

Information Literacy and the Internet:
Teaching Students How to Fish in a Sea of Information©

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"Feed a man a fish if he is hungry or
teach him how to fish, and he will eat for a lifetime."
--Chinese Proverb

Technology pioneers have witnessed an interesting evolution of the computer over the last thirty years. In the 1970s, we saw computers as a way of "crunching numbers." In the 1980s, a second wave saw personal computers being used for word processing, spread sheets, data bases, and presentation devices. In the 1990s, computers and other technologies combined to create opportunities for electronic communication, electronic creation (Websites), and electronic collaboration (e-mail, chat groups, listservs, etc.). In the 2000s, we will undoubtedly see more sophisticated techniques of electronic strategies for communication, creation, and collaboration. In this evolutionary period, teachers have used emerging technologies (computer, modem, CD ROM, etc.) in three primary ways: (1) technology-as-aid, or (2) technology-as-subject and (3) technology as-empowerment-tool.

In technology-as-aid practices, teachers have used technology to buttress or support direct instruction (i.e., sometimes called "teacher talk & technology" or "electronic chalk"). Teachers who use technology applications (e.g., HyperCard®, PowerPoint®, Persuasion®, or HyperStudio®) to support direct instruction fall into the category of technology-as-an-aid. What technology users have found is that direct instruction can be greatly enhanced by integrating appropriate forms of technology. For these teachers, the primary focus is on **teaching with technology**.

Another group of teachers who focus on technology-as-subject are usually found outside the traditional college preparation curriculum. Tech Ed programs or Tech Prep programs are where the curriculum is focused on the tools and subject of technology. It is common to see Tech Ed programs include courses of communication, transportation, and production. These courses can include a combination of physics, biological, and informational technologies as well as programming languages and system design processes. Tech Prep Programs usually include vocational programs that combine secondary and post-secondary courses that lead to an associate degree or two-year certificate. In both Tech Ed and Tech Prep programs, **there is a tendency to focus on learning about technology using technology**.

A more recent response to technology integration reveals a group of teachers

using **technology-as-empowerment tool**. In this instance, technology is seen as the core or foundation for the learning. These teachers are most interested in putting the technology hardware and software in the hands of students where students discover meaning for themselves. Many authorities place these technology users in the camp of the constructivists (making meaning for oneself). In these classrooms, we see students learning to use technology (Internet and applications like PowerPoint® or HyperStudio®) to aid them in their learning process while the teacher assumes the role as facilitator or co-learner. The primary focus is on **learning with technology**.

Depending on your viewpoint, each technology integration strategy would seem to take the act of teaching/learning in a very different direction. Within the evolutionary uses of technology, new problems and new challenges are surfacing.

New Problems and New Challenges

Futurists have provided the following information about changes in society:

- The amount of information is doubling every two to three years.
- Everyday, 7,000 scientific and technical articles are published.
- Satellites orbiting the globe send enough data to fill 19 million volumes in the Library of Congress--every two weeks.
- High school graduates are exposed to more information than their grandparents were in a lifetime.
- Only 15 percent of jobs will require a college education, but nearly all jobs will require the equivalent knowledge of a college education.
- There will be as much change in the next three decades as there was in the last three centuries.
- Technology development is doubling every eighteen months.
- Ninety percent of the technology that people will be using in next ten years has not been invented yet, or people don't have access to it (Bailey, Lumley, & Dunbar, 1995 and Bailey and Lumley, 1997).

Taken together, these facts begin to show a trend that the nature of change is changing our private and public lives. Public education which has been primarily focused on a combined college prep curriculum-teacher and text delivery system appears to be struggling to meet these Information Age challenges. Specifically, access to Internet has made teachers overwhelmingly aware of the information explosion because both teachers and students are drowning in a sea of

information. Too often, teachers and students "begin fishing on the internet" and catch hundreds of Websites. In the midst of this endless harvest of fish, there are snags, distractions, junk disguised as quality, and an incredible amount of debris. In short, it is common to see students who don't know how information is organized, how to find useful information, how to create new information, and how to use information in such a way that others can learn from them (Websites). In their effort to save drowning students or to prevent students from entering the torrent current of the Internet, it is easier to resort to feeding students information--teacher-talk and text.

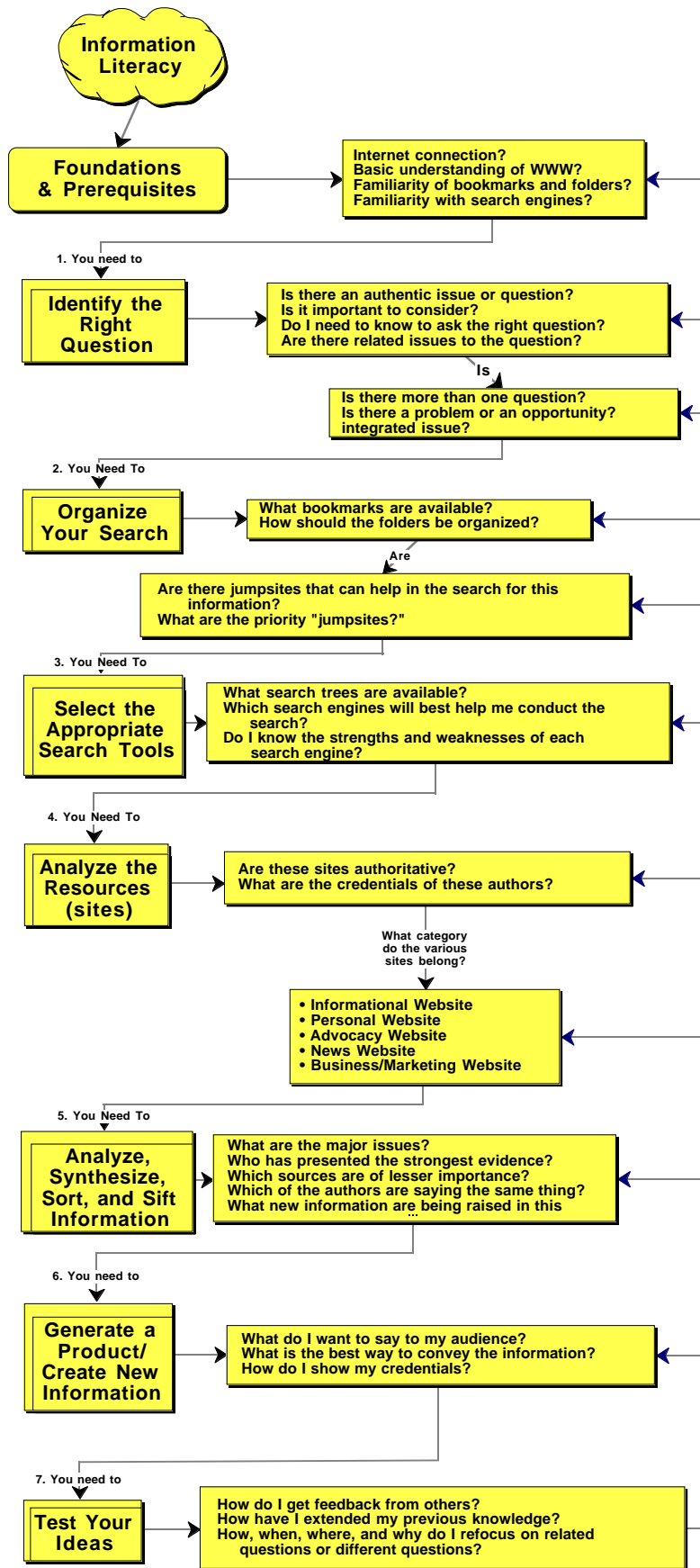
The Response

In their search for answers to these Information-age challenges, many teachers, who have seen technology-as-empowerment-tool (learning with technology), have become more interested in the concept of **Information Literacy**. Information can be defined as identifying, accessing, applying, and and creating information. Information Literacy is a problem solving process and addresses many of the challenges and problems of the Internet. In 1989, the American Library Association Presidential Committee on Information Literacy outlined the basic underpinnings of Information Literacy. Additional information about the concept of Information Literacy can be found at the American Library Association's site:

http://www.ala.org/aasl/positions/PS_infolit.html. According to the American Library Association, many groups have helped to define Information Literacy. Information Literacy is one of five essential competencies for solid job performance according to the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS). Many educational associations including the Association for Supervision and Curriculum Development (ASCD) have supported the concept of Information Literacy. In addition, authors such as Eisenberg and Berkowitz (See: <http://ericir.syr.edu/big6/bigsix.html>) have helped refine our ideas about Information Literacy.

Whatever authority you associate Information Literacy, they generally agree that there are steps or stages found in this process of "learning how to learn." Each step must be explained, understood, and followed if students are to become a life-long learners--making sense out of information for themselves.

To further clarify Information Literacy and it's relationship to the Internet, the authors have created the Bailey-Lumley Information Literacy Model (See Figure 1).



Bailey-Lumley Information Literacy Model©

Figure 1

Materials related to this model have been field-tested in a collaborative project at Kansas State University and Spring Hill School District in Spring Hill, Kansas, as well as hundreds of teachers in other school districts throughout the nation. The Bailey-Lumley Information Literacy Model provides ideas and suggestions for putting Information Literacy into action for teachers who are creating a learning-based environment for students by focusing on the Internet. In the center of the model are the seven steps of Information Literacy:

Step 1: Identifying the Right Question(s)

In the first step of Information literacy, teachers must facilitate students as they begin to ask the right question(s). To solve a problem, there must be something significant to study. There must be a problem which needs a solution. The question(s) must be relevant and worthwhile to both the teacher and student. The student must be able to apply what they have learned. Identifying the right question takes considerable practice. Here are a few of the questions that the teacher needs to get students to consider:

- What is real, authentic issue (problem), or question?
- Is there more than one question that needs to be addressed?
- What is important to consider when addressing the questions?
- Is there an opportunity for creating new information in this information search?
- Is this an integrated issue? (i.e., crosses several disciplines or one discipline)
- What do I need to know to ask the right question(s)?
- What are the related issues to the question (i.e., system's perspective)?
- Can I formulate a hypothesis about this question?

In short, "learning how to learn" requires thinking about what answers you are seeking--the learner returns to the original question to determine if the answers (which were found as a result of the search) are appropriate.

As the teacher guides the student in asking the right question, motivational strategies must be considered (See Figure 2). The following questions can be used to guide the teacher in that process:

- How do I motivate students to ask the right question(s)?
- What type of motivational strategies best work for this step?
- How do I make these questions authentic & meaningful?
- How do I illustrate that this is a "pressing" problem?
- How do I keep up with the student if I am a co-learner?
- Is there a need for direct instruction during this stage of the Information Literacy process?

1. Story Telling--relating personal events or happenings
 - defining moments
 - personal stories
2. Humor--breaking the tension with levity.
 - self deprecating
 - humor related to the concept
 - humor to break tension
3. Cognitive Dissonance--conflicting sources of information
 - disturbing data
4. Appeal to Emotions--making a case for rightness or justice
 - to appeal to sense of right
 - to appeal to sense of justice
5. Metaphors--stories.
 - to illustrate complex concepts into simple ideas
 - to create images which simplify ideas
6. Demonstrations--acting out of behavior or behaviors that have consequence.
 - to model complex actions
7. Role Playing--assuming the roles of characters in situations
 - to place learner in role into simulated situation
 - to wear costumes of real characters
8. Use of Technology--using emerging technologies for demonstration
 - to appeal to many senses (Dales Cone of Experience)
10. Anticipated Consequence--reaction to an action
 - to set up a set of consequences to convince learners that behavior will have an impact
 - set, body, closure
11. Simulation--assuming roles, life-like events with consequences
 - to place learner in near-life like conditions
12. Virtual Reality--events which occur in circuits of computer which appear to be real
 - to fool the senses into believing these are real conditions

Motivational Strategies Used in Information Literacy

Figure 2

Step 2: Organizing Your Search

The prerequisites to Step 2 include having a basic understanding of the Internet and World Wide Web. Obviously, students need to be connected to the WWW and have an Internet browser. In addition, students must have an understanding of the basics of bookmarks, folders, and search engines. Students must have some fundamental understandings of how things work to begin getting ready to organize their search. In Step 2, questions relating to the search process include the following:

- What bookmarks are available from the web?
- What print resources are available?
- How can I organize this information quickly and efficiently? What folders do I create to house these bookmarks?
- Are there some Websites ("jumpsites") that can help in the search for information?

In addition, questions like the following are helpful to the learner:

- How long do I have to do the search?
- Are some print materials available to help me in my digital search?
- Do I have some general idea of how my information is going to be used?

As the teacher guides the student in getting organized (thinking about searching), motivational strategies must be considered (See Figure 2). The following questions guide the teacher in that process:

- How do I illustrate the need for organization?
- How do I illustrate that problem solving (Information Literacy) is a communications, collaboration, and creation process (finding, sharing, and creating information)?
- How do I get students to understand the difference between data, information, knowledge, and wisdom?

Step 3: Selecting the Appropriate Search Tools (search trees and search engines)

In Step 3, the learner must know how to identify and use the tools for finding information. Search engines enable users to search a database of Web documents using key words. The search engine surveys a database of Web documents.

Web search engines attempt to create a detailed record of the Web using automated software agents--nicknamed spiders--that crawl from URL to URL, visiting every site in the public areas of the Web and recording the addresses. All search

engines handle these initial steps in essentially the same way.

Few people give much thought to the search engines they use. They find what's handy or what they've heard about, often using what's on their browser or a favorite Website. The various search sites do seem different, but it's difficult to determine differences. As a result, a clear path of problem solving does not emerge for the learner.

Students need to understand what the various search engines do. Often times, students will stay with only one search engine--the first one used rather than explore others. Search engines make significant differences in the quality and quantity of search results. Some send robot software to every site and record the full text of every page. Others first analyze the addresses in the database to determine which sites seem most popular (typically by determining the number of links pointing to the sites in question). They then send out software to record information at these sites only--anything from the bare HTML title and header to an algorithmically constructed summary of contents to the full text of the entire site. And whatever the scope of the database, it must be rebuilt, refreshed, or updated regularly to keep the system current.

The search logic used to extract information from the database is another crucial component of these tools. Engines should be able to find the Web sites that match the search criteria and rank the results according to a degree of relevancy.

The essential questions that learners need to address:

- Are there search trees which lead to information before selecting a particular search engine (See Yahoo)?
- Which search engines will best help me conduct the search?
- Do I know the strengths and weaknesses of each search engine?
- Who else has researched this area?
- Who are the authorities?
- Have credible researchers researched this area?

As the teacher guides the student in selecting the appropriate search tools, motivational strategies must be considered (See Figure 2). The following questions guide the teacher in that process:

- How can I motivate students to want to explore search engines in depth?
- How do I motivate students to learn how to engage in "intelligent and selective" searching?

Step 4: Analyzing the Resources (sites)

One of the biggest problems that teachers and students encounter is determining whether the Website is credible. A prerequisite to determining credibility is knowing the intended purpose. These categories include but are not limited to the following:

•**Informational Websites.** An informational Website is one whose purpose is to present factual information. The URL's frequently end with an **.edu** or **.gov** extension. Examples would be dictionaries, directories, statistical data, presentations of research, etc. See Library of Congress at <http://lcweb.loc.gov/homepage/>

•**Personal Website or Home Page.** A personal Home Page is one published by an individual who may *or may not be* affiliated with a larger institution. The URL addresses of the page may have a variety of extensions (e.g. , **.com** or **.edu**) An example: <http://www.educ.ksu.edu/go/bailey>

•**Advocacy Website.** An advocacy Website is one sponsored by an organization attempting to influence public opinion. The URL address of the page frequently ends in **.org** (organization). For example: American Civil Liberties Union: <http://www.aclu.org/>

•**News Website.** News Website is one with a primary purpose of providing extremely current information. Examples include USA Today, CNN, etc. See CNN Interactive at: <http://www.cnn.com.US/>

•**Business/Marketing Website.** A business marketing Website is one sponsored by a commercial enterprise (usually it is a page trying to promote or sell products). The URL address of the page frequently includes the **.com** (commercial) extension. Examples include Coca Cola, Apple, IBM, Adobe, Claris, etc. See Apple at: <http://www.apple.com/>

Once the sites are categorized for their intent, the following questions can be posed:

- Are these sites authoritative? Who are the authors?
- What are the credentials of these authors?
- Is the site "good" or does it just "look good?" (flash vs. substance?)
- If credibility is unknown, do others with "determined credibility" say the same thing?

As the teacher guides the student in scrutinizing sites for credibility, motivational strategies must be considered (See Figure 2). The following questions guide the teacher in that process:

- How do I illustrate the need for questioning or challenging sources of information?
- How do I teach intelligent skepticism about Websites?

Step 5: Analyzing, Synthesizing, Sorting, and Sifting Information

Once credibility is determined, an equally tough task is determining what the information says and does not say. In essence, the learner is holding up the question posed in Step 1 to determine what information answers that question. Questions which need to be answered in Step 5 include the following:

- What are the major issues? What sources reflect these issues?
- Who has presented the strongest evidence? What is the evidence?
- Which sources are of lesser importance? Why are they of lesser importance?
- Which of the authors are saying the same thing? How many are saying it?
- What new issues are being raised in this information (identified in the original search questions)?

As the teacher guides the student in analyzing, synthesizing information, motivational strategies must be considered (See Figure 2). The following questions guide the teacher in that process:

- How do I get students to analyze and synthesize information in an intelligent fashion?
- How do I motivate students to become analytical problem solvers?

Step 6: Generating a Product or Creating New Information (Website)

First, students and teachers must learn to frame their Website in the context of information literacy. That is, the creation of a Website is the highest form of information literacy, and without the foundational steps of information literacy, the Website is merely a electronic missile ready to explode or land without impact.

Second, Information literacy (IL) involves more than text. IL is comprised of text, audio, video, and graphics. When combined, they become new forms of information to be learned and mastered for communication purposes. Conveying meaning from a wider spectrum of communication mechanisms rather than using one medium (text) is a new opportunity for teachers and learners. It is an opportunity to make Websites more than text with enticing "eye candy" made up of flashy graphics, blurbs of video,

and sound bites.

Interestingly, we don't have a verb like "read" (e.g., to read a book) that embraces all of these media in the communication process. As verbs, "watch" or "hear" do not embrace the total communication process that occurs in some of our very best Websites. At the present time, we are in the midst of learning to interact with Websites that incorporate combinations of various media in very unique formats.

Many of the current education (learning or instructional) Websites appear to be built around "electronic activities" (e.g., electronic pen pals, telecomputing, games, competition). The process of creating Websites needs to be undertaken in the spirit of "exploration," "experimentation," and "entrepreneurialship" with the goal of fostering Information Literacy. Creating activity-oriented Websites which are not tied to information literacy (even though, they are very sophisticated technology-based learning when compared to teacher-based instruction) will not lead to information literate learners needed in the 21st century.

Many of the "best examples" of education-related Websites are rooted in the old paradigm of specific curriculum outcomes, competencies (i.e., the existing curriculum) while much of the Website construction forms of the future needs to engage students in constructivist learning. Our Websites need to become interactive and Website construction should focus on transformational learning and information literacy--not "electrifying what we have done in the past." Basic literacy considerations tend to dominate the total curriculum spectrum. In light of what we know about the explosion of information, the questions remains: can we find room in our "bloated curriculum" to integrate information literacy concepts?

You don't need to be a "technocrat", "technology buff," or "wirehead" to build a good Website. Website construction is not totally dependent on knowledge of html (hypertext markup language). While knowledge of html is important, it will become less important and will be replaced with other applications which use language that will be invisible to most Web users and creators.

The fundamental questions that need to be answered in Step 6 are:

- How do I determine audiences and their needs?
- What do I want to say to my audience(s)?
- What is the best way to structure my information to meet those needs?
- How do I show my credentials, biases, etc. to potential audiences?

As the teacher guides the student as they develop a product, motivational strategies must be considered (See Figure 2). The following questions guide the teacher in that process:

- What is inherently motivating about producing a product?
- How do I get students to motivate others by producing a technology-based product?
- What do students need to know about motivation theory when presenting their own materials to other students or adult audiences?
- What do students need to know about visual literacy as they create their technology-based product?

Step 7: Testing Ideas for Feedback

Testing ideas may be one of most difficult tasks for the learner. The essential question is: what do other people think? What can I learn from the material that I put into Cyberspace? These questions have everything to do with "push/pull" concept of getting people to visit your Website on a regular basis. That is, if I push this information out to people, what can I do to pull information back (i.e., getting the observer to return to your site to get information from that person). The essence of life-long learning is that few ideas remain stagnant and unchanged. If new information becomes available, how does that information impact the information that you have created in the format of a Website.

Essential questions that need answers include the following:

- How do determine my audience? motivate my audience?
- How do I get feedback from others about my new knowledge?
- How have I extended my previous knowledge?
- How, when, where, and why do I refocus on related questions or different questions?

As the teacher guides the student in getting feedback and refocusing on the next tasks, motivational strategies must be considered (See Figure 2). The following questions guide the teacher in that process:

- How do I motivate students to get feedback from audiences who will be using the product?
- How do I motivate students to test their own ideas?
- How do I motivate students to refine their life-long learning skills (information literacy)?
- How do I motivate students to focus on related or other questions?
- How do I motivate students to extend their intended audience beyond the teacher?

Six Interacting Themes Buttressing: Seven Step Information Literacy Model

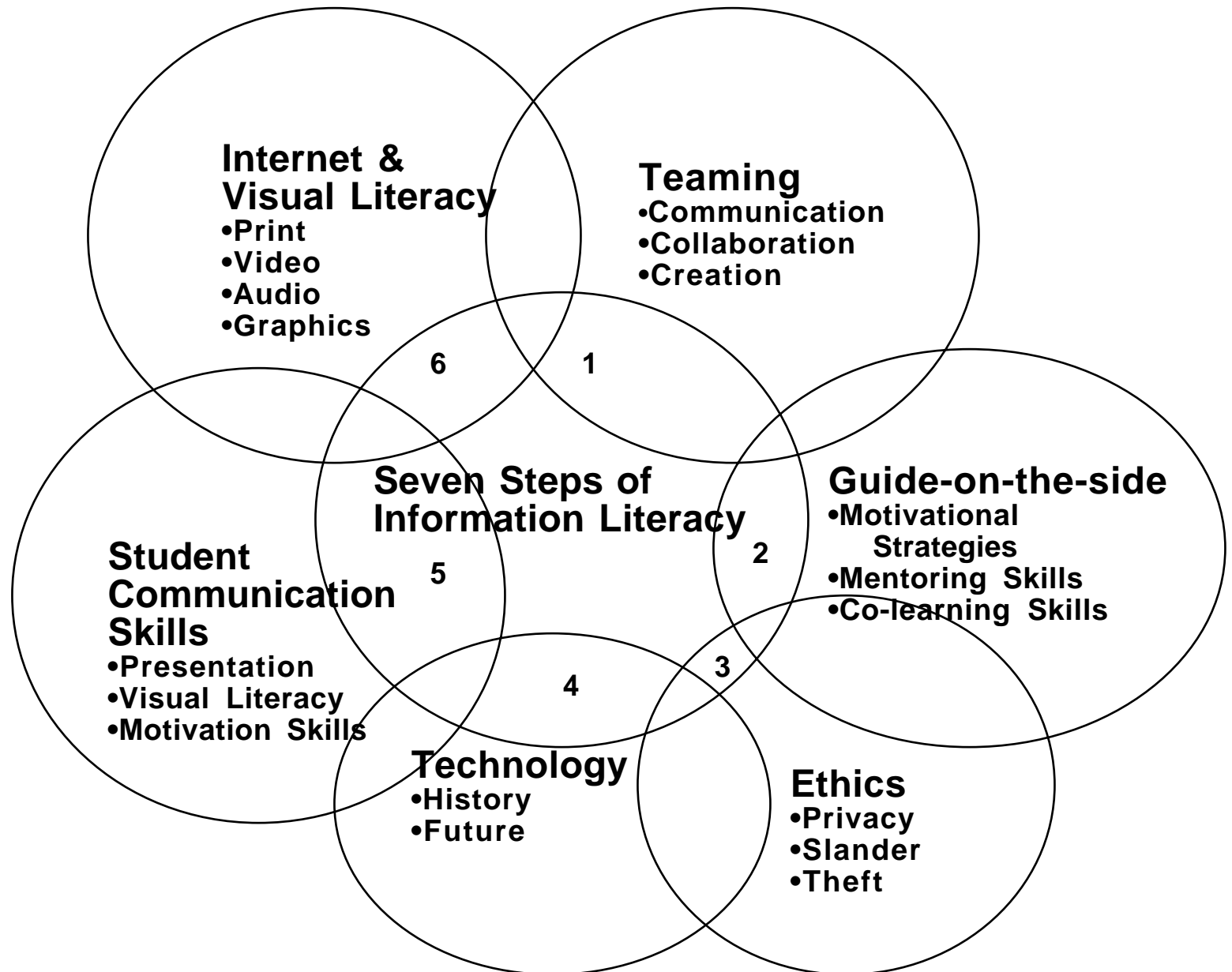
Information Literacy does not exist in a void in the teaching and learning process. The power in Information Literacy lies in the ability to identify other supporting concepts. There are six themes which support Information Literacy and can be visualized in Figure 3.

1. Teaming Should Be Taught as Part of the Learning Process in Information Literacy. Teaching interdependence is a natural act in the process of Information Literacy. Students, as well as teachers, must learn how to use technology as a communication, creation, and collaboration tool if the power of Information Literacy is to be unleashed. Learning with others "face-to-face" as well as "learning together a part" is the new form of collaboration in the new millennium. A solid understanding of teaming and the teaming process is at the heart of Information Literacy.

2. The Primary Role of the Teacher as Guide-on-the-side is an Essential Part of Information Literacy. Teachers must discover or rediscover the role of, learning leader, motivator, mentor, and co-learner if Information Literacy is to succeed as a strategy of teaching and learning. Mentoring is a critical skill if Information Literacy is to be successfully implemented (See telementoring at National Network School Exchange's site: <http://nsn.bbn.com/>).

3. Ethics Play an Essential Role in the Development of Information Literacy as a Model of Effective Teaching and Learning. The use, misuse and abuse of technology must be explored in Information Literacy if our society is to maintain a balance of freedoms guaranteed in the United States Constitution. Students must understand the ethical issues raised by the use and misuse of the Internet. Ethical use of technology will only come about when users have a more complete understanding of Internet's impact on our society (i.e., social, economic, political, religious).

4. Technology as part of the Curriculum Must Find Its Way into the Process of Information Literacy. Technology as a topic has and will continue to



Bailey-Lumley Information Literacy Model:
A Systems Perspective

Figure 3

have a tremendous impact--socially, politically, and economically. Students must develop an understanding of how technology influences our daily lives. Our 21st century curriculum must be relevant to students. Current elements found in courses of communication, transportation, production, etc. (Tech Ed) have much to offer our students who find themselves in a "pure" college curriculum where there is little or no reference to technology. Unfortunately, many schools see Tech Ed and Tech Prep as a separate curriculum which is kept separate from our college prep curriculum.

5. An Essential Outcome of Information Literacy is That Students Must Learn Communication Skills Which Includes Presentation and Motivation Skills. Communicating learning outcomes is a natural outgrowth of information literacy. Students in the 21st century must be able to communicate with many technological mediums--text, graphics, video, and sound. Once they have an understanding of the content, students must learn how to arrange information and motivate learners with more than the written and spoken word. Understanding the motivation of providing and receiving information will be one of the great challenges of Information Literacy.

6. Visual Literacy Skills are Essential Learning Competencies in Information Literacy. This includes knowing how to create, organize, and display print, video, audio, and graphics in a motivating, informative manner. Learning how to use color, style, placement, font size, etc. are the foundational underpinnings of visual literacy and information literacy. Once they have an understanding of the content, students must learn to display (articulate) their knowledge.

Conclusion

Information Literacy in the context of the Internet and supporting teaching and learning strategies has great potential to transform the face of education. The three major approaches of using technology: (1) technology-as-aid, (2) technology-as-subject, and (3) technology-as-empowerment can not be viewed as competing approaches to the use of technology. Rather, they need to be integrated under the umbrella of Information Literacy.

First, "teaching with technology" can not be abandoned. But it should not

be the end-goal of technology-infused learning. The teacher needs to play a primary role of teaching (with technology) while gradually moving and growing into the role as facilitator of learning. This evolving role is one of motivating, counseling, and co-learning. Most importantly, the new role of the teacher must focus on motivational strategies while teaching students to learn how to learn (Information Literacy).

Second, "**learning about technology**" is critically important. However, the curriculum of technology needs to be integrated with other curriculum subjects. Knowledge about the history of technology, information-age, as well as the sociological impact of technology on lives of people is critical information. Information about technology is necessary to understand the concept of life-long education and the role that technology plays in life-long education.

Third, "**learning with technology**" needs to be the end-goal of technology-infused learning. Technology-infused learning needs to become ubiquitous and unnoticed in the teaching and learning process. We must learn when to "feed students" as well as know when to "teach students how to fish." There is a need for both approaches depending where students are in their understanding of Information Literacy.

If students are to become the leaders we need in the 21st century, Information Literacy must become a highly visible strategy in the technology leadership process. In the final analysis, teaching students how to fish in a sea of information has become *the* defining moment for those who educators who want to develop a new vision education where the Internet fluency represents one of the core values of teaching and learning.