

# DEVELOPING RESEARCH & COMMUNICATION SKILLS

## GUIDELINES FOR INFORMATION LITERACY IN THE CURRICULUM

Middle States Commission on Higher Education

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# Developing Research & Communication Skills

## Guidelines for Information Literacy In the Curriculum

**T**he Middle States Commission on Higher Education, in the 2002 edition of *Characteristics of Excellence in Higher Education: Eligibility Requirements and Standards for Accreditation*, defines information literacy as:

...an intellectual framework for identifying, finding, understanding, evaluating and using information. It includes determining the nature and extent of needed information; accessing information effectively and efficiently; evaluating critically information and its sources; incorporating selected information in the learner's knowledge base and value system; using information effectively to accomplish a specific purpose; understanding the economic, legal and social issues surrounding the use of information and information technology; and observing laws, regulations, and institutional policies related to the access and use of information (p. 32).

The guidelines in this publication, *Developing Research & Communication Skills*, do not expand the requirements for accreditation that are outlined in the Commission's standards. Nor does the Commission require that information literacy be defined and assessed separately from other student learning goals, because it may well be reflected in the achievement of other goals. Rather, these guidelines offer specific suggestions for integrating information literacy throughout the curriculum.

The principles underlying information literacy are as old as higher education itself. Faculty and administrators have expectations for how students will acquire, analyze, and use information related to courses that the institution offers. However, the usage of the term in contemporary educational practice has brought these various elements together into a single concept that has increasing value as a way to cope with the challenges of the "Information Age."

### Why Focus on Information Literacy?

These guidelines demonstrate how the concept of information literacy has relevance for faculty members, librarians, students, administrators, and the institution as a whole. For the faculty, Chapter 1 demonstrates that information literacy can serve as a framework for linking together and enhancing the various expectations for student learning at the institution, program, and classroom levels. Chapter 2 offers suggestions for incorporating information literacy, explicitly or seamlessly, into the curriculum at lower, upper, and graduate levels. Chapters 3 and 4 address assessment and the use of assessment findings for improving teaching and learning. Throughout, the text and the appendices illustrate how faculty and librarians can help students to understand the benefits that come from being information literate.

Information literacy frequently is introduced to students when they are expected to access and evaluate sources available in or through a library. However, it also extends to the essential tasks of analyzing the content of the material, creating new knowledge, and using that knowledge to produce a product, performance, or other activity. For these reasons, information literacy applies to anyone learning anything, anywhere, and at any time. In other words, in any learning endeavor, the student invokes some aspect(s) of the information literacy process, although the particular skills involved may not be well-honed or even recognized as part of a larger, coherent, and iterative process. In this sense, information literacy could be considered as a metaphor for the entire learning experience.

As noted by the Association of College and Research Libraries (2000), one of the highest and best uses for information literacy is as a metacognitive device for students to manage better the learning process, because they will be able to determine more clearly where their search for information and understanding fit within the paradigm at any given moment—whether they are accessing, evaluating, or using a particular piece of information. They can decide whether they need to return to some prior point, even to reframing the research question, and then retrace their steps with a different breadth or depth.

The National Research Council (2001, pp. 78-79) recommends the use of a metacognitive approach to learning, because it enables students “to step back from problem solving activities” and to reexamine their progress. Drawing on research, the Council also discusses some of the merits of metacognition and its strong links to “domain-specific knowledge and expertise.”

Furthermore, as students adapt to emerging technologies, they begin to appreciate the array of digital media and the tools that deliver and process information. Information literacy initiatives also emphasize the importance of “lifelong learning,” because learning occurs inside and outside the classroom, as students encounter information in all phases of life, in multiple forms, and at varied locations.

At the more advanced levels of higher education, information literacy strategies become increasingly sophisticated, and they differ according to the disciplines involved. For example, scientific and historical researchers each will gather and analyze data differently. For this reason, collaboration among faculty and librarians with administrative support is essential for managing the use of expanding information resources, changing investigative methods, and emerging technological tools.

The options presented here represent only a few of the resources from which institutions may select as they seek to fulfill their mission and their goals for student learning. These guidelines also offer suggestions for documentation that will be useful during the decennial self-study process and team visit.



## General Education and Information Literacy

Standard 12, General Education, in *Characteristics of Excellence* (p. 37) specifies some of the skills that typically are included in general education programs, “including oral and written communication, scientific and quantitative reasoning, critical analysis and reason, technological competence, and information literacy.” Many aspects of information literacy are essential components of general education, and many institutions incorporate some information literacy skills in the requirements for their general education curriculum. However, the content and structure of both general education goals and information literacy goals will vary among institutions according to their mission, goals, and objectives.

Information literacy training can deepen and improve basic general education skills. However, some general education programs are provided during the first two years at a university. In those circumstances, general education programs cannot offer a sufficient opportunity for students to achieve fully the higher-order information

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literacy skills, such as thinking more critically about content, pursuing even deeper lines of inquiry with more sophisticated methods, and becoming facile with the tools that enable students to grapple philosophically with the nature of inquiry itself.

In addition, weaving information literacy instruction explicitly into specific disciplines enables students to place the essential skills in the context of their majors, because each discipline has its unique approach to information, critical thinking, and evaluation. This may be done seamlessly throughout a course or as an explicit and minor component of a course.

As students deepen their understanding of their disciplines, they also should be challenged to deepen their understanding of information and to achieve the higher-order information literacy goals that the institution has established.

## Information Literacy as an Evolving Concept

The term “information literacy” has evolved over the past two decades in response to the changing requirements of higher education. From its beginnings as a form of library instruction, the concept now has been extended to describe a more comprehensive vision of teaching and learning in academe.

Marcum (2002) credits Patricia Breivik with presenting “a comprehensive model, and program of information literacy in the late 1980’s that marked the serious beginnings of the initiative in academe.” He further points out that Breivik first identified information literacy “as an essential in lifelong learning rather than a matter of library instruction.” This definition extends beyond the classroom and enhances the traditional understanding of critical thinking.

In 1989, the Presidential Committee on Information Literacy of the American Library Association (ALA) released a report addressing the rapid changes in American society as a result of “the emergence of the Information Age.” The Committee proposed a “restructuring of the learning process” to “enhance the critical thinking skills of students” and to “empower them for lifelong learning and the effective performance of professional and civic responsibility.” This “restructuring” takes into account the realities of an expansive “information age” and extends far beyond developing technology skills to offering a deeper and more meaningful definition of learning that includes the ongoing pursuit of knowledge outside the classroom. Consequently, information literacy challenges educators to provide students with a more complex set of skills that they can use when they enter the “real world.” According to the Committee, this “restructuring of the learning process” will “actively involve students” in a process of “knowing,” “identifying,” “finding,” “evaluating,” “organizing” and “using information effectively to address the problem or issue at hand.”

The Middle States Commission on Higher Education has emphasized the importance of libraries in colleges and universities since its first standards for accreditation were published in 1919. Simmons (1992) further traced the evolution of the Commission’s growing interest in and specificity about libraries and resource-based learning. The term, “information literacy,” however, first appeared in the Commission’s standards in 1994, accompanied by a very basic definition consistent with what had been introduced by the ALA’s Presidential Committee in 1989.

The Association of College and Research Libraries (ACRL) extended the concept in 2000 when it published *Information Literacy Competency Standards for Higher Education*, the product of a multi-institutional task force. These standards outlined what it means for a college or university student to be information literate. This document was distributed broadly in the higher education community, and it significantly influenced the task forces that developed *Characteristics of Excellence in Higher Education*, the 2002 standards for accreditation of the Middle States Commission on Higher Education. While the revised standards still include the notion of resource-based learning, they emphasize more clearly the need for information literacy learning experiences in all educational offerings and in general education in particular.

## **Information Literacy and Technological Competence**

Information literacy is much more than technological competence or on-line research. It encourages critical thinking and reflection in the context of the increasingly extensive amounts of information now available through a wide range of technologies. Students today need the skills that will enable them to access and navigate the growing universe of information, to select appropriately the credible and reliable information they need, to read critically and think independently as they produce their own ideas, and then to use that refined information for their academic careers.

With the continuing growth of distance or distributed learning, technologies continue to extend the places where learning occurs—beyond the walls of classrooms and libraries to the home, the cyber-café, or wireless locations liberated from traditional concepts of place. As Adler (1999, p. 4) points out, the effect of the Internet and its “interactive, dynamic, and decentralized” nature creates an additional dilemma

because the Internet environment “makes less distinction than older media between consumers and producers of content.” Therefore, the evaluative skills of information literate consumers become much more important as they participate more effectively and actively in society.

As technologies continue to transform learning, it is important to separate the technological tools used to access information from the skills of understanding and using the content of that information. Technology is a part of the overall process but not an endpoint. In other words, information literacy requires an understanding of

technology, but it focuses on content and the delivery of that content through such educational institutions as libraries, classrooms, and distributed learning environments.

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The Commission’s standards in *Characteristics of Excellence* recognize this distinction between content and tools, particularly in the discussion of the fundamental elements of general education:

Relative to this standard, an accredited institution is characterized by:...general education requirements assuring that...students are proficient in...technological capabilities appropriate to the discipline, and information literacy...(p. 38).

It is almost impossible to avoid technology in contemporary education. Instead, educators engage students in a process of discovery that demands knowledge of the intersections between information, technology, and the systems that have been developed for managing and

disseminating information.

## **The Faculty and the Institution**

The broad scope of the concept of information literacy emphasizes critical reading, evaluation, and the use of information to produce understanding and new knowledge. As institutions respond to the challenges of developing or enhancing their information literacy initiatives, they undoubtedly will recognize that faculty, librarians, and other administrative staff already are addressing many aspects of information literacy as they promote teaching and learning at the institution, even if they do not currently apply this label to their activities.

Information literacy supports pedagogy focused on the development of effective research, critical thinking, and writing or other communication skills. Most faculty can identify these key characteristics in courses they currently are teaching. Instead of creating new courses based on an entirely new concept, the current classes faculty teach can become starting points for creating a more structured information literacy initiative, one in which information literacy strategies are incorporated within courses in the major fields of study.

To facilitate faculty ownership of their central role in information literacy instruction, institutions should provide structured professional development opportunities or

recognize and encourage informal efforts by their own faculty and staff as part of a larger curricular strategy. These would provide the tools and information about pedagogical strategies necessary to support its instructional and administrative staff.

The institution first should agree on a working definition of information literacy. The second step should be to build upon that general definition by identifying the learning goals and objectives within the various disciplines represented in the curriculum in order to clarify the knowledge and skills that graduating majors should possess. Finally, the institution should decide which types of support could be provided to achieve these objectives.

Ultimately, the campus community should come to understand that providing tools is not the same as providing content. The fact that students have access to computers, computer application instruction, and library resources such as books, periodicals, and databases does not necessarily translate into information literate students. Students still need specific skills in order to become information literate. Therefore, by defining the term, an institution can help to reshape conversations in the academy about the role of information and technology in the construction of knowledge and the subsequent use of that knowledge in society.

# 1

## Planning for Information Literacy Institutional Goals, Curricular Design, And the Campus Context

The first step toward planning for information literacy is to gain an initial understanding of the status of information literacy on campus. An institution can achieve this objective by reviewing its structures and processes in order to support the learning goals that it has identified. Standards 11, 12, and 14 of *Characteristics of Excellence in Higher Education* presuppose that this planning will occur, and it is the same process that is recommended for approaching all of an institution's student learning goals (see the Middle States publication of *Student Learning Assessment: Options and Resources*, 2003).

For example, Standard 11 speaks to all of the institution's educational offerings:

The institution identifies students learning goals and objectives, including knowledge and skills, for its educational offerings.

Standard 12 refers specifically to general education offerings:

The institution's curricula are designed so that students acquire and demonstrate college-level proficiency in general education and essential skills, including oral and written communication, scientific and quantitative reasoning, critical analysis and reasoning, technological competency, and information literacy.

Standard 14 discusses outcomes in the context of planning for assessment so that an institution's goals can be achieved:

Assessment of student learning demonstrates that the institution's students have knowledge, skills, and competencies consistent with institutional goals and that students at graduation have achieved appropriate higher education goals.

Therefore, an institution first should conduct a review of its institutional goals, its curricular design, and the campus context that will ensure that the institution's outcomes can be realized.

**Figure 1**

## **Profile of an Information Literate Student**

An information literate student:

- ❖ Thinks about framing the research question so that it is appropriate for the breadth and depth required for the research project, in the context of available resources and time for research;
- ❖ Asks questions for clarification after receiving an assignment;
- ❖ Knows where to start looking for information, is aware of a broad range of information sources (e.g., electronic and print periodicals, chapters in books, government documents, archival material, and microfilm), and can distinguish among the various types of resources (e.g., scholarly work, informed opinions of practitioners, and trade literature);
- ❖ Is familiar with major reference collections in his or her discipline and selects from among them appropriately;
- ❖ Conducts electronic database searches effectively (e.g., knows how to use quotation marks, Boolean operators such as or/and/not, and other technical strategies);
- ❖ Knows how to use discipline-specific strategies for field searches, such as archaeological recovery techniques, patient interviewing, or laboratory experimentation;
- ❖ Knows how to evaluate information sources;
- ❖ Is able to select key points from retrieved information and summarize them, rather than simply repeating material from research;
- ❖ Evaluates and explains or resolves contradictory information;
- ❖ Understands what plagiarism is and some of the complexities of copyright law, the ethical use of information, intellectual property, etc.;
- ❖ Has learned how to cite material appropriately and develop a bibliography;
- ❖ Confidently explores the recursive nature of the information literacy process to conduct research;
- ❖ Uses high-quality content and reflects evaluative thinking in the context of the student's academic level and discipline, as evidenced during classroom discussions, when writing papers, creating displays, or when speaking or performing publicly;
- ❖ Is able to develop new insights or theories, or discover previously unknown facts, based on material he or she already knew and the new information;
- ❖ Knows how to seek help from faculty members, reference librarians, and others outside the institution; and
- ❖ Recognizes that a set of specific information literacy skills is transferrable and can be applied throughout life, for both professional and personal learning objectives.

This list was compiled as a result of two focus groups, one held at the University at Albany, State University of New York, and the other at Millersville University of Pennsylvania.

## Institutional Goals

The wide range of institutional missions and goals accounts for an equally wide range of student learning outcomes at the institutional level, various curricular designs and outcomes at the program level, and focused course outlines and specialized outcomes at the classroom level. However, even within a single institution, different

learning goals may require students to have similar information literacy skills, because information literacy has a role in enhancing the acquisition of other learning outcomes.

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**In defining information literacy goals, an institution should distinguish between lower-level, rudimentary information literacy skills and higher-level, more sophisticated skills.**

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When surveying the status of information literacy at an institution, it is necessary to determine, in general terms, what students across the institution should be able to accomplish to be information literate. Figure 1 describes the skills of an information literate student. Faculty members can use this example of broadly-stated skills in order to understand the specific components of information literacy explored in greater depth throughout this book.

It should be noted, however, that a student's level of maturity and number of years at an institution are important considerations in evaluating a student's mastery of these skills. In other words, the skills listed in Figure 1 are more

likely to be found among students who are at least at the sophomore level, when they are likely to have a more focused interest in the subject matter of the discipline through which information literacy is being taught.

Faculty also can identify how the broadly stated learning goals in Figure 1 can be adapted for specific disciplines or groups of disciplines. Additional goals may be outlined in the instructional programs of the library. Having identified all of the profiles that apply to a particular institution, the faculty, librarians, and other staff at that institution then can identify the steps needed at the program and course levels to produce the desired skills.

A further discussion of learning goals at these levels may be found in Chapter 2. A more thorough discussion of the relationship among learning goals at the institutional, program, and course levels, as well as between learning goals and assessment methods, also may be found in Chapter 2 of the Commission's *Student Learning Assessment: Options and Resources* (2003).

## Curricular Design

Information literacy might be taught through the general education program, reinforced in specific courses designated as information literacy courses (which may or may not be discipline-specific), or embedded either seamlessly or explicitly within all courses in the major fields of study.<sup>1</sup> Therefore, to understand an institution's curricular design for information literacy, it is important to identify the institution's standards for defining quality in student learning, where information literacy instruction currently exists across the institution, the advantages and disadvantages of particular models from which faculty may choose, and the incentives that will support faculty implementation.

### Defining "Quality" in Student Learning

The Middle States Commission on Higher Education expects each institution to define student learning at the course, program, and institutional levels. The institution also should evaluate student learning, but it may select the levels at which this will occur for each learning goal. Information literacy is one of several student learning outcomes specifically mentioned in *Characteristics of Excellence*. Thus, in the descriptions of learning outcomes at each institution, one should be able to identify, either explicitly or implicitly, the components of information literacy. It follows that the placement of and emphasis given to these components should be part of a coherent plan to improve student learning.

An institution that is committed to developing information skills ensures that its curriculum and its faculty work toward teaching students to be self-directed learners and problem-solvers. A process that requires extensive student use of technology, library, and other information resources also helps to justify the investment in those resources.

In defining information literacy goals, an institution should distinguish between lower-level, rudimentary information literacy skills and higher-level, more sophisticated skills. There are also highly specialized information literacy skills that are discipline-specific. Two-year institutions will define information literacy skills that are appropriate to two-year degrees. The skills acceptable for a senior in a baccalaureate program are likely to be less sophisticated than the skills required of a student in a highly specialized graduate program.

Figure 2 illustrates these concepts across academic levels. Appendix 1 is a more detailed explanation of the differences in expectations for quality among novices, those who have begun to develop information literacy skills, and those who are proficient and accomplished. These examples can be adapted for use in any course.

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1 To explore this subject further, consider the work of Oberman (1998) for a discussion of an "information literacy IQ test" that may be used to determine where an institution is in the information literacy process.



**Figure 2**

**Learning Goals across Academic Levels**

| <b>Information Literacy Components</b> | <b>Learning Goals (Quality Criteria)</b>   |  |  |
|--|--|--|--|
|  | <b>First-year Student</b>  | <b>Senior</b>  | <b>Graduate Student</b>  |
| <b>Framing the Research Question</b>   | Recognizes the need to find information to fill the gaps in his/her knowledge; begins to understand the value of finding information to support own ideas and opinions | Recognizes the value of using information to strengthen his/her own arguments; articulates focused research questions  | Articulates a focused research question; reevaluates it for clarity or precision; refines the question; considers the costs and benefits of completing a particular research project in light of available financial resources |
| <b>Accessing Sources</b>               | Understands that there are differences among information sources; can search several kinds of sources to retrieve information  | Identifies the most appropriate sources to answer the question; develops effective search strategies that may be unique to each source   | Understands how information is produced and disseminated; develops and implements a search strategy appropriate to the discipline  |
| <b>Evaluating Sources</b>              | Reviews information retrieved to assess the reliability of each source; considers whether or not the amount of information is sufficient to address the issue          | Reviews information retrieved to assess the reliability of each source; determines ways of modifying search strategies to ensure that information is sufficient to address the issue at a level appropriate for a senior | Reviews information retrieved to assess the reliability of each source; modifies search strategies to ensure that the information retrieved is as comprehensive as possible  |

|  |   |  |   |
|--|---|--|---|
| <p style="text-align: center;"><b>Evaluating Content</b></p> <p>(Including: the learner achieves understanding, then incorporates selected information in his/her knowledge base and value system)</p> | <p>Examines and compares information from various sources; determines the probable accuracy and reliability of the content; identifies an author's thesis and the basic structure of the information; avoids immediate agreement or disagreement with the information</p> | <p>Analyzes information and evaluates point of view; considers contradictory information; recognizes prejudice, deception, or manipulation; compares new information with prior knowledge; draws conclusions based on the information retrieved; develops a critical response to the information</p> | <p>Understands the value of the information within a discipline or profession, its contradictions, the author's research methodology, and other unique characteristics; selects information that provides the evidence needed at a professional level; skillfully integrates new information with prior knowledge</p> |
| <p style="text-align: center;"><b>Using Information for a Specific Purpose</b></p>   | <p>Organizes content to support the purposes of the student's product; develops topic in essay or other format; communicates cogently; can prepare an annotated bibliography; and uses the designated editorial style appropriately</p>                                   | <p>Effectively organizes content in support of the purposes of a product, using multiple sources; chooses a communication medium that best supports the purposes of the assignment; and uses an editorial style appropriate to the specific discipline involved</p>                                  | <p>Expertly organizes content in support of the student's product or performance; produces new knowledge in the discipline or develops new strategies as a practitioner; and considers the value of further research using alternative methods or strategies</p>  |
| <p style="text-align: center;"><b>Understanding Issues Affecting the Use of Information; Observing Laws, Regulations, and Institutional Policies</b></p>   | <p>Understands what plagiarism is and does not plagiarize; uses appropriate documentation style for citing sources</p>  | <p>Observes copyright laws; understands issues of privacy, information security, censorship, and freedom of speech</p>   | <p>Understands issues of intellectual property, copyright, the fair use of copyrighted material, human subject research, and other emerging or reemerging ethical issues.</p>   |

The Middle States standards permit institutions to choose the level at which they assess student learning. However, if an institution chooses to assess at all or at multiple academic levels, the evidence that students have mastered the institution's defined information literacy skills should be identified. In addition, the measurement of students' learning should reflect the progressive development of their information literacy skills throughout their college experience.

### **Strategically Locating Information Literacy Instruction**

After an institution defines its quality criteria for information literacy, the next step is to decide the extent to which its basic learning goals will be emphasized at each level. Students at all levels should have some exposure to all six of the information literacy components shown in the first column of Figure 2, whether information literacy is taught as a separate course or course supplements or whether it is distributed across the curriculum, as discussed in the next section. For most students, the specific information resources, search strategies, evaluative techniques, and uses for information will increase in sophistication over time, although some advanced students may function early at higher levels for some of the components.

The learning goals that faculty and librarians select become what the National Research Council (2001, pp. 44-47) calls "targets of inference." In other words, these desired learning goals will become the foundation, during subsequent assessment, for inferences that will be made about student learning. Furthermore, these targets of inference should be part of a larger cognitive model of how students develop mastery of a particular subject matter, whether it is a concept in a discipline or a specific set of information literacy skills.

The initial planning task facing faculty and librarians is to examine the entire institution to identify where the appropriate instruction currently exists and whether additional instructional content is necessary. Evidence of the extent to which information literacy is incorporated within the institution's mission, goals, and curricula may be found at the institutional, program, and course levels, as well as within the library's instructional programs and in formally structured extra-curricular activities.

Answers to the following questions may suggest how information literacy might best be strategically and coherently located within the institution's larger plans for defining and for assessing student learning.

**At the Institutional Level.** Is information literacy part of the general education requirements? Does information literacy instruction occur in an integrated and coherent approach throughout the curriculum so that student experience increasingly sophisticated concepts as they progress through the institution?

**At the Program Level.** Do individual programs recognize and address program-specific information literacy needs? Do the disciplines recognize the need for general information literacy skills to supplement their own more specialized needs? Are the skills that students are expected to acquire taught in a progressively sophisticated, integrated, and organized manner? Are faculty within departments encouraged to tailor courses to include information literacy skills?

**At the Course Level.** Many existing courses require students to develop research skills. In those courses, is it possible to identify the characteristics of information literacy that are being taught? Have courses been re-engineered to meet the current

definitions of information literacy? Do the faculty have the entire responsibility for information literacy instruction, or do they receive appropriate support from librarians? Is there too much repetition among courses, so that only lower-level skills are developed, or are there more effective strategies for ensuring that the higher-level skills are being learned?

**At the Library.** Do faculty and librarians work together to redesign courses to incorporate information literacy instruction? Are students made aware of the information literacy components in library programs and academic courses? Are information literacy skills being addressed in only rudimentary ways (such as tours of the library)? If the instruction is formatted as traditional bibliographic instruction, are information literacy learning outcomes addressed, and is the effectiveness of the instruction measured and evaluated? Is there a formal program of instruction with goals, objectives, and assessment? Is the instruction integrated into the disciplines?

## Curriculum Models

As with all goals for student learning, each institution determines the best strategies for meeting its information literacy goals, based on its mission, goals, and overall curricular design. These strategies involve selecting the most effective curriculum model and then providing support for that model, such as professional development opportunities and incentives.

Breivik (1992, p. 7) notes that students “whose education largely consists of lecture, textbooks, and reading lists are not well prepared for problem solving in the complex world in which they must work.” This view is shared by Whitmire (1998), who calls for a “focused use of the academic library and its resources,” as opposed to a lecture-only format. Her research indicates that this is one of the key factors in increasing students’ critical thinking skills. Consequently, institutions should shape students’ learning experiences across the curriculum by encouraging the use of assignments that are designed to make effective use of information resources. In fact, one of the “fundamental elements” in the Middle States standards is that an accredited institution is characterized by “programs that promote student use of information and learning resources” (Standard 11, *Characteristics*, p. 34). Through this process, students can better understand the relationships between what they learn in their general education courses and what they learn in their major field of study.

As information literacy instruction has evolved over time, two major models for developing those programs have emerged: the separate or compartmentalized curriculum and the integrated or distributed curriculum. It also is possible to combine these two strategies to achieve the institution’s desired learning outcomes. In addition to its place in the curriculum, information literacy also may have an important role in the formal extra-curricular programs at the institution.

***The Separate or Compartmentalized Curriculum Model.*** In the separate or compartmentalized curriculum, information literacy is taught as a stand-alone course. It can appear in the curriculum at the lower or upper academic levels. Since information literacy first became a requirement in the 1994 Middle States standards for accreditation, many different options for separate or compartmentalized courses have emerged.

For example, some institutions currently provide the majority of their information literacy instruction in general education programs that focus on the first two years of college, either in a separate course or repeated throughout the general education curriculum. However, as noted previously, this type of instruction provides only a baseline of skills. Students need more specialized instruction as they continue in their major fields of study. On the other hand, a general education program that is developed as an institution-wide “umbrella” for instruction at all academic levels could be an effective vehicle for incorporating higher-order information literacy skills.

Figure 3 describes the characteristics of information literacy instruction when it occurs in a separate module. Appendix 2 is one example of a new course designed for entry-level information literacy skills. It is a stand-alone course that emphasizes problem-solving to build information-gathering skills.

Some instructors encourage students to use a basic interactive on-line tutorial that provides entry-level instruction in selecting, searching, and evaluating sources.<sup>2</sup> With this type of general instruction available on-line to students, instructors are able to concentrate on more specific, course-related or problem-solving strategies for advancing information literacy skills.

Some institutions provide separate “bibliographic instruction” courses which help students understand the library structure, resources, and services; how to gain access to materials; and how to evaluate the sources of information. These programs also can provide guidance to discipline-specific resources. This type of course generally is limited to bibliographic sources. However, the concept of information literacy in the Middle States standards extends beyond materials available in or through a library.<sup>3</sup> It touches on the fundamental processes of learning itself: the evaluation of information content and its use, including the process of generating new information, such as in a laboratory or field investigation. When bibliographic instruction is offered as a stand-alone course, an institution’s plan should place it in the context of its larger set of student learning outcomes for information literacy.

Other institutions have developed separate information literacy courses and resources to supplement the instruction of students in graduate programs. One university developed a “Digital Dissertation” service “[t]o provide well-rounded support to graduate students conducting advanced research” and “to provide support for graduate students as teachers.” It includes technology classes and library resource sessions as well as a “Digital Dissertation Virtual Companion” (Nichols, 2002). Another college offers an instruction and orientation program for graduate students which includes: “Presentations and tours during orientation, open workshops, course related lectures at faculty request, ‘niche marketed’ workshops organized on request by groups of students, and individual and group consultations.” In addition, “Library subject specialists teach introductory and intermediate workshops in Subotnick Financial Resources Center (simulated trading floor)” (Bornstein, 2002).

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2 One of the most widely used nationally is the tutorial available from the University of Texas System Digital Library at <http://tilt.lib.utsystem.edu/>.

3 The *Information Literacy Competency Standards for Higher Education*, published by the Association of College and Research Libraries (2000) also supports this perspective on information literacy.

**Figure 3**

### **Characteristics of Information Literacy Instruction As a Separate Course**

When information literacy is taught in one or more separate courses at lower levels, the instruction should be:

- ❖ Conducted with small class sizes and
- ❖ Started within a student's first two years on campus and reinforced throughout the student's academic career

When it is taught at the upper levels, instruction should be:

- ❖ Discipline-specific, if possible, to ensure its relevance to students' academic interests and to benefit from their maturity in evaluating sources and content

The curriculum should include:

- ❖ Practical, hands-on work, as well as theoretical presentations
- ❖ A lab or practicum with sufficient class time for the students to present their concepts
- ❖ Writing assignments that relate to issues that are, when possible, both germane to curriculum content and relevant to student interests
- ❖ "Field trips" to the library
- ❖ On-line exercises under supervision
- ❖ Connections to other classes and to how the student can use information literacy skills in their future careers and to meet personal needs

The curriculum also may include:

- ❖ Submission of an annotated bibliography

This list was compiled by a focus group held at the University at Albany, State University of New York. Reproduced with permission of Thomas P. Mackey, Ph.D., Assistant Professor, School of Information Science & Policy

Courses in the separate curriculum model usually emphasize the first stages of the information literacy paradigm: identifying the information needed, finding that information, and evaluating the sources. The remaining aspects—evaluating and understanding the content and using it ethically and legally for a specific purpose—usually are the responsibility of faculty in the disciplines.

Regardless of the model selected, information literacy offerings should be sufficient to meet the goals for student learning at the levels and in the disciplines for which it is offered. However, it is unlikely that a single course can satisfy all of an institution's information literacy goals, because the skills should be addressed and reinforced at various levels of sophistication throughout a student's academic career. If students take multiple information literacy courses, the overall curriculum should consist of complementary and progressively advanced components.

**The Integrated or Distributed Curriculum Model.** In a distributed model, various disciplines and co-curricular activities address a core set of information literacy skills, which may be blended seamlessly into upper-level courses. Following are some examples of how information literacy instruction has been presented in the integrated or distributed curriculum model:

Appendix 3 provides an example of teaching basic information literacy skills in a literature course at a two-year institution. The faculty member provides specific library assignments and evaluates the students' information literacy and content learning simultaneously during structured discussion periods and through report writing assignments. The "role sheets" are unique in that they not only provide a basis for evaluating a student's use of sources but also the student's understanding as it is discussed in Teaching Students to Evaluate and Understand Content (Chapter 2). The "Library Research and Literature Circles Project," therefore, becomes both a teaching tool and a vehicle for formative assessment by enabling the professor to improve both teaching and learning as the class progresses.

Appendix 4 describes an economics course that introduces students to some of the basics of information literacy as part of the course. The faculty member focuses students on important research skills and simultaneously introduces students to economic concepts underlying public issues. Information literacy is prominent, but it is woven into the instruction on economic concepts.

Appendix 5 illustrates an upper-level course on information science and policy that explicitly incorporates information literacy components. It is an interdisciplinary approach in which the research, analysis, and production of information, together with their related technology components, are an integral part of the course itself.

Appendix 6 presents an upper-level biology curriculum. In this instance, the professor integrates information literacy criteria seamlessly throughout the course. He includes framing the research question, analyzing the sources, analyzing the content, and using the material effectively, ethically, and legally. The professor judges many of the information literacy skills of his students in the classroom, but he also requires a written certification from the librarian that the student has completed other information literacy activities outside of the classroom.

One advantage of the distributed approach is that it places information literacy education in the context of the discipline, thereby deepening students' understanding of the importance of information literacy within their chosen fields. Another advantage of using upper-level and graduate courses is that students are more mature and bring a wider range of experiences to the process of framing the research question, identifying more obscure sources to explore, devising complex search strategies, engaging in deeper analysis of the content, and presenting new insights or even new knowledge to their chosen audiences. The distributed approach also engages faculty members by making them partners in information literacy instruction and enabling them to blend information literacy with the discussion of other curriculum content.

All institutions may not have evolved the level of course integration required for a fully distributed model. Some may make the transition from the compartmentalized model by having separate courses on information literacy that are discipline-specific. However, this should be regarded as only a transition and not as a final goal. Faculty in these courses can collaborate with subject-specialist librarians to engage students in the discussion of advanced issues, refine their baseline search strategies, explore advanced source and content evaluation, and shape the students' use of information in the context of a course that is meaningful to them.

One difficulty with the distributed model may be unplanned redundancies within the institution's overall curriculum. However, when conceived appropriately, distributed information literacy offerings are developed as part of a coherent institution-wide plan, in collaboration not only with other faculty but with librarians as well. Nerz and Weiner (2001), describing their experiences at North Carolina State University, refer to this process as "curricular integration," which requires "a strategic or system-wide approach."

In either the compartmentalized or distributed models, information literacy should be integrated into the general education core and students' major fields of study, and its relationships across the curriculum should be transparent to the student, whether they are explicitly or implicitly reinforced during instruction. These reinforcing elements should be developed in preferably all disciplinary areas and be part of a coherent plan which ensures that students are information literate for the goals established at each academic level. The plan also should indicate that the terminal qualifications for undergraduates, preparing them for lifelong learning after graduation, are quite different from the terminal qualifications for a graduate preparing to be a professional in a specialized field such as medicine, law, or engineering.

**In Extra-curricular Programs.** Most institutions offer extra-curricular programs that are consistent with the institution's mission and the interests of its students. They usually promote skills that enhance the social development of the individual. Participant interest is often extremely high, and these programs provide an opportunity for students to learn informally. *Characteristics of Excellence* requires coherence among curricular offerings and activities such as:

...out-of-class lectures and exhibitions, study abroad, civic involvement, independent learning and research, opportunities for informal student-faculty contact and other student activities (p. 32).

Other examples include community service opportunities and sports programs. For example, information literacy skills would be useful to research the performance histories of players, teams, or leagues; to learn about new playing strategies; and to identify preventive and rehabilitative measures for sports injuries. Therefore, any extra-curricular activity can promote information literacy and reinforce principles learned in classroom activities.

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**One advantage of the distributed approach is that it places information literacy education in the context of the discipline, thereby deepening students' understanding of the importance of information literacy within their chosen fields.**

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## The Campus Context

Institutions that support information literacy recognize that information literacy instruction does not occur in a vacuum. The resources needed to support an information literacy initiative may include personnel, fiscal responsibility, technology, and services. Faculty and librarians need support to provide information literacy instruction and to develop a curriculum in an atmosphere of collaboration, including professional development opportunities and incentives. In addition, it is helpful if there is also a culture of information literacy evident in other aspects of campus life. All of these contextual characteristics of the institution's information literacy program should be considered in the institution's strategic, operational, and assessment plans.

*Characteristics of Excellence* (2002)—especially Standards 2, 7, 11, and 14—requires that each institution have a plan for student learning that should be part of larger plans for the allocation of resources and for outcomes assessment. The assessment plan for information literacy in particular is discussed in greater detail in Chapter 3 of this book. In addition, general guidance on developing assessment plans at the institutional and program levels may be found in Chapter 4 of the Commission's *Student Learning Assessment: Options and Resources* (2003).

Information literacy should be part of the institution's continuing process of planning for all student learning, because strategies for information literacy instruction and assessment are continually evolving. Therefore, in considering the role of information literacy within the overall institutional plan for student learning, it is appropriate to ask questions relevant to each institution. These could include:

- ✧ What are the goals of the plan, and to what extent is information literacy part of this plan?
- ✧ If a formal plan for student learning has not been finalized, how is the institution's educational mission being implemented, and how are outcomes measured?
- ✧ How is the information literacy component of the plan being implemented, and is it consistent with its stated goals?
- ✧ Does the strategy for information literacy instruction address multiple learning styles?
- ✧ Are adequate staff and other resources available to meet the information literacy goals and objectives?
- ✧ Do faculty and staff have the updated skills needed to develop and implement information literacy instruction?
- ✧ Does planning include a commitment to support emerging information literacy programs and pedagogical strategies or a willingness to promote the development of new ones?
- ✧ Is information literacy supported by adequate technological tools and other services dedicated to the delivery of information literacy?
- ✧ Are actual or potential inter-institutional resources, such as consortia, being utilized fully?

- ✧ If the institution has not made an adequate and evident commitment to information literacy, how should the institution’s plan and culture be modified?

## Benchmarking

Although not required by the Middle States standards, institutions frequently identify peer institutions that are engaged in what are commonly recognized as “best practices” for the purpose of comparing the framework each uses for its own information literacy curricula, its pedagogies, its assessment criteria and practices, and its resources. If the institution falls short of its benchmark(s), it might consider adopting some of the best practices of the other institutions.<sup>4</sup>

For benchmarking to be a realistic process, the institution should be able to gather and evaluate information about the institution against which it is benchmarking itself. Does the benchmark group reflect an accurate profile of the institution as a whole? Is it what the institution or the units delivering information literacy aspire to become?

In addition, it is important for the units or groups of individuals responsible for delivering information literacy instruction to be certain that they are benchmarking against the same peer group used for other institutional benchmarking. Unfortunately, an institution’s official peer group may not be very far advanced in this particular area, because it is still a relatively new focus for many institutions. If so, institutions outside the peer group might have better practices that could be adapted to meet an institution’s mission and goals. On the other hand, benchmarking may not be useful at all.

## Faculty and Librarians

Institutions may need to enhance the information literacy skills of faculty and librarians to ensure that they collaborate in developing a coherent institution-wide program for teaching the information literacy skills that the institution has identified as learning goals.

Technology has changed the quantity and the structure of available information. Synchronous and asynchronous information structures exist side by side, enabling students to learn the same information in the classroom and with distributed learning

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**Some faculty may be interested in re-engineering their existing courses by choosing to define what they are already doing as an explicit reference to information literacy or by incorporating new information literacy components seamlessly into their instruction.**

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4 For a further discussion of benchmarking, see *Student Learning Assessment: Options and Resources* (2003), Chapter 3.

technologies—in real time or with a time delay. Methods for delivering instruction, and related pedagogical strategies have evolved or changed completely. This process of change probably will continue, and the skills needed today or tomorrow may be quite different from skills needed in previous years.

As *Characteristics of Excellence* explains:

How to develop and utilize knowledge and skills and discipline-specific investigative methods to identify, access, retrieve, and apply relevant content is a challenge for the future of learning and teaching in our universities, colleges and schools. Because the rate of technological change is rapid, affecting the ability to access and to utilize information and knowledge, periodic updating or retraining is necessary (pp. 32-33).

Faculty members have information literacy skills which have been developed over many years, but these need upgrading as technologies and resources evolve, both to enhance teaching and learning and to refine their skills in order to conduct research and publish in their disciplines, often with the help of librarians. Some faculty may be interested in re-engineering their existing courses by choosing to define what they are already doing as an explicit reference to information literacy or by incorporating new information literacy components seamlessly into their instruction. If so, they may require opportunities to learn how others in the field have accomplished similar pedagogical objectives.

Some librarians also need to refine their information literacy skills. For example, they may have had prior specialized assignments, such as managing the inventory, processes, and structures of the library itself. These assignments may have limited their opportunities to become familiar with new instructional technologies and pedagogical strategies. Others may be experienced with a particular curriculum model but need to learn about different strategies at other institutions. Training for librarians is readily available at numerous professional conferences and by networking with colleagues at other institutions.

## **Collaboration**

The institution's plans for student learning should encourage faculty members to take advantage of opportunities to collaborate with each other and with librarians to prevent curricular references to concepts or instructional redundancy within and across academic levels. In addition, collaboration provides faculty with new ideas for improving curricula.

An institution that relies entirely on a single session of traditional library instruction to fulfill its information literacy requirements is placing itself at the lower end of information literacy delivery. It is also likely that in this situation there is little demonstrable collaboration. In fact, the relationship is likely to have the appearance of a "hands off" approach, relegating to the librarian what the faculty member perceives as information literacy.

Institutions that provide higher levels of information literacy instruction benefit from the collaboration of faculty and librarians in jointly developing curricula. Collaboration also extends to their engagement with students and other campus leaders, who are also partners in the learning process. (See Chapter 1 of *Student Learning Assessment: Options and Resources*.)

Figure 4 illustrates how the elements of information literacy may be shared among faculty and librarians when the search for information involves the use of the library. When the search for information involves a field trip or a laboratory experience, the faculty member may be responsible for the entire information literacy learning process.

Some institutions may have a formal committee dedicated to collaborative efforts to improve the curriculum and administrative or operational procedures. One would expect faculty, librarians, and other administrative staff to be included in these committees.

### **Professional Development Opportunities**

Each institution should examine its mission and goals periodically to ensure that they are consistent with the changing environment of higher education, reconsider how information literacy should be taught, and update its information literacy programs. As part of this process, it will recognize the difference between fads and constructive trends, as well as the changing legal environment of the world of information.

To maintain a dynamic information literacy program, institutions should provide adequate professional development programs and related tools. This can be done through formal structures or informal practices. For example, training could be sponsored by a center for teaching through a series of workshops and tutorials led by experts, or an institution could facilitate the efforts of faculty and administrators who can assemble support teams and arrange workshops.

If the institution has a teaching center, it may be useful to consider the following:

- ✧ How is the teaching center used to develop information literacy skills?
- ✧ Are the tools and materials at the teaching center adequate for mastering information literacy skills?
- ✧ Do the curriculum content and reinforcing activities clearly distinguish between strategies for developing the skills of evaluating and using information as opposed to using technological tools and various types of resource materials?
- ✧ To what extent do faculty and librarians collaborate in the design and delivery of the curriculum at the teaching center?

Professional development also may occur informally. Institutions may permit and/or financially support faculty and administrative staff attendance at conferences sponsored by external organizations, without having institutional oversight of the content. Some institutions encourage faculty and staff to sponsor informal roundtables and information sharing sessions. The institution's own information literacy experts or external consultants may lead the professional development activities, engage in collaborative instruction and mentoring, or develop tutorials. In these instances, the following questions may be useful:

- ✧ How are the support teams organized, what are the criteria for selection, and are librarians an integral part of the support teams?
- ✧ Do the teams utilize the expertise of their own members to enhance the teaching skills of others on those teams? If so, do those team instructors have adequate information literacy skills?

**Figure 4**

### **Shared Responsibilities for Learning**

Each institution determines which personnel conduct information literacy instructional activities. The following allocations of responsibility are most common when the search involves a library.

| <b>Information Literacy Skills</b> |  | <b>Responsibility</b>   |
|------------------------------------|--|---|
| <b>Know</b>                        | Determines the nature and extent of information needed   | Starts with the faculty member;<br>Reinforced by librarians   |
| <b>Access</b>                      | Efficiently and effectively accesses information sources   | The librarian usually leads, with faculty support   |
| <b>Evaluate Sources</b>            | Critically evaluates information sources   | The librarian may lead initially;<br>Faculty make the ultimate determination from student's work product or performance     |
| <b>Evaluate Content</b>            | Critically evaluates information content; Considers impact on student' prior knowledge, value system, and future direction in life | Faculty leads in classroom or other course context; Student also may consult librarians, external subject experts, or peers |
| <b>Use</b>                         | Uses information found to accomplish a specific purpose  | Faculty leads; Can be reinforced by librarians  |
| <b>Ethically/Legally</b>           | Understands the economic, legal, and social issues surrounding the acquisition and use of information                              | Faculty and librarians jointly and continuously   |

Source: Ratteray (2000-2002). The responsibility for evaluation was expanded in this publication.

- ✧ Is the institution providing adequate financial support to faculty and librarians to participate in opportunities to enhance their own information literacy skills, such as attending professional conferences? Do those conferences adequately address the skills needed to provide instruction?
- ✧ Does the institution provide the information resources and tools necessary to facilitate the support that faculty and staff are expected to provide?
- ✧ How is skill development evaluated?
- ✧ Are the new skills actually incorporated into the instructional activities of faculty and staff?
- ✧ Does the institution recognize and reward the efforts of faculty and staff who effectively incorporate information literacy skills into the curriculum?

## Incentives

The changing content of disciplines, strategies for evaluation and instruction, technological environments, and types of resources available to faculty and staff require significant continuing effort by faculty and staff to keep abreast of new developments. Faculty, administrators, and librarians are, of course, lifelong learners who consider it their professional responsibility to model certain behaviors for their students. However, acquiring information literacy skills is a time-consuming process. Institutions may find it necessary to supplement individual self-direction with incentives to update those skills or to learn new ones.

Incentives can take several forms, including grants for collaborative ventures by faculty, librarians, and other administrative staff to develop information literacy models. Other incentives might include awards for achievement, increases in base compensation, or release time for an individual to develop information literacy skills more fully.

Some non-financial incentives include special awards to recognize an individual's achievement of a particular information literacy strategic objective. These incentives reinforce formally the institution's position that information literacy skills enhance teaching skills and may result in greater student success. The institution also could adopt the policy that incorporating information literacy explicitly into the curriculum is sufficiently important to be considered as an indication of good teaching, which is a criterion for promotion or tenure.

Some specific behaviors, policies, and institutional structures can be forceful disincentives. These could include:

- ✘ Insufficient officially-supported opportunities for faculty to learn new strategies for teaching information literacy
- ✘ An instructional tradition which reinforces the notion that the primary role of faculty is to purvey specialized content (i.e., "the sage on the stage"), instead of being educators who use content as a context for teaching (i.e., as in problem-based learning), or which encourages faculty to limit instruction to teaching from assigned materials, instead of requiring students to discover other information resources
- ✘ Recognizing that some students have inadequate information skills for success in a course but not developing a corrective strategy, such as consulting with other faculty and librarians about possible causes and solutions
- ✘ Inadequate equipment and facilities for faculty and librarians
- ✘ Inadequate space in the library for programs that involve groups or teams
- ✘ Inadequate staffing levels and burdensome workloads for faculty and administrative staff, leading to a belief that the administration is insensitive to the issues or is unwilling to make changes
- ✘ A hectic campus environment that does not provide opportunities to discuss constructive changes
- ✘ Workshops offered at inconvenient times and places

## **A Culture of Information Literacy**

The final aspect of the campus context is the extent to which other campus activities reflect a culture of information literacy, because it is one sign of an academic community with vitality. A culture of information literacy permeates the entire institution when various units apply the principles of information literacy to areas such as institutional research, the review of programs and services, or the decennial self-study process for accreditation. Using terminology taken from the definition of information literacy as it applies to students, one could say that an institution demonstrates that it enjoys a culture of information literacy by:

- ✧ determining what it needs to know about its status and activities (i.e., planning for student learning and its assessment);
- ✧ researching best practices at other institutions;
- ✧ evaluating that information for its accuracy, relevance, and content;
- ✧ using the information to improve the experiences of its students, faculty, and staff; to increase the effectiveness and efficiency of the institution itself; and to become a learning organization; and
- ✧ doing all of these ethically and legally

In conclusion, the cumulative effect of examining institutional goals, curricular design, and all the aspects of the campus context should lead to conclusions about what might best be incorporated within the institution's overall strategic and operational plans.

# 2

## Learning Goals and Teaching Strategies for Information Literacy

**M**ost teaching has at its core an emphasis on ensuring that the student knows how to access, evaluate, understand, and produce information. It is the role of faculty members, librarians, administrators, and trustees to choose the proficiencies that students should be able to demonstrate upon graduation. However, the faculty define the specific student outcomes that are desired, outline where in the curriculum certain skills are developed and practiced, develop the range of potential learning experiences, select the most appropriate teaching strategies, and determine where the outcomes will be assessed.

These strategies, as noted in *Characteristics of Excellence* (p. 33), should be “designed to foster a coherent student learning experience and to promote synthesis of learning,” because the Commission considers such coherence to be essential. The result of detailed planning is a better education for students and a faculty who clearly understand the structure needed to provide a quality education.

Faculty members can improve student learning by encouraging students to explore and analyze ideas creatively. They also can use an awareness of the principles of information literacy as a metacognitive strategy to manage their own learning. In other words, as discussed earlier in the Introduction, an awareness of the components of information literacy enables students to determine more clearly where they fit within the paradigm at any given moment—whether accessing, evaluating, or using a particular piece of information—and whether they need to return to some prior point, even to reframing the research question and then retracing their steps with a different breadth or depth.

Information literacy also presents a new way to think about campus collaboration with support services, such as the library, the teaching center, the writing center, computing or media services, and structured extra-curricular units or programs.

Once learning goals have been established, as discussed in Chapter 1, the process of teaching information literacy usually consists of four phases (Figure 5), approached in the following sequence: Preparing students for an information literacy experience; Teaching students how to find and evaluate sources; Teaching students to evaluate and understand the content of the information they find; and Encouraging students to produce new information for others (or to articulate their own new understanding)



**Figure 5**

## **Phases in the Process of Teaching Information Literacy**

### **I: Preparing Students for an Information Literacy Experience**

- ❖ Defining Information Literacy and Learning Goals
- ❖ Surveying Student Preparedness

### **II: Teaching Students How to Find and Evaluate Sources**

- ❖ Navigating the Library and Identifying Other Resources
- ❖ Providing Structure for Student Assignments
- ❖ Exploring examples of Collaboration
- ❖ Considering Active Learning Assignments

### **IV: Teaching Students to Evaluate and Understand Content**

- ❖ Summarizing and Synthesizing Information
- ❖ Pursuing Deeper Understanding

### **V: Encouraging Students to Produce New Information**

- ❖ Enhancing assignments in Writing, Oral Presentation, Visual Arts Projects or Artistic Performances, Service Learning, Empirical Research, and Digital Media

by using information effectively in their documents, displays, constructions, performances, or other activities.

## **Phase 1: Preparing Students for an Information Literacy Experience**

Any course in a discipline or any interdisciplinary course that elects to include information literacy as one of its objectives (or interpreting what it is already doing as a component of information literacy) should provide, at the beginning of the class, a clear presentation of what students will be learning. This presentation should enable a student to identify how information literacy relates to the specific learning goals for the course and how any prior information literacy skills that the student brings to the classroom may relate to the course content.

### **Defining Information Literacy and Learning Goals**

Faculty, librarians, and administrators may need to define information literacy for students, especially those in lower-level courses, but it is important to bring students into the conversation. In the classroom, instructors should explain to students the history, scope, and intended uses of information literacy. They also should allow students to discuss their understanding of key concepts, such as the relationships between information literacy and computer or technology literacy, including

explanations of their differences and how they overlap. Understanding students' perceptions helps instructors to develop better active-learning classroom strategies.

The goals at different levels of the organization are likely to be different. For example, at the institutional level, goals are likely to be more general, but they will be more specific at the program and course levels. In the library, the goals could be associated with an already flourishing bibliographic instruction or library skills program. Learning goals also will vary across disciplines, but the core requirements of any information literacy initiative should reflect the commonly understood characteristics that define information literacy.<sup>5</sup>

A common problem in defining learning goals is setting too many learning goals for the time available and the scope of students' projects. Covering material is not the same as ensuring that students learn it. Instructors may well ask: Are the learning objectives arranged in the best teaching sequence? Do the information concepts and skills taught build upon each other? Are there sufficient opportunities for students to develop their knowledge and to practice their skills before assessment occurs?

A related difficulty lies in making the match between the choice of instructional method and the type and level of learning objectives (Svinicki and Schwartz, 1988, pp. 215-216). It is important for faculty and other instructors to make abstract concepts appear "real" to students, and to accommodate more than one learning style in their teaching strategies. For example, lecturing to develop students' information skills may not be as effective as a brief presentation followed by a well-conceived, hands-on assignment and a discussion of the concepts involved. Perhaps having the students begin by doing the exercises would create a more "teachable situation," breaking down student resistance. Having students grapple with a task briefly before moving into the explanation helps the instructor and students to gauge what the students actually can do, not what students say they can do. This simple reversal of the usual sequence confronts students with any gaps in their skills and helps them to understand why the explanation of information literacy is important for their success in a project.

## Surveying Student Preparedness

Lifelong learning does not begin after students receive instruction in information literacy. This process started before the students arrived in the college or university classroom, and it is important to build on those skills and experiences throughout an information literacy course. At the beginning of a course, the faculty member should determine where the students are in this process of lifelong learning, given the general learning goals that the institution has published and the faculty's specific goals for that course. This can be accomplished with a preliminary survey to measure student perceptions of specific information literacy skills.

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5 See the general goals from the Middle States Commission on Higher Education, outlined in the introduction to these guidelines and in the 2002 edition of *Characteristics of Excellence in Higher Education: Eligibility Requirements and Standards for Accreditation*, as well a set of more detailed but generic goals outlined by the Association for College and Research Libraries (2000).

Figure 6 contains examples of some of the primarily library-related skill areas that might be included in a survey of student preparedness. Although such a survey would be an indirect measure of student knowledge and skills, the items in Figure 6 could be adapted to construct direct measures in the form of assignments that require students to perform the specific types of tasks described. Faculty also can add items related to evaluating and using the content of information that will be discussed in the course.

One method for collecting these kinds of data is to distribute a paper survey on the first day of class so that students can indicate their level of experience with research methods, library resources, databases, online searching, research writing, and information production as it relates to the discipline involved. Another option is to develop a web-based form, or to use a survey-tool function in a software program that the institution supports. For example, WebCT allows instructors to develop a web-based survey without having to write HTML code. Students in the course can complete the WebCT survey in a password-protected environment. This tool generates detailed reports based on responses from the entire class, and it also can be used as a template for an exit survey to assess learning outcomes.

Either the indirect or the direct measures might produce surprising results about how much students already know about key information literacy concepts. The results also may suggest a need to modify the planned course outline, or they may reinforce the original plan.

**Figure 6**

### **Skill Areas for a Preliminary Survey of Students**

Survey questions may address the student's perception of information literacy skills in the following areas (but not necessarily in one question per skill area):

**Familiarity with:**

- ❖ the campus library Web site
- ❖ resources available through the institution, such as EBSCO and ArticleFirst
- ❖ discipline-specific online journals
- ❖ editorial styles such as APA and MLA
- ❖ the benefits of using interlibrary loan and its procedures
- ❖ search engines

**Knowledge of:**

- ❖ the existence of academic sources such as books, newspapers, media, and periodicals in the campus library
- ❖ the value of evaluating academic and popular resources in the context of the caliber of information needed
- ❖ the credibility and reliability of Web sites

**Experience writing research papers**

It is important also to share the results of the survey, assignment, or other test with the class and to explain how students can use the results. They can better understand their own skills as they begin the course, they can compare their skills to those of their classmates, they can set their own individualized learning goals and objectives, and they can be inspired to participate in course activities and assignments. Sharing these data with students demonstrates that the faculty member is including the students as partners in the learning process and is not just lecturing from a pre-determined syllabus. Results indicating that most students in the course are not familiar with databases such as EBSCO or ArticleFirst may make students who are not familiar with these terms feel less isolated. This information also reinforces the course assignments and activities related to learning and using these databases.

The accreditation standards of the Middle States Commission on Higher Education focus on the skills that students have at graduation. However, although the Commission does not require it, an institution may wish to measure the value added by its information literacy instruction, whether that instruction occurs in a separate course or is distributed across the entire curriculum. An institution may find that a value added approach, if feasible, can be useful for its own information, for improving teaching and learning, and for public accountability. In this instance, the preliminary survey of student preparedness shown in Figure 5 could be made part of the value-added measurement discussed in “Reflecting on Context” (Chapter 4).

## **Phase 2: Teaching Students to Find and Evaluate Sources**

Pedagogical approaches to teaching students to find and evaluate sources are as distinct as individualized teaching styles, as varied as the disciplines involved, or as common across disciplines as interdisciplinary relationships permit. Nevertheless, the basic principles for finding and evaluating sources can be addressed in formal lectures, discussion sections, library visits, writing workshops, computer labs, or with distributed learning technologies such as WebCT or Blackboard.

Instructors often can clarify what they are attempting to teach if they place disciplinary differences and interdisciplinary connections in the foreground of discussions, and this reinforces the metacognitive value of the information literacy process. For example, in introductory courses, this technique can illustrate the differences between academic and popular sources of information. In more advanced courses, students can understand the complex nature of information within various disciplines.

Teaching students how to find and evaluate sources typically begins by ensuring that they understand how to navigate the library and identify other resources. In addition, it is important for faculty to provide some structure and criteria for identifying resources. Collaboration among faculty and librarians can achieve both of these objectives, which are critical for active learning assignments.

### **Navigating the Library and Identifying Other Resources**

The library includes both its physical space; archived materials; the print and electronic resources available through the library web site, its databases, and tutorials; and connections to libraries and virtual library collections beyond the campus. When sources are not found in a library, it may be necessary to conduct oral interviews with subjects, develop experiments in laboratories, explore visualization techniques or

simulations to challenge the mind about yet-unexplored sources of information, or participate in field explorations such as those of a geographical or archaeological nature. In the latter instance, the faculty member is likely to be the student's primary or only advisor for identifying and selecting potential sources and effective strategies for access.

### **Providing Structure for Student Assignments**

A second important objective for faculty in many instances would be to provide some structure for students as they begin to identify sources for assignments. It has been widely discussed in the media that many students, especially at the lower levels, improperly rely on the Internet as their major or even only reference medium. As a result, they often unearth material from sources of questionable reliability and accuracy (Carlson, 2003; Stepp, 2002; and Carnie, 2001). Davis (2003) conducted a longitudinal study at Cornell University from 1996 to 2001 and concluded that "Setting minimum guidelines in assignments ensures that students will attempt to identify relevant scholarly literature in their subject field."

### **Exploring Examples of Collaboration**

Collaboration among teaching faculty and librarians is especially important for developing active learning activities and assignments for students to engage in this process. This type of collaboration could result in the following activities to begin the process:

- ✧ Librarians can visit classrooms to discuss the organization of information; electronic resources; library research methods; the differences among popular, trade, and academic sources of information; and the content and credibility of sources. Librarians who specialize in particular disciplines also have a unique role in helping faculty achieve their objectives for student learning in the major fields of study.
- ✧ Students can engage in small group discussions about the content of information that they have located from a range of sources. In this instance, the faculty member can evaluate the relevance of the issues raised to the course objectives and can ask probing questions. The librarian can assist in evaluating the discussions with a focus on the students' justification for their sources.
- ✧ Computer labs and workshops provide an opportunity to demonstrate search strategies using specialized databases, web sites, and search engines, as well as how to use discipline-specific research strategies and information technology.
- ✧ As noted in Figure 4, both faculty and librarians have a role in discussions about ethical and legal considerations, including intellectual property, plagiarism, copyright law, and the appropriate use of citations, quotations, and summarizing techniques.
- ✧ Broader discussions can cover the expanding role of information resources, libraries, and societal values in the digital age.

Figure 7 provides an example of learning goals for accessing and evaluating information sources.

**Figure 7**

### **Sample Learning Goals for Accessing and Evaluating Information Sources**

Students will learn how to:

- ❖ Identify, find, understand, evaluate, and use sources in a variety of formats
- ❖ Evaluate and analyze information sources in academic, trade, and popular contexts
- ❖ Evaluate Internet resources, learning how to differentiate between work that is produced for the Web and research that is reviewed by editors or peers in a specific discipline.
- ❖ Use particular editorial styles, such as those of the American Psychological Association (APA), the Modern Languages Association (MLA), or others that the institution encourages
- ❖ Navigate the collections in libraries as well as the electronic resources available through library databases, electronic journals, and web sites.
- ❖ Identify the ethical considerations relevant to the use of information, with a particular focus on how to prevent plagiarism.

### **Considering Examples of Active Learning Assignments**

Specific active learning assignments which faculty and librarians can develop together may result in the following:

- ✧ Writing assignments that challenge students to differentiate between academic scholarly journal articles and popular sources of information.
- ✧ Homework assignments that require students to chronicle the research process by developing a paper or electronic journal to document their search strategy, including a list of the keywords they used, the number of hits based on Boolean search strategies (e.g., AND, OR, and NOT) compared to the number of relevant hits, the modifications they made to their original search, and specific documents that resulted from their search.
- ✧ Small group discussion focused on students' experiences accessing and evaluating a range of information sources.
- ✧ Collaborative writing assignments that require students to work together to access a range of information sources and to write a collaborative evaluative response.
- ✧ A web tutorial, developed collaboratively, teaching how to evaluate web-based resources.

Faculty also benefit from a wide range of educational resources developed by the campus library, including:

- ✧ Workshops on a variety of topics, including:
  - ▲ Internet searching
  - ▲ Evaluating Internet Resources
  - ▲ Discipline specific databases
  - ▲ Producing documents for the Web
  - ▲ Multimedia production
- ✧ Handouts and web-based resources about various aspects of information literacy, including research methods, evaluating resources, preventing plagiarism, and editorial styles<sup>6</sup>

Libraries are dynamic institutions that are constantly evolving and responding to a wide range of digital technologies for transmitting information and to new strategies for interpreting that information. Therefore, students should understand the changing role of libraries within communities and institutions of higher learning. This will enable them to gain a better understanding of how information is organized and evaluated within an academic context. They also will broaden their perspective of information resources beyond popular ones and perhaps further develop their own skills in the critical analysis of resources. It is also possible that a student's relationship with libraries will expand beyond the need to fulfill an assignment for a course to having a deeper appreciation for the ongoing pursuit of knowledge in a variety of contexts.

### **Phase 3: Teaching Students to Evaluate and Understand Content**

Becoming information literate is a pattern of learning that builds to a climax each time it is invoked. The pattern will reoccur throughout a person's lifetime with each learning experience as the individual achieves even higher levels of information literacy. It starts when the student frames the research question, then identifies and accesses information sources, evaluates the information, and finally uses the information effectively to accomplish a specific purpose.

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6 The University Libraries at the University at Albany, State University of New York has produced such resources as: Instructions and Tutorials (<http://library.albany.edu/usered/>); Doing Research (<http://library.albany.edu/usered/research/main.html>); How to Cite... (<http://library.albany.edu/usered/style/main.html>); Tutorials (<http://library.albany.edu/usered/tut.html>); Plagiarism 101 (<http://library.albany.edu/usered/plagiarism/index.html>); and Characteristics of Scholarly Journals, Trade Journals, and Popular Magazines (<http://library.albany.edu/usered/char/index.html>).

Evaluating the sources of information is critical for the next multi-stage phase, which occurs when the student summarizes and synthesizes the information that he or she has found and pursues even deeper understanding.

### **Summarizing and Synthesizing Information**

The bridge that links access and evaluation is the ability to articulate the essential content of the information that the student has found. This is accomplished by summarizing and synthesizing the information, and it lays the foundation for critically analyzing the content and its sources on the path toward understanding.

Ratteray (1985) describes the historical evidence for seven legitimate techniques for summarizing that students can use, provided that they are guided by ethical principles:

They can be divided into two major categories: sequential summaries and synthesizing summaries. Sequential summaries retain more or less the order in which the ideas being summarized were originally presented. Among these summaries are the abstract, the précis, secretarial minutes, and the abridging digest. A synthesizing summary, on the other hand, alters the original sequence of ideas, sometimes drastically, so as to accommodate the special research needs of certain users or to provide structural coherence, clarity, or dramatic effect. These types of summaries include what can be called locational digests, restructuring digests, and reviews (p. 458).

The organized information-gathering student deliberately chooses the most appropriate sequential summary technique as the first step. As sufficient numbers of these pieces of information are gathered, the student then is able to use a completely separate strategy, the synthesizing summary, which pulls them together into the material needed for any class discussion, writing assignment, or examination in order to demonstrate his or her level of understanding.

### **Pursuing Deeper Understanding**

In a chapter on “The Six Facets of Understanding,” Wiggins and McTighe (1998) propose the theory that students should meet all of the following criteria in order to achieve understanding in the various subjects they study and at all academic levels:

1. **Explanation**— The student can “provide thorough, supported, and justifiable accounts of phenomena, facts, and data.”
2. **Interpretation**— Can “tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal or accessible through images, anecdotes, analogies, and models.”
3. **Application**— Can “effectively use and adapt what we know in diverse contexts.”
4. **Perspective**— Can “see and hear points of view through critical eyes and ears; see the big picture.”
5. **Empathy**— Can “find value in what others might find odd, alien, or implausible; perceive sensitively on the basis of prior direct experience.”
6. **Self-Knowledge**— Can “perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard.”



Information literacy skills provide the raw material upon which a student can draw to perform each of the six facets of understanding proposed by Wiggins and McTighe. In other words, students would derive the “phenomena, facts, and data,” as well as the “images, anecdotes, analogies, and models” and so on, from information literacy experiences that occurred prior to the class discussion of the topic. In this sense, there can be no understanding without some foundation in information literacy skills. The best understanding probably would come from honing these skills to increasingly sophisticated levels.

Having achieved understanding, the student then may select information to incorporate into his or her knowledge base and may make a conscious determination whether this “new” information affects not only the student’s beliefs about what is or is not true but also the student’s underlying values that shape attitudes toward other aspects of life. The ability to use that information becomes the evidence of understanding, and the effective use of the information is one basis for the student’s final grade.

## **Phase 4: Producing New Information**

Students gain critical insights about information literacy through their own production of information in writing assignments, performances, and technology development. These insights are likely to be the result of some form of active learning opportunities—those that go beyond lectures and require students to make critical decisions about the information they evaluate and produce, especially as they try to formulate a response to an issue or develop a product or performance. Active learning assignments in research, writing, oral presentation, constructions for engineering or the visual arts, performances, service learning, and digital media have the potential to challenge students to engage in critical analysis and the evaluation of information.

### **Writing**

A research writing assignment challenges students to examine a range of academic and popular sources as they process and develop their own written response. This approach may include the following assignments:

- ✧ A research paper using a range of library and electronic sources focused on the development of a thesis statement and proper documentation using a formal editorial style
- ✧ An annotated bibliography that requires the critical analysis and evaluation of academic and popular sources in a bibliographic format
- ✧ Short papers that examine in detail specific sources, such as a scholarly journal article, or a short paper assignment that requires students to compare the structure and content of scholarly and popular sources
- ✧ Electronic communications in a web based asynchronous bulletin board or synchronous chat room that require students to explore discipline specific or interdisciplinary issues in dialogue with other students.

Writing assignments provide instructors with an opportunity to consider collaboration on campus beyond the library. For example, writing assignments across the curriculum may be more effective in a course if the instructor works closely with the campus writing center. This collaboration may include in-class visits by tutors from the writing center or the development of assignments and follow-up workshops in the classroom and at the center. In addition, students can improve their writing through consultation with writing tutors from a range of disciplines, even though they may not see themselves as “writers.”

### ***Oral Presentation***

An oral presentation requirement challenges students to support their arguments with research from a range of sources. This approach may include the following assignments:

- ✧ Individual or collaborative assignments using presentation software that require students to evaluate, analyze, and interpret resources based on a common theme
- ✧ Individual or collaborative student lectures based on a specific course theme that require students to research a topic, assign readings, and pose discussion questions to the class
- ✧ Videotaped presentations that require students to construct an oral argument for the class and then analyze their own presentation of materials
- ✧ A structured debate, based on a contemporary issue, requiring students to research topics in advance and to present their arguments through an organized point and counter-point format.
- ✧ In large classes, teams of students can be assigned to develop an oral presentation by the team.

### ***Visual Arts Projects or Artistic Performances***

Projects in the visual arts or artistic performances might include such assignments as:

- ✧ The preparation of derivative works (including a work inspired by the techniques and themes of a Master or a “Master copy,” which is an exact replica of a work by a Master, using the original artist’s palette of colors or performance techniques)
- ✧ Student development of program notes for a dramatic performance (e.g., historical explanations of language usage, period conventions, and other social contexts for a play by Shakespeare)
- ✧ A multimedia project for the web, CD-ROM or DVD, with dynamic links to video and audio clips, text, web sites, narratives, and performance
- ✧ A hypertext project for the web, CD-ROM or DVD, with associative links to multiple content pages and images
- ✧ Individual and collaborative web sites focused on discipline-specific and interdisciplinary research topics

- ✧ A video project based on discipline-specific research or explorations into media studies, art, contemporary issues, or popular culture
- ✧ An artistic performance that incorporates a live performance with video projection, music, art, set design, and an information website about the project

### ***Service Learning Experiences***

Service-learning is an experiential learning strategy that combines academic study in the disciplines with course-required community service assignments. The pedagogy of service-learning can be found in all sectors of higher education. It is most often associated with individual courses, but the practice is also found in learning communities (i.e., two or more courses taught to a common student cohort).

The richest service-learning experiences go well beyond volunteer service and ask students to engage in information gathering, analysis, and problem-solving processes that can become very complex. In addition, the academic and experiential components of a course or a series of courses are linked through processes of reflection that include journals, essays, and group presentations. Academic theory and content enhance the service-experience and, when combined with structured reflections, enhance the acquisition of both content and service skills.

The following are examples of service-learning assignments:

- ✧ Third year accountancy students at an urban university design and implement free assistance in filing income taxes for low-income community members.
- ✧ Students enrolled in a first-year learning community design and implement a holiday food drive that requires them to research health department regulations regarding food preparation and storage and also to investigate issues of personal and institutional liability related to the delivery of the food to poor families at off-campus locations.
- ✧ Biology majors work with local environmental agencies to design and implement environmental impact studies related to water quality.
- ✧ Service-learning students engaged in an honors seminar are assigned to work with homeless clients at a nearby shelter. Their first reflective essay assignment is to interview agency personnel and others in the process of writing an essay entitled “Anatomy of an Agency.”
- ✧ Research, design, and write a “business plan” for a United Way Agency, including a description of the agency’s services, profile of clients, projection of requests for services, as well as a profile of agencies that offer similar and supporting services.

### ***Empirical Research Projects***

Some examples of empirical research projects that rely on a mastery of information literacy principles are:

- ✧ A database project that requires students to develop a searchable database of information based on research topic

- ✧ A survey project that requires students to develop research questions based on the study of research methodology
- ✧ A web project that requires students to develop research questions and to post questions on the web via forms
- ✧ A Geographic Information System (GIS) project that requires students to develop a map using GIS software, with content based on the visual representation of map data, history, and communities
- ✧ An advanced research project that requires students to conduct a literature review, develop a research instrument, collect and analyze the data, and prepare a written essay, thesis, or dissertation based on the findings

### ***Digital Media***

Media projects may challenge students in different ways. For example, learning how to develop a web page may demystify the process of how the web works and may demonstrate for students how easy it is to “publish” documents through a medium that does not require editorial or peer review. Students will gain important insights about the credibility and reliability of information sources, as well as their understanding of the content and how they have constructed meaning, by placing them in an active role of developing their own content for the Web. This may help students to recognize the importance of a review process in determining the credibility and reliability of information sources. This approach may include the following assignments:

- ✧ Individual or collaborative web projects that require the analysis of web based resources, including search engines, university and library web sites, and online databases and journals
- ✧ Research web sites that require academic research and formal academic documentation using editorial styles
- ✧ Digital portfolios in a web-based, multimedia, CD-ROM or DVD format that require students to document their academic work and intellectual growth over time in a single comprehensive format

Assignments in a range of digital media—from using presentation software to web development to multimedia—may require another layer of expertise that benefits from collaboration with campus computing, the teaching center, or media services. These assignments also may require collaboration with students who have some technical expertise in designing a web page but who may need to be challenged to think critically about the credibility and reliability of popular sources found on the Web.

In summary, teaching information literacy offers faculty an opportunity to take a fresh look at their courses and to build on assignments that already are focused on research, writing, and technology. Redesigning a course to incorporate information literacy explicitly also challenges faculty to think about how information is presented in class and the extent to which students participate as active learners.

# 3

## Information Literacy Assessment: A Reflective, Integrative, and Iterative Process

**T**he assessment of information literacy is an essential element of overall curricular evaluation. It is part of the institution's evaluation of its effectiveness in meeting its goals for teaching and learning. *Characteristics of Excellence*, in Standards 11 and 12, indicates that one of these goals should be to produce information literate graduates.

Assessment of any type is a reflective, integrative, and iterative process:

It is *reflective* in that it supports the practices that faculty members already use to improve teaching and learning or to encourage new approaches, it provides concrete feedback for critical reflection about instructional design, and it enables students to reflect formatively on their own development.

It is *integrative* because of its focus on both institutional and programmatic improvement, which is discussed further in Chapter 4. A review of assessment results can help to incorporate the larger institutional goals for information literacy within the disciplines and in the classroom. An integrated assessment process for information literacy provides data on student learning that faculty members can share with students to highlight goals that are being met, to emphasize additional goals that should be met, and to encourage dialogue and reflection on difficult concepts. Assessment data also can be used to revise assignments or to develop follow-up quizzes, surveys, additional lectures, or discussion groups to meet students' learning needs more effectively.

It is *iterative* in that an institution may at any point in this process find it necessary to return to an earlier point and retrace its steps in order to refine the breadth and depth of its self-examination. Once all the steps have been completed and improvements have been made, the process begins again.

Effective courses continue to change and develop over time. Changes made to instructional design, based on feedback from information literacy assessment, may not be fully realized until subsequent semesters when faculty have a better perspective about which approaches may have been more effective than others.

## Why Assess Information Literacy?

Three of the most important purposes of the assessment of student learning are to ensure that students are learning what the institution considers essential to their education, to provide a basis for improving learning, and to satisfy the public's need for accountability by explaining clearly the institution's goals and accomplishments. This applies no less to information literacy.

The Middle States Commission on Higher Education emphasizes the role of information literacy in the self-study process for institutions. The revised *Characteristics of Excellence in Higher Education* specifically states that the Commission seeks to determine that "programs are in place that promote student use of information and learning resources" (p. 34), and it includes a request for information on the institution's "assessment of information literacy outcomes, including assessment of related learner abilities" (p. 36).

As the Commission points out in *Assessment of Student Learning: Options and Resources*, "The purpose of assessment is to engage a campus community collectively in a systematic process to understand and enhance learning. Those who have direct instructional and supportive contact with the students, as well as those who lead assessment initiatives, are responsible for motivating and involving the rest of the campus community" (p. 5).

The National Research Council (2001, pp. 51-53) strongly supports the alignment of curriculum, instruction, and assessment so that all three are "directed toward the same ends and reinforce each other rather than working at cross-purposes." To accomplish this objective, the Council further recommends that all three share a common "knowledge base about cognition and learning in the subject domain."

**The Commission does not suggest that there needs to be a separate unit of assessment or a distinct assessment instrument labeled "information literacy." The various elements of information literacy already may be assessed across the curriculum. Some are integral parts of teaching specific courses in the disciplines, some may be incorporated within the institution's general education objectives, and some are unique to teaching library and other research skills. When making the case that students who graduate are information literate, it is the institution's responsibility to ensure that information literacy goals are defined and that the various elements scattered across the curriculum are identified as part of a coherent whole.**

Assessment enables faculty and administrative staff to improve student learning and to identify how best to revise and improve current offerings in curricular and co-curricular programs and services. It helps to enhance current offerings by engaging the faculty members, librarians, and the rest of the campus community in the initial assessment, evaluating the findings, and making improvements to existing programs for the purpose of enhancing learning and instructor satisfaction.

Therefore, at the institution, program, and course levels, as well as in the instructional activities of the library, assessment provides the data needed to: (1) ensure that learning is taking place, (2) engage in the process of improving teaching and learning, and (3) justify continuing expenditures for programs that have been demonstrated to be effective and increase expenditures for program enhancements.

Additionally, accountability has become of great importance to higher education to demonstrate the contribution that higher education makes to the lives of its students and for the benefit of the greater community at the local, regional, and national levels. Assessment also is crucial because it lends credibility to offerings within the disciplines and by libraries.

As with the assessment of all student learning, the most effective approach to assessing information literacy is to take an inventory of the extent to which information literacy is reflected in curricula, programs, and existing assessment at the institution, to consider institutional constraints, to develop or refine a plan for implementation, to measure the effectiveness of that plan, and to make any necessary improvements.

## Taking Inventory

Developing an assessment program that incorporates information literacy begins with taking an initial inventory of where the institution currently stands in its assessment efforts and whether expertise is available on campus. The process for taking an inventory is outlined in general terms in Chapter 1, Planning for Information Literacy.

An inventory of the institution's current assessment efforts provides at least four benefits:

- ✧ access to information on current projects that are currently underway, including those that may not have been publicized to the campus community;
- ✧ understanding of gaps in the assessment plan and its implementation;
- ✧ an opportunity to determine whether any existing programs might be revised so that they include the assessment of information literacy; and
- ✧ economies of scale which can derive from linking information literacy assessment to existing assessment efforts, thereby making them less expensive and easier to implement.

The inventory process also should be informed by the Commission's guidelines in *Student Learning Assessment: Options and Resources*, which contains useful support for institutions beginning or enhancing an existing assessment program. This publication includes several exercises and resources that can assist the campus community in identifying its goals and objectives. A website that is organized around the chapters of the book ([www.msache.org/mainstudents.html](http://www.msache.org/mainstudents.html)) provides many "real life" examples and links to numerous resources. They can be adapted for planning, implementing, and revising the institution's focus on information literacy assessment.

The professional literature also provides specific information that is useful for developing information literacy programs. For example, Grassian and Kaplowitz (2001, p. 265) describe the development of an assessment program for information literacy that provides insights into efforts currently underway and provides an example of how to approach assessment at the campus level.

In addition, the nine “Principles of Good Practice for Assessing Student Learning” proposed by the American Association for Higher Education (AAHE) provide a starting point for determining how to approach the assessment process. The following list also includes a tenth point, recommended by Pausch and Popp (1997, p. 1).

1. The assessment of student learning begins with educational values.
2. Assessment is most effective when it reflects an understanding of learning as multidimensional, integrated, and revealed in performance over time.
3. Assessment works best when the programs it seeks to improve have clear, explicitly stated purposes.
4. Assessment requires attention to outcomes but also and equally to the experiences that lead to those outcomes.
5. Assessment works best when it is ongoing, not episodic.
6. Assessment fosters wider improvement when representatives from across the educational community are involved.
7. Assessment makes a difference when it begins with issues of use and illuminates questions that people really care about.
8. Assessment is most likely to lead to improvement when it is part of a larger set of conditions that promote change.
9. Through assessment educators meet responsibilities to students.
10. Assessment is most effective when undertaken in an environment that is receptive, supportive, and enabling.

It is important to identify individuals on campus who have expertise in developing assessment strategies and who may have relevant assessment instruments available. These individuals can provide feedback, support, ideas, and perhaps serve on the campus group that is spearheading the assessment effort. These individuals also often have information on other successful assessment efforts and can provide suggestions for making information literacy assessment a success.

All of the stakeholders in the process of assessing information literacy should be involved, including faculty, students, librarians, and the administration of the college or university. All points of view should be included to ensure that the final assessment direction chosen has campus-wide support and is useful for the institution.

## **Institutional Constraints**

After the institution has reviewed its current assessment efforts, examined its institutional mission and goals, and identified the educational values it wishes to promote through information literacy education, the institution should consider any constraints on the initiative.

Among the many limitations an institution may face when it considers an information literacy assessment initiative is the possibility that funds may not be sufficient to implement an entirely new assessment effort. If it is not possible to begin a new assessment effort, combining information literacy assessment with other efforts already underway may be the most expedient way for an institution to achieve its goals.



It may not be realistic for a large institution to assess information literacy across its entire student population. The Commission states in *Characteristics of Excellence* (p. 51) that sampling methods are acceptable for assessment, and this applies equally to information literacy initiatives. Therefore, it is possible to obtain results at the institutional, program, or course levels without requiring a massive undertaking across all levels, which would be overwhelming. In other words, assessment efforts can achieve their goals and be both manageable and affordable.

In order for an institution to determine its constraints and its strategy, consider the following questions:

- ✧ What is the size of my institution? Is assessment of the entire student body feasible? Would sampling be expedient for my institution? If so, how would we determine the appropriate sample?
- ✧ What other assessment efforts have been successful on campus? Were they quantitative or qualitative or some combination of both? Who conducted these efforts and how might their experience be useful in developing an information literacy assessment effort?
- ✧ What constraints do we face in establishing an information literacy assessment effort? How can we accommodate our limitations? What can we accomplish, given our current limitations?
- ✧ What further assessment efforts would we like to achieve? When might it be feasible to pursue these efforts?

## **Developing or Refining a Plan for Information Literacy Assessment**

An assessment plan is part of the institution's overall plan for teaching and improving student learning. Efforts to develop or refine an assessment plan necessarily involve making decisions about the level or levels at which assessment will occur and the types of assessment that are appropriate. These decisions also apply to the role of information literacy assessment and how to incorporate the assessment of any existing programs for bibliographic instruction (now called library instruction) in the plan for assessing student learning.

Chapters 1 and 2 discussed the need to review the goals for teaching and learning at the institutional, program, and course levels (and in extra-curricular programs, if desirable) to ensure that expected outcomes are linked closely to the institutional mission and to ensure that they are relevant and meaningful. In addition, Grassian and Kaplowitz (2001) point out that "the presence of a strong institutional mission statement provides an invaluable starting point for the assessment/evaluation/revision cycle. When questions about educational mission and values are skipped over, assessment may become an exercise in measuring what is easy rather than meaningful" (p. 266). This linkage also is discussed in greater detail in Chapter 4 of *Student Learning Assessment: Options and Resources*.

## The Plan to Assess Information Literacy

There are two primary decisions to make when deciding how to assess information literacy. The first decision is whether to assess at the institutional, program, and/or course levels; in the instructional activities of the library; or at various combinations of these. However, all assessment efforts should be part of a coherent plan for systematic data collection and linked to the institution's overall plan for assessing student learning outcomes. The second decision is to select the best type of assessment strategy for the level at which information literacy assessment will be conducted, including how best to incorporate the assessment of existing bibliographic instruction programs into the overall information literacy assessment plan.

One advantage of assessing at multiple levels of the organization is that it provides comprehensive data for understanding how student learning is taking place so that the teaching and learning process can be improved. Combining efforts at the institutional, program, and course levels, as well as from library instruction, offers numerous data sources that reflect on students' attainment of information literacy in different settings within the institution. To accomplish this effect, it even may be necessary to develop entirely new data sets, a practice that the Commission encourages in *Characteristics* (Standard 14, p. 51), and this could be a particularly helpful strategy in the still-evolving field of information literacy.

In addition, many different campus constituency groups should be included in the planning process. The more collaboration there is among the faculty members, librarians, and the administration, the greater the likelihood of a rewarding outcome.

Finally, the information literacy assessment plan can anticipate implementation in phases, because it is neither necessary nor desirable to impose an elaborate and daunting process on the institutional community. Efforts in one course can be adapted for other courses or programs as long as the progress is intentional and part of a coherent process.

For additional resources, such as information on formulating an assessment strategy and a review of some assessment project examples, see *Working with Faculty to Design Undergraduate Information Literacy Programs* (Young and Harmony, 1999). In addition, the Association of College and Research Libraries (ACRL) offers an example of a successful initiative for individual, campus-based programs. There is now an ACRL Best Practices Initiative<sup>7</sup> that includes innovations in information literacy education and assessment at a range of colleges and universities.

In selecting the best assessment strategy for the chosen level of assessment, the following questions might be useful:

- ✧ What will be the guiding principles under which assessment will occur?
- ✧ Are the assessment goals tied to the institution's mission and goals?
- ✧ Does the assessment instrument measure what the institution wants to measure?

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7 See <http://www.ala.org/acrl/nili>.

- ✧ Do the assessment efforts cover the entirety of the standards and goals established for information literacy at the institution?
- ✧ Will the assessment of information literacy occur at one level or on several levels?
- ✧ Is it better to develop a new assessment effort or to alter an existing assessment effort to include information literacy?
- ✧ How will the current bibliographic instruction program be made part of the overall information literacy assessment effort and linked to the course, program, or institutional levels?
- ✧ Are there any similarities between the information literacy assessment effort and other programs (e.g., writing across the curriculum)? Do these similarities overlap or offer any opportunities for coordinated activities?
- ✧ To what extent will the plan rely on direct or indirect measures, quantitative or qualitative evidence, or some combination of all of them?
- ✧ Will information literacy assessment be formative or summative or both?
- ✧ Will data from new assessment efforts be linked to data from previous or other types of assessments?
- ✧ Do assessment results contain adequate evidence of success?
- ✧ Who will be responsible for implementing information literacy assessment and ensuring that results are obtained in a coordinated manner? In other words, will the assessment effort be collaborative or, instead, conducted by one individual or unit only?
- ✧ Are the goals, benchmarks, milestones, and time lines for accomplishing the information literacy assessment plan reasonable?
- ✧ Is the institution prepared for possible mishaps or needed changes, and can the assessment project accommodate such possibilities?
- ✧ What will be the feedback loop? That is, how will the assessment results be reported and used to improve current practice?
- ✧ What are likely next steps, including what maintenance will be necessary and what revisions are likely? Is there a timeline for these next steps?

Several institutions have devised successful information literacy assessment planning initiatives. For example, Kings College in Wilkes-Barre, Pennsylvania, is discussed in the book, *Student Learning in the Information Age* by Patricia Breivik. The College identified eight information literacy skills to address throughout the College's programs, both within and beyond the library. The planning process, shown in Figure 8, resulted in a definition of information literacy for the College and a set of standards for measuring achievement of the standards.<sup>8</sup>

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8 For further information on Kings College's information literacy program, see <http://www.kings.edu/infoliteracy/index.html>.

Figure 9 describes the process at the University of Maryland, University College that produced a planning document for the infusion of information literacy throughout the curriculum, and it continues to guide the enhancement of the information literacy program at the University.

Another institution, the University at Albany, State University of New York, included an information literacy component in the University's general education requirement. The library staff formed a committee and created a for-credit course to respond to the new requirements. The committee's formation, progress, and the results of their

### **Figure 8**

#### **Kings College Information Literacy Assessment Planning Process**

Step 1: Establish a team of individuals to define information literacy and to champion the project. Ensure that the group represents a cross section of the campus community.

Step 2: Create a definition of information literacy and shepherd it through the campus community for formal acceptance.

Step 3: Establish competencies (or standards) for information literacy. (Refer to the ACRL standards to assist in this process: <http://www.ala.org/acrl/ilintro.html>.)

Step 4: Identify relevant resources for assisting with implementation, assessment, and evaluation. Examples include tutorials, guides on information literacy, and instructional techniques already in use or developed for information literacy.

Step 5: Assess current efforts, make revisions, ensure desired learning outcomes are being achieved, and make changes accordingly.

### **Figure 9**

#### **The University of Maryland University College Assessment Planning Process**

The process at UMUC followed these steps:

Step 1: Establish an information literacy study group for the School of Undergraduate Studies (SUS). Ensure wide representation from librarians and faculty.

Step 2: Charge the study group to devise a definition of information literacy, establish information literacy standards, and develop a plan for approaching implementation, assessment and on-going evaluation of information literacy standards across the curriculum.

Step 3: Present the plan to the Curriculum Committee for formal acceptance.

Step 4: Implement the recommendations of the study group.

Step 5: Develop an initial course, and revise upper-level courses as appropriate.

Step 6: Devise assessment measures, and review and evaluate the effectiveness of current offerings.

Step 7: Use assessment results to revise the learning process and improve assessment efforts.

information literacy activities provide insight into how to integrate information literacy into the curriculum and assess information literacy achievement (Bernnhard, 2002).

It also is possible to develop collaboratively an information literacy initiative that applies to an entire university system. Such a plan could outline the information literacy competencies and indicators that would be expected at all of the institutions in the system, and it would provide a process for implementing the initiative.<sup>9</sup>

Dunn (2002) relates her experience assessing information literacy in the set of institutions that comprise the California State University. Her article reviews the process that was followed to determine information literacy competencies system-wide, and it outlines the efforts to assess student information literacy. The assessment plan was comprehensive, extends over several years, and builds on each effort to create a unified whole.

The California plan included the following elements:

Phase I: A questionnaire-based quantitative study to establish a baseline of student information competence;

Phase II: A multi-method qualitative study to capture what students do when they search for information;

Phase III. A multi-part study to include some or all of the following:

- ▲ A longitudinal study of a sample of students, using control groups and specific instructional models or activities;
- ▲ The development and testing of questions for an entrance/exit assessment; and
- ▲ A system-wide survey of faculty attitudes, expectations, and awareness of student information.

Another university assessed its entire freshman class and used the results as a benchmark for further assessment at the sophomore and senior level.<sup>10</sup>

The assessment tool was based on the information literacy goals of the institution and of the library. It is an example of an institution-wide assessment effort with systematic assessment and with evaluation included to improve student learning.

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9 See the State University of New York (SUNY) document, available at <http://www.sunyconnect.suny.edu/ili/final.htm>.

10 See the information literacy assessment effort of Appalachian State University, available at [http://appstate.edu/www\\_docs/depart/assessment/reports/literacy.html](http://appstate.edu/www_docs/depart/assessment/reports/literacy.html).

## Types of Assessment

After there is campus-wide agreement on the institutional definition of information literacy, the institutional goals and standards for information literacy, and the final plan, then it is possible to begin exploring more specifically what types of assessment are appropriate for the institution.

When developing an information literacy assessment strategy, it is important to review Chapter 3 of *Student Learning Assessment: Options and Resources* for a discussion of direct and indirect measures, quantitative and qualitative evidence, other methodological considerations, and key questions to consider when choosing evaluation instruments. Successful assessment requires that the institution consider the type of assessment to be used and match it with an assessment tool that is meaningful for the information literacy goal to be examined. This resource also notes that assessment need not be difficult or complicated, but it needs to be objective, fair, and helpful to students and faculty.

Assessment data on students' information literacy skills may come from many quantitative and qualitative measures as well as direct and indirect methods for measuring students' skills. Examinations, quizzes and essays, portfolios, direct observation, anecdotal accounts, and peer and self-reviews are some of the potential data sources on students' information literacy.

Hernon and Dugan (2002, pp. 104-111) discuss these and other methods in some detail. Their suggestions include such additional qualitative measures as "think-aloud" protocols and "directed conversations." The other quantitative methods they discuss include content analysis, thesis/dissertation/senior paper evaluation, and videotape or audiotape evaluation.

Figure 10 illustrates some of the measures that can be used to evaluate students with regard to the six components of information literacy shown in the first column. The examples of measures in the second column are phrased in qualitative terms. However, some lend themselves well to devices that can produce quantitative data, such as rubrics, which are discussed extensively in the Commission's *Student Learning Assessment: Options and Resources*, by Huba and Freed (2000), and by Walvoord and Anderson (1998). Furthermore, different measures may be appropriate for various types of institutions. Each of these measures could produce the results similar to those illustrated in the third column of the figure.<sup>11</sup>

*Locally-developed Measures.* There are numerous locally-developed measures that faculty and librarians have developed at their respective institutions. Creating an anthology of existing measures is beyond the scope of this book, but each institution can develop its own and be inspired by instruments and evaluation strategies used by its benchmarked peer group. Nevertheless, there are several recent reports and articles outlining successful information literacy assessment efforts. The types of programs designed and the assessment tools chosen varied by institution.

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11 See also Hernon and Dugan (2002, pp. 111-115).

**Figure 10**

**Selecting Appropriate Assessment Measures**

| <b>Information Literacy Components</b>  | <b>Measures</b>   | <b>Findings</b>  |
|---|---|--|
| <b>Framing the Research Question</b>  | Instructor or librarian reviews the students thesis statement for a 10-page paper.  | Students' thesis statements are not focused.   |
| <b>Accessing Sources</b>  | Instructor or librarian reviews a list of keywords and synonyms that students generate from their topics and thesis statements.   | Students' keywords are too broad to be productive. Few synonyms or related words are included.   |
| <b>Evaluating Sources</b>   | Sports medicine instructor reviews the bibliographies submitted with students' outlines of their 10-page paper.   | Eighty-five percent of the sources are from appropriate current peer-reviewed scholarly sources.   |
| <b>Evaluating Content</b>   | Psychology students verbally critique a journal article commenting on the author's use of the scientific method. Students are asked to identify the author's rationale for the research, the validity of the conclusions, and the article's significance and potential contribution to the project. | Students identify the various elements of the articles but are uncertain how the author's method evolved from his thesis. Students have more difficulty identifying the article's significance. Some issues remain with students identifying the article's potential contribution to the project.  |
| <b>Using Information for a Specific Purpose</b>   | Ecology instructor reviews students' poster presentations of their semester projects, using a criterion-based scale (a rubric).<br>Instructor determines the effectiveness of the students' constructed tables to present their project data.   | "Text heavy" posters indicate students have difficulty selecting and concisely presenting the main points of their projects.<br>Students have difficulty using graphic information effectively, but there are no unnecessary tables. Most tables are self-explanatory, correctly labeled and supplement but do not effectively explicate the text. |
| <b>Understanding Issues Affecting the Use of Information; and Observing Laws, Regulations, and Institutional Policies</b> | History instructor reviews students' projects with particular attention to attribution and the use of documentation.  | Students consistently use an appropriate documentation style, complete with page numbers for quoted material.  |

The majority of assessment efforts currently in use are test-based, quantitative measures, and some rely on both direct and indirect methods. For example, librarians and a faculty member worked collaboratively to develop an information literacy assignment and assessment for a biology laboratory session (Bowden and DiBenedetto, 2002). They evaluated the students' final projects for the course to examine how well they had learned information literacy skills (a direct method). In addition, they distributed a questionnaire to determine the students' perception of their information literacy learning (an indirect method). This enabled them to compare student perceptions of learning to actual performance.

There are other opportunities on campus for collecting indirect evidence. For example, students' perceptions of their information skills can be captured using a brief exit survey, conducted as part of the institution's commencement practice.

Moore, Brewster, Dorroh, and Moreau (2002) describe several different approaches to assessment at a California community college. In one instance, they compared the grades of students who took library workshops with those who did not and found statistically significant differences—up to 35 percent higher pass rates in courses for those who took the workshops.

An important element of these examples is that indirect methods by themselves are not sufficient. It is important to go beyond perceptions; to assert that learning has occurred, it is important to have an objective measure that confirms or refutes perceptions. There are many more assessment projects in information literacy that focus on perception, and there is a further need for assessment projects that measure both perceptions and actual learning.

Course-embedded assessments, such as students' papers and other measures of student performance, are rich sources of assessment data at both the course and the program level because they are closest to the learning process. A review of students' papers could indicate the range and types of information sources students use, how well students develop a thesis, and how effectively they use those sources to support their thesis. Separate examinations of the papers by the instructor and a librarian might reveal different information regarding the strengths and weaknesses of the students' work because of the expertise each reviewer can bring to issues of content and available resources.

Other sources of assessment data might include:

- ✧ A faculty member's observation that students in the capstone course who take certain major courses in a particular sequence tend to create better oral presentations or more focused poster sessions than other students. A transcript analysis and grade correlation could confirm that observation. A review of the course syllabi and assignments should indicate the learning activities that contribute to students' success.
- ✧ The results of placement tests that colleges frequently use to assist incoming students in their course selections could provide a profile of students' information skills at the time of entry. It could be reinforced by or combined with the preliminary survey of student preparedness discussed in Chapter 2. As noted there, indicators of students' information skills may come from students' performance on a commercial or institutionally-developed objective test which is specifically designed to measure information skills directly.



- ✧ Comments from alumni, who now understand how their undergraduate research projects prepared them for graduate school, may reaffirm the program's rationale for the role of information skills in its curriculum. Alumni comments also provide an opportunity for the faculty to communicate with current students about how the program's emphasis on information skills contributes to the success of its graduates.

*Standardized Tests and National Surveys.* It should be noted that there are no standardized measures for evaluating competencies in the emerging field of information literacy, although one is currently under development.<sup>12</sup> However, many discipline specific or other standardized tests may include elements that meet some of the components of information literacy, and an institution could develop a chart that draws together these data sources and explains how information literacy is being measured across the curriculum.

Institutions may find useful information in existing data from national surveys such as the National Survey of Student Engagement,<sup>13</sup> the Freshman Experience Survey, and the Senior Experience Survey, all of which offer profiles of students' observations and assessments of their college experiences. National or regional surveys are helpful because they allow comparisons with national norms or institutionally selected peer groups. Standardized tests of specific students' skills also can be helpful. These data may provide schools with a sense of how confident students are about their information skills and whether students believe that the curriculum challenges their information skills.

All of these assessment measures produce data that can be analyzed by major and by performance in each of the six information literacy areas. They could yield a wealth of meaningful assessment findings on students' information skills, which in turn may be useful for curriculum redesign.

### **Links to Bibliographic Instruction**

At many institutions, bibliographic instruction (now usually called library skills instruction) has been an important vehicle for introducing students to library research. In fact, it was the forerunner of today's concept of information literacy, although information literacy now goes much further than accessing and evaluating bibliographic sources. Nevertheless, a bibliographic instruction program provides an opportunity to assess some of the lower-level aspects of contemporary information literacy. **Basic library instruction in some form will continue to be critical for all students who are experiencing library research for the first time. However, assessment at this level must be combined with other efforts on campus to obtain a more well-rounded view of what students are learning within the classroom, the library, or the co-curriculum in preparation for lifelong learning.**

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12 O'Connor, Radcliff, & Gedeon (2002)

13 See [www.iub.edu/~nsse/html/facts.shtml](http://www.iub.edu/~nsse/html/facts.shtml).

Numerous assessment instruments for bibliographic instruction programs are available.<sup>14</sup> Many instruments assess the students' perceptions of what they have learned. While these types of assessments are helpful, it is important to include both opinion questions and questions that actually assess learning in order to have more objective data for improving instructional practices and to evaluate the level of student learning. The latter requirement increases the importance of the role of faculty members in the overall plan for information literacy.

At the end of an instructional session, two or three questions could be included in an assessment instrument to determine if students learned information that was new to them. In addition, a pretest could be helpful in further shaping both the instructional sessions and their final evaluation. If this is desirable, a librarian, collaborating with the instructor, could administer a pre-test before the actual session. The assessment instrument designed for use at the end of the bibliographic instruction session then could indicate either the areas that students were unaware of or not knowledgeable about or whether they had in fact learned the material that had been covered during the session.

## **Measuring Assessment Effectiveness**

Developing a successful assessment effort is an ongoing process. It should be part of an overall plan that is focused on ensuring effective assessment, evaluation, the attainment of learning, and the further improvement of the program. The purpose of the assessment instrument is to obtain useful information for measuring student learning and the success of educational efforts.

Having devised an assessment program, the institution is responsible for ensuring that what it is measuring is what the institution seeks to learn about student attainment of information literacy. Therefore, it is important to test the instrument and to refine it before implementing it as a permanent part of the assessment effort. Once the instrument is in use and there are sufficient data to understand what it measures effectively, it is appropriate to consider opportunities for improvement.

Not only is the information obtained from an assessment effort helpful in refining the instrument so that it is even more effective, the results also provide clues about what other types of assessment may need to be performed or perhaps executed in a different manner. For example, it may indicate that qualitative rather than quantitative measures might further illuminate what students have learned.

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14 See Merz and Mark (2002).

# 4

## Improving Teaching and Learning

**Y**ears ago, when prospective students and their parents visited a college they were considering, institutions encouraged them to visit the college's library and the science laboratories to see types of student activities. The level of library use, as well as the variety of student learning activities observed, were accepted as unobtrusive indicators of the quality of education that an institution provided. Today, an institution emphasizes the skills of its graduates, and the extent to which the institution develops and improves the information skills of students is one indicator of the institution's commitment to effective education. The institution's resources are only a means to the end.

Institutions usually rely on some form of assessment to determine the skills of their graduates. One of the most important steps in the assessment process is what happens after the data are collected (*Assessment of Student Learning: Options and Resources*, Chapter 5). With regard to information literacy, after identifying the sources of available data discussed in Chapter 3, the data should be analyzed, the results presented in an understandable format, the findings summarized and communicated with at least the campus community (and preferably also with a broader audience), and improvements effected in teaching, learning, and institutional effectiveness.

### Analyzing the Information

Raw assessment data must be analyzed in order to contribute to student learning and institutional effectiveness. Analysis of assessment results consists of three complementary activities: (1) an examination of the data from a particular instrument or other source; (2) a reflection on the context in which the particular instruction and testing in question occurred; and (3) a description of the implications of the findings, along with recommendations for action. Depending upon the nature of the data and whether the assessment purposes are for course, program, or institutional level improvements in student learning, the type and sophistication of the analysis will vary.

Effective analysis at the course level may begin with pencil strokes on a simple tally sheet or a scoring rubric, as an instructor seeks to identify where students had difficulties with an assignment. At the course level, an instructor may be able to communicate the assessment findings immediately to students and then use the analysis to make changes in the course or assignments. Campus-wide results from

an objective multiple-choice instrument intended to measure students' information literacy skills may require an entire range of statistical tests and involve several faculty members and librarians in the analysis process.

While a composite score or general indication of students' information skills is helpful, analysis of the data by particular information sets of skills or competency areas—such as those in the Commission's standards in *Characteristics of Excellence*, which were adapted from *Information Literacy Competency Standards for Higher Education* (ACRL, 2000)—is even more helpful in identifying students' information strengths and weaknesses. The richer the level of detail, the easier it is for faculty members to reaffirm or to improve instructional practices.

## Examining the Data

Information literacy assessment data can be qualitative or quantitative, as described in Chapter 3, "Types of Assessment." Some qualitative data can be manually coded and, like quantitative data, subjected to basic statistical procedures. Both then can be assembled in an understandable format to provide an overview of student learning. The answers to the following questions may spur further assessment procedures to gain a deeper understanding of the students' skills:

- ✧ Do the data appear to be reasonably distributed and free of errors or discrepancies which could be the result of a faulty instrument, including ambiguous instructions, a particular qualitative assessment strategy, or mistakes in sampling or data entry?
- ✧ By controlling for selected variables, do the students' information skills differ by instructional method; by whether instructions are written or given orally; by the respondents' gender, grade point average, year in school, or major program; or by students' previous experiences? If so, what might account for those differences?
- ✧ Based on an analysis, where in the program, course, or instructional session did students experience difficulties or misunderstandings?
- ✧ What other data might further inform the analysis?

## Reflecting on Context

Assessment data can reveal the level of actual student learning, compared to the desired levels that are outlined in the institutional, program, or course learning goals. For these findings to be helpful, it is important to understand the educational processes that lead to that student learning. Gardiner (1994, p. 126) asks: What is in the educational process that promotes students' cognitive and affective development? In other words, what are the conditions or situations that are most likely to facilitate students' learning?

Middle States focuses on the skills of graduates and requires the use of multiple measures. However, as explained in Chapter 3, the Commission does not require institutions to demonstrate that value is added by a particular course or program. Nevertheless, an institution may consider it important to determine whether a course or program could be credited with effecting a change in student performance. In this instance, collecting multiple sets of data from different sources or from the same sources over a semester, several semesters, or years might be appropriate.

The underlying reason is that a single set of assessment results is like a snapshot in time, but it does not permit a comparison of the situation before and after the learning experience. Using multiple sets of data for analysis, although fraught with methodological dangers, can provide some additional context in which to interpret the results. Executed correctly, it can reinforce the validity of assessment measures and strengthen subsequent recommendations.

It also is possible to shed light on students' information literacy by using data that have been gathered for another purpose. For example, students' evaluations of their courses and assignments may include data that can be used to confirm results from other data sources and to suggest patterns. Likewise, indirect self-reported data from attitudinal measures, which reflect how students feel about their information skills, can be compared to direct measures of actual knowledge or to other evidence of student performance.

The following questions might inform the analysis of data to describe the students' information literacy skills, to reflect on possible causes for the findings, and to determine how teaching and learning can be improved:

- ✧ Understanding Skill Levels:
  - ▲ First and foremost, is the assessment measuring what it is intended to measure?
  - ▲ Are students able to apply what they learned in a subsequent part of the course or major program? (Selected examples from these assignments could prove helpful in illustrating to other students excellent, acceptable, or poor applications of information skills in a particular content area.) If there are multiple sessions, with students from different course sections, do the results vary?
  - ▲ Are there differences in the levels of sophistication with which students use information resources in their projects, within or across academic levels, and are any patterns evident?
  - ▲ Do the data on information literacy skills correlate or triangulate with other institutional data on students' learning? For example, are faculty in the disciplines inclined to believe that students actually may have mastered the content of the course, using acceptable citations, without reference to whether the students have accessed and evaluated some of the less obvious but available resources?
  - ▲ Do the instructor's observations of students' behavior while doing the exercises correlate with their assignment results, comments, and "one-minute papers"<sup>15</sup>? (For example, a faculty member can observe students execute a project or a librarian can observe students' actual search strategies, and they can draw inferences about whether a student's performance on any particular assignment exceeded or fell below the assumed prerequisite knowledge and skills.)

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15 The one-minute paper was developed by Cross and Angelo (1988, pp. 148-150).

- ✧ Reflecting on Possible Causes of Assessment Findings:
  - ▲ Might a pre-test of students' skills have revealed that students are not quite ready to pursue fully previously-established learning outcomes for the course? If so, there may be one or more gaps in basic and prerequisite information or skills that need to be filled before the course can be pursued.
  - ▲ Were the instructions communicated clearly in the assessment instrument, or were instructions explained clearly prior to the evaluative strategy the instructor used for gathering qualitative information?
  - ▲ Would the use of examples or different examples help students to understand?
  - ▲ Were the objectives for the instructional session appropriate for the time available?
  - ▲ Do any unusual distributions in the data or responses, such as extraordinary highs and lows or clusters in the data, suggest potential biases in the sample, the questions, the procedures, or other aspects of the process?
- ✧ How might the expected or any unexpected discoveries be used to improve teaching, learning, and assessment?

## Findings and Recommendations

In addition to a summary and analysis of the data, a report on information literacy assessment results also should include a discussion of findings and recommendations for action.

*Findings.* The final question for the institution is: Can it be stated with confidence that, upon graduation, students have achieved the institution's standards for information literacy? This question also can be adapted for the program or course level and included with more precise findings that are consistent with the particular learning goals and assessment methods being used.

*Recommendations.* The recommendations are a call for actions that will further develop students' information skills. These recommendations should be supported by evidence that is credible, and specific recommendations make it easier for faculty and librarians to accept the challenge and to make changes in their information literacy instruction. Faculty, librarians, and administrators should be willing to provide the resources necessary for implementation. This can be accomplished by ensuring that there is agreement on an implementation plan (Palomba & Banta, 1999, p. 311-313). This plan should include, as Farmer and Napieralski (1997) point out, the assignment of responsibility and a time frame for actions.

*Multiple Perspectives.* Data often can be interpreted as having more than one meaning, because people with various perspectives see different possibilities in the data. Therefore, faculty, librarians, and other administrative staff should engage in extended conversations before the final report is shared. Such conversations, relying on multiple viewpoints as filters, can be invaluable in interpreting the data and

drawing conclusions (Palomba & Banta, 1999, p. 311), as well as developing any recommendations that might emerge.

## Improving the Curriculum

After the initial development of courses or programs for information literacy, applying the knowledge gained through assessment to improve student learning begins to bring the process full circle. Most institutions will take what they have learned and progress to the next level, improvement, to assure the vitality and relevance of the course and its role in institutional effectiveness.

As Breivik (1998) succinctly notes, the primary value of assessment is “the early detection and redirection of any learning effort that is not producing the intended outcomes in students’ mastery of information [skills]” (p. 114). Evaluating and improving instruction based on the feedback received from sharing assessment results can accomplish this. Those redirected efforts also should affect the institution’s overall effectiveness, because student learning is at the heart of most, if not all, academic institutions.

For example, in 1996, the University of Maryland University College established a non-credit, online tutorial on library research skills. The tutorial is required for all entering graduate students at the university. The students provided an independent assessment of the tutorial every semester. Typically, over 600 students completed the tutorial each time it was administered. After an analysis of data from the student evaluations, it became clear that while the tutorial provided a solid foundation and ensured that students had a fundamental understanding of resources and services, it did not include enough built-in assignments and assessment to ensure a consistent understanding and achievement for all students taking the course. As a result, the Graduate School, in collaboration with the library staff, revised the tutorial and created a new course that addressed its inadequacies. The tutorial also measures the students’ level of understanding and achievement at the conclusion of the course in order to ensure that they have the foundation necessary to progress successfully through the Graduate School.

Figure 11 indicates how data from a variety of sources can lead to specific improvements in the curriculum to promote learning. Faculty and librarians who analyze assessment findings may suggest the need for specific types of professional development opportunities, such as how to improve the design of assignments or effective teaching techniques for different learning styles. Their discussions also may reveal underlying assumptions about how students and faculty apply information skills, and further discussion may test those assumptions.

The summary and analysis of the assessment results, along with the implications and recommendations, can be used in the institution’s annual reports, postings to a web site, or broadcasts via campus e-mail. They can become a discussion topic at departmental meetings. An information literacy listserv or web-based bulletin board could be used to share best practices electronically. If a campus favors face-to-face interaction, workshops or brown bag lunches, sponsored by the library or the teaching center, can be used to demonstrate and discuss experiences in teaching information literacy. The specific form of communication and reflection will depend on the campus culture at an institution.

**Figure 11**

**From Assessment Data to Improvement**

| Assessment Findings  | Problem Areas Identified   | Proposed Solutions  |
|--|--|---|
| <b>Lower-level Examples:</b>   |  |   |
| <p><i>Freshman Experience Survey</i> reveals that 35 percent of freshmen believed their library skills were deficient; 55 percent indicated that the curriculum challenged their library skills.</p> | <p>Students unprepared in basic skills, such as the ability to formulate a search and identify appropriate information; limited previous experience with libraries and information resources</p> | <p>Freshman seminar to include series of short assignments designed to improve students' ability to formulate searches and to identify topics and resources for their seminar project</p> <p>Students complete an on-line tutorial for basic skills as part of their first assignment</p>                   |
| <p>A sociology instructor finds numerous references to <i>Redbook</i>, <i>Newsweek</i>, and web sites in students' social problems reports.</p>  | <p>Expectations not clearly communicated; students unfamiliar with the types of resources expected</p>   | <p>Study guide detailing the differences between popular and scholarly information resources</p> <p>Study guide outlining sociology-related information resources</p>   |
| <p>A review of a semester-long project (due by the last class) reveals several students plagiarized and most students did not effectively utilize information sources to support their thesis.</p>   | <p>Procrastination; lack of familiarity with the steps in the research and writing process and with the use of information sources in building and refuting a position</p>                       | <p>More detailed instructions; outline the role of information sources in the project; break the project into smaller segments with sequential due dates and more frequent feedback; provide a project rubric and samples of excellent work; and offer warnings about the significance of plagiarizing.</p> |
| <b>Upper-level Examples:</b>   |  |   |
| <p>Instructor notes many students were unable to critique journal articles effectively</p>   | <p>Limited knowledge of the structure of research articles and elements of research design</p>   | <p>Materials distributed to detail the elements of a research article, their purpose, and common research flaws; more practice in critiquing</p>  |
| <p>Program faculty observe that several capstone students had difficulty distilling their research for oral presentation.</p>  | <p>Inability to summarize, identify major points, and point out the implications of their findings; no oral presentations in previous courses</p>  | <p>Multiple assignments requiring the abstracting and annotation of research as well as oral presentations introduced earlier in the curriculum</p>   |



Discussions such as these may create a long-term opportunity for librarians and the faculty who are developing students' information literacy skills to share best practices and to address common problem areas. It will provide an opportunity to reflect and build on the assessment process in order to improve students' information skills, the acquisition of specific learning outcomes, and overall institutional effectiveness.

## **Communicating Assessment Information**

Information derived from the assessment of information literacy should be communicated to and discussed with others, both students and faculty on campus and colleagues off campus. Assessment is designed to be a supportive process that leads to improvement in practice; it is not a report card on instructional performance. Therefore, sharing assessment results can lead to a discussion of instructional objectives, trends, accomplishments, and what the faculty members and the institution plan to do differently in the future.

As Palomba and Banta (1999) point out, "Assessment information is of little use if it is not shared with appropriate audiences and used in meaningful ways" (p. 297). They also note: "Much of the value of assessment comes from the systematic way it makes educators question, discuss, share, and observe" (p. 328). To facilitate that discussion and understanding, it is important to avoid jargon or terminology with which the intended audience may not be familiar or comfortable. The communication process should not derail assessment efforts because of "value laden" terminology or words with connotations that some may find distasteful.

In addition to the findings and recommendations, the implications of the data should be communicated clearly. Explaining the implications reduces indifference, defensiveness, or tendencies to rationalize and dismiss the findings (Astin, 1991, p. 134-135). If the results indicate a need for improvement, this can be an opportunity to explain what has been learned and, more importantly, how that learning will be applied to improvement in the development of students' information skills (Grassian & Kaplowitz, 2001, p. 269).

Making the connections between assessment findings, recommendations, or implications and what they may mean for "their students" helps faculty to put a human face on the findings. Disaggregating institutional data and making comparisons by student subgroups or major programs also may assist readers in understanding the information and reflecting on the larger message.

At the institution level, the act of sharing assessment results solidifies perceptions about the institution's return on its financial investment in learning and celebrates the success of its efforts. In addition, a successful program in one department should be shared with other departments and organizations across campus. One of the most convincing ways to let others know the value of information literacy and assessment is to make them aware of how assessment results have been used in the past to improve student information skills, such as by modifying classes, assignments, and courses or by introducing new strategies for teaching and learning. Faculty and librarians can learn from each other, and this feedback enhances their understanding of the connections between their actions and the development of students' information skills. In other words, it assists them in becoming more effective (Astin, 1991, p.130).

Increased confidence in the process and the results may gradually raise the level of faculty commitment and increase their expectations for student learning (Katz, 1993, p. 62). Communication also reinforces the commitment made by faculty who recognized early the importance of information literacy instruction and who are well placed to help prepare others. With a common knowledge and understanding of the institution's information literacy efforts and assessment results, it is possible to develop strategic partnerships and to create a supportive environment for innovative approaches to developing information and lifelong learning skills. It is especially important to share information about the institution's efforts with new faculty, who may not yet understand or accept the concept of information literacy instruction, because they are the future leadership who will shape the curriculum.

Sharing assessment information can be an invitation for constructive input from a variety of sources, and it can lead to assessment efforts being recognized at the local, regional, and national levels. By reaching out to peer or "sister" institutions with information about successful programs, such as through a consortium or a system-wide supportive committee, an institution can promote collaborative approaches that will generate new ideas, and those joint efforts will invigorate each institution's programs. In the absence of formal collaboration, inter-institutional discussions by local, regional, or statewide groups of faculty and librarians should further benefit an established program.

Finally, *Characteristics of Excellence* requires institutions to make "information on student learning outcomes available to prospective students" (p. 25). Applicants should be aware of the institution's commitment to information literacy, which is one of the student learning outcomes specified in *Characteristics*; the students' success in mastering the necessary skills, as reflected in assessment data; and the student's obligation to be information literate upon graduation. This advance notice should help to focus the prospective student's approach to learning across the curriculum and have a positive effect on persistence and retention.

For these reasons, institutions may wish to ask the following questions when they consider how and with whom to share the results of their information literacy assessment:

- ✧ Who should have access to the assessment results?
- ✧ How will the reporting of the results ensure privacy for all concerned?
- ✧ Can the information be shared widely for planning purposes?
- ✧ Will the results be combined with other efforts or reported separately?
- ✧ To what extent and how can the results be summarized and shared beyond the campus?

In summary, continually diffusing innovative approaches will invigorate and further develop programs and courses.

# 5

## Sustaining the Momentum of Information Literacy: An Overview

As explained in Chapter 3, the various elements of information literacy may be taught and assessed across the curriculum, in the general education requirements, in the major fields of study, and in the library. Therefore each institution will want to assure itself that the various elements of information literacy that are scattered across the curriculum form a coherent whole. Even after the “perfect” student learning plan is in place, each institution will continue to review the status and success of its information literacy program and to plan for the future.

Institutions with different missions will have different expectations, both within and across institutions, for the specific information literacy skills that students will have achieved when they graduate. These specific skills would be in addition to the minimum expectations for information literacy at all institutions, as recognized across the United States, as described in *Characteristics of Excellence in Higher Education* (2002), and as shown in the examples given in these guidelines. In addition, not all institutions will explore or emphasize the same areas in creating a plan for themselves or when choosing a design for self-study in preparation for the decennial accreditation review.

This chapter suggests several areas that institutions may choose to consider as they review their existing efforts from a broad perspective and consider how best to revise their institutional plans, curricula, teaching strategies, and information resources in order to sustain the momentum for developing information literate graduates. The questions that follow will not be applicable to all institutions, and they are not presented as lists of requirements for any institution.

- ✧ Are the curricula part of an obviously-integrated plan for learning?
  - ▲ Are the student learning outcomes that the institution seeks to foster at the institutional and program levels (i.e., whether part of the institutional plan for general education, its program-specific goals, or both) integrated into a coherent set of experiences, designed to promote synthesis of learning?
  - ▲ Is information literacy included appropriately and sufficiently among the outcomes that are discussed in the institution’s plan for defining, teaching, and assessing student learning?

- ▲ Is the information literacy curriculum distributed across curricula (either in course-related sessions or embedded within and throughout each course), or is it compartmentalized (e.g., as one or more courses in its own right or as part of the general education curriculum)?
- ▲ Does the institution make connections between learning in its general education courses (including but not limited to information literacy) and learning in the students' major programs?
- ▲ Is information literacy explicitly or implicitly recognized as an outcome that facilitates and enhances other learning outcomes?
- ▲ How does the role of information literacy relate to the institution's other parallel and overlapping curricular initiatives, such as critical thinking, technology competency, writing, and public speaking?

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**[E]ach institution will want to assure itself that the various elements of information literacy that are scattered across the curriculum form a coherent whole.**

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- ☒ What is the institution's process for defining specific information literacy outcomes?
  - ▲ Is developing information literacy outcomes part of the institution's planning process at the institution, department/program, and course levels?
  - ▲ Is the explication of those outcomes consistent and relevant as the definitions become more specific?
  
- ☒ How has the institution defined the characteristics of an information literate graduate?
  - ▲ Is the institution's definition of information literacy consistent with *Characteristics 2002* and with the institution-wide mission and goals? Are the criteria (i.e., the elements of the definition) appropriate and sufficient?
  - ▲ Are there explicit, different characteristics for students as they progress through various years or levels during their career at the institution? Are there major differences for various programs that are offered?
  - ▲ Can the criteria defining an information literate student reasonably be expected to lead to a manageable assessment program that develops useful results within an appropriate time frame?



When the institution is reviewing and explaining the results of its data on student learning with regard to information literacy, it may consider a number of indirect factors, even though many are not requirements for accreditation.<sup>16</sup> These include:

- ✧ Do faculty members and administrators collaborate on information literacy in the areas that are uniquely within their separate expertise?
- ✧ Is there an ongoing discussion on campus about using the results of information literacy assessment to improve individual student learning, teaching, and administration?
- ✧ To what extent do the faculty use active learning techniques (including requiring students to use information resources), whether or not a library is necessary in the information-gathering process (i.e., on field trips, in the laboratory, or in developing oral histories and patient profiles)?
- ✧ What professional development is available to full-time and adjunct faculty, administrators, and professional staff with reference to student learning and information literacy?
  - ▲ Specifically, do professional development seminars address all six of the components of the information literacy paradigm, or are they limited to only those within the technical expertise of a particular seminar facilitator?
- ✧ Does the institution lack any resources that others might consider as baseline and indispensable for a higher education mission, whether those resources are available from the institution's own library or by contracts with others?
- ✧ Could the institution use its web site(s) more effectively to support its information literacy program? Can it also effectively rely on websites from other institutions to help meet its needs? What types of tutorials, study guides, or handouts are available to students and faculty?
- ✧ Are the resources supporting information literacy dedicated to that purpose, or are they shared with other instructional units that use them for different purposes or shared by independent or affiliated providers (e.g., consortia) under contractual agreements?
  - ▲ Are they being utilized appropriately and sufficiently to achieve the stated learning outcomes or other institutional objectives?

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16 To identify the actual Middle States requirements for accreditation, see *Characteristics of Excellence in Higher Education*.

- ▲ Do contracts with affiliated or unaffiliated providers not only comply with the Commission's standards in *Characteristics 2002* but are not barriers to improvements based on the institution's unique assessment findings?
- ✧ Do institutions or programs that deliver instruction by distance-learning ensure that their resources are adequate for the institution's mission and that distance learning students and off-campus faculty are integrated into information literacy planning, instruction, assessment, and improvement?

Many of the skills included in information literacy are not new. Framing the research question and finding, evaluating, using, and communicating information ethically and legally are basic elements of higher education. However, as the amount of available information expands rapidly, and as technology and methods of research change, it is important to pay attention to the increasing complexity of skills needed to ensure that all students are prepared to use information in all aspects of their lives.

The detail devoted to information literacy in these guidelines is not intended to impose new burdens on institutions to create large, new programs. It is intended to demonstrate how this important area can be addressed within existing curricular structures and content, using existing faculty and librarians when possible. Once the need for educating students about information literacy is accepted, the means to achieve that objective may be diverse. The challenge for each institution is to define its own mission-driven path to producing information literate graduates.

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  - (2) The Spring Meeting of the Congress of Academic Library Directors of Maryland, May 19, 2000;
  - (3) Are Students Really Learning? Faculty/Librarian Collaboration for Accreditation, an address to The Greater New York Metropolitan Area Chapter of the Association of College & Research Libraries, December 7, 2001; and
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Appendix 1

# Criteria for Information Literacy Competency

Developed by Grace Bulaong, Director of the Library; Dr. Helen Hoch, Professor of Biology; and Robert J. Matthews, Associate Professor of Business Administration, New Jersey City University. It is based on *Information Literacy Competency Standards for Higher Education* (Association of College and Research Libraries, 2000). Reproduced with permission.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Course Title: \_\_\_\_\_ Instructor: \_\_\_\_\_

Assignment Title: \_\_\_\_\_

| Competency  | Assessment Criteria   |  |   |  |                          |
|---|---|--|---|--|--------------------------|
|   | Novice  | Developing   | Proficient  | Accomplished   | N/A                      |
| <b>Extent of Information</b>                                      |   |  |   |  |                          |
| 1. Ability to define and articulate the need for information      | <input type="checkbox"/> Cannot develop a thesis statement  | <input type="checkbox"/> Develops a clear thesis statement, formulates a question based on information needed                                | <input type="checkbox"/> Defines or modifies information to achieve a manageable focus and can identify key concepts and terms  | <input type="checkbox"/> Combines existing information and original thought, experimentation and/or analysis to produce new information  | <input type="checkbox"/> |
| 2. Identifies a variety of types and formats of potential sources | <input type="checkbox"/> Does not recognize that knowledge is organized into disciplines and cannot locate information beyond local and print resources | <input type="checkbox"/> Recognizes that knowledge is organized into disciplines and identifies the value differences of potential resources | <input type="checkbox"/> Identifies the purpose and audience of potential resources, reevaluates the nature and extent of information needed and differentiates between primary and secondary sources | <input type="checkbox"/> Recognizes the use and importance of primary and secondary sources and realizes that information may need to be constructed with raw data from primary sources<br><input type="checkbox"/> Knows how information is formally and informally produced, organized, and disseminated | <input type="checkbox"/> |

| Competency   | Assessment Criteria  |   |  |   |                          |
|--|--|---|--|---|--------------------------|
|  | Novice   | Developing  | Proficient   | Accomplished  | N/A                      |
| <b>Access to Information</b>   |  |   |  |   |                          |
| 1. Selects the most appropriate investigative methods or information retrieval systems | <input type="checkbox"/> Cannot select appropriate investigative methods for information retrieval | <input type="checkbox"/> Identifies appropriate methods and investigates the benefits and applicability     | <input type="checkbox"/> Investigates the scope, content, and organization of information retrieval systems  | <input type="checkbox"/> Selects efficient and effective approaches from the investigative method or information retrieval system   | <input type="checkbox"/> |
| 2. Constructs and implements effectively designed search strategies                    | <input type="checkbox"/> Cannot construct or implement search strategies                           | <input type="checkbox"/> Identifies key words, synonyms, and related terms                                  | <input type="checkbox"/> Constructs a search strategy appropriate to the information retrieval system  | <input type="checkbox"/> Selects discipline-specific search vocabulary and develops an appropriate research plan  | <input type="checkbox"/> |
| 3. Retrieves information using a variety of methods                                    | <input type="checkbox"/> Cannot retrieve information effectively from any source                   | <input type="checkbox"/> Uses various search systems in a variety of formats                                | <input type="checkbox"/> Uses various classification schemes and other systems to locate information resources and identifies specific sites for exploration | <input type="checkbox"/> Uses specialized services (on-site or on-line) as well as surveys, letters, interviews, and other forms of inquiry to retrieve primary information             | <input type="checkbox"/> |
| 4. Refines the search strategy   | <input type="checkbox"/> Cannot assess the quantity, quality, and relevance of search results      | <input type="checkbox"/> Revises and repeats searches effectively   | <input type="checkbox"/> Identifies gaps in retrieved information and determines if search strategy should be revised  | <input type="checkbox"/> Assesses quantity, quality, and relevant search results to determine whether alternative information retrieval systems or investigative methods should be used | <input type="checkbox"/> |
| 5. Extracts, records, and manages the information and its sources                      | <input type="checkbox"/> Cannot select appropriate information technologies to gather information  | <input type="checkbox"/> Selects appropriate sources and can create a system for organizing the information | <input type="checkbox"/> Differentiates between types of sources and understands the elements and syntax of citations  | <input type="checkbox"/> Uses various technologies to manage information and can record all pertinent citation information for a wide range of resources                                | <input type="checkbox"/> |

| Competency  | Assessment Criteria   |   |  |  |                          |
|---|---|---|--|--|--------------------------|
|   | Novice  | Developing  | Proficient   | Accomplished   | N/A                      |
| <b>Evaluation of Information</b>  |   |   |  |  |                          |
| 1. Summarizes main ideas  | <input type="checkbox"/> Cannot select main ideas from text information gathered                    | <input type="checkbox"/> Selects data accurately  | <input type="checkbox"/> Identifies verbatim material and appropriately quotes it  | <input type="checkbox"/> Summarizes main ideas from information sources and can restate textual concepts in own words  | <input type="checkbox"/> |
| 2. Articulates and applies initial criteria for information and its sources   | <input type="checkbox"/> Cannot evaluate information  | <input type="checkbox"/> Examines and compares information from various sources to evaluate reliability, validity, and timeliness, authority, and point of view of bias | <input type="checkbox"/> Analyzes the structure and logic supporting arguments or methods<br><input type="checkbox"/> Recognizes prejudice, deception, or manipulation | <input type="checkbox"/> Recognizes the cultural, physical, or other contexts within which the information was created and understands the impact of context on information  | <input type="checkbox"/> |
| 3. Synthesizes main ideas to construct new concepts   | <input type="checkbox"/> Cannot synthesize main ideas   | <input type="checkbox"/> Uses computer and other technologies for studying the interaction of ideas and other phenomena   | <input type="checkbox"/> Recognizes interrelationships among concepts and combines them into potentially useful primary statements with supporting evidence            | <input type="checkbox"/> Extends initial synthesis to construct new hypotheses that may require additional information   | <input type="checkbox"/> |
| 4. Compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of information | <input type="checkbox"/> Cannot determine whether information satisfies the information need        | <input type="checkbox"/> Tests theories with discipline-appropriate techniques  | <input type="checkbox"/> Uses consciously selected criteria to evaluate information from other sources and draws conclusions based upon information gathered           | <input type="checkbox"/> Integrates new information with previous knowledge, can select information that provides evidence for the topic<br><input type="checkbox"/> Determines probable accuracy by questioning the source, the limitations of gathering information, and the reasonableness of conclusions | <input type="checkbox"/> |
| 5. Determines whether new knowledge has an impact on the individual's value system and takes steps to reconcile differences                 | <input type="checkbox"/> Cannot determine whether new knowledge has an impact on one's value system | <input type="checkbox"/> Investigates differing viewpoints  | <input type="checkbox"/> Investigates differing viewpoints to determine whether to reject viewpoints encountered   | <input type="checkbox"/> Determines whether to incorporate viewpoints encountered into one's own value system  | <input type="checkbox"/> |

| Competency   | Assessment Criteria  |   |   |  |                          |
|--|--|---|---|--|--------------------------|
|  | Novice   | Developing  | Proficient  | Accomplished   | N/A                      |
| <b>Evaluation of Information cont'd</b>  |  |   |   |  |                          |
| 6. Validates understanding and interpretation of information through discourse with others, including experts and/or practitioners | <input type="checkbox"/> Cannot effectively participate in discussions             | <input type="checkbox"/> Participates effectively in classroom and other discussions                                  | <input type="checkbox"/> Effectively uses class-sponsored electronic communications forums  | <input type="checkbox"/> Seeks appropriate expert opinions through a variety of mechanisms   | <input type="checkbox"/> |
| 7. Determines whether the initial query should be revised  | <input type="checkbox"/> Cannot determine if information needs have been satisfied | <input type="checkbox"/> Determines if original information need has been satisfied or if added information is needed | <input type="checkbox"/> Reviews search strategy and incorporates additional concepts as necessary  | <input type="checkbox"/> Reviews information retrieval sources and search strategies used to revise initial queries  | <input type="checkbox"/> |
| <b>Use of Information</b>  |  |   |   |  |                          |
| 1. Applies new and prior information to the planning and creation of a particular product or performance                           | <input type="checkbox"/> Cannot organize content in a meaningful way               | <input type="checkbox"/> Manipulates digital text, images, and data from original locations to format a new context   | <input type="checkbox"/> Organizes content in support of purposes and format and articulates knowledge and skills from prior experiences  | <input type="checkbox"/> Integrates new and prior information, including quotations and paraphrasing, in a manner that supports the product or performance | <input type="checkbox"/> |
| 2. Revises the development process for the product or performance  | <input type="checkbox"/> Cannot effectively revise work                            | <input type="checkbox"/> Maintains a journal or log of activities   | <input type="checkbox"/> Maintains a log that includes an evaluation of information relevant to the data found  | <input type="checkbox"/> Reflects on past successes and failures; Develops alternative strategies in searching, evaluating, and communicating              | <input type="checkbox"/> |
| 3. Communicates the product or performance effectively   | <input type="checkbox"/> Cannot communicate effectively                            | <input type="checkbox"/> Uses a limited range of information technology   | <input type="checkbox"/> Uses a range of information technology<br><input type="checkbox"/> Chooses communication medium/format that best supports the purposes of the product or performance and the intended audience | <input type="checkbox"/> Incorporates principles of design and communication and communicates clearly to the intended audience                             | <input type="checkbox"/> |

| Competency   | Assessment Criteria   |   |   |  |                          |
|--|---|---|---|--|--------------------------|
|  | Novice  | Developing  | Proficient  | Accomplished   | N/A                      |
| <b>Ethical and Legal Issues</b>  |   |   |   |  |                          |
| 1. Understand ethical, legal, and socio-economic issues surrounding information and information technology                                     | <input type="checkbox"/> Does not understand the ethical/legal/socio-economic issues surrounding information and information technology | <input type="checkbox"/> Identifies and discusses issues related to free vs. fee-based access in print and electronic environments  | <input type="checkbox"/> Identifies and discusses issues of privacy, security, censorship, and freedom of speech  | <input type="checkbox"/> Demonstrates an understanding of intellectual property, copyright, and the fair use of copyrighted material   | <input type="checkbox"/> |
| 2. Follows copyright and other laws, regulations, institutional policies, and etiquette related to the access and use of information resources | <input type="checkbox"/> Does not follow appropriate laws, policies, and "netiquette"   | <input type="checkbox"/> Uses appropriate passwords, ID, and "netiquette" in the collection of information<br><input type="checkbox"/> Understands what plagiarism is and does not plagiarize | <input type="checkbox"/> Complies with institutional policies on information resources and preserves the integrity of information sources, equipment, systems, and facilities | <input type="checkbox"/> Obtains, stores, and disseminates text, data, images, and sounds within legal guidelines<br><input type="checkbox"/> Understands relevant institutional policies, including those on human subject research | <input type="checkbox"/> |
| 3. Acknowledges the use of information sources   | <input type="checkbox"/> Does not acknowledge sources   | <input type="checkbox"/> Inappropriately acknowledges sources   | <input type="checkbox"/> Usually acknowledges sources in an appropriate style   | <input type="checkbox"/> Consistently cites sources in an appropriate style and posts permission granted notices for copyrighted material, where applicable  | <input type="checkbox"/> |
| <b>Self-Assessment</b>   |   |   |   |  |                          |
| Self-regulation and goal-setting   | <input type="checkbox"/> Identifies major weaknesses and strengths  | <input type="checkbox"/> Synthesizes feedback from instructor and students  | <input type="checkbox"/> Synthesizes feedback and integrates with self-analysis   | <input type="checkbox"/> Utilizes self-assessment and feedback to determine means of modifying performance   | <input type="checkbox"/> |

## Appendix 2

# An Entry-level Course on The Research Aspects of Information Literacy

### Course Proposal for CSIS 103: Information Literacy

Marist College, Poughkeepsie, NY (Master's I). [Reproduced with permission of Dr. Artin Arslanian, Dean of Faculty and Vice President for Academic Affairs.]

The Middle States Commission on Higher Education defines information literacy as:

... an intellectual framework for identifying, finding, understanding, evaluating and using information. It includes determining the nature and extent of needed information; accessing information effectively and efficiently; evaluating critically information and its sources; incorporating selected information in the learner's knowledge base and value system; using information effectively to accomplish a specific purpose; understanding the economic, legal and social issues surrounding the use of information and information technology; and observing laws, regulations, and institutional policies related to the access and use of information.

Information management skills are necessary in every discipline and in every professional career. The ability to locate and evaluate meaningful information is vital to good decision-making. Information literacy is a means of personal empowerment; it allows individuals to verify or refute expert opinions and to become independent seekers of truth; it provides them with the ability to build their own arguments and to experience the excitement of the search for knowledge.

Information (organized data, the raw material for specialized knowledge, and generalist wisdom) is a globally important resource. Industry, diplomacy, politics, and commerce are based on a transfer of specific kinds of data and information. As the world embraces technology as its primary vehicle for information transfer, special skills have become necessary to process and analyze information.

It has been said that today's students are the first "truly wired" generation. Students entering the global marketplace in the 21st Century are far more likely to be familiar with current technologies, including the expanse of the World Wide Web. Success in this environment will be determined by a student's ability to master these technological tools and access the information they require quickly and effectively.

Information literacy standards explore an approach to problem solving that suggests multiple solutions of varying degrees of usefulness that can be pieced together—often from many disciplines and from multiple information sources such as online databases, videotapes, government documents, and journals. This method of locating and analyzing information is a lifelong learning activity, and is evidenced by: knowing when there is a need for information; identifying information needed to address a given problem or issue; finding needed information and evaluating the information; organizing the information; and using the information effectively to address the problem or issue at hand.



This learning process will not only enhance the critical thinking skills of students but will also promote the effective performance of professional and civic responsibilities.

Number of Credits: 3

Suggested class size: 20 (due to class projects and lab requirements which demand significant instructor-student interaction)

Requirements: None. This is a basic course for entry-level students.

Planned number of meetings per week: 2 at 1 hour 15 minutes each (lecture and lab will be combined)

Professor responsible for the course: Computer Science and Information/Library Science faculty.

Previous Offerings: The content of this course is new and incorporates certain aspects from CSIS 150, 151, 152, 153, and 158.

### **Course Approach**

In order to teach information literacy effectively, it must be done from the pedagogical framework of problem solving (i.e., the asking of significant questions, researching of those questions, analysis of the questions, and the successful communication of the results). Successful integrated information skills programs are designed around collaborative projects and will include computer skills instruction.

A computer literacy curriculum must be more than “laundry lists” of isolated skills, such as: knowing the parts of the computer, writing drafts and final products with a word processor, or searching for information using a CD-ROM database. This approach does not allow students to understand why or when or a certain piece of data, information, or tool is called for. Students need to be able to recognize that computers and other technologies serve learning as a means to obtain information, but do not substitute for an ability to locate and analyze that information. Information literacy includes building computer skills as part of the problem-solving process, but it focuses on overall learning and information-gathering skills. Experts in the field of information literacy have warned against teaching computer skills in isolation and have emphasized a need to combine such training with the student’s knowledge base and value system, whereby the student fully understands the nature and impact of the information sought.

### **Catalog Description**

This hands-on course will provide students with an overview of the types of information resources found in libraries and with a working knowledge of the electronic resources available in the Marist College Library. In addition, information available via the Internet, and the World Wide Web in particular, will be explored. Search techniques will be demonstrated and practiced. Critical thinking and evaluation of information resources will be emphasized throughout the course. The impact of the use and availability of information locally, nationally and globally will be discussed. MLA and APA citation style will be used. Students will learn “when” and “why” to use computer skills as well as “how.” Students will develop information and computer literacy by applying various computer skills as part of the learning process.

### **Background**

It is the general consensus among the various schools that the current computer modules no longer meet the needs of our students. Issues raised include:

Students are arriving with significantly more computer skills and no longer need introductory skill courses.

More and varied computer skills are needed depending upon the curriculum in which the student is majoring.

Skill courses do not fulfill the pedagogical requirements of a college course; they specifically do not encourage independent thinking or problem solving.

Skills that are learned in isolation are not retained or transferred to future courses.

## Rationale for the Course

In response to a growing need for a less computer-skills-driven and more ideologically focused component to helping students fulfill information needs, the School of Computer Science and Mathematics is proposing a course that will emphasize the principles of information literacy. This assumes that Marist students are approaching this course with a more technologically-advanced skill base than previous classes and will need to keep ahead of changes in the information technology world.

Information literacy has been defined as a set of abilities requiring individuals to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information.” Information literacy is increasingly important in the contemporary environment of rapid technological change and proliferating information resources. The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively.

Information literacy, while showing significant overlap with information technology skills, is a distinct and broader area of competence. Increasingly, information technology skills are interwoven with, and support, information literacy. “Fluency with technology” focuses on understanding the underlying concepts of technology and applying problem-solving and critical thinking to using technology.

- ✧ Information technology “fluency” focuses on a deep understanding of technology and graduated, increasingly skilled use of it.
- ✧ “Fluency” with information technology may require more intellectual ability than the rote learning of software and hardware associated with “computer literacy,” but the focus is still on the technology itself.
- ✧ Information literacy, on the other hand, is an intellectual framework for understanding, finding, evaluating, and using information—activities which may be accomplished in part by fluency with information technology, in part by sound investigative methods, but most importantly, through critical discernment and reasoning. Information literacy initiates, sustains, and extends lifelong learning through abilities that may use technologies but are ultimately independent of them.<sup>17</sup>

The following standards, performance indicators, and outcomes (In *Information Literacy Competency Standards for Higher Education*, Approved by the ACRL Board, January 18, 2000) will be used.

1. The information literate student determines the nature and extent of the information needed.
2. The information literate student accesses needed information effectively and efficiently.

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17 *Information Literacy Competency Standards for Higher Education*. Association of College and Research Libraries. <http://www.ala.org/acrl/ilintro.html>.

3. The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.
4. The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.
5. The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

## **Bibliography**

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Committee on Information Technology Literacy. *Being Fluent with Information Technology*. Washington, DC: National Academy Press.

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## **CSIS 103: Information Literacy**

### **Objectives**

By the end of the course students will:

- ✧ Understand electronic information resources found in Libraries, such as OPACS (Online Public Access Catalogs), bibliographic, full text, and directory databases.
- ✧ Use effectively the electronic resources in the Marist College Library.
- ✧ Understand and correctly use basic searching techniques.
- ✧ Have a basic understanding of the Internet including the sources and quality of the information available to the general public, and through fee-based services.
- ✧ Navigate and effectively search the World Wide Web.
- ✧ Be able to discuss political, social, legal, economic, and intellectual property issues relevant to electronic information.
- ✧ Be able to evaluate information for reliability and accuracy.
- ✧ Develop tool literacy (integrating and utilizing various software packages for problem solving, such as SPSS and Excel)
- ✧ Understand resource literacy (ability to understand the form and format)
- ✧ Have a basic understanding of electronic publishing (web page an example of this)
- ✧ Be exposed to emerging technology literacy (new methods of communication such as net meeting, etc.)

## Assessment methods include

- ✧ Tests and in-class exercises
- ✧ Annotated bibliography
- ✧ Documents and presentation of project using MS Word, PowerPoint, Excel, SPSS
- ✧ Demonstrated classroom use of the WWW, eLearning, e-mail, virtual classroom exercises

### **Class 1 Information Literacy**

Overview of course and definitions  
Introduction to elearning.Marist.edu  
Overview of library web page and class web page and lecture on the reading  
Reading: *Educom Review* article: Information Literacy as a Liberal Art

### **Class 2 Introduction to the Internet**

Reading : *Introduction to the Internet*. Lagerstrom

### **Class 3 Internet: Socio-political issues and technology.**

Reading: *Introduction to Information Systems*, Chapter 11, O'Brien

### **Class 4 Internet: Online discussion (virtual) on the Digital Divide**

Reading: *The Digital Divide* by Kathy Koch (CQ Researcher)

### **Class 5 Topic selections for term project based on social, legal, political, moral, and ethical issues relating to the Internet**

Explanation of term project

### **Class 6 Selection and evaluation of websites.**

Limit your search to get better results  
structure vs. interface  
controlled vocabulary; semantic web  
keyword searches  
search engine directories

### **Class 7 Test One**

### **Class 8 Web evaluation continued**

In-class assignment using search engines  
Reading: *Evaluating a Website*

### **Class 9 Scholarly, Popular, and Professional Journals. What's the difference?**

Reading: *Scholarly Research and Publishing* by Katy Silberger

### **Class 10 Primary & Secondary**

Reading: *Primary, Secondary and Tertiary Sources of Information*, by Katy Silberger

- Class 11 Library web page and catalogs: Overview of library web page contents**
- Classes 12-16 Database research**  
Using: Electronic resources of Marist Library and subscription services
- Class 17 Annotations, citations, and writing style manuals using End Notes or APA Software**  
Annotated bibliography is begun
- Class 18 Annotated bibliography completed.**
- Class 19 Systems approach as a problem solving framework for research**  
Reading: Chapter 10 *Introduction to Information Systems*, O'Brien
- Class 20 Creating an opinion survey instrument on your topic of research using MS Word, Excel, etc.**  
Reading: *Integrating and Extending Office*: Hutchinson and Coulthard Chapters 1 – 3.
- Classes 21–22 Enter and analyze data in Excel and/or SPSS**  
Reading: SPSS tutorial and Office XP, by O'Leary Ex 1, 2, 3.
- Class 23 Link data into PowerPoint**
- Classes 24–26 Design and e-publish the analysis and research from your project.**  
Reading: *Internet Literacy*. Hofstetter, Chapters 15 - 17)
- Classes 27–28 Presentations of final projects**

## Appendix 3

# A Distributed Approach to Information Literacy at A Two-Year Institution

### **RDG 030: Library Research and Literature Circles Project**

Nassau Community College (Associate's)

[Reproduced with Permission of Dr. Qiong-Ying Chen,

Assistant Professor, Reading and Basic Education Department]

The purpose of this project is to help you become actively engaged in researching, reading, discussing, and reflecting on the novel, *A Walk to Remember*, throughout the semester. The project consists of three components: (a) library research, (b) literature circle discussion, and (c) a novel/movie report. Therefore, you will be assigned to work in groups of 4-5 students and required to do both individual reading/writing outside of class and group discussing/sharing inside of class.

### **I. Library Research**

The purpose of the library research is to help you learn to use the library facilities to do research projects, not just for this class but also for other classes you will take in the future.

- A. You will use the library catalog to find the novel and the movie, *A Walk to Remember*. You must fill out request slips or attach the printout of this search to the assignment.
- B. You will use the different online databases, literature resource center, websites, etc., to locate articles on:
  1. the novel (e.g., book review)]
  2. the author
  3. the movie
  4. the director
  5. the actors, actresses, etc.
  6. the setting of the novel and the movie
- C. You will have to print or photocopy the articles for literature circle discussions and to use as sources for your novel/movie report.

## II. Literature Circles

The purpose of literature circles is to provide an opportunity for you to share your understanding of the events of the novel and to discuss your ideas, concerns, and questions of what you read.

- A. You will read, discuss, and reflect the novel and the articles on the novel/movie.
- B. You will have rotating task roles in the literature circles discussions. (See sample role sheets attached.) Role sheets are to be developed.
- C. You will be assigned a specific role for each literature circle discussion.
- D. You are responsible for reading, annotating the novel/articles, and preparing/completing the role sheets.
- E. Each student will assume the role of Discussion Director at least once and contribute one article to the group.
- F. When you have the role of Discussion Director, you are responsible for developing a list of questions that your group might want to discuss.
- G. You will write a reflective journal entry after each group discussion.

**Note: Library research printouts, articles, literature circles discussion notes, role sheets, and journal entries should be arranged into a portfolio and handed in before the end of the semester.**

## III. A Novel/Movie Report

Students will write a novel/movie report on *A Walk to Remember*, using at least four sources from the library research and the skills learned in class, such as mapping, outlining, summarizing, etc. The purpose of this report is to help you develop appreciation and critical thinking on two art forms: books and movies. **This report must be typed and should include the following:**

- A. A title page with your name and class/section on it
- B. Information about the novel and the movie:
  - a. Title of the novel, author, publisher, and date
  - b. Title of the movie, director, producer, main actors/actresses
- C. A comparison between the movie and the novel: Were the setting, characters, plot, and resolution the same as the novel? If not, where did the movie differ? Which did you like better? Did the movie help clarify any part of the story? Do you think the characters or plot took on a different meaning in the movie version? Did you see the movie and read the novel for the first time? Which did you prefer and why?

Please refer to the course outline for the due dates of each part of the assignments of this project.

**ROLE SHEET: DISCUSSION DIRECTOR**

**Group Members:** \_\_\_\_\_

**Book:** *A Walk to Remember*

**Assignment Chapters:** \_\_\_\_\_

**Discussion Director:** Your job is to develop a list of questions that your group might want to discuss about these chapters of the book. Don't worry about the small details: your task is to help people to talk over the big ideas in the reading and share their reactions. Usually the best discussion questions come from your own thoughts, feelings, and concerns as you read, which you can list below, during or after your reading. Or you may use some of the general questions below to develop topics for your group.

**Possible discussion questions or topics:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**Sample questions:**

What was going through your mind while you read this?

How did you feel while reading this part of the book?

What was discussed in this section of the book?

Can someone summarize briefly?

Did today's reading remind you of any real-life experiences?

What questions did you have when you finished this section?

Did anything in this section of the book surprise you?

What are the one or two most important ideas?

Predict some things you think will be talked about next.

Adapted from *Literature Circles: Voice and choice in the student-centered classroom* by Harvey Daniels. Stenhouse Publishers, York, ME.



**ROLE SHEET: LITERARY LUMINARY**

**Group Members:** \_\_\_\_\_  
**Book:** *A Walk to Remember*  
**Assignment Chapters:** \_\_\_\_\_

**Literary Luminary:** Your job is to locate a few special sections of the novel that your group would like to hear read aloud. The idea is to help people remember some interesting, powerful, funny, puzzling, or important sections of the text. You decide which passages or paragraphs are worth hearing, and then jot plans for how they should be shared. You can read passages aloud yourself, ask someone else to read them, or have people read silently and then discuss.

| Location                        | Reason for Picking | Plan for Reading |
|---------------------------------|--------------------|------------------|
| 1. Page _____<br>Paragraph ____ | _____<br>_____     | _____<br>_____   |
| 2. Page _____<br>Paragraph ____ | _____<br>_____     | _____<br>_____   |
| 3. Page _____<br>Paragraph ____ | _____<br>_____     | _____<br>_____   |
| 4. Page _____<br>Paragraph ____ | _____<br>_____     | _____<br>_____   |

**Possible reasons for picking a passage to be shared:**

- Important      Informative
- Surprising      Controversial
- Funny      Well written
- Confusing      Thought provoking

Other: \_\_\_\_\_

Adapted from *Literature Circles: Voice and choice in the student-centered classroom* by Harvey Daniels. Stenhouse Publishers, York, ME.

**ROLE SHEET: CONNECTOR**

**Group Members:** \_\_\_\_\_

**Book:** *A Walk to Remember*

**Assignment Chapters:** \_\_\_\_\_

**Connector:** Your job is to find connections between the book your group is reading and the world outside. This means connecting the reading to your own life, to happenings at school or in the community, to similar events at other times or places, to other people or problems you are reminded of. You might also see connections between this book and other writings on the same topic, or by the same author. There are no right answers here—whatever the reading connects **you** with is worth sharing.

**Some connections I found between this reading and other people, places, events, authors. . .**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

Adapted from *Literature Circles: Voice and choice in the student-centered classroom* by Harvey Daniels. Stenhouse Publishers, York, ME.

RDG 030  
Dr. Chen

Name: \_\_\_\_\_  
Date: \_\_\_\_\_

**ROLE SHEET: SUMMARIZER**

**Group Members:** \_\_\_\_\_  
**Book:** *A Walk to Remember*  
**Assignment Chapters:** \_\_\_\_\_

**Summarizer:** Your job is to prepare a brief summary of today's reading. The other members of your group will be counting on you to give a quick (one- or two-minute) statement that conveys the gist, the key points, the main idea or events, the **essence** of today's reading assignment. If there are several main ideas or events to remember, you can use the numbered slots below.

**Summary:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key points:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Adapted from *Literature Circles: Voice and choice in the student-centered classroom* by Harvey Daniels. Stenhouse Publishers, York, ME.



RDG 030  
Dr. Chen

Name: \_\_\_\_\_  
Date: \_\_\_\_\_

### ROLE SHEET: RESEARCHER

**Group Members:** \_\_\_\_\_  
**Book:** *A Walk to Remember*  
**Assignment:** \_\_\_\_\_

**Researcher:** Your job is to dig up some information/articles on any topic related to the novel and the movie. This might include:

1. Information about the setting of the novel and the movie (time, place, season, etc.).
2. Information about the author, his life, and other works.
3. Information about the director, actors, and actresses of the movie.
4. Pictures, objects, or materials that illustrate elements of the book.
5. Article(s) about the novel (e.g. book review).
6. Article(s) about the movie (e.g. movie review).

Note: The idea is to find some information or material that will help your group understand the book better and to do the novel/movie report. Since there are so many topics you need to investigate, you may want to discuss with your group members to decide who is going to do what (i.e., to divide the library research topics among yourselves). So, each of you will get at least one article of the related topics to share with your group members. This way, you will have all the related information/material you need to write your novel/movie report.

Adapted from *Literature Circles: Voice and choice in the student-centered classroom* by Harvey Daniels. Stenhouse Publishers, York, ME.

## ROLE SHEET: TRAVEL TRACER

**Group Members:** \_\_\_\_\_

**Book:** *A Walk to Remember*

**Assignment Chapters:** \_\_\_\_\_

**Travel Tracer:** When you are reading a novel where characters move around a lot and the scene changes frequently, it is important for everyone in your group to know **where** things are happening and how the setting may have changed. So your job is to track carefully where the action takes place during today's reading. Describe each setting in detail, either in words or with an action map or diagram you can show to your group. Be sure to give the page number(s) where the scene is described.

Describe or sketch the setting (you may also use the back of this sheet or another sheet):

Where today's action **begins**: \_\_\_\_\_ Page where it is described \_\_\_\_\_

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---

Where **key events** happen today: \_\_\_\_\_ Page where it is described \_\_\_\_\_

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Where today's events **end**: \_\_\_\_\_ Page where it is described \_\_\_\_\_

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Adapted from *Literature Circles: Voice and choice in the student-centered classroom* by Harvey Daniels. Stenhouse Publishers, York, ME.

## Appendix 4

# A Distributed Approach to Information Literacy in A Lower-level Economics Course

### **ECON 115: Economy, Jobs, and You (Revised 12/02/02)**

Mercy College, Dobb's Ferry, NY (Master's I)

[Reproduced with permission of Dr. Stuart Cohen, Professor, Activity Director Title V, Division of Social & Behavioral Sciences]

### **Topic**

The purpose of this introductory course is to enable you to acquire some basic concepts of economics that you can apply to current public issues in order to understand them better and to take informed positions on them. The textbook presents a number of these issues, all of which you can understand better by examining them from an economic point of view or perspective. This perspective has a number of basic concepts, which include the following:

- ✧ Scarcity and trade-offs
- ✧ Marginal analysis: costs, benefits, and opportunity costs
- ✧ Supply and demand
- ✧ Market price system: equilibrium price, elasticity
- ✧ Non-price rationing: wage and price controls
- ✧ Market structures: monopoly, pure competition
- ✧ Product differentiation
- ✧ Economies of scale
- ✧ Public goods and property rights
- ✧ Intellectual property and human capital
- ✧ Negative externalities and social costs
- ✧ Monetary policy: money supply, interest rates, inflation
- ✧ Fiscal policy: surplus, deficit, public debt
- ✧ Gains from trade: comparative advantage, protectionism

For the information literacy assignment, you are to choose a public issue and examine it by applying a concept or concepts from economics. You may choose an issue presented by the textbook or an issue that you have identified by reading, viewing, or hearing the news. You must frame the issue as a question in a form that requires an examination of more than one side. For example, you could frame the question: "Should the government ban smoking?"

That would require you to examine arguments in favor and against such a policy. These arguments must be based on economic concepts.

Framing your question in a productive form will enable you to focus your research. Without such focus, you will not be able to carry out this assignment effectively, so **you are required to obtain prior approval of your question from the instructor.**

This project addresses parts of the information literacy competency (listed under “General Education Competencies” section near the beginning of the undergraduate catalog). You will need to frame a topic, choose workable databases and sources concerning the topic, and briefly cite and evaluate those sources. All these skills will be vital in other research and in other settings.

## Assignment Overview

**For this assignment you will not write a paper, but you will choose the best sources for such a paper.** Over several weeks you will:

1. Choose a topic, approved by your instructor
  - a. Pose the relevant questions and look up definitions as needed**Complete Form 1: Developing a Topic**  
**Your class should get a library session soon after this.**
2. Create a documentation file of research activities and their outcomes
  - a. Access suggested databases, listing key words/terms used in each one
  - b. Evaluate each database for your topic, and provide notes on items found in each database
  - c. Print/record potentially useful items for further evaluation**Complete Form 2: Database Search and Evaluation**
3. From the materials identified above, select (and justify your choices):
  - a. Two books or selections/chapters from books
  - b. Two articles from scholarly journals
  - c. Two articles from general audience (popular)magazines or newspapersFrom an Internet search engine (www.Google.com), select and justify:
  - d. Two good Websites that deal with your topicPrint the first one to two pages of each of these 8 sources.  
**Complete Form 3: List of Recommended Sources**, citing all sources in the reference style attached to these guidelines.

**Use the three forms that follow. Your instructor will provide a due date for each one. It's essential to hand them in on time so that you get feedback on each stage before you proceed to the next.**

Whenever you have questions about the databases or the research process, **ask a librarian.**

## Tips from the Library

The topic selected and the question that you seek to answer may not be represented in each type of source. It's not likely that you'll find a whole magazine article, a whole newspaper article, or a whole book, on that exact topic. So be flexible and learn to examine each resource for any relevant information it may contain about your topic and the question you seek to answer. Sometimes if you can't find information on a topic it may not be because of your search procedures. If this occurs please see your instructor or a librarian.

When you search, try different terms, and keep track of the terms that work well. Even a term that is changed by one letter will give different results.



The library's website is at [www.mercy.edu/libraries](http://www.mercy.edu/libraries). The main menu begins with the CATALOG, then INDEXES ("General" or "Current Affairs"), where you get to the databases recommended below:

- ✧ Catalog (books and AV) – You'll need to see the book to determine whether any part of it can be useful for your topic. If you need to get it from another Mercy library, allow a week or more for delivery.
- ✧ Paroquet – A group of very large databases. If you want to focus on business and economics journals, you might choose ABI-Inform. If you want to focus on the newspaper articles, try Paroquet Newspapers. (The New York Times and Wall Street Journal both have their own
- ✧ databases also.) If you pull up too many (50+) citations in Paroquet, try adding a word like "ECON?" or "cost?" to your topic to focus the search. You can always rerun the search back before 1999 by selecting "Date range: Backfile." Many sources are full text, and Mercy owns most of the others as well.
- ✧ Wilson OmniFile – All full text. Especially strong in journals.
- ✧ EBSCO Host Masterfile – Like Paroquet but much smaller.
- ✧ SIRS Researcher – Excellent for full-text articles and editorials that have been selected to represent differing points of view.
- ✧ CQ Library – Especially for the CQ Researcher (first on the menu), which will examine any major public issue in depth. You would cite the name and date of the most useful report, which counts as a magazine article.
- ✧ Issues & Controversies – Similar to the CQ Researcher above.
- ✧ Alt-Press Watch – Includes full texts of articles from the alternative and independent press. Mostly recent magazine articles and newspaper editorials, especially from the Left.
- ✧ Other databases: Ask the librarian if you need other ideas.

Search engine for the Internet:

- ✧ Google.com – A search engine to find material anywhere on the Internet. It's important to check the sites and the information for quality – e.g., authority of the source and depth of the evidence provided.



**Form 2 – Database Search and Evaluation  
Information Literacy Assignment**

Name \_\_\_\_\_ ECON 115 Sec. \_\_\_\_\_ Date \_\_\_\_\_

Use the scale provided to assign the rating value indicating the usefulness of the database for your research objectives.

1-----2-----3-----4-----5

Very Useful      Useful      Average Useful      Minimally useful      Not Useful

For "Strengths and Weaknesses," ask yourself: Are the articles from this database actually relevant? Are they too brief and "newsy"? Too advanced? Too biased? Do any take an economic viewpoint?

| Databases                         | Keywords/ Terms Used to Search | # of Hits | Rating | Strengths or Weaknesses of the Database |
|-----------------------------------|--------------------------------|-----------|--------|---|
| Books and Media Catalog (WebPals) |                                |           |        |   |
| Paroquet Direct                   |                                |           |        |   |
| Wilson Omnifile                   |                                |           |        |   |
| EBSCO Masterfile                  |                                |           |        |   |
| SIRS Researcher                   |                                |           |        |   |
| CQ Library                        |                                |           |        |   |
| Issues & Controversies            |                                |           |        |   |
| Alt-Press Watch                   |                                |           |        |   |
| Other Library Database:           |                                |           |        |   |
| Internet Search Engine (Google)   |                                |           |        |   |

**Form 3 – List of recommended sources  
Information Literacy Assignment**

Name \_\_\_\_\_ ECON 115 Sec. \_\_\_\_\_ Date \_\_\_\_\_

Now cite the 8 sources you've chosen, using the reference style provided on pages 9-10. You will also indicate the database where you found each source, and type a justification for each source you chose. Here is an example:

Smith, J. P. 1998. Global strategy: A necessity. *Journal of International Business* 23 (December): 92-121. (From Paroquet)

This clearly written article reviews much of the recent literature and gives a marketing perspective that isn't covered in my other sources.

Then—for your articles, chapters and Websites—attach to this form the first 1-2 pages copied from each, so that your instructor can judge the usefulness of your sources.

**Books or book chapters:**

1.  
Justify this choice :
2.  
Justify this choice :

**Journal articles:**

3.  
Justify this choice :
4.  
Justify this choice :

**Magazine or newspaper articles:**

5.  
Justify this choice:
6.  
Justify this choice:

**Websites:**

7.  
Justify this choice:
8.  
Justify this choice:

Staple these sheets to your photocopies/printouts.

## Appendix 5

# A Distributed Approach to Information Literacy in An Upper-level Course on Information Science and Policy

### **R ISP 301 (5677): The Information Environment (3), Spring 2003**

University at Albany, State University of New York (Doctoral/Research-Extensive)

[Reproduced with permission of Dr. Thomas P. Mackey

Assistant Professor, School of Information Science & Policy]

### **Texts**

Lessig, Lawrence. *The Future of Ideas: The Fate of the Commons in a Connected World*. New York: Random House, 2001.

Niederst, Jennifer. *Web Design in a Nutshell: A Desktop Quick Reference (Second Edition)*. Sebastopol: O'Reilly & Associates, Inc., 2001.

Books are available uptown at the Barnes and Noble Campus Bookstore and downtown at MaryJane Books.

Additional readings will be available in ERes (electronic reserves).

### **Description**

ISP301 is a core requirement for undergraduate majors in the School of Information Science & Policy. This course will approach Information Science from an interdisciplinary perspective and address several technical and theoretical issues related to the field, including Internet and Web History, Web Design and Usability, Web Accessibility and Compliance, Information Architecture, Information Ethics, and the Digital Divide.

ISP301 fulfills the University at Albany's *Information Literacy Requirement*. As such, this course includes a **research component**. Students will access and evaluate a wide range of sources from the University Libraries, including scholarly journals in the field of information science, popular and trade magazines, newspapers, and government documents. Students will differentiate between academic, trade, and popular sources and will analyze content and the research process in several writing assignments.

This course includes a **technology component** that requires introductory web development through the application of HTML 4.01, XML, XHTML, Cascading Style Sheets and UNIX. This introduction to web design addresses web compliance, the World Wide Web Consortium (W3C), and the Web Accessibility Initiative (WAI). The technology component will intersect the research component through the analysis and production of meaningful web content.

## Learning Goals

Students will participate in a research and discovery process in which they:

- ✧ Find, organize, evaluate, and cite information in print and electronic sources from the University Libraries and the World Wide Web;
- ✧ Utilize information technologies for research, communication, and the development and design of original web based research projects with meaningful content.
- ✧ Work as individuals and in collaboration with other students in web teams to learn UNIX, HTML, CSS, XML, XHTML, and Adobe Photoshop.
- ✧ Address issues of web accessibility and web compliance based on the World Wide Web Consortium's Web Accessibility Initiative.

Students will gain a critical understanding of the following issues:

- ✧ Ethical and professional considerations of the information environment, including responsible computing, intellectual property, online publishing, content development, information analysis and evaluation, and research methods;
- ✧ Impact of the World Wide Web on today's information environment;
- ✧ Changing role of information and information technologies in society, popular culture, and its impact on individuals, groups, and education;
- ✧ Relationship between the information environment, information technologies, and the development of public policy.

## Technology

|                   |   |
|-------------------|---|
| WebCT             | Students are required to login to our ISP301 WebCT course on a regular basis to be aware of all updates and assignments posted in this web-based extension of our course. We will use several WebCT features, including: grading, bulletin board, private e-mail, and online quizzes.   |
| E-Res             | Electronic Reserves is facilitated by the University Libraries and provides legal copies of essays and book chapters in the PDF format. E-Res also provides links to full-text scholarly journal articles. These readings are password protected for the class. The password you will need to access ERes for this course is: (omitted). You will need to have Adobe Acrobat on your computer in order to read these PDF files. If you do not have Adobe Acrobat installed on your computer you can download it for free from the Adobe home page at: <a href="http://www.adobe.com/products/acrobat/readstep2.html">http://www.adobe.com/products/acrobat/readstep2.html</a> . |
| UNIX              | Students are required to have an active UNIX account. The web files you create for this course will be uploaded to a public_html sub directory in your UNIX space. If you do not have a UNIX account you can obtain one via WEBCAAP, which is available at the Computing at UAlbany Home Page, at: <a href="https://maenad.csc.albany.edu/accounts/webcaap_newuser.html">https://maenad.csc.albany.edu/accounts/webcaap_newuser.html</a> .  |
| HTML and HTML-Kit | Students will learn the basics of HTML code and will be introduced to the HTML editor HTML-Kit. Students will be required to produce original web pages that are web compliant based on W3C guidelines for accessibility. Students are required to use this editor to complete all web assignments in this class. Students will be expected to understand how HTML works, how to validate HTML documents, and to think through troubleshooting problems that involve HTML code. Download HTML-Kit for free at <a href="http://chami.com/html-kit/">http://chami.com/html-kit/</a>   |

|                   |   |
|-------------------|---|
| XML and XHTML     | XHTML is the latest recommendation for writing markup by the World Wide Web Consortium (W3C), combining the strict rules of XML with HTML 4.01. Coding a document in XHTML is very similar to creating an HTML file, but XHTML allows for a relatively easy transition for creating XML documents. Since the technology component of this course focuses on developing effective content through the production of original digital documents, it is important to understand the latest developments in writing markup.   |
| CSS               | W3C highly recommends the use of Cascading Style Sheets to separate style elements such as typography and color from the structure and content of HTML documents. Students in this course will be introduced to internal and external style sheets and will learn how to validate CSS documents through W3C's web-based CSS validation service.   |
| Adobe Photoshop   | This is the definitive program for developing digital images for the web. This course will introduce a few key Photoshop concepts.  |
| ISP301-L Listserv | <p>The purpose of the ISP301-L listserv is for me to communicate essential updates and announcements about the course to everyone in class via e-mail. Students are required to subscribe to the ISP301-L class listserv from the e-mail address of your choice. Be sure to subscribe to this listserv using an e-mail address that you use often. If you change e-mail providers it is your responsibility to re-subscribe to the ISP301-L listserv with your new address. You will not be able to post messages to this listserv. Students are responsible for all information sent via the listserv.</p> <p>To subscribe to the ISP301-L listserv, follow these instructions:</p> <ol style="list-style-type: none"> <li>1. Send an e-mail message to: <a href="mailto:listserv@listserv.albany.edu">listserv@listserv.albany.edu</a>.</li> <li>2. Leave the subject line blank.</li> <li>3. On the first line of this e-mail message to the listserv, type the following message: "subscribe ISP301-L your name." (Be sure to type your first and last name where the directions indicate "your name.")</li> <li>4. Send your message.</li> <li>5. Don't stop there!</li> <li>6. If you did everything right up to this point, the automated listserv will send a message to your e-mail address asking you to <b>confirm</b> your subscription to the listserv. You need to open this message and look for the hypertext link to confirm your subscription. From a web based e-mail service click on the link provided in the message from the automated listserv.</li> <li>7. Once you are officially subscribed to the listserv you will receive a Welcome message from the listserv confirming your subscription. Make sure you receive this final confirmation message because if you are not subscribed to the listserv you will not receive credit for this assignment.</li> </ol> <p><i>Please note:</i> the ISP301-L listserve is completely separate from the SISP-L and SISP-BA listservs available through the SISP department. Subscription to the SISP-L and SISP-BA listserv does not count toward the requirement for the ISP301-L listserv. The ISP301-L is unique to this course.</p> |
| SISP-BA           | You are also encouraged to subscribe to the SISP-BA listserv available to all ISP undergraduates. Please follow the same instructions above to subscribe to the SISP-BA listserv (but in the first line of the message type: subscribe <b>sisp-ba</b> followed by your first and last name).  |

## Grading

| Assignments   | Percentage  |
|---|-------------|
| Participation Grade: WebCT Bulletin Board discussion responses, Quizzes, Homework and In-class Assignments, 3 Library Tutorials, and Extra Credit Computer Labs | 15%         |
| Web Project #1 (HTML): Individual Information Page and Web Team Page #1.  | 15%         |
| Scholarly Journal Critique  | 15%         |
| Midterm Exam  | 20%         |
| Web Project #2 (XHTML): Individual Evaluation Page and Web Team Page #2   | 15%         |
| Final Exam  | 20%         |
| <b>Total</b>  | <b>100%</b> |

|            |            |            |            |                  |
|------------|------------|------------|------------|------------------|
| A = 100-95 | B+ = 89-96 | C+ = 79-76 | D+ = 69-66 | E = 59 and below |
| A- = 94-90 | B = 85     | C = 75     | D = 65     |                  |
|            | B- = 84-80 | C- = 74-70 | D- = 64-60 |                  |

## Web Pages

Students will learn the basics of HTML, XML, XHTML, CSS, and UNIX to develop 2 individual web pages, and 2 web team pages.

All web pages produced for this class must be completely original and must **not** contain: clip-art, background images, animated gifs, downloaded images, code or content from other sites.

### Web Teams

Students will be organized into **web teams** to provide peer support for individual and collaborative web development. The web team format also provides a way to organize a large class into smaller sections for group work during lecture and for troubleshooting support outside of class and via WebCT. Each web team will have access to a separate bulletin board and private e-mail in WebCT especially for your team to communicate. Web teams also have access to a folder in WebCT for file sharing.

It is important that everyone on the team contribute to this process in a fair and meaningful way. Each team is required to designate a **project manager** and to assign specific duties to each individual team member. Students who do not work on the team page will not receive credit. Each team will determine which students receive credit for the web team pages. The project manager is responsible for including the names of students who worked on the web team page in the meta tag for author (based on input from the team). Students will not receive credit for the web team page if their name is not in the meta tag.



## Web Project #1 (HTML)

### Informatrix (75 Points)

This web page provides relevant and credible information links to reliable web resources in a table format. The purpose of this first page is to locate and organize web sites that may assist you in your academic research and web development and to explore possible topic areas based on professional Information Science sites (for example, you may discover an information science theme in this first project that you choose to explore further in your scholarly journal critique and/or final web site evaluation page). The design of this first page is entirely up to you, as long as you include the following requirements:

1. Professional heading defining your information theme (based on content)
2. Table for layout to organize page elements
3. Menu bar with internal links (using name tag) linking to the main headings in your page.
4. Return to top links after main information categories
5. Unordered List with links to 5 different search engines.
6. Ordered list with links to your “top five” links to web development sites (tutorials and how-to’s, product information, free downloads, etc.)
7. Data Table with links to 5 reliable information sources, including: online dictionary, online newspaper, online news magazine, online TV news source, and technology news source.
8. Data Table with links to five academic and/or professional web sites related to Information Science. These web sites must be academic, based on *Library and Information Science* topics available at [BUBL](#). To read more about the way this online service is organized, visit: [BUBL Link / 5:15](#)
9. Include 1 column for the number of your site in the table, 1 column for the site type, 1 column for the name of the site as a hypertext link, and 1 column for a brief but meaningful one-sentence description of the site. This data table must also include a table heading (and colspan) with an appropriate heading based on content.
10. This initial exploration of a specific information science topic through academic web sites may inform your scholarly journal critique and final web site evaluation page.
11. Mailto link to your e-mail address and page authored by: your name
12. This page must be saved as your\_last\_name.html in your /isp301 subdirectory (which is a subdirectory or folder you will create in your public\_html subdirectory).
13. Include title tag and meta tags for author, keywords, description, char-set, and generator.
14. Internal Style Sheet with at least **6 different** selectors and **10 unique** properties and values.
15. Link to your Web Team page
16. This page must pass the W3C Validation Service for HTML and CSS (you must include the HTML and CSS icons for validation. The CSS validation icon must link to your validation results and not the generic CSS page).

### **Informatrix Web Team Page (25 Points)**

This is a collaborative web team page that links to all the informatrix web pages developed by your individual team members (in a table), with the names of each student and a brief but professional description of each page. This team page must reside in a directory named after your web team (such as "/webteam1") in the /isp301 subdirectory of your project manager. You will also need to link this page back to the main ISP301 page. This team page must also pass the HTML Validator and include the W3C icon for validation.

### **Web Project #2 (XHTML)**

#### **Web Site Evaluation Page (75 Points)**

This page provides evaluations of 6 relevant web sites based on a common web format, such as: Search Engines, News, Business, Technology, Women in Technology, Student Resources, Employment Resources, Online Magazines, Research, Digital Libraries, College and University Sites, Museums, Artists, Graphics, Internet and Web History, Tutorials, Travel Sites, or Diversity. If you have a topic that is not on this list, feel free to propose your idea via e-mail or during office hours, but your topic must be approved in advance (absolutely no unprofessional or inappropriate sites).

1. Write evaluations for 6 web sites based on usability and accessibility criteria (150 word minimum for each site).
2. All web site evaluations must be written in a professional manner and address the design of each site as well as the relevance of the site's **content**.
3. Organize this information in a data table (2 columns and 7 rows) and include table headings for each column of information.
4. Internal links and links using name tags
5. Create a professional banner in Photoshop using color, gradient, and type tools.
6. Link to a common External Style Sheet (CSS) created by your web team (this means that every page will have the same styles).
7. Include columns and rows with the names of each site (with hypertext links to each site), and the description and evaluation of the 6 sites based on web usability and content.
8. Save this page with a unique name (page2.html or eval.html) in your /isp301 subdirectory (contained inside your public\_html subdirectory).
9. Include title tag and meta tags for author, keywords, description, char-set, and generator.
10. This page must also pass the W3C Validation Service for XHTML and CSS (you must include the XHTML and CSS icons for validation. The CSS validation icon must link to your validation results and not the generic CSS page).

#### **Web Team Page for Web Site Evaluations (25 Points)**

This is a collaborative team page that includes links to all of the individual evaluation pages created by students on your team. For this page, create a professional banner based on the evaluation topics (absolutely no inappropriate or non-academic images). You will also need to link to all of the individual evaluation pages in a table and include a brief description of each individual student page. This team page must also pass the W3C Validation Service for XHTML and CSS (with each icon).

This project also requires your team to develop 1 external style sheet that defines the styles of all of individual evaluation pages. The CSS file and XHTML file created by your web team must reside in the subdirectory for your web team (inside the /isp301 subdirectory of your web team manager)

## Participation

Students are expected to attend every class and to participate effectively in all lecture center activities and discussions. It is also expected that students will read all required texts in advance of each class session and that students will bring questions, insights, and ideas to the lecture based on the readings. If you have questions during class, please feel free to ask for further clarification about the ideas and technical procedures discussed that day.

Your participation grade will include the following:

### WebCT Bulletin Board

Students are required to contribute to the online discussions in WebCT. Two discussion questions will be posted throughout the semester. One of these questions will be based on the Lessig text, and the other will be based on the video *Digital Divide: Virtual Equality, the Information Revolution and the Inner City*. Students will have one week to complete each discussion question. All student responses in WebCT must be posted in the main forum. **Late posts will not be accepted.** The detailed grading scale for the WebCT Bulletin Board responses is based on the following points system:

**20 points:** Excellent and thoughtful post. This is an effective response to the discussion question. It is clear that the student has a full understanding of the issues examined, incorporating class discussions, readings (with specific page citations) and original insights. Student also makes thoughtful connections to other student posts (without simply repeating what other students wrote). Please note: students who are the first to post will need to return to the online conversation with follow-up comments.

**18-19 points:** Very Good Response, but missing a key point or two (such as a substantive reference to another student's post or specific page citation).

**14-17 points:** Good Response, but missing a number of key points.

**12-13 points:** Good insights overall, but ideas are not fully developed (you should discuss this with us so that we can offer suggestions for improvement).

**11 points (and below):** Not an effective response (you need to discuss this with us so that we can offer suggestions for improvement).

**0 points:** Response was not completed or was submitted past the deadline.

The WebCT Bulletin Board is an academic forum for students to discuss readings, lectures, technical procedures, and assignments related to this course. Students will be expected to communicate online in a responsible manner at all times and to be aware of spelling, grammar, voice, audience, and appropriate language. **Online "flaming" will not be accepted.** Please think carefully about your responses to other student comments or messages from the instructor or assignments before posting in WebCT. You may want to preview all of your messages before sending. Please do not post information that has nothing to do with this course.

### **Quizzes (10 points each)**

Students are responsible for all quizzes that are assigned throughout the semester. Quizzes will take place in lecture **unannounced** and via WebCT. The quizzes scheduled in WebCT will be announced in lecture or via the ISP301-I class listserv. Students are responsible for knowing when the WebCT quizzes are announced. Points will be assigned to each quiz and will be factored into your participation grade. Quizzes will not be accepted late and cannot be made-up.

### **Homework and In-Class Assignments**

This course requires homework and in-class assignments. Some of the in-class assignments may include group work. The points for these assignments will vary. In-Class assignments will always be evaluated based on the expectations for that assignment. Students will not automatically receive full points for filling out an assignment. The quality of the response will always be a consideration for grading.

### **Library Tutorials (10 points each)**

Students will complete three library tutorials available at the ULIB web site: Researching 101, Evaluating Internet Sites 101, and Plagiarism 101.

## **Scholarly Journal Critique (5-page essay)**

Students must demonstrate the ability to conduct academic research utilizing the resources of a research library. This assignment will focus on locating and evaluating 1 specific Information Science **scholarly journal article** and 4 different sources (newspaper, web site, government document, trade and/or popular magazine) based on an information science topic, such as: web usability, accessibility, copyright, meta data, information architecture, information literacy, digital libraries, electronic books, distance education, distributed learning, databases, XML, CSS, or perhaps a topic you discovered when developing your informatrix web page. The purpose of this assignment is to evaluate the content of a wide range of sources and to better understand the conceptual links and differences between each.

This is not a generic "research paper," but rather an essay focused on the evaluation of one scholarly journal article in relation to 4 additional sources of information. The focus here is on the types of sources, similarities and differences between these sources, and the kinds of information you discover through each source. The major requirements for this assignment are organized into two parts (with very specific questions):

### **Part I:**

1. Locate 1 scholarly article in an Information Science Journal (full-text online or in the library) and take the time to read the article closely and carefully. Then, compare this resource with the same topic area in 4 additional popular, trade and/or government resources, such as a newspaper, a popular or trade magazine, government document, web site, video, or web based multimedia or audio file.
2. Write about the content of the scholarly journal article in detail. This part of your critique must demonstrate that you read the entire article and not just the abstract. What is the article about? What conclusions did the authors arrive at? Do you agree or disagree with these conclusions? Did the author fully support his or her ideas and conclusions?
3. Closely examine the Bibliography or Works Cited page included in the article (if this is a scholarly journal article it will include this; if your source does not have a bibliography or works cited page you need to find another article). Describe the

references used by the author to write this article. For example, did the author refer to other scholarly journal articles, books, magazines, and/or web sites?

4. How would you describe the writing style of the article? Does the article have a serious tone? Is the writing intended for a specific or a general audience?

#### **Part II:**

1. Locate the same or similar topic in 4 different sources of information.
2. What are the popular, government, and/or trade sources about? How do these sources relate to the scholarly article? In your view what are the most obvious differences between the scholarly article and your popular, government, and/or trade sources? How would you describe the writing style of your additional sources?
3. The web source can be from your informatrix web page.
4. Include a complete bibliographic entry using APA style for each resource.
5. Spell check and grammar check your document using a word processor.
6. Submit your article via the WebCT drop box.

Although you must address all of these questions in your essay, be sure to write a cohesive response in actual essay form (and not a Q & A format). Your essay should also include an introduction and a conclusion. Every student must locate their own scholarly journal article. Unintentional overlap may occur, but if we see a repetition of the same articles we will raise questions about research methods and this may impact your grade.

**Students will have the option to revise and resubmit this assignment, but the first submission is an absolute requirement.** Students who do not submit the first essay on **March 20** will **not** have the option to submit a revision on **April 24**. Students who submit the required essay and the optional revision will receive a final essay grade based on the highest of the two scores (the lowest essay grade will be dropped).

### **Extra Credit Computer Labs**

Detailed concepts for understanding HTML, XHTML, CSS, and UNIX will be covered in lecture. Students are expected to attend lecture, complete the readings, and work through the troubleshooting challenges that may arise when developing your own code. Students should consider troubleshooting an essential part of the process and do so on their own.

Additional instruction is also available during weekly computer labs in CETL's Digital Workshop 2. These weekly labs are held outside of our scheduled class time and are completely **optional**, but students are strongly encouraged to attend (which is why you receive extra credit for doing so).

**Extra Credit:** Every computer lab you attend is worth **10 bonus points**. These points will be added to your total participation grade. Students who leave the extra credit lab early or arrive late will not receive full points for the lab. Each lab has a defined start and end time. The labs are not open hours for drop-by troubleshooting questions. If you sign-up for the lab, you need to be on time and prepared to work on the topic for that day.

CETL's Digital Workshop 2 has 40 workstations, so if you are interested in attending one of the weekly labs, you will need to reserve your seat in advance.

*Please note:* it is not possible to substitute any of the required participation assignments with extra credit. In order to receive any extra credit, students must complete all participation assignments. This is extra credit that is added to your total participation grade (extra credit points beyond 100% will **not** be added to any other category). The computer lab option is not a substitute for any lecture class. Students will need to sign-up for the lab in advance (during lecture) and then sign the attendance sheet in the lab to receive credit.

| <b>Extra Credit Computer Labs</b> |               |                    |
|-----------------------------------|---------------|--------------------|
| Thursdays                         | 5:35pm–7:05pm | Digital Workshop 2 |

### **Computer Lab Policy**

If you sign-up for one of the weekly computer labs, please arrive on time and follow all policies and procedures defined by CETL when working in Digital Workshop 2. Do not bring food or drink into the digital workshop at any time. When you are done with your computer session, be sure to close out any programs that you opened (but do not turn off the computer). You may save temporary files in the “My Documents” folder on your desktop, but these files are routinely deleted. We will also have access to an ISP301 folder on the common drive (W) that is accessible via the computers in either digital workshop. You may want to bring a CD-RW disk to save your work or use WS-FTP to upload your files to your UNIX account.

## **Exams**

### **Mid-term and Final Exam:**

Each exam will consist of 50 multiple choice questions. Each question is worth 2 points for a total of 100 points (for each exam). All course content will be considered for inclusion in the exams (lectures, readings, technical instructions and procedures, etc.). The Final Exam is not cumulative. Grades will not be curved in any way.

If you arrive to the Mid-term or Final Exam after the first student leaves, you will be unable to take the exam late and you will automatically receive a zero for the exam.

It is not possible to make-up either exam.

Please bring your SUNY ID to each exam. We may spot check SUNY ID's. If you do not have your ID we will be unable to accept your exam and you will automatically receive a zero for the exam.

## **Policy**

### **Assignment Completion**

Students must complete **all** assignments in order to pass this course.

### **HTML Code vs. Web Development Software**

Students must demonstrate an understanding of HTML Code and UNIX basics for all web projects, quizzes, and exams. Students are required to write original code using HTML-kit rather than a WYSIWYG (What You See Is What You Get) editor. Code that is generated from a WYSIWYG program will not meet the requirements for this course and will result in a failing grade for that file. In addition, appropriated code from online sources or other student pages

(or from my pages!) is plagiarism and will result in a **failing grade for the course**. Turning in any code or writing that is not your own is plagiarism. Any reports indicating that some students are creating web pages for other students will be taken seriously and follow-up may result in referrals to the Dean's office or the Office of Judicial Affairs.

*Example pages* will not be made available for any assignment in this course.

Last-minute troubleshooting assistance will not be available.

Please note: Students who post inappropriate images or link to inappropriate resources will receive a zero for the web page that includes such material.

### **Troubleshooting**

Troubleshooting technical problems is probably one of the most important skills you can learn. In this course, students will be encouraged to troubleshoot on their own before seeking assistance. Support will be provided to help students think through problems, but not to complete a certain task for the student or to do all the work when troubleshooting.

Technical assistance is also available during office hours, via e-mail, and WebCT, but again, students will be encouraged to think through problems on their own.

Specific questions about course assignments should be directed to me during class, office hours, computer lab, or via e-mail. Please do not expect the IMC or the Computing at UAlbany Help Desk to know about ISP301 course assignments or requirements. Please do not ask for troubleshooting assistance about specific course assignments at the IMC or the Computing at UAlbany Helpdesk.

### **Cheating and Plagiarism**

Cheating on exams will result in a **zero** for the exam, a **zero for the course** and a referral to the Office of Judicial Affairs.

Plagiarism will result in a **zero** for the assignment in which the plagiarism occurred, a **zero for the course** and a referral to the Dean of Undergraduate Studies. After two referrals to the Dean's office for plagiarism students are automatically referred to the Office of Judicial Affairs.

Please read the "Standards of Academic Integrity" in the Undergraduate Bulletin 1999-2000 at: [http://www.albany.edu/tree-tops/docs/undergraduate\\_bulletin/regulations.html](http://www.albany.edu/tree-tops/docs/undergraduate_bulletin/regulations.html). The standards described in this document will be upheld in this course.

### **Late Assignments/Missed Classes or Exams**

Students will not be excused from any class, assignment, due date, or exam for any reason.

### **Reasonable Accommodations Policy**

Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the Director of Disabled Student Services (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations.

## Lecture Center Policy

- ✧ Please consider this course an active learning opportunity for you to work with me, teaching assistants, and other students to advance your knowledge and skills. Active learning in the lecture center requires concentration, cooperation, and dialogue.
- ✧ Do all that you can to plan ahead, arrive to class on time, and read all print and online assignments. You need to be aware of all WebCT updates, E-mail from the ISP301-L listserv, and the syllabus topic for each class.
- ✧ Please do not arrive to class late and do not leave early. Late is defined as 5 minutes after class starts. Plan ahead rather than rush to class. Everyone has a bad day and this is understood but repeated lateness by students is very distracting in the lecture center. If you have special circumstances that require you to be late or to leave early on rare occasion, please let me know in advance of the class or soon after so that I am aware of your special circumstances.
- ✧ If you have a question about the lecture material, please feel free to ask.
- ✧ If any aspect of the technology is not working from where you are sitting, or if the microphone is set too low or too loud, please let me know.
- ✧ Please be aware that talking during lecture is distracting to everyone.
- ✧ If other students are being disruptive and you cannot hear the lecture, please say something (it is not always possible to hear this from the podium).
- ✧ Most class sessions will run for the entire class time (4:15pm-5:35pm) but never over that time. Be prepared to attend the entire class session.
- ✧ If someone in class expresses an idea that is different from your own, always be certain to respond in a respectful and thoughtful manner. Always try to carefully listen to what other students in class are saying and understand their viewpoint before responding.
- ✧ Please turn off your cell phone before class starts.
- ✧ Please do not bring food to the lecture center.
- ✧ Additional lecture center policies may be established if the need arises.
- ✧

## Student Feedback

If you have any comments or suggestions concerning the syllabus or the course feel free to let me know. Your constructive feedback concerning this class will be welcomed and appreciated and your ideas or concerns will always be taken seriously. Please talk to me after class, or visit office hours with your questions or comments. If you are unable to attend scheduled office hours feel free to call my office or send e-mail to set up an appointment: [tmackey@uamail.albany.edu](mailto:tmackey@uamail.albany.edu).



## Appendix 6

# A Distributed Approach to Information Literacy in An Upper-level Biology Course

### Cell Biology BS 461, Fall 2002

University of the Sciences in Philadelphia (Specialized)

[Reproduced with permission of Dr. John R. Porter, Professor of Biology and Graduate Director of Cell Biology and Biotechnology]

### Texts:

Alberts, B., A. Johnson, J. Lewis, M. Raff, K. Roberts, and P. Walter. 2002. *Molecular Cell Biology*, 4e. Garland Science, New York, NY.

Ambrose, III, H. W., K. P. Ambrose, D. J. Emlen, and K. L. Bright. 2002. *A Handbook of Biological Investigation*, 6e. Hunter Textbooks, Winston Salem, NC.

### Course administration. Grading:

First writing assignment (100 pts.: article listing (50 pts.), five abstracts (50 pts.)), second writing assignment (150 pts.), 5 completed labs (25 pts ea., 125 pts), two examinations (100 pts. each, 200 pts.) Course total - 575 pts. Each student will be expected to complete two written assignments based on searches of a specific topic in the current literature.

### Cell Biology Writing Assignment 1

Virtually all of science is communicated through journal articles. This is especially true in cell biology, which is moving at such a rapid pace that no textbook can hope to stay current for more than a few months. In this assignment, you will choose a topic of relevance to cell biology, thoroughly research it, prepare a comprehensive bibliographic list for the topic, prepare article summaries of a few of the articles found, and then prepare a “state of the art” paper. Writing Assignment I encompasses the list and summaries, while Writing Assignment II is the paper.

Several sources are available to provide the ability to locate and collect a body of literature on a given topic, about a specific organism or by a particular author. These bibliographic indexes include, but are certainly not limited to *Medline*, *Biological Abstracts/BIOSIS*, *Chemical Abstracts/SciFinder Scholar*, and *Science Citation Index*. The first three of these allow you to build a reference list based on certain key words, phrases or authors’ names, or, in the case of Chemical Abstracts, based on a particular chemical structure or functional group. Searching these databases requires much time and effort to choose appropriate searching vocabulary and syntax and to refine searches to optimize search results.

Further information on use of the library and bibliographic sources, in addition to being readily available in the library itself, can be found in chapters 9 and 10 of the *Handbook of Biological Investigation*, 6e.

The assignment for this course will begin by providing you with background in using several of the various types of bibliographic searching. Because these methods require some training, you will receive an orientation during the normal class time and be assigned to a session for more training in the library. More will be said about these training sessions during the initial introduction. You must provide written evidence that you have done this training and demonstrated some proficiency in search strategies. A form for this purpose is available on-line. The form must be completed, signed by a librarian, and submitted to Dr. Porter by no later than 5 p.m., Friday, October 4, 2002.

## Part One

From the list of citations provided, select one article you would like to pursue. From that article, or abstract of that article, choose a single topic which you can search (it is a good idea to obtain the article you have chosen to pursue to get a better idea of what it is about and the different topic ideas which it may contain). The topic you choose may **not** be the title of your citation reiterated verbatim but must come from the ideas presented in the article. For example, one past citation was "Denaturation of viruses by ethanol" which could lead to topics such as the use of organic solvents in controlling viral contamination, the action of ethanol on viral coat proteins, the sensitivity of viral coat proteins to denaturation, the importance of coat proteins in viral infection, or other similar topics. Keep in mind that this is a course in cell biology and choose your topics accordingly. The list of citations is generated from listings of "Hot Papers," covering areas of intense research interest, in *The Scientist*. Before you choose your article you should first seek and digest relevant background so that you understand what task you are setting for yourself. This may mean searching encyclopedias, scientific dictionaries, the library catalog, and textbooks pertinent to your topic area. To assure that you have time to do this, although you have access to the list before you are introduced to the searching, you will not be allowed to sign up for an article before 12 noon on Friday, September 13. Only one student may sign up for a given article even though there may be several viable topics contained in that article. Each student must sign up before Friday, September 20 at 5 p.m. **You may not change your mind about an article for any reason once you have signed for it.**

Update the topic you have chosen for the last two years. This means that you will develop a list of articles that relate to your topic, none of which may be older than 2000. Your choice of topic will dictate how onerous a task this will be, but you must narrow or expand the topic to generate a list with between 30 and 50 articles. Fewer than 30 articles found will result in a lower evaluation of your efforts and more than 50 will just create extra work for yourself (and me) and represent a topic too broad to be understood with any ease. In any case, **the topic being searched must be clearly stated at the beginning of the listing.** The format of the reference list is to follow the format set out in the *Handbook of Biological Investigation*, 6e, pp. 141-142, regardless of the format of the original article or of the bibliographic database(s) searched. The expected format is also used in the citation list from which you choose your original article. This is the first part of the assignment and will be due by no later than Wednesday, October 16 at 5 p.m. The assignment may be handed in as traditional hard-copy (paper), on disk or submitted electronically by e-mail.

## Part Two

The second part of the first assignment will consist of annotations of five of the listed articles. This means that you will write a unique summary or abstract of five of the articles contained in your reference list (*Handbook of Biological Investigation*, pp. 120-122). This summary **will be unique** (not plagiarized) from the abstract published as a part of the paper and **must show the relevance of that article to the chosen topic** as well as outlining the major methods, results and discussion relevant to the topic. Because the topic of choice may be different from the main topic of a chosen paper, you will probably highlight different things than were felt to be of most importance by the original authors. Each summary should be at least one full

paragraph, but no more than one page in length. **The citation of the annotated paper must be clearly stated at the beginning of each annotation**, not referred to by reference number, first author's name only, etc. These five abstracts are due Monday, October 28, by 5 p.m. Again, paper or readable electronic submission is acceptable.

Grading of this assignment will be based on adherence to the requirements as outlined above: Search certification form completed, there must be a clear statement of the topic and the citation classic from which the topic originated, a list of 30-50 articles relevant to the topic, and five abstract summaries showing relevance to the topic. You will also be judged on how completely you update the topic, the style and evenness of the abstracts, format, and for the adherence to your topic in both the reference list and annotations (you should be aware that I strictly enforce adherence to format guidelines). Examination for plagiarism, accuracy, relevance, and completeness will occur using the same sources available to you. Plagiarism in any form will be submitted to the Committee on Student Discipline; penalties may include failure in the course. This assignment constitutes a significant proportion of your course grade and will also be used as the basis for the second assignment. Choose your topic carefully; it will be yours throughout the semester. Any difficulties you are having in choosing an article or topic or any other aspect of this assignment should be referred to Dr. Porter well in advance of any deadlines.

#### Summary of deadlines and due dates

|                                    |             |
|------------------------------------|-------------|
| Sign up for topic begins (12 noon) | 13 Sep 2002 |
| Topic sign-up closes (5 p.m.)      | 20 Sep 2002 |
| Submit signed certification form   | 4 Oct 2002  |
| Citation list due (30-50 article)  | 16 Oct 2002 |
| Article summaries due              | 28 Oct 2002 |
| Final paper due                    | 3 Dec 2002  |

#### CELL BIOLOGY 1ST WRITING ASSIGNMENT CHECKLIST

##### Citation List

- Search certification form completed
- Topic clearly stated
- List comprehensive and complete for the last two years  
(including all languages and meeting abstracts)
- List consists of between 30 and 50 relevant articles
- Citation format follows that of the *Handbook of Biological Investigation*, 6e, p. 141-142
- List alphabetically arranged by first author
- Author lists complete
- Spelling correct

##### Abstracts

- Topic clearly stated
- Citations complete
- Each abstract is unique from all published abstracts
- Each abstract covers all sections of the paper (Intro, Methods, Results, Discussion)
- Each abstract not more than one page in length
- Each abstract relates the article to your topic (implicit or explicit)
- Sentence construction clear and language coherent
- Spelling correct
- Total of 5 abstracts

## Cell Biology Writing Assignment II

### Position Paper

Now that you have thoroughly immersed yourself in the literature of your topic, it is time to put together a position paper about the state of the research on your topic. Among the resources (references) for this position paper, there are to be a minimum of two electronic resources (web pages, e-mail contacts with researchers currently working within the topic you have chosen).

The position paper should be thought of as a mini-review of the state of knowledge about the topic, which you have chosen for the semester. The paper will consist of five parts, labeled as follows: **Background, Principal Approaches, Present Knowledge, Future Directions, and Conclusions**. You may use subheadings, as you feel appropriate. The **Background** section should contain a historical perspective, terms and definitions. The **Principal Approaches** section is a methodology section, which explains the major types of experimental designs, which are found in the field of your topic (not solution-by-solution methods, but kinds of experiments that are done). The **Present Knowledge** section contains just that - what is known about the topic at the present time. **Future Directions** includes the kinds of experiments which need to be done, along with probable results or implications of possible results, or the directions that the research seems to be heading in the near and/or distant future. **Conclusions** should contain a summary of the previous sections as well as major implications of the types of experiments, which have been done and are likely to be done.

All statements should be firmly grounded in the literature. You may speculate, but not wildly. Nor is this to be a one paragraph - one reference type of approach common to most undergraduate scientific writing. Use the **Handbook of Biological Investigation** and reviews on the topic of choice for guidance in style and construction, referencing, phraseology, and limits of conclusions (e-mail and other electronic sources should be referenced using the guidelines contained in **How do you cite URL's in a bibliography?**, available online). Use the same reference format as you used for your bibliographic list. You do not have to use all of the literature, which your searching has revealed, but you should plan to use a significant proportion. I will judge whether you have made adequate use of the available literature. **Plagiarism is strictly prohibited** and the Student Handbook will be followed in the event of evidence of this and other forms of cheating.

The paper should be 9 to 12 pages in length, with a greater emphasis on a well-executed, well-researched topic than on an absolute page limit. The papers must be word-processed, with spell checking, and may be submitted electronically. If you do submit electronically, they must be submitted as a word-processing file or as an e-mail attachment of such a file so that you do not lose the formatting. The paper is to be 1.5- to double-spaced, with 1-inch margins all around, and with a reasonable font size (11-13 point). All aspects of the paper will be graded, including scientific soundness, content, literature use, referencing (format and appropriate use), grammar, spelling, sentence construction, clarity, and title.

The paper is due no later than 5 p.m., Monday, December 2, 2002.

### Web Pages

Much useful information has become available on web pages; especially those associated with a particular laboratory or research group, which may be relevant to your topic. See if one of more of the researchers in your list has a lab web page. Search engines also are very effective tools to finding a relevant web page. But, be aware that a recent review of search engines shows that even the best access no more than 15% of the web at any one time. A lack of relevant hits does not necessarily mean that there are no relevant sites (I will be glad to engage in a discussion of why this is the case, if you wish). However, be aware that not everything published on the web is of high quality. Much of the content has not gone through the scrutiny or oversight of peer or editor review. Even very reputable sites may be publishing

information, which is speculative or tentative, without clear indication that this is the case. Other web sites are downright fabrications, which have been created to support a particular political, personal or other agenda.

Whenever you view a web site, ask yourself three questions: 1) Who wrote this? What are their credentials and is it reasonable to think that they would be a reputable authority on the topic? 2) When was this written? Is the material factually correct, but only for a previous time? Web pages sometimes do not get updated for 10 years! 3) When was the web page last revised? Is this a site, which is frequently modified and updated, or seldom managed? The latter indication may mean that even its creator does not take the web site very seriously.

### **Making E-mail Contact**

If you wish to communicate by e-mail with a researcher as one form of electronic resource, keep a few of things in mind. Not all scientists are well connected - they may have e-mail but they may seldom use it. Scientists are busy people and they may not respond if 1) they view your e-mail as trivial, 2) they are too busy at the moment, or 3) they are not at their labs temporarily. It has not been unusual for a student to receive a very good response up to two months after the inquiry because the person was out of the country. You can avoid being viewed as trivial if you show enthusiasm, genuine interest, and write with an obvious appreciation of the current literature. Inquire as to the current state of the research in their laboratories, whether the same topic is of major importance or have other avenues become more promising, do they still accept the hypotheses and conclusions stated in the papers to be correct or have there been modifications, and similar questions related to the information you have learned from the literature. Ask open-ended questions (those which do not result in simple "yes" or "no" responses) and clearly identify who you are (undergraduate biology, biochemistry, microbiology, pharm chem, pharm/tox major), why you are making the contact (assignment in your Cell Biology course), what your interest in the topic is, and enough sense of urgency that they will respond soon. Some students believe a mild threat is effective ("I really need this, so you must respond."). This tactic seldom works. If you have gotten very involved in the topic, and the contact might be in consideration as a graduate school advisor, mention this also, but only if it is true. Such requests for information are common in the scientific community. Your enthusiasm and clarity are more likely to yield good responses than is boredom and half-hearted attempts.

The sooner you start making the contacts, the sooner you will start receiving responses. Do not expect researchers to drop everything to e-mail a reasoned response overnight.

### **What To Do When Researchers Won't Reply**

Sometimes, even with your best efforts, you cannot get researchers to respond. In that case, pose specific questions on your topic to the Cell Biology UseNet forum or one of the other topic-specific discussion groups (e.g., Virology, Caenorhabditis, Arabidopsis, Drosophila). This will likely yield responses, but do not be surprised if they are not on topic or ask you for information because you raised the topic for discussion. Compile these responses, as you would have for an individual direct contact.

## Finding a Researcher's E-mail Address

Follow the suggestions listed to maximize the chance that you will find the electronic address of the person of choice. These are listed roughly in the order that will give you the most success or be least intimidating to you.

1. Look at the addresses given in the papers these researchers have written. It is becoming increasingly common for e-mail addresses to be given in addition to the postal address.
2. Use Yahoo. Choose Education, College and University, Colleges and Universities, and then the country, as appropriate. You can search institutions by country, then state, public or private, and then institution, to find whether a faculty and staff directory exists (it most often does). If there is not a directory, look for a listing of faculty within the department, college, division, graduate programs, or other such category. If a person is listed in boldface or color highlighted, this is a hot-link, meaning that you can click on it and send the message or question directly. If the name is not bold-faced, there may be an e-mail address listed next to the name. If not, that person may not be electronically connected.
3. Use one of the Internet search engines, such as Altavista, Lycos, Google, or WebCrawler, either using these hotlinks or from the Netscape Search page. Go to the page which allows Boolean searches (and, or, near, etc.) and construct a search which consists of the person's last name and one or more words in the institution or department name. The listings returned when you submit the search may or may not have what you want depending on the commonness of the name and whether or not they are connected.
4. Use the article address and directory assistance or the White Pages search engine to find a phone number for the researcher. Call and ask whether they have an e-mail address; be sure to tell them why you are asking and why it is important to contact them electronically.
5. Probably the longest shot, especially for a researcher who doesn't use electronic communication very often, is to use the Usenet News address search, but the suggestions above are much more likely to yield the person you want with relatively little extraneous material.
6. Remember that you can use the Cell Biology UseNet group to pose specific questions for discussion or reply in the event that you cannot contact any researchers directly. Depending on the specific topic being researched, one of the other Usenet groups (e.g., Virology, Arabidopsis, Caenorhabditis, and many others) might be more appropriate. (A full listing of the BioScience UseNet discussion groups is available.)

j:\Developing Skills