinker:

²⁴² Ennis, Robert H. "A Taxonomy of Critical Thinking Dispositions and Abilities." in: J.B. Baron and R.J. Sternberg, eds. *Teaching Thinking Skills: Theory and Practice*. New York: W. H. Freeman and Company, 1987, p. 12-15.

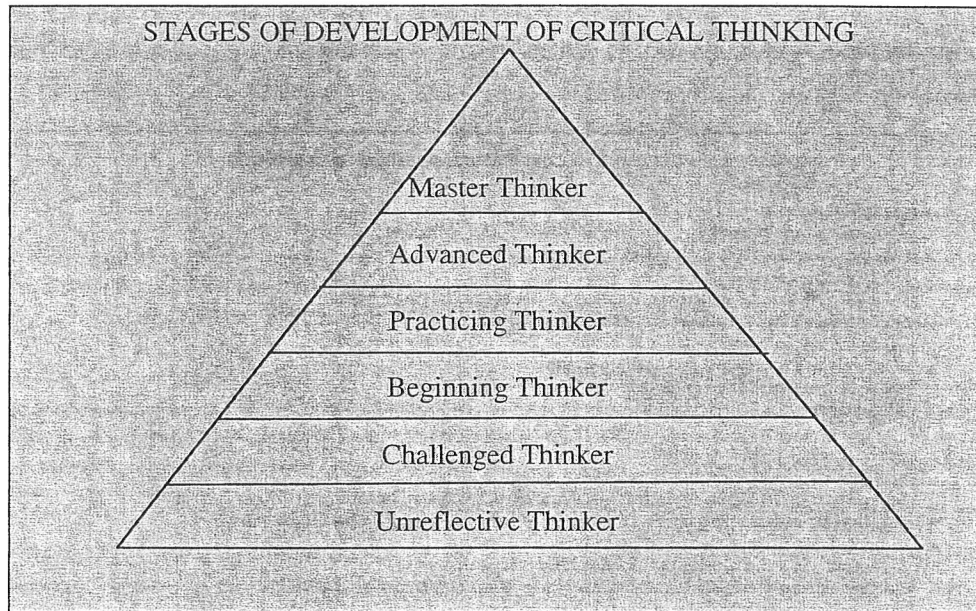
1. Focusing on a question
2. Analyzing arguments
3. Asking and answering questions of clarification and/or challenge.
4. Judging the credibility of a source.
5. Observing and judging observation reports.
6. Deducing and judging deductions.
7. Inducing and judging inductions.
8. Making value judgments.
9. Defining terms and judging definitions in three dimensions.
10. Identifying assumptions.
11. Deciding on an action.
12. Interacting with others. (p. 13)

²⁴³ Halpern, Diane F. *Critical Thinking Across the Curriculum*. Mahwah, NJ: Lawrence Erlbaum Associates, 1997.

Another excellent writer on the subject of critical thinking, Diane Halpern²⁴³ makes this point: "Critical thinking instruction is predicated on two assumptions: (a) that there are clearly identifiable and definable thinking skills that students can be taught to recognize and apply appropriately, and (b) if recognized and applied, students will be more effective thinkers. Intellectual skills, like physical skills, require specific instruction, practice in a variety of contexts, feedback, and time to develop." (p. 17)

²⁴⁴ Paul, Richard and Linda Elder. *Critical Thinking: Tools for Taking Charge of Your Learning and Your Life*. Upper Saddle River, New Jersey: Prentice Hall, 2001, p. 22.

Another model of critical thinking has been recently published by Paul and Elder²⁴⁴ who trace the stages of development of critical thinking. The model is particularly interesting because it presumes that learners would develop sophistication over time as young people normally do. The model is presented below:



- Stage 1: The Unreflective Thinker (We are unaware of significant problems in our thinking)
 Stage 2: The Challenged Thinker (We become aware of problems in our thinking)
 Stage 3: The Beginning Thinker (We try to improve but without regular practice)
 Stage 4: The Practicing Thinker (We recognize the necessity of regular practice)
 Stage 5: The Advanced Thinker (We advance in accordance with our practice)
 Stage 6: The Master Thinker (Skilled and insightful thinking become second nature to us)

²⁴⁵ Center for Critical Thinking. "Strategy List: 35 Dimension of Critical Thought (Formally Named)" in: "Critical Thinking Primary & Secondary Information: Library." The URL for the Critical Thinking Consortium is <http://www.criticalthin king.org/> and the strategy list is at <http://www.criticalthin king.org/K12/k12class/ strat/stratall.html>

One of the popular centers for teaching critical thinking is the California State University at Sonoma. Located in the famous Napa Valley, the Center for Critical Thinking Consortium ²⁴⁵ conducts critical thinking seminars each summer. They publish a web page where they list their "Strategy List: 35 Dimensions of Critical Thought."

Strategy List: 35 Dimensions of Critical Thought

A. Affective Strategies

- S-1 thinking independently
- S-2 developing insight into egocentricity or sociocentricity
- S-3 exercising fairmindedness
- S-4 exploring thoughts underlying feelings and feelings underlying thoughts
- S-5 developing intellectual humility and suspending judgment
- S-6 developing intellectual courage
- S-7 developing intellectual good faith or integrity
- S-8 developing intellectual perseverance
- S-9 developing confidence in reason

B. Cognitive Strategies - Macro-Abilities

- S-10 refining generalizations and avoiding oversimplifications
- S-11 comparing analogous situations: transferring insights to new contexts
- S-12 developing one's perspective: creating or exploring beliefs, arguments, or theories
- S-13 clarifying issues, conclusions, or beliefs
- S-14 clarifying and analyzing the meanings of words or phrases
- S-15 developing criteria for evaluation: clarifying values and standards
- S-16 evaluating the credibility of sources of information
- S-17 questioning deeply: raising and pursuing root or significant questions
- S-18 analyzing or evaluating arguments, interpretations, beliefs, or theories
- S-19 generating or assessing solutions
- S-20 analyzing or evaluating actions or policies
- S-21 reading critically: clarifying or critiquing texts
- S-22 listening critically: the art of silent dialogue
- S-23 making interdisciplinary connections
- S-24 practicing Socratic discussion: clarifying and questioning beliefs, theories, or perspectives
- S-25 reasoning dialogically: comparing perspectives, interpretations, or theories
- S-26 reasoning dialectically: evaluating perspectives, interpretations, or theories

C. Cognitive Strategies - Micro-Skills

- S-27 comparing and contrasting ideals with actual practice
- S-28 thinking precisely about thinking: using critical vocabulary
- S-29 noting significant similarities and differences
- S-30 examining or evaluating assumptions
- S-31 distinguishing relevant from irrelevant facts
- S-32 making plausible inferences, predictions, or interpretations
- S-33 giving reasons and evaluating evidence and alleged facts
- S-34 recognizing contradictions
- S-35 exploring implications and consequences

²⁴⁶ Critical Thinking Consortium. "Valuable Intellectual Traits." (<http://www.criticalthinking.org/University/intraits.html>)

In addition to the 35 dimensions, there is an excellent list of valuable intellectual traits²⁴⁶ which are described and discussed. The traits are:

- Intellectual humility
- Intellectual courage
- Intellectual empathy
- Intellectual integrity
- Intellectual perseverance
- Faith in reason
- Fairmindedness

²⁴⁷ Facione & Facione.
 "Holistic Critical
 Thinking Scoring
 Rubric." California
 Academic Press, 1996.
 (<http://www.calpress.com/rubric.html>)

Facione & Facione²⁴⁷ constructed a scoring rubric that could be used to judge a product created by students to rate how sophisticated critical thinking was in the student's work.. Their rubric was as follows:

4 Consistently does all of almost all of the following:

Accurately interprets evidence, statements, graphics, questions, etc. Identifies the salient arguments (reasons and claims) pro and con. Thoughtfully analyzes and evaluates major alternative points of view. Draws warranted judicious, non-fallacious conclusions. Justifies key results and procedures, explains assumptions and reasons. Fair-mindedly follows where evidence and reasons lead.

3 Does most or many of the following

Accurately interprets evidence, statements, graphics, questions, etc. Identifies the salient arguments (reasons and claims) pro and con. Thoughtfully analyzes and evaluates major alternative points of view. Draws warranted judicious, non-fallacious conclusions. Justifies key results and procedures, explains assumptions and reasons. Fair-mindedly follows where evidence and reasons lead.

2 Does most or many of the following:

Misinterprets evidence, statements, graphics, questions, etc. Fails to identify strong, relevant counter-arguments. Ignores or superficially evaluates obvious alternative points of view. Draws unwarranted or fallacious conclusions. Justifies few results or procedures, seldom explains reasons. Regardless of the evidence or reasons, maintains or defends views based on self-interest or preconceptions.

1 Consistently does all or almost all of the following:

Offers biased interpretations of evidence, statements, graphics, questions, information, or the points of view of others. Fails to identify or hastily dismisses strong, relevant counter-arguments. Ignores or superficially evaluates obvious alternative points of view. Argues using fallacious or irrelevant reasons, and unwarranted claims. Does not justify results or procedures, nor explain reasons. Regardless of the evidence or reasons, maintains or defends views based on self-interest or preconceptions. Exhibits close-mindedness or hostility to reason.

²⁴⁸ Borup, Byron Lee,
 II. *Critical Thinking
 About Critical
 Thinking: A Historical
 and Analytical Study of
 Its Origins, Its
 Divergent Definitions,
 and Its Struggle with
 the Transfer Issue.*
 Ph.D. dissertation,
 Utah State University,
 2001. (DAI-A61/12, p.
 4724, Jun 2001)

Finally, one of the most recent and thorough reviews of the research on critical thinking was done by Borup²⁴⁸ who compares all the theories about critical thinking including its detractors.

Gifted and Talented Education (GATE)

²⁴⁹ Feldhusen, John F.
 “Creativity, Teaching and
 Testing for.” In: *The
 International Encyclopedia
 of Education*. 2nd ed.
 Tarrytown, NY: Pergamon,
 1994, p. 1178-83.

Feldhusen,²⁴⁹ a well-known researcher on creativity offered this model, popular in gifted education in the 1970s and 80s. Creative problem solving consists of:

- Sensing that a problem exists;
- Formulating questions to clarify the problem;
- Determining causes of the problem;
- Identifying relevant aspects of the problem;
- Judging if more information is needed to solve the problem;
- Determining the specific problem;
- Clarifying the goal or desired solution;
- Redefining or creating a new use for a familiar object or concept;
- Seeing implications of a possible action;
- Selecting the best or most unusual solution among several possible solutions; and
- Sensing what follows problem solutions.

Business

The reader has probably heard the story of the farmer and his wife who were going to market. They got into their mule-driven cart and the husband signaled the mule to start. After repeated tries to get started with no results, the farmer took a baseball bat from the carriage and struck the mule with all his might on the nose. Alarmed, his wife cried, “Why did you do such a terrible thing?” The husband answered: “Sometimes you just need to get its attention!” Davenport and Beck²⁵⁰ see ATTENTION as a 21st century currency governing many of our decisions in an information economy. They define attention thusly: “Attention is focused mental engagement on a particular item of information. Items come into our awareness, we attend to a particular item, and then we decide whether to act.” (p. 20) They see six types of attention paired in three dimensions worthy of the reader’s perusal: (p. 22)

²⁵⁰ Davenport, Thomas H.
 and John C. Beck. *The
 Attention Economy:
 Understanding the New
 Currency of Business*.
 Harvard Business School
 Press, 2001.

1. Captive or Voluntary
2. Aversion-based or Attraction-based
3. Front of Mind or Back of Mind

It becomes clearer and clearer as library media specialists work with children and teenagers who are distracted by information noise and smog, that attention-getting information literacy strategies may be of enormous help.

Study Skills

²⁵¹ Rothenberg, A.S.
 "Integrating Study Skills
 into the Secondary School
 Curriculum." Toronto:
 Paper presented to Study
 Skills Unlimited. (ERIC
 Document Reproduction
 Service No. 339 999),
 1991.

Rothenberg²⁵¹ defines study skills as "skills used to acquire, organize, understand, remember and express any information which students must learn... They are skills which are not unique to school learning, but are lifetime learning skills." If this definition is prevalent in education, how do study skills differ from information skills?

²⁵² Boucher, Elizabeth F.
 and Ada F. Haynes.
 "Faculty Across the
 Discipline Respond to
 Study Skills Content."
RTDE, vol. 12, no. 2,
 Spring, 1996, p. 31-40.

Boucher and Haynes²⁵² do provide some enlightenment as they used an opinion survey to ask college instructors what study skills they valued in their students. The list in rank order was:

1. Critical Thinking
2. Personal Responsibility
3. Time Management
4. Problem Solving
5. Note-Taking
6. Comprehension
7. Test-Taking
8. Ask Assistance
9. Computer
10. Stress Management
11. Creativity
12. Decision Making
13. Interpersonal Skills
14. Memory Techniques

Since there is considerable overlap in study skills and information literacy, library media specialists should gather as much the literature as possible of this area looking for good teaching techniques and ideas for students. Linking up with teachers in a building who are interested in study skills would also seem to be a wise idea.

²⁵³ *The Secretary's*

Commission on Achieving Necessary Skills (SCANS) Report. Washington, D.C.: U.S. Department of Labor, 1991. (ED 332 054) Skills related to information literacy in this report summarized in: Holloway, Robert Evan and Christina S. Doyle and John Lindsay. "Performance Assessment for Information Literacy." in: *Instructional Interventions for Information Use: Papers of Treasure Mountain VI.* San Jose, CA: Hi Willow, 1997. p. 1-12. *The Secretary's Commission on Achieving Necessary Skills (SCANS) Report.* Washington, D.C.: U.S. Department of Labor, 1991. also at: http://www.ed.gov/databases/ERIC_Digests/ed389879.html

Skills Needed for the Workplace

The Secretary's Commission on Achieving Necessary Skills (SCANS Report),²⁵³ published in 1991 by the U.S. Department of Labor. This report provided the library media community with a great deal of evidence that the information literacy skills are needed to function in the workplace as well as in elementary, secondary, and higher education.

WHAT ARE WORKPLACE SKILLS?

To find meaningful work, high school graduates need to master certain workplace skills. SCANS calls these essentials "foundation skills" and "competencies." Workers use foundation skills – both academic and behavioral characteristics - to build competencies.

Foundation skills fall into three domains:

- basic skills - reading, writing, speaking, listening, and knowing arithmetic and mathematical concepts;
- thinking skills - reasoning, making decisions, thinking creatively, solving problems, seeing things in the mind's eye, and knowing how to learn; and
- personal qualities - responsibility, self-esteem, sociability, self-management, integrity, and honesty.

Competencies, however, more closely relate to what people actually do at work. The competencies that SCANS has identified fall into five domains:

- resources - identifying, organizing, planning, and allocating time, money, materials, and workers;
- interpersonal skills - negotiating, exercising leadership, working with diversity, teaching others new skills, serving clients and customers, and participating as a team member;
- information skills - using computers to process information and acquiring and evaluating, organizing and maintaining, and interpreting and communicating information;
- systems skills - understanding systems, monitoring and correcting system performance, and improving and designing systems; and
- technology utilization skills - electing technology, applying technology to a task, and maintaining and troubleshooting technology.

Curricular Models

²⁵⁴ Dalbotten, Mary S.
 "Inquiry in the National
 Content Standards." in:
*Instructional Interventions
 for Information Use: Papers
 of Treasure Mountain VI.*
 San Jose, CA: *Hi Willow*,
 1997. p. 246-304.

The process of inquiry is being promoted in many curricular areas in national standards created during the federal initiative to reform curriculum in the early 1990s. (Find the complete list of standards and other documents at: <http://www.mcrel.org>.) Mary Dalbotten²⁵⁴ from the State Department of Education in Minnesota did an extensive analysis of the various national standards documents, extracting information literacy components and then comparing them to the Inquiry Process of Minnesota's Graduation Standards. Her comparison included the following disciplines (Citations are given at the left and bottom):²⁵⁵

Arts - Dance, Music, Theatre, and Visual Arts
 Civics & Government
 English/Language Arts
 Foreign Language
 Geography
 Health
 History
 Mathematics
 Physical Education
 Science
 Social Studies
 Technology Education

In virtually all of the standards documents, Dalbotten could find parallel inquiry process skills of generating questions, determining feasibility, collecting data, reducing and organizing data, displaying data, and compiling conclusions.

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- Music Educators National Conference. *National Standards for Arts Education*. Reston, VA: The Conference, 1994.
- Center for Civic Education. *National Standards for Civics and Government*. Calabasas, CA: The Center, 1994.
- National Council of Teachers of English. *Standards for the English Language Arts*. Urbana, IL: The Council, 1996.
- *Standards for Foreign Language Learning: Preparing for the 21st Century*. Lawrence, KS: Allen Press, 1996.
- Bednarz, S. W. and others. *Geography for Life: National Geography Standards*. Washington, D.C.: Department of Education, National Endowment for the Humanities, and the National Geographic Society, 1994.
- Joint Committee on National Health Education Standards. *National Health Education Standards*. Washington, D.C.: American Cancer Society, 1995.
- National Center for History in the Schools. *National Standards for History*. Los Angeles, CA: The Center, 1996.
- National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: The Council, 1989.
- National Association for Sport & Physical Education. *Moving into the Future: National Physical Education Standards: A Guide to Content and Assessment*. St. Louis, MO: Mosby, 1995.
- *National Science Education Standards*. Washington, DC: National Academy Press, 1996.
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From Academic Libraries

In 1997, Dupuis²⁵⁶ published an information literacy model aimed at the college student that expands greatly the knowledge of the publishing and technological worlds. The model suggests something that is currently expected of graduates of a library and information science master's program.

INFORMATION LITERACY SKILLS

Understanding Information World and Needs

- › Familiarity with the variety of information sources, including libraries.
- › Understand the diversity of technologies involved.
- › Learn when and how to use computers and other machines for information needs.
- › Understand all information can not be found via the computer.
- › Understand how information is gathered, organized, packaged, and stored.
- › Understand the publication cycle and system of scholarly communication.
- › Recognize the need for information to make educated and intelligent decisions.
- › Learn how to articulate their information needs.
- › Learn to transfer skills between platforms and systems.
- › Accept that information searching can be time-consuming.
- › Understand phenomenon of information explosion.
- › Learn ways to keep current and deal with information overload.
- › Understand concepts of intellectual property and other political, social, and economic agendas associated with information creation and provision.

Assessing and Selecting Resource

- › Assess sources of information, including computer-based and other technologies.
- › Know when to use print, CD-ROM, online and full-text sources.
- › Evaluate the effectiveness of channels for different needs.
- › Understand the difference between primary and secondary sources.

Searching and Locating Information

- › Understand database structure and content.
- › Know how to build successful search strategies using Boolean logic, field searching and limiters.
- › Understand when to use controlled vocabulary.
- › Understand difference between precise and comprehensive searches.
- › Understand how to interpret citations and use call numbers to locate print items.
- › Recognize how to alter the search if the first attempt does not find information or finds too much information.

Evaluating and Interpreting Information

- › Employ critical thinking skills.
- › Distinguish relevant from irrelevant information.
- › Determine the strength of the argument.
- › Determine the factual accuracy of a statement.
- › Consider currency, authority, bias, viewpoints, and assumptions.

Manipulating and Organizing Information

- › Understand the process for saving, downloading, e-mailing, or printing search results.
- › Understand how and when to use document delivery to retrieve documents.
- › Organize information for practical applications, including within documents such as World Wide Web pages.

Citing and Communicating Information

- › Know relevant terms and acronyms.
- › Understand how to cite sources, including electronic resources.
- › Know how to communicate results to others.
- › Understand how to integrate new information into an existing body of knowledge.

²⁵⁷ Association of College and Research Libraries. "Information Literacy Competency Standards for Higher Education." ACRL, 2001. (<http://www.ala.org/acrl/il/intro.html>)

In 2001 two major documents were published for academic libraries. The first was done in the United States by the Association of College and Research Libraries (ACRL).²⁵⁷ Their model is in terms of competencies to be achieved by students. In its shortened form it includes the following:

An information literate individual is able to:

- Determine the extent of information needed.
- Access the needed information effectively and efficiently.
- Evaluate information and its sources critically.
- Incorporate selected information into one's knowledge base.
- Use information effectively to accomplish a specific purpose.
- Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally.

²⁵⁸ Council of Australian University Librarians. *Information Literacy Standards. First edition.* Canberra, The Council, 2001. available at: <http://www.caul.edu.au/>

The second set of standards was issued by the Council of Australian University Librarians²⁵⁸ in 2001. Their shortened version is as follows:

An information literate person is able to:

- Recognize a need for information.
- Determine the extent of information needed.
- Access the needed information efficiently.
- Evaluate the information and its sources.
- Incorporate selected information into their knowledge base.
- Use information effectively to accomplish a purpose.
- Understand economic, legal, social and cultural issues in the use of information.
- Access and use information ethically and legally.
- Classify, store, manipulate and redraft information collected or generated.
- Recognize information literacy as a prerequisite for lifelong learning.

Their list is broken down into a lengthy list of outcomes and behaviors that should be demonstrated. It is scheduled to be revised in 2003.

²⁵⁹ Bruce, Christine.
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²⁶⁰ Limberg, Louise.
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²⁶¹ Branch, Jennifer L.
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²⁶² Bilal, Dania.
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Promising Research Techniques

In addition to the well-known techniques of qualitative research encountered in this research review, a few interesting techniques appeared that hold some promise for understanding.

Phenomenology/Phenomenography: used by Christine Bruce from Australia and Louise Limberg from Sweden, is a research technique that looks at a phenomena as experienced by users. Thus it is a multi-dimensional view of an experience such as information literacy. Bruce²⁵⁹ discusses the approach and readers can consult her web page for an interesting "tour" of the idea. Limberg²⁶⁰ has also described the technique.

Think Alouds and Think Afters: was used by Jennifer L. Branch²⁶¹ in her study of adolescents using a CD encyclopedia. Titled "verbal protocol analysis," searchers talk their way through a search and later reflect on that search verbally while the researcher records and then analyzes their process thinking. The technique would seem to have practical applications if practitioners would have individuals or groups vocalize their research when the adult was nearby and in a reflection interview.

Web Traversal Measure: was developed by Dania Bilal²⁶² in a study of children searching Yahoo!igans! web search engine. The computer was used to record every query a student would make during the research and these data were combined with interviews and adult judgments for a score that could be used to measure search effectiveness. One would think that developers of search engines would study such data to more closely match their features with the ways children actually search.

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