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Justify Our Love: Information Literacy, Student Learning, and the Role of Assessment in Higher Education

By Anne Scrivener Agee and Craig Gibson

The genesis of the modern era of educational standards and the concomitant growth of interest in outcomes assessment are generally attributed to the publication in 1983 of the U.S. Department of Education's A Nation at Risk, which identified a "rising tide of mediocrity" as a threat to "our very future as a nation and a people" (National Commission, 65). As a result of this indictment of American education, particularly with regard to mathematics and science education, there has been increasing pressure on educational institutions at all levels to explain what they are doing and to provide evidence of how well they are doing it. Since 1983, concerns about science and mathematics education have broadened to include concerns about technology literacy as a prerequisite for success in an increasingly technology-driven society. Educational institutions have focused not only on how to integrate information technology literacy into our educational system, but also about how to measure the success of those integration efforts. The numbers indicate that this will be a long, slow process.

In 1994, the Association of College and Research Libraries (ACRL) surveyed 830 institutions of higher education to explore the status of initiatives to promote information literacy. Overall, twenty-one percent of the respondents, or 171 institutions indicated that they had a "functional" information literacy program, with the Middle States region well above the average at thirty-one percent. Unfortunately, this information is not as encouraging as it might be since, as the Middle States analysis of the data notes, "the word 'functional' means different things to different people in different disciplines, and the word 'program' also is subject to multiple interpretations" (Ratteray and Simmons 1995, 2).

The survey also indicates that, "generally speaking, more institutions have a specific course on information literacy skills (70 institutions) than have attempted to integrate information literacy in all majors (49 institutions)" (Ratteray and Simmons 1995, 5). What is perhaps more significant, though, is that only seventeen percent of the respondents, or 135 institutions, indicated that they had a formal assessment of students' information literacy performance, no matter what kind of functional program they had or didn't have.

In this paper, we will explore the nature of assessment and some of the ways that it can be applied to the measurement of information literacy.

Assessment is an ongoing process of evaluation aimed at understanding and improving student learning. It involves, according to Thomas Angelo:

- Making our expectations explicit and public;
- Setting appropriate criteria and high standards for learning quality;
- Systematically gathering, analyzing, and interpreting evidence to determine how well performance matches those expectations and standards; and
- Using the resulting information to document, explain and improve performance (Angelo 1995, 7-9).

In this paper, we have laid out our discussion to correspond to these four elements of assessment.

Making our Expectations Explicit and Public: Definitions of Information Literacy

Information literacy is one of the most significant emerging concepts at all levels of education—K-12, college and university, and post-higher education. While the concept is hardly new—its first use in any professional literature dates from 1974—the critical mass of articles, books, reports, studies, Web-based projects, and general interest in it is striking at the end of the 1990s. Information literacy is, truly, a concept whose "time has come."

At the same time, information literacy resists easy, universally accepted definitions. This has not been for lack of much careful thought among librarians, technologists, faculty, and administrators at all levels of education. Over the past quarter century, many of the definitions have focused on information literacy as a set of concepts and skills that empower the individual to make sense of an exploding array of information resources. Closely allied to information literacy are such concepts as resource-based learning and lifelong learning—the former emphasizing the students' inquiry into a topic or issue using a wide range of information resources outside of the classroom, and the latter focusing on learning in progressive, developmentally-and career-appropriate stages across the lifespan.

For librarians, the core elements of information literacy date from the 1989 Final Report of the American Library Association Presidential Committee on Information Literacy. This Report's definition reads:

> To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. (American Library Association 1989, 1)

Following the publication of this report, Doyle conducted a survey to determine what a number of educational and societal leaders consider as the attributes of an information-literate person. Her expanded list is instructive, for it proposes that such a person:

- Recognizes that accurate and complete information is the basis for intelligent decision-making
- Recognizes the need for information
- Formulates questions based on information needs
- Identifies potential sources of information
- Develops successful search strategies
- Accesses sources of information including computer-based and other technologies
- Evaluates information
- Organizes information for practical application
- Integrates new information into an existing body of knowledge
- Uses information in critical thinking and problem-solving (Doyle 1994, 3)

This expanded, elaborated conception especially calls attention to the applications and uses of information, instead of the more typical "finding" and "searching" elements of information retrieval. Noteworthy, too, is the emphasis on critical thinking and problem-solving. Doyle, calling upon the thinking and research of Robert Sternberg, is especially concerned with how information literacy is taught—through ill-structured information problems that approximate those of "real life" rather than through well-structured, formulaic library or classroom research projects. Doyle believes that:

> Critical thinking and information literacy skills need to be consciously merged. They must become part of the assessment criteria for American students. While critical thinking skills provide the theoretical basis for the process, information literacy provides the skills for practical, real world application. Students need to acquire competence with critical thinking and information literacy skills in experiences that are part of the core curriculum. (Doyle 1994, 9)

This close relationship between critical thinking and information literacy poses large implications for assessment of information literacy skills and concepts. Information literacy encompasses a set of concepts and skills that facilitate lifelong learning, but such learning can occur only through carefully orchestrated, problem-based learning embedded within a curriculum, with information problems that have real meaning for students.

The critical thinking approach to information literacy highlighted by Doyle is one to which many librarians and educational technologists might aspire, but for which assessment poses additional challenges because of limited staff time, difficulties of agreeing upon definitions for rating, and the sheer scope and scale of such assessment. Even more daunting are the challenges posed by defining and assessing "critical thinking," which educators continue to grapple with in a wide variety of contexts and disciplines.

More fundamental for librarians, though, is the continuing life of such concepts as "library skills," "bibliographic instruction," and "user education," in parallel existence with the newer concept of "information literacy" and its allied terms "digital literacy," "network literacy," and "information management." The proliferation of these allied terms, all related to the idea of information retrieval, management, evaluation, and use, shows just how far we have moved from the traditional "library skills" paradigm, with its focus on nontransferable, tool-specific, place-bound instruction, which was rarely if ever assessed in terms of learning outcomes.

The proliferation of the newer cluster of information skills concepts points up a salient fact: that "information literacy" is not the exclusive province of librarians. Educational technologists, media specialists, computing professionals, instructional designers, communications specialists and practicing journalists, and faculty in a wide range of disciplines have all shown increasing interest in information literacy. Because the concept is not "owned" by librarians but by many constituencies both inside and outside of K-12 and higher education, agreement upon precise definitions and standards becomes difficult—but all the more important, at least in a general way, if assessment of information literacy skills and programs is to occur.

The ambiguities in the concept of "information literacy" arise precisely because it is such an all-encompassing, "umbrella" term that touches so much of what professionals are expected to know and do in an information-intense, knowledge-driven economy. For many in the business world, of course, "information literacy" connotes more of a technological emphasis, with knowledge of specific computing applications and the use of proprietary databases—software productivity tools that assist knowledge management. Even within the business community, however, there is a range of differing definitions, with a management theorist like Peter Drucker

insisting that information itself, not just the technology that enables its dissemination and organization, should be every company's lifeblood. But the technological component of information literacy, for many practicing business people, is the overriding concern.

The technological aspect of information literacy is one with very large implications for assessment. Pure "technology literacy" by itself is somewhat reminiscent of the older concept of "computer literacy," with its emphasis on skills tied to specific computers and software applications. The older "computer literacy" concept, using a behaviorist, application-specific approach to training, is strikingly similar to the older "library skills" approach, which used behaviorist, tool-based teaching in libraries. Such skills do not transfer—librarians and technologists alike have known this for years—but the demands of the curriculum often force such training and teaching. Assessing the acquisition of "computer literacy" and "library skills", is, on one level, relatively simple. Pre- and post-tests show student gains in using specific applications and tools. Relating these gains to larger educational outcomes is, of course, much more problematic. And the concern with larger educational outcomes is, in a fundamental sense, what information literacy—the larger concept that encompasses both computer skills and library skills—is all about.

The ambiguities of definition for "information literacy" are only beginning to be resolved. Two crucial documents for librarians and educational technologists to know in terms of the definitional issues are Christine Brace's Seven Faces of Information Literacy and the 1999 report of the National Research Council's "Being Fluent with "Information Technology." These two documents present several strands of thinking about information literacy that also have large implications for assessment. An Australian researcher, Bruce interviewed academic professionals to learn how they "experience" information literacy; in effect, Bruce conducted a kind of ethnographic research. Her in-depth discussions with academics as "knowledge workers" helped her develop a multidimensional model for information literacy (hence the "seven faces"):

- The First Face: Information literacy is experienced as using information technology for information awareness and communication
- The Second Face: Information literacy is experienced as finding information from appropriate sources
- The Third Face: Information literacy is experienced as executing a process
- The Fourth Face: Information literacy is experienced as controlling information
- The Fifth Face: Information literacy is experienced as building up a personal knowledge base in a new area of interest
- The Sixth Face: Information literacy is experienced working with knowledge and personal perspectives adopted in such a way that novel insights are gained
- The Seventh Face: Information literacy is experienced as using information wisely for the benefit of others (Bruce 1997, 3-7)

To date, Bruce's "information literacy" is the most encompassing of all the conceptions—and it is so precisely because of her research with professionals who search for, evaluate, manage, and create information on a daily basis. This deepening conception of information literacy, however, poses even larger challenges for assessment. Librarians and educational technologists will readily recognize their areas of expertise in Bruce's first two faces—the information technology experience and the information sources experience—but the other "faces" are bound up with every practicing professional's work life. It is not realistic to expect,

nor is there any rationale for, assessment of information literacy, as Bruce defines it, in the workplace. But how can we develop assessment of problem-based learning of information literacy in higher education, for example, that would reasonably simulate the workplace processes and experiences that Bruce investigated? This suggests enormous curricular changes and a pervasive "cultural shift" toward information problem-solving across the curriculum; it also suggests substantially greater institutional resources devoted to assessment and the creation of a culture of assessment currently lacking at most colleges and universities.

It is noteworthy that, for Bruce, the "information technology experience" is only the most basic and enabling component of the overall information literacy matrix. For her, workplace information literacy is characterized by "varying emphases on technology" and "broad professional responsibilities" rather than "specific skills"; collaboration with colleagues; and most telling, "intellectual manipulation of information rather than technical skills with IT." Bruce found that most workplace uses of information literacy depend on "conceptual skill and intellectual agility" rather than skills with specific technologies. She points out that

> We need to remember that training people to use various forms of software packages or technologies does not constitute information literacy education; we also need to remember that teaching information sources is only one facet of information literacy education. (Bruce 1997, 10)

Bruce's comments should resonate for both educational technologists and librarians who want to assess information literacy in their own ways, for her conception encompasses both the technology literacy skills and the information resources skills as enabling abilities to larger educational ends. One implication of Bruce's schema for assessment of technology literacy skills and information resources skills is that they should be assessed together as an integrated skill set, and that librarians and technologists should collaborate on such assessment initiatives.

The definitional conundrum remains, however: how much of information literacy is really concerned with technology literacy per se, and how can skills with computer hardware and software be assessed when the technology changes so rapidly? Some answers are found in the 1999 report by a group of computer and information scientists appointed by the National Research Council, "Being Fluent with Information Technology." This report draws a sharp distinction between information technology literacy, as understood by computer scientists, and information literacy, as understood by librarians and others. According to the authors of this report:

> Information literacy and FITness [Fluency with Information Technology—the author's acronym is used throughout the report] are interrelated but quite distinct. Information literacy focuses on content and communication: it encompasses authoring, information finding and organization, research, and information analysis, assessment, and evaluation ... By contrast, FITness focuses on a set of intellectual capabilities, conceptual knowledge, and contemporary skills associated with information technology . . .
> Both information literacy and FITness are essential for individuals to use information technology effectively. Today, the acquisition and shaping of information are increasingly mediated by information technology. Information technology shapes the channels of publication, access, and dissemination of information. The nature of increasingly common digital documents raises new issues in the activities and practices of analysis, assessment, evaluation, and criticism. Much of today's information technology and supporting infrastructure is intended to enable communication, information finding, information access, and information delivery. (Computer Science and Telecommunications Board 1999, 3-5, 3-6)

The report's authors speak of "fluency" with information technology as "graduated and dynamic" rather than static. Individual students should learn technology in three ways: through

foundational concepts, intellectual capabilities, and contemporary skills. The authors insist that "computer literacy" is a limiting concept and that students and others should learn universal, transferable concepts related to technology (a reminder for librarians of how they have sought to transcend tool-based instruction over the past twenty years).

Perhaps it is the concept of "fluency" itself that is most telling in this report. The authors have chosen that term quite deliberately because, for them, it expresses a higher degree of competency than basic computer literacy. The "information technology fluent" individual can deal with ill-structured technology problems, understands technology in a variety of domains, and can adapt to changes in technology. Most important, an individual who is "fluent" continues to learn. Fluency with Information Technology (FITness) "should not be regarded as an end state that is independent of domain, but rather as something that develops over a lifetime in particular domains of interest and that has a different character and tone depending on which domains are involved." (Computer Science and Telecommunications Board 1999, ES-2). The authors also insist on the integrative nature of this "fluency" and insist that a project-based, problem-based approach be used in teaching it within the curriculum.

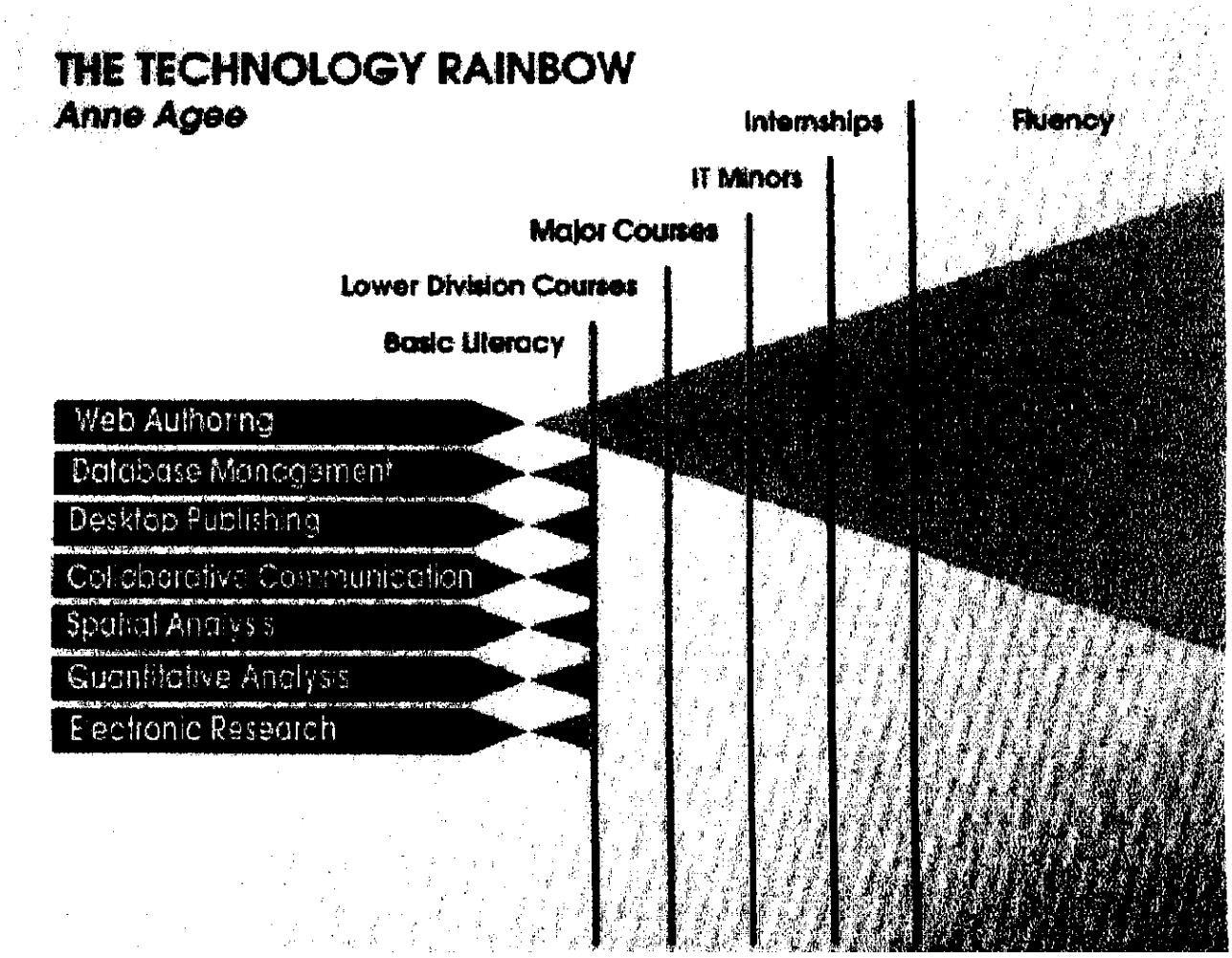

FIGURE 1: INFORMATION LFTERACY/I.T. FLUENCY STAGE ONE: INDIVIDUAL SKILL DEVELOPMENT

The illustrations below suggest a way of thinking about information literacy as part of an array of technology competencies, leading ultimately to the type of FITness described in the NRC report (illustrations courtesy of Bill Vitucci, Internet Multimedia Center, George Mason University.)

The first concept is that the development of information literacy is not linear. A student's knowledge and skills do not progress in a straight line from greater to lesser; they develop rather in a vector model where each increment in learning actually broadens the range of application of the concept.

Further, various areas of learning about information technology intersect and reinforce each other to create more complex learning and more complex applications. For instance, a student's knowledge and skills in electronic research impact on and are impacted by her knowledge and skills in database development and management. An understanding of database structure develops understanding of search strategies. A knowledge of database management provides additional ways to manage information discovered in a search. Knowledge and skills in Web page development may similarly impact on both electronic research and database management, extending and extended by application of knowledge from other technology areas.

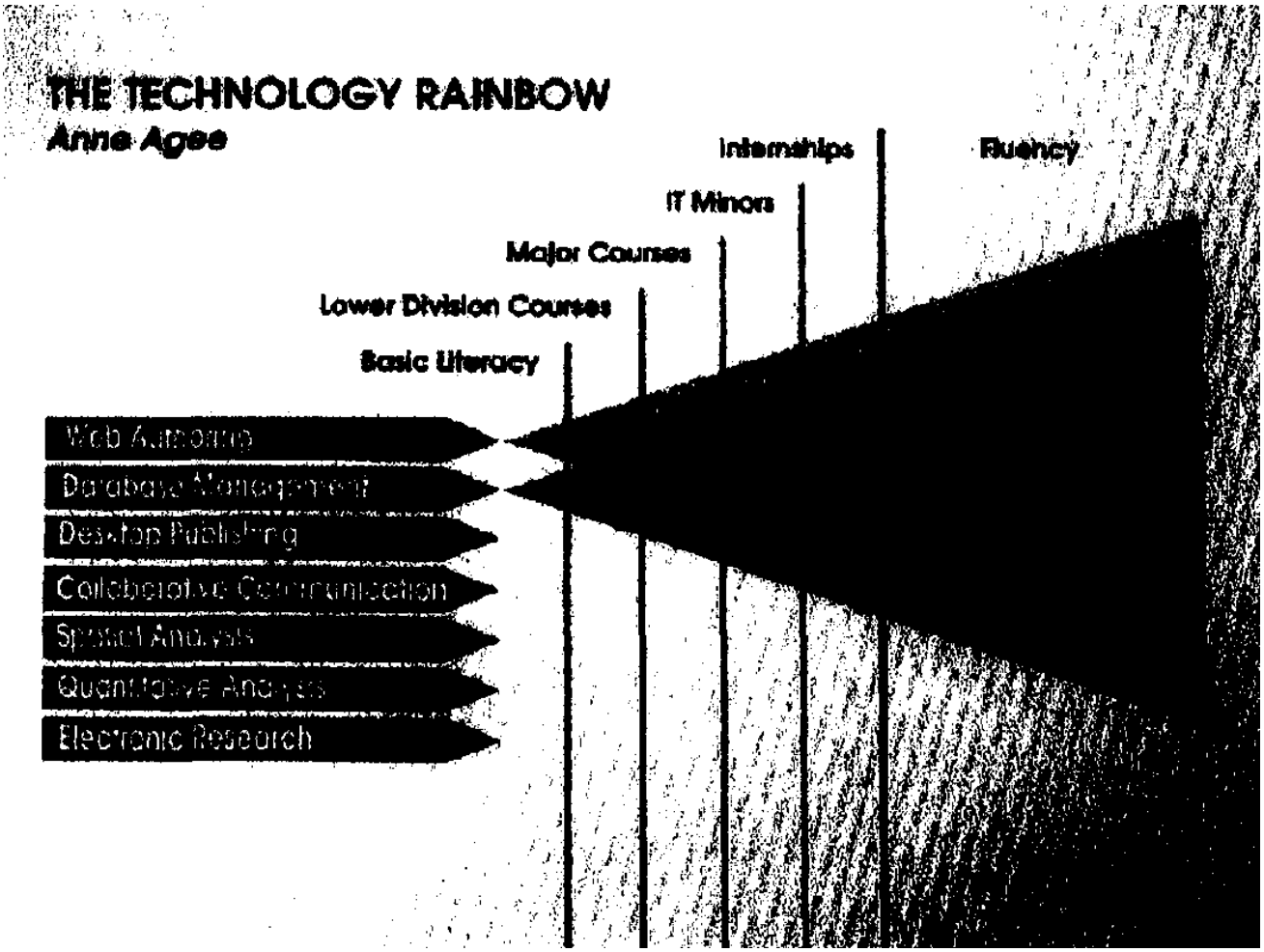

FIGURE 2: INFORMATION LITERACY/I.T. FLUENCY STAGE TWO: SKILL INTEGRATION

Finally, different intersections along the vector represent different levels of program implementation. Many definitions of information literacy and many information literacy implementation programs stop at the lowest level on this model where each skill area is seen as separate. However, development of FITness actually requires an increasingly complex integration of concepts, knowledge and skills introduced throughout a program of study from basic training sessions to courses in the major to internships.

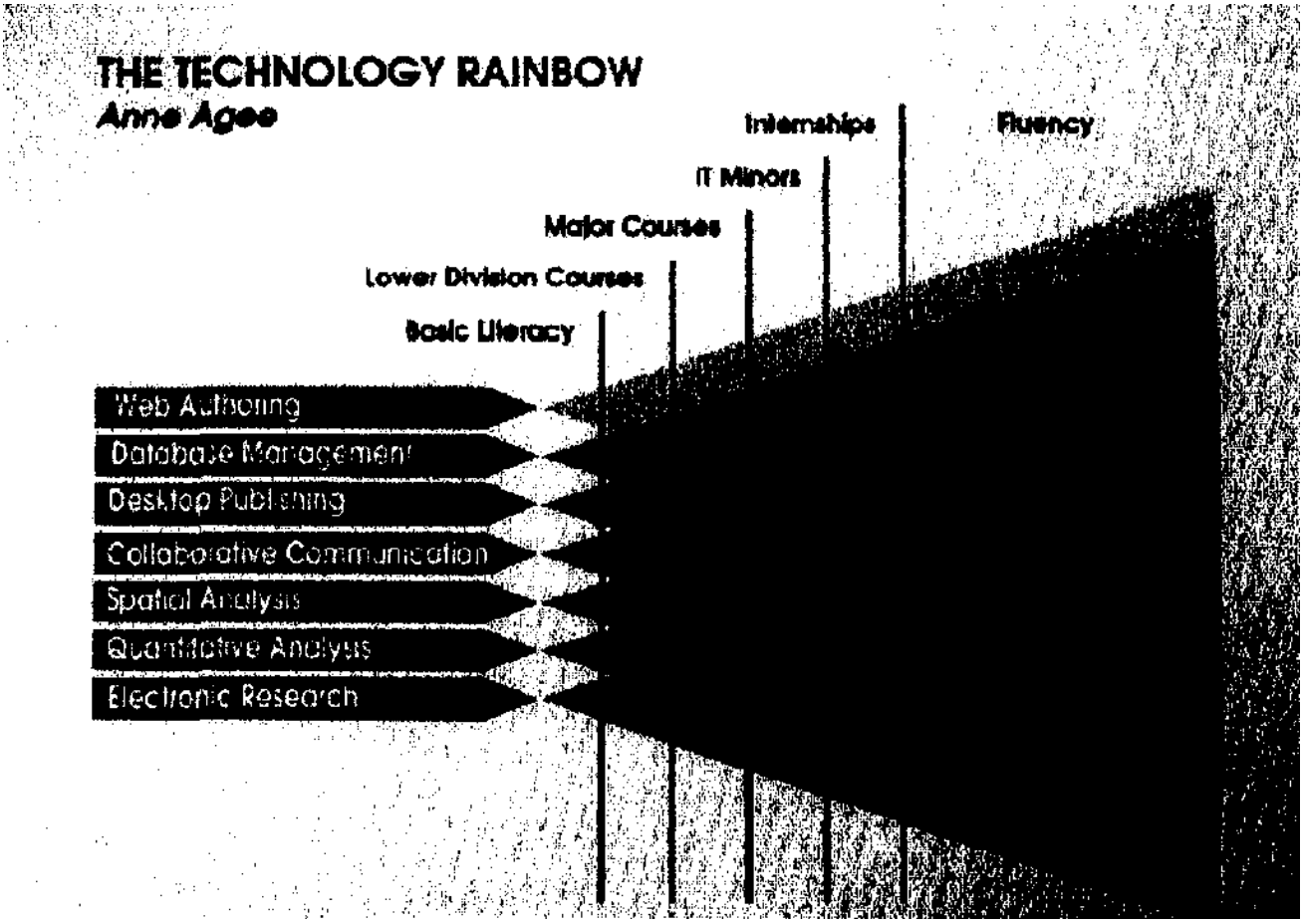

FIGURE 3: INFORMATION LITERACY/I.T. FLUENCY STAGE THREE: PROGRAM IMPLEMENTATION

Setting Appropriate Criteria and High Standards for Learning Quality: Standards for Information Literacy

Standards, which embody a coherent, professionally defensible conception of how a field can be framed for purposes of instruction, help to define the performance criteria that will actualize whatever definition of information literacy has been accepted. Standards may be set by accrediting agencies, professional organizations, state boards, or other agencies with an overarching purview of the agencies, professional organizations, state boards, or other agencies with an overarching purview of the educational process.

In recent years, more and more of these agencies have been attempting to define standards for information literacy. In the K-12 arena, for example, the National Council of Teachers of English and the International Reading Association collaborated to produce Standards

for the English Language Arts in 1996. Of the twelve standards proposed, two of them deal directly with information literacy issues:

7. Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

8. Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge. (NCTE/IRA 1996)

The International Society for Technology in Education (ISTE) has likewise proposed Technology Foundation standards for all students in six categories, including "Technology Research Tools":

- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks (ISTE 1988).

The State of Wisconsin Department of Public Instruction has proposed Model Academic Standards for Information and Technology Literacy, including "Information and Inquiry," as one of the four major content areas:

- Define the need for information Develop information seeking strategies
- Locate and access information sources Evaluate and select information from a variety of print, non-print, and electronic formats
- Record and organize information Interpret and use information to solve the problem or answer the question
- Communicate the results of research and inquiry in an appropriate format
- Evaluate the information product and process (Fortier et al.1998, 10-16).

ISTE has also proposed standards for teachers, which have been adopted by NCATE (National Council for Accreditation of Teacher Education) for programs that prepare teachers of educational computing and technology literacy. Institutions seeking NCATE accreditation are required to respond to these standards. Performance indicators in the category of Telecommunications and Information Access are:

2.3.1 access and use telecommunications tools and resources for information sharing, remote information access and retrieval, and multimedia/hypermedia publishing.

2.3.2 use electronic mail and web browser applications for communications and research to support instruction.

2.3.3 use automated on-line search tools and intelligent agents to identify and index desired information resources (NCATE 1996, 245).

Regional higher education accreditation commissions are also putting increasing emphasis on information literacy in their accreditation standards. Bonnie Gratch Lindauer's excellent article on "Defining and Measuring the Library's Impact on Campus wide Outcomes" provides a useful summary of accreditation standards (Lindauer 1998, 551-553). All seven regional commissions make some reference to the use of information resources within the standards relating to the library.

The Western Association of Schools and Colleges (WASC), however, also introduces information literacy in the educational program section of the standards:

> The general education program provides the opportunity for students to develop the intellectual skills, information technology facility, affective and creative capabilities, social attitudes, and an appreciation for cultural diversity that will make them effective learners and citizens (WASC 1996, 4.C.3).

The Middle States and Southern (SACS) regions include separate sections for standards related to academic computing and information technology. The SACS standard states:

> . . . There must be a reasonable infusion of information technology into the curricula so that students exit with the fundamental knowledge and basic abilities to use these resources in everyday life and in future occupations. Institutions must provide the means by which students may acquire basic competencies in the use of computers and related information technology resources. A reliable data network should be available so that students, faculty, and staff may become accustomed to electronic communication and familiar with accessing national and global information resources. There must be provisions for ongoing training of faculty and staff members so that they may make skillful use of appropriate application software (SACS 1996, 5.3).

The Middle States Commission on Higher Education's Characteristics of Excellence in Higher Education (1994) requires institutions to "foster optimal use of its learning resources through strategies designed to help students develop information literacy—the ability to locate, evaluate, and use information in order to become independent learners" (15). Further, the document continues, the most important measure of the effectiveness of library and learning resources will be "how effectively students are prepared to become independent, self-directed learners" (16). In its 1996 Framework for Outcomes Assessment, Middle States notes that information literacy embraces at least four competencies: cognitive abilities, such as critical thinking and problem solving; content literacy; competence in information management skills; and value awareness (35-36).

Finally, some colleges and universities have begun to define their own standards of performance for information literacy. Notable among these is the California State University system. CSU's core competencies include demonstration of the following skills:

1. Formulate and state a research question, problem or issue not only within the conceptual framework of a discipline, but also in a manner in which others can readily understand and cooperatively engage in the search.

2. Determine the information requirements of a research question, problem, or issue in order to formulate a search strategy that will use a variety of resources.

3. Locate and retrieve relevant information, in all its various formats, using, when appropriate, technological tools.

4. Organize information in a manner that permits analysis, evaluation, synthesis, and understanding.

5. Create and communicate information effectively using various media.

6. Understand the ethical, legal and socio-political issues surrounding information.

7. Understand the techniques, points of view and practices employed in the presentation of information from all sources (CLRIT 1997).

The Maricopa Community Colleges (Arizona) have addressed this issue by defining an "information literate person" as one who can:

A. Understand the basic organization of a college library/information center and the significance of the growing and changing world of information access.

    1. Know different types of access tools available in various formats, electronic (e.g., online catalogs, CD-ROM databases), audiovisual, and print reference sources.
    2. Navigate the information highway with vehicles such as Internet, BITNET, and other networks.

B. Identify the information needed.
    1. Select appropriate subject terms and/or keywords.
    2. Determine type of information needed such as popular vs. scholarly, primary vs. secondary, current vs. retrospective, and so on.

C. Develop a search strategy.
    1. Identify types of sources needed, e.g., books and/or periodical articles.
    2. Select appropriate reference sources.
    3. Determine availability of periodicals.

D. Evaluate the information content.
    1. Understand the implications of the difference between information and knowledge.
    2. Analyze sources for quality, relevance, timeliness, and authority.

E. Apply information appropriately in a research task.
    1. Integrate information resources into academic discourse.
    2. Apply principles of academic honesty in crediting information sources (Ocotillo Information Literacy Group 1994).

To summarize, Bonnie Gratch Lindauer has compiled a statement of core information competencies, based on her research into standards set by libraries, university systems, and state departments of education. Her research indicates a consensus that students who are information literate can:

I. Recognize and articulate information need
    1. Student states a research question, problem, or issue.
    2. Student defines a manageable focus and time line.

II. Develop effective search strategies

1. Student determines the information requirements for the research question, problem, or issue.
2. Student determines what category of information resource is most relevant to the information need and develops a plan to search for needed information.

III. Select and use information retrieval tools
2. Student selects and uses effectively information retrieval tools, including modifying the search strategy for any given tool in response to the results obtained.
3. Student uses the technological tools for accessing information.
4. Student can access and effectively use the campus information systems, information networks, and the Internet to locate information appropriate to the need.

IV. Locate and retrieve information sources
1. Student correctly interprets bibliographic citations and Internet equivalents and knows how to obtain cited items.
2. Student uses interlibrary loan, document delivery, electronic transmission, or other means to obtain material not available locally.

V. Analyze and critically evaluate information
1. Student analyzes and critically evaluates the results of a search for accuracy, relevance, timeliness, authority, etc.
2. Student filters large amounts of information and distinguishes among facts, points of view, and opinion.

VI. Organize and synthesize information
1. Student synthesizes information from a variety of sources and organizes information for practical application.

VII. Use/apply information
1. Student applies information to critical thinking and problem-solving situations.
2. Student communicates using a variety of information technologies.
3. Student integrates information resources into academic discourse.
4. Student produces and communicates information in effective and appropriate formats.

VIII. Awareness and attitude formation about information and information technology
1. Student is aware of the ethical, legal, and socio-political issues surrounding information and information technology, such as copyright and the responsibility to properly credit information sources.
2. Student appreciates that the skills gained in information competence enable lifelong learning.
3. Student is aware of the difference between information and knowledge.
4. Student is aware of the structure and dissemination channels of the global information environment (Lindauer, Compilation 1998).

The most wide-ranging "standards setting" document for information literacy in colleges and universities is the Information Literacy Competency Standards for Higher Education, first released in 1999. These standards were developed by a task force composed of librarians, higher education administrators, and accreditation officials; they were reviewed by an assessment

specialist; finally, they were approved by the Board of the Association of College and Research Libraries in January 2000 and, in May 2000, were endorsed by AAHE (American Association of Higher Education). These standards were written to be as conceptually inclusive as possible of all facets of information literacy that one might expect to find in higher education. For example, there are outcomes statements given under several of the standards relating to specific information technology skills (i.e, use of electronic discussion groups and chat rooms; use of personal productivity software to extract and manage information; use of computer technologies such as simulations to study the interaction of ideas). The standards also focus on social, ethical, and legal uses of information—a burgeoning area of concern for faculty and others. Overall, these Competency Standards bring together the entire range of intellectual activity associated with information-seeking, retrieval, evaluation, management, and use; and embed this multi-faceted activity within the context of disciplines and research processes particular to applied fields. Most central to the Competency Standards, whether their eventual application lies in use of specific technologies in locating and managing information, or in the recursive revision of an entire research process, is critical thinking—deliberative judgment in making sound choices about all aspects of information retrieval, management, evaluation, and use.

These *Information Literacy Competency Standards* envision a highly integrated, collaborative approach to information literacy instruction, programming, and assessment—one involving faculty, educational technologists, assessment specialists, administrators, as well as librarians. The Competency Standards offer a guide for program and curriculum planning, curriculum revision, and transitioning from more traditional "library skills" to more curriculum-integrated approaches. The outcomes stated under the "standards" and "performance indicators" in the document can be adapted in local institutions as librarians, educational technologists, and others work with faculty on assessment initiatives.

For example, Standard Three deals with evaluation of information: "The information-literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system" (Information Literacy Competency Standards, 2000). Under this Standard, two different "performance indicators" obviously call for involvement by librarians and technologists working with faculty: Performance Indicator 2. The information-literate student articulates and applies initial criteria for evaluating both the information and its sources.

Outcome a. Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias. [faculty, librarians]

Performance Indicator 3. The information-literate student synthesizes main ideas to construct new concepts.

Outcome c. Utilizes computer and other technologies (e.g., spreadsheets, databases, multimedia, and audio or visual equipment) for studying the interaction of ideas and other phenomena [faculty, educational technologists] (Information Literacy Competency Standards 2000).

The *Competency Standards* enlarge the possibilities for both campus-wide discussions on information literacy and program-specific implementation of outcomes and assessment instruments that create an information literacy program with both breadth (programmatic scope) and depth (increased student understanding of information seeking and management in specific

disciplines). The "broad umbrella" for information literacy envisioned in the Competency Standards, combined with a growing appreciation of the developmental or "fluency" dimension of information skills over a lifetime (as suggested in the "FITness Report"), create a compelling vision for collaboration, planning, and assessment.

The broad range of definitions of information literacy and the broad diversity of agencies interested in setting standards for information literacy indicates that this issue has impact well beyond the library. On the other hand, as Lindauer's compilation of core competencies indicates, there is a great deal of similarity in the standards set by these various organizations, which provides the basis for a collaborative approach to this issue. Libraries can certainly have a leadership role in building coalitions across departments and institutions to leverage resources to address information literacy.

Systematically Gathering, Analyzing, and Interpreting Evidence: Assessing Compliance with the Standards

Having established standards or criteria by which to measure learning, the next step is to carry out the measurement or assessment of the degree to which the stated learning has been achieved.

In 1992, with the assistance of a FIPSE grant, the American Association for Higher Education (AAHE) developed and published Principles of Good Practice for Assessing Student Learning. As shown below, this document remains one of the clearest statements of the components of effective assessment and should inform any assessment effort.

1. The assessment of student learning begins with educational values.

Assessment is not an end in itself but a vehicle for educational improvement. Its effective practice, then, begins with and enacts a vision of the kinds of learning we most value for students and strive to help them achieve. Educational values should drive not only what we choose to assess but also how we do so. Where questions about educational mission and values are skipped over, assessment threatens to be an exercise in measuring what's easy, rather than a process of improving what we really care about.

2. Assessment is most effective when it reflects an understanding of learning as multidimensional, integrated, and revealed in performance over time.

Learning is a complex process. It entails not only what students know but what they can do with what they know; it involves not only knowledge and abilities but values, attitudes, and habits of mind that affect both academic success and performance beyond the classroom. Assessment should reflect these understandings by employing a diverse array of methods, including those that call for actual performance, using them over time so as to reveal change, growth, and increasing degrees of integration. Such an approach aims for a more complete and accurate picture of learning, and therefore firmer bases for improving our students' educational experience.

3. Assessment works best when the programs it seeks to improve have clear, explicitly stated purposes.

Assessment is a goal-oriented process. It entails comparing educational performance with educational purposes and expectations—those derived from the institution's mission, from faculty intentions in program and course design, and from knowledge of students' own goals. Where program purposes lack specificity or agreement, assessment as a process pushes a campus toward clarity about where to aim and what standards to apply; assessment also prompts attention to where and how program goals will be taught and learned. Clear, shared, implementable goals are the cornerstone for assessment that is focused and useful.

4. Assessment requires attention to outcomes but also and equally to the experiences that lead to those outcomes.

Information about outcomes is of high importance; where students "end up" matters greatly. But to improve outcomes, we need to know about student experience along the way—about the curricula, teaching, and kind of student effort that lead to particular outcomes. Assessment can help us understand which students learn best under what conditions; with such knowledge comes the capacity to improve the whole of their learning.

5. Assessment works best when it is ongoing not episodic.

Assessment is a process whose power is cumulative. Though isolated, "one-shot" assessment can be better than none, improvement is best fostered when assessment entails a linked series of activities undertaken over time. This may mean tracking the process of individual students, or of cohorts of students; it may mean collecting the same examples of student performance or using the same instrument semester after semester. The point is to monitor progress toward intended goals in a spirit of continuous improvement. Along the way, the assessment process itself should be evaluated and refined in light of emerging insights.

6. Assessment fosters wider improvement when representatives from across the educational community are involved.

Student learning is a campus-wide responsibility, and assessment is a way of enacting that responsibility. Thus, while assessment efforts may start small, the aim over time is to involve people from across the educational community. Faculty play an especially important role, but assessment's questions can't be fully addressed without participation by student-affairs educators, librarians, administrators, and students. Assessment may also involve individuals from beyond the campus (alumni/ae, trustees, employers) whose experience can enrich the sense of appropriate aims and standards for learning. Thus understood, assessment is not a task for small groups of experts but a collaborative activity; its aim is wider, better-informed attention to student learning by all parties with a stake in its improvement.

7. Assessment makes a difference when it begins with issues of use and illuminates questions that people really care about.

Assessment recognizes the value of information in the process of improvement. But to be useful, information must be connected to issues or questions that people really care about. This

implies assessment approaches that produce evidence that relevant parties will find credible, suggestive, and applicable to decisions that need to be made. It means thinking in advance about how the information will be used, and by whom. The point of assessment is not to gather data and return "results"; it is a process that starts with the questions of decision-makers, that involves them in the gathering and interpreting of data, and that informs and helps guide continuous improvement.

8. Assessment is most likely to lead to improvement when it is part of a larger set of conditions that promote change.

Assessment alone changes little. Its greatest contribution comes on campuses where the quality of teaching and learning is visibly valued and worked at. On such campuses, the push to improve educational performance is a visible and primary goal of leadership; improving the quality of undergraduate education is central to the institution's planning, budgeting, and personnel decisions. On such campuses, information about learning outcomes is seen as an integral part of decision making, and avidly sought.

9. Through assessment, educators meet responsibilities to students and to the public.

There is a compelling public stake in education. As educators, we have a responsibility to the public that support or depend on us to provide information about the ways in which our students meet goals and expectations. But that responsibility goes beyond the reporting of such information; our deeper obligation—to ourselves, our students, and society—is to improve. Those to whom educators are accountable have a corresponding obligation to support such attempts at improvement (AAHE Assessment Forum 1992).

Methods of assessment may vary depending on what is being measured and what implementation strategies have been adopted by the institution. At the very least, though, assessment needs to be considered for individual assignments or classes, for individual courses, and for entire programs of study. Assessment methods range from tests of knowledge to tests of performance, seen as individual elements or seen holistically as part of a comprehensive and integrated program of student learning. In a comprehensive institutional program of information literacy, various assessment tools may be appropriate at different stages of the program. However, it is clear that accrediting agencies and other stakeholders are putting increasing emphasis on assessment that measures student learning outcomes directly rather than those measures which indirectly assess an institution's performance. The Western Association of Schools and Colleges (WASC), for example, is currently engaged in a revision of its standards of accreditation. In its "Invitation to Dialogue" about new standards, WASC notes a major shift in the core beliefs underlying the standards.

> ... the 1988 Standards reflect a definition of quality that places emphasis on the existence of institutional structures and processes—e.g. does the institution have a mission statement, planning processes, faculty senate, and program review procedures. There is less emphasis, however, on the demonstrated effectiveness of these structures and processes or of their contribution to student learning. As a consequence, self studies are consistently structured around descriptions of structures and processes rather than analyses of effectiveness (WASC 1998, 4).

Further, WASC's "Invitation to Dialogue" posits as one of its guiding principles: "Greater emphasis is needed on evidence of educational effectiveness and student learning" (8).

In other words, in terms of assessing students' information literacy, it is not enough to gather data about how many classes were offered by the library or how many research assignments students had to complete in a given program. To demonstrate student learning, assessment strategies should focus on direct measures of student learning. The North Central Association Commission on Institutions of Higher Education (NCA) offers the following examples of such direct measures:

- A capstone experience
- Portfolio assessment
- Standardized tests
- Performance on national licensor, certification, or professional exams
- Locally developed tests
- Essay questions blind scored by faculty across the department, division, school, or college
- Qualitative internal and external juried review of comprehensive senior projects
- External evaluation of performance during internships based on stated program
- objectives (Lopez 1996, 2-3).

NCA further notes that meaningful assessment should be conducted at various points throughout the learning experience, not just before it and after it.

> Practices that gather, accrue and finally assess the cumulative evidence of the academic experience ... are cited as exemplary means of measuring learning that has taken place during completion of a program. Team members typically consider it to be a primary weakness if an assessment program lacks any specific measurement of learning in-process (i.e., over time or at different points in time rather than at only the beginning or at only the completion of a program) (Lopez 1996, 2).

> Evaluators find that direct measures of student learning yield useful information… especially when the results from multiple measures are triangulated and are compared with (1) baseline data and/or with (2) data from other measures taken over time (Lopez 1996, 4).

Student learning takes place in several domains: cognitive (knowledge acquisition), behavioral (skill acquisition), and affective (attitudinal development). Assessment measures, therefore, should be designed to look at all three types of learning.

The Middle States Commission on Higher Education suggests in Frameworks for Outcomes Assessment (1996) that standardized test instruments are one of the best demonstrations of cognitive abilities and content literacy. Further, "in many cases, the results of these objective tests for seniors can be validly juxtaposed with the scores of the same students when they were freshmen, thus providing documentation for the value added by the institution's program of general education" (36).

While there are a number of vendor-specific certification exams, there is, at the moment, no national standardized test available for information technology literacy. However, there are some current attempts to develop such an instrument. The Virginia Foundation of Independent Colleges (VFIC) is one agency that has undertaken to create an Information Technology Certification Exam: tek.Xam. VFIC's Web site (1999) describes the potential of this instrument:

> The Virginia Foundation for Independent Colleges (VFIC), in conjunction with Virginia's business community, has developed Tek.Xam -The Technology Certification Exam. Tek.Xam will enable students to indicate to potential employers that they possess a level of technological proficiency that has become essential in today's workplace. The examination has the potential to serve as a widely-accepted credential that can help meet the needs of corporations across the country seeking to fill technology-intensive jobs.

Tek.Xam, computer-based and delivered via the Internet, is a five-hour examination. It is currently being piloted at a number of Virginia institutions. According to VFIC, "the exam is not merely a test of students' technical proficiency, but is designed to measure their ability to use technical tools to solve problems that require critical thinking and analytic skill."

The exam covers seven different information technology skill areas:

Skill Area 1: Internet Research & Evaluation
A student is asked to use an Internet browser and search engine to find the answers to specific questions. Given several specified websites, a student is asked to determine bias, quality of information available at those sites, and perspective of the website creator.

Skill Area 2: General Computing Concepts
A selected response section that deals mainly with telecommunications, network applications, technical terminology, problem solving in a technical environment, software & hardware components and use thereof, etc.

Skill Area 3: Web Design
Student is asked to create a multi-page working website.

Skill Area 4: Presentation
Student is asked to create a multi-slide presentation about a given topic.

Skill Area 5: Spreadsheets
Student is asked to create a spreadsheet and graph given raw data.

Skill Area 6: Word Processing
Student is asked to create a document using a word processor and incorporate tables and graphs from another application software product.

Skill Area 7: Legal & Ethical Issues in Technology
Selected response section in which a student reads a case study, ascertains the ethical issues involved, selects appropriate behavior, and defines legal terms (VFIC 1999).

Montana State University-Bozeman's campus assessment program (1999) has posted on its Web site an excellent list of assessment methods that suggests a very broad range of techniques designed to measure different types of learning. A selection of these assessment tools, many of which can be adapted for assessing students' growth in information technology literacy, is shown below.

- Conduct focus group interviews with students at different levels of the major to obtain student feedback on advising, courses, and curriculum.

    - Collect and review portfolios of students' work from several courses taken throughout the major.
    - Conduct pre- and post-testing of student knowledge in a capstone course.
    - Develop a checklist and rating scale for expected knowledge and skills. Have three faculty use these tools to evaluate major works such as senior projects, theses, and dissertations. Although many of these undertakings receive an "A" grade, reviewing content for specific knowledge and skills may reveal areas which, although acceptable, are consistently below expectations.
- Evaluate videotapes of students' skills, such as student teaching or making class presentations.
- Invite outside examiners from business, industry, and the professions to provide feedback on students' presentations or projects.
- Assign a research/creative project to be evaluated by several faculty members.
- Evaluate student performance in internships, practica, student teaching, etc., from the student's perspective, the faculty member's perspective, and the supervisor's perspective.
- Use "real-world" assignments such as case studies, in-basket exercises, recitals, and exhibits to evaluate whether students can integrate knowledge and skills developed throughout their progress in the major.
- Attach a short survey to forms required for graduation to capture feedback from students about to graduate. If you have a one-year-out alumni survey, avoid asking redundant questions of these two similar groups.
- Conduct exit interviews with graduating seniors, either individually or in focus groups, or ask for written evaluations of how well the major met their personal goals.
- Survey employers of alumni.
    - Determine whether you want general information about "our graduates" or specific information about "this graduate"
    - Make the survey short and pertinent
    - Recognize that the response rate is likely to be low
    - Consider the possibility of focus groups with employers

The strategies discussed above emphasize institutional assessment. However, Middle States' Framework for Outcomes Assessment indicates a growing trend toward classroom or course-embedded assessment as the tool of choice.

> Assessment of student learning is best accomplished in the place where that learning occurs—in the classroom. The placement in courses across the curriculum of specific expectations for the general education of students and the coordination of course-embedded assessment tasks to document their attainment is a strategy which holds much promise in providing a natural context for the assessment of cumulative learning. Indeed, course-embedded assessment may well be unlimited in the range of outcomes which can be assessed, including the cognitive abilities, literacy skills and value awareness associated with general education (Commission on Higher Education 1996, 37).

The work of Thomas Angelo and K. Patricia Cross, leaders in the classroom research movement, addresses what they describe as "a major problem encountered by the assessment movement," namely, that "faculty members are not fully involved in the process, and the results of institutional assessment are rarely used to make a difference in the classroom" (xiii). Their book, Classroom Assessment Techniques: A Handbook for College Teachers, now in its second edition (1993), is the bible of the classroom assessment movement.

One of Angelo and Cross's primary tools is the "Teaching Goals Inventory," a self-assessment of instructional goals, designed to help faculty members become more aware of what they want to accomplish in a given course. Just as institutional assessment, in order to be effective, must be linked to institutional goals, classroom assessment must be related to course goals. Angelo and Cross also provide an index of assessment techniques cross referenced to specific kinds of instructional goals and to specific disciplines.

Classroom assessment techniques can range from fairly simple techniques like directed paraphrasing to rather complex techniques like classroom assessment quality circles. The first technique involves asking students to paraphrase important information from a particular lesson. For example, a nursing student might receive this prompt:

> In one or two sentences, paraphrase what you have learned about hospice care to inform a dying, but still lucid, patient of its possible advantages over hospital or home care (Angelo and Cross 1993, 233).

The paraphrase exercise provides a quick assessment of students' ability to translate specialized information for an audience with less specialized knowledge. This technique might be adapted for information literacy assessment by asking students to paraphrase what they have learned about search strategies for a younger sibling who has asked for help with a school assignment.

Quality circles, a more complex classroom assessment technique, gives students a structured way to respond thoughtfully to class sessions, and may be especially effective in large classes. Cross and Angelo's example of this technique presents a Western Civilization class of 200 where 20 students volunteer to act as a quality circle. The professor meets with part of the group every three weeks or so to get feedback on the learning in the class. The quality circle members also agrees to contact, poll, or meet with other students in the class to solicit their feedback as well (Angelo and Cross 1993, 340). This technique might be adapted to get feedback on students' learning of information literacy skills in almost any course.

Certainly there is no shortage of techniques available for institutional or classroom-based assessment. Knowledge of these strategies is an important first step in assessment. But being able to apply the techniques in a systematic way and use the information to improve student learning of information literacy requires more than just an awareness of assessment possibilities. It calls for institutional or cross-institutional commitment and resources. The case studies in the next section detail how several institutions have developed information literacy programs that include meaningful assessment components.

Using the Resulting Information to Document, Explain and Improve Performance: Case Studies

Assessment of information literacy programs depends, of course, upon a coherent plan for assessing student learning resulting from those programs. Lacking such a plan, many traditional library instruction or bibliographic instruction programs have attempted various forms of evaluation using established methodologies such as pre- and post-tests and student surveys which identify the affective dimensions of learning. But these evaluation efforts have usually been episodic and short term, and rarely related to larger educational goals or learning outcomes at the institutional level. In part this has resulted from the disconnected nature of much traditional bibliographic instruction, even in its course-related form; such instruction is not connected to the curriculum. The "course-integrated" instruction that librarians sometimes refer

to holds much more promise for deeply embedding information literacy concepts and skills within and across the curriculum, but the course-integrated model has been implemented only in rare instances. This model would involve librarians as team members with educational technologists, instructional designers, and assessment specialists, working together with faculty and students to develop a fully realized, sustainable, and constantly attended to assessment plan connecting information literacy to the major educational goals of an institution.

Some of the best-known bibliographic instruction/user education programs in the country, though, do provide instructive examples of the potential and pitfalls of assessment for information literacy planning. One such program is the very well-known User Education Program at Ohio State University. This program, reaching thousands of students at one of the largest state universities, has seen dramatic changes over the past twenty years, with the proliferation of electronic resources and the escalating demands on instruction librarians eventually resulting in a technology-based solution to instructional delivery.

In 1989, Virginia Tiefel, the Director of the program, published a very honest account of ten year's worth of experience in evaluating the freshman component of the program. Tiefel's evaluations documented that the program made substantial differences in students' cognitive skills and attitudes toward libraries and library resources. In conducting her systematic, program-level overview of the student evaluations, however, Tiefel identified a number of problems with the pre- and post-tests employed in assessing student skills: lack of consistency in pretests, test questions that were not field-tested, and lack of adequate sample sizes in student populations. To correct these problems, Tiefel sought the support of an evaluation specialist on her campus. The resulting testing/assessment procedures were much more rigorous, even if some difficulties remained with specific test questions. Overall, Tiefel was able to use the data from the tests and surveys given to students to demonstrate to administrators that the program made a difference in student learning about library-specific topics, such as search strategy, use of the online catalog, understanding call numbers, even though student's misperceptions about some of these topics continued (Tiefel 1989).

Most notable about this earlier Ohio State experience with evaluation is the commitment to correcting problems systematically and at the "program level": that is, making sure the resources are available to conduct rigorous, valid evaluations, and making sure evaluations are used to make programmatic changes. The subsequent history of the Ohio State program is well-known: the award of a FIPSE Grant to develop the highly regarded "Gateway to Information" project that guides students in finding and evaluating information through a plethora of electronic resources. It is probably reasonable to believe that rigorously evaluated and assessed programs, because they are a relative rarity, are able to expand and develop in innovative ways because they document both their successes and their failures to both internal and external audiences.

Another very interesting case is that of James Madison University, a smaller (Master's I) university in Virginia with a highly developed assessment effort across the campus. The library instruction program has worked with the Office of Student Assessment since 1989 to measure students' developing library skills across four years of the undergraduate experience. Notable in this assessment program is the use of two "assessment days" each year: the first in the fall semester, designed only for first year students, and the second in the spring semester, for second-semester sophomore and first-semester juniors. Classes are canceled, and students are given a series of tests to assess knowledge and skills from a number of areas across the curriculum, including library research skills. (The same assessment days are used to assess graduating

seniors' knowledge and skills in their majors). In total, therefore, there are three tiers of assessment: a basic skills test for entering freshmen; the sophomore/junior tests; and the subject-specific tests for graduating seniors.

Results from these series of assessments show significant gains from the freshman to the sophomore/junior level in basic library and research skills. The tests and surveys administered also show positive student attitudes toward electronic information sources and active learning methods. Librarians with assignments to specific academic departments developed sophisticated "mastery tests" for specific majors. However, the test for freshmen show low scores on questions related to the Virginia Standards of Learning and Library/Information Use (the standards used in public schools), despite the students' having received library instruction in the public schools. Therefore, the James Madison entering freshmen tests have provided some invaluable "articulation information" to both university librarians and school librarians in the state (Banta 1996, 223-226).

More recently, the James Madison program has implemented a series of Web-based modules ("Go for the Gold") to teach information literacy skills. Students' use of the skills learned from these modules in their course work has been evaluated through competency tests tied to the general education curriculum. Test questions center on four areas: general library/bibliographic skills; database searching; Internet skills; and information ethics. Results from the 1999 academic year showed strong performance in all areas, with students showing more confidence in using the Internet than the library. Although overall performance standards have not been set for these competency tests, such standards are currently being developed and will be applied to tests administered in Fall semester 1999 (Cameron 1999).

In sum, the fact that the university dedicates two days to assessment during each academic year—and funds and staffs an Office of Student Assessment—shows the importance of this activity at James Madison. The library instruction program has taken advantage of these opportunities to gather invaluable longitudinal data about student progress with library and research skills—and the emerging "information literacy" skill set—over students' four-year careers. Longitudinal studies and long-term assessment efforts are all too rare in information literacy programs; the James Madison case shows what can be done with sustained support from central administration and active interest among librarians.

Different types of institutions have, of course, approached assessment differently. Community colleges have implemented some of the most innovative assessment programs. One such example is Pierce College, a state-funded community in Washington state. Strong leadership from the library director at Pierce, working with faculty and administrators, resulted in an adaptation of the well-known Alverno College model of assessment. The Pierce College "Information Abilities Program" grew out of careful study of the Alverno College model, which sees student self-assessment as integral to all assessment. As early as 1991, the library at Pierce College experimented with a variety of assessment methods, but concentrated its most serious assessment efforts in two pilot-tested courses using the "Abilities Model" in the 1994-95 academic year. The very positive results allowed librarians to work with faculty in integrating information competencies (another variant in the "information literacy" family of terminology) across the curriculum. The strong collaborative relationships between librarians, faculty, and others show how assessment can become part of an institutional culture. Most important, students are an integral part of this effort because they are educated from the outset about standards, abilities, and skills they are expected to acquire as they learn to assess themselves (Gilchrist 1997).

These cases demonstrate what is increasingly necessary for sound assessment of information literacy: active participation by librarians, collaboration with others across campus, sustained support at the institutional level, and persistence in working through problems and difficulties that inevitably arise in any assessment program. Some newer information literacy programs have fortunately chosen to build in assessment and evaluation as an integral part of their program planning, and have benefitted from the experience with evaluating "library skills" in the older paradigm. However, assessment of information literacy will need much more concerted attention and effort because of problems in working out definitions and performance standards with a wide variety of professionals who have a stake in seeing information literacy become pervasive in their institutions.

Three notable examples of newer information literacy programs with assessment plans are those of Florida International University, the California State University system, and the Uwired Program at the University of Washington. The Information Literacy Initiative at Florida International involves a partnership between the library, departmental faculty, and the Academy for the Art of Teaching. This program is especially designed to develop students' critical thinking skills in dealing with information. The developers of the program see the following as outcomes:

- Information literacy classes in more areas of the curriculum
- Definition of critical thinking outcomes for each level of core courses within a given curriculum
- Specific assignments that involve both enhancement of information literacy skills and the application of critical thinking to search outcomes
- Assessment tools to measure outcomes (Florida International University 1999)

The "cross-curricular" nature of this initiative, with outcomes assessment envisioned throughout, is especially promising.

The California State University Library system has developed an assessment plan for all of its campuses, linked to the system-wide Information Competence Plan. The assessment plan builds on the system's earlier Master Plan for Library Instruction, first produced in 1988. The newer assessment plan states that the university system "has adopted a policy requiring our students to acquire, process, communicate, and critically evaluate information using current electronic technologies before graduation." The Plan provides for a number of pilot projects throughout the state, each with a pretest and follow up formal evaluation by faculty and students involved. Formal evaluation forms are used for other components of the program, and librarians are encouraged to become involved in reviewing student papers to assess the quality of the resources cited in them. That this major state university system has a comprehensive assessment plan underway is noteworthy; the effort to conduct systematic and formal evaluations of program components will produce large amounts of data that should prove useful to decision-makers in further developing the state-wide Information Competence program (California State University 1999).

The UWired Program at the University of Washington, begun in 1995, is a multi-faceted initiative designed to integrate information and technology into the curriculum through faculty development, improved telecommunications infrastructure, innovative teaching and learning spaces, and partnerships among the Libraries, Computing and Communications, and the Undergraduate Education program. Particularly noteworthy is the Library's leadership in curriculum development for teaching information literacy skills in a variety of venues: in linked

courses, in information and technology seminars, in specially developed credit courses on information literacy, and in a number of subject-specific, advanced courses.

Evaluation was envisioned as part of the UWired Program since its beginning. Formative evaluation instruments have been used from the early stages to provide necessary feedback to leaders and coordinators of various parts of the program. More recently, the Evaluation Committee associated with the program has especially focused on assessment of outcomes or products rather than piecemeal, uncoordinated evaluations of various parts of the program. The Evaluation Committee is especially interested in exploring new Web-based evaluation techniques and instruments for measuring program effectiveness. The complexity of the UWired program poses special challenges for program review and assessment, but the technological innovation so crucial to the program's success, together with the strong collaborative working relationships among librarians, computing professionals, faculty, and administrators, shows great promise for producing ongoing, systematic, comprehensive program assessment. (University of Washington 1999)

Whither Assessment? A Conclusion

The future of information literacy programs is at once promising and problematic. Many leaders in education, business, community organizations, and other arenas are recognizing the need for an information-literate population. At the same time, all of us responsible for developing and assessing information literacy programs are only beginning to understand the full complexities involved. Older models of library instruction and computer skills training teach us something about program development and assessment, but not enough. Future information literacy programs will have to become more integral to teaching and learning processes on college and university campuses and elsewhere for a true "outcomes approach" to information literacy to be recognizable.

The strands of thought and practice interwoven into some of case studies discussed in this paper point toward future "best practices" for assessment of information literacy programs (and of the learning that is looked for as a result of such programs). These "best practices" can be summarized as follows:

1. Pervasiveness of assessment. Assessment should not be episodic and infrequent, but ongoing, regular, and systematic, as the AAHE "best practices" suggest. Assessment of information literacy should be carried out "across the curriculum" in the same manner that "writing across the curriculum" is part of some institutions' culture. Assessment of information literacy should also occur regularly as part of a student's progress through general education and a major in college.

2. Training and education for managers. Information literacy program managers must devote substantially more of their time to assessment and must have much more in-depth training in assessment and evaluation issues from library school curricula or other appropriate training and continuing education opportunities. They should enlist the support of assessment experts on their own campuses, of course, but must be prepared to address assessment issues on

a deep, programmatic, and continuous level that moves beyond the assistance assessment experts and offices might provide.

3. Clarity of definitions of information literacy. The ambiguities defining information literacy continue. While we cannot spend inordinate amounts of time working out the finer points and nuances of definitions, some issues need to be settled. These include: information literacy as a state of knowing vs a state of becoming (static concepts vs "fluency"); the relationship between information literacy and some of the other, newer, literacies (e.g., network literacy, digital literacy, media literacy); the relationship between information literacy and the problem-solving and critical thinking processes many institutions want to inculcate in their students; and of course, the role of information technology skills within an overall concept of information literacy.

4. Standards and performance indicators for information literacy competencies. In some states, K-12 school systems and state departments of education have delineated major information literacy competency lists. College and universities have not done so. The ACRL Model Statement of Objectives, written in 1988, was never intended to be a national curriculum but rather an advisory curricular planning document. The same spirit will prevail in the newly revised Model Statement. The Information Literacy Competency Standards/or Higher Education, released in 2000, also promises to systematize thinking about such standards in higher education.

5. Articulation of standards and assessment approaches between levels of education. It follows from points #3 and #4 that leaders in K-12 and higher education should be discussing information literacy programs and major assessment initiatives in their respective arenas, looking for opportunities to link K-12 and college- and university-system assessment efforts for information literacy programming. The wide disparity of information literacy competencies required within specific states and within particular institutions is a major hurdle but also a major opportunity to develop more coherent, less duplicative information literacy programming as students progress through various levels of education.

6. Collaboration among all the "stakeholders". Information literacy assessment is such a large undertaking that neither librarians nor educational technologists by themselves can ever hope to implement systematic, comprehensive assessment programs. Faculty, administrators, assessment and evaluation personnel, and students themselves should be involved in planning assessment as an integral part of program development. As Lindauer says:

> An environment that encourages the growth and development of an information literacy program is built on collegial partnerships of librarians, disciplinary faculty and other appropriate staff and founded on collaboration and articulation within the college community and K-12 sectors. Communication and cooperative agreements are developed among the units of an institution that provide information literacy instruction and training

so that each contributes to campus-wide goals of teaching information literacy competencies (Lindauer, Compilation, 2).

7. Development of standardized instruments where appropriate. Librarians and others frequently search for examples of sound assessment and evaluation instruments and processes in their professional literature—instruments and processes that are portable and adaptable from one institution to another. Commonly agreed upon definitions and standards for information literacy should allow for creation of standardized assessment instruments for capturing "baseline" information on students' competencies. This might be especially appropriate for large populations, using Web-based testing and evaluation software.

8. Transformed curricular structures that improve learning of information literacy concepts and skills. Librarians have long lamented the limitations of the "one shot" presentation, pointing to its extremely short-term impact on student learning. In large part, opportunities for assessing the one-shot are usually limited to taking stock of students' perceptions. Multiple sessions and credit courses (including linked credit courses) obviously extend the learning horizon. However, information literacy must become everyone's business, not just the business of librarians and technologists. Just as writing-across-the-curriculum makes writing the responsibility of faculty in all disciplines, information literacy programming should permeate the curriculum so that everyone has ownership of it and takes responsibility for coaching students in the long developmental process of becoming more information literate—a process that lasts a lifetime. The learning opportunities tied to information literacy in college should be problem-based, create opportunities for critical thinking about information and technology, and move students toward taking responsibility for their own learning and for assessing their own information literacy.

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Related Web Sites

AAHE Assessment Forum http://www.aahe.org/assessment/assessnw.htm

Directory of Online Resources for Information Literacy http://www.cas.usf.edu/lis/il/

Institute for Information Literacy http://www.ala.org/acrl/nili/nilihp.html

National Forum on Information Literacy http://www.infolit.org