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Information Literacy: Philosophy, Principles, and Practice

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This article provides a philosophical framework for developing integrated information literacy programs. First, it explores "thing" and "effects" meanings of "information" and argues that a view of information as a process of constructing meaning should underpin information literacy instruction. Second, it reports on current qualitative and quantitative research that examines the impact of integrated information literacy programs. This research suggests that information literacy instruction has a significant positive impact on mastery of content and attitudes to learning and identifies a range of variables for examination in future research. Third, it presents general principles that might underpin instructional design for information literacy.

In our communications and technology oriented world, *information literacy* has become quite a buzzword. For information professionals and educators, it represents one of the greatest educational challenges now and into the 21st century. This article provides a philosophical framework for the development of information literacy programs integrated into school curriculums, reports on research in Australia that examines the impact of integrated information literacy programs on student learning and attitudes, and explores some general principles that should underpin instructional design for information literacy.

What is Information Literacy?

Information literacy is defined as the ability to use information purposefully and effectively. The American Library Association (ALA, 1990) Presidential Committee Report suggests that to be information literate, a person must

> be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information. Ultimately information literate people are those who have learned how to learn ... because they know how information is organized, how to find information, and how to use information in such a way that others can learn from them. (p. 1)

Information literacy is presented by Kirk, Poston-Anderson, and Yerbury (1990) as a holistic, interactive learning process encompassing skills of utilizing information from sources, being able to consider it in the light of current knowledge, adding it to existing knowledge, and applying this knowledge capably and confidently to solve information needs. In particular, the skills involved in this process are: defining the tasks for which information is

needed; locating appropriate sources of information; selecting and recording relevant information; understanding and appreciating this information and being able to combine and organize it for best application; presenting the information learned in an appropriate way; and evaluating the outcomes in terms of task requirements and increases in knowledge. In essence, information literacy is demonstrated when competence with the range of information skills is evident.

Framework for Information Literacy Instruction

For some years now, teacher-librarians have worked to establish their credibility as effective educators for information literacy. This is reflected in role statements and official educational documents. For example, in the United States, *Information Power* identifies the importance of providing "intellectual access to information through systematic learning activities which develop cognitive strategies for selecting, retrieving, analyzing, evaluating, synthesizing and creating information at all age levels and in all curriculum content areas" (ALA, 1988, p. 1). In Australia, the Australian School Library Association/Australian Library and Information Association's (ASLA/ALIA, 1993) *Learning for the Future* asserts that "the ability to process and use information effectively is ... the basic survival skill for those who wish to be successful in the 1990s and beyond" (p. 1). In Great Britain, Marland's (1981) *Information Skills in the Secondary Curriculum* claims that a whole-school information skills policy "would improve pupils' ability to search for and make use of information, and also greatly facilitate their learning in all areas" (p. 43).

The starting point for explicating a philosophical framework for information literacy instruction is found in the meaning of the central concept *information*. What is information? Some definitions from information scientists such as Horton, Yovits, Farradane, Belkin, Dervin, and Debons include: facts and knowledge that are believed to be true; that which reduces uncertainty in the receiver; any physical form of representation, or surrogate, of knowledge, such as books, articles, and audiotapes; the structure of any text that is capable of changing the image structure of the recipient; any stimulus that alters the cognitive structure of a receiver; whatever an individual finds informing. Two broad perspectives of information can be identified: "thing" oriented definitions and "effect" oriented definitions.

"Thing" Perspective of Information

Information here is used attributively for objects that have the quality of imparting information. What constitutes information is "objective," something out there with constant meaning and some element of absolute correspondence to reality. It exists in easily recognizable things such as books, videos, and multimedia that can be stored, exchanged, transmitted, lost, and destroyed. Information is thus quite detached from people, who are seen as passive recipients. The focus is on the task of delivering information, and

being informed is seen to ensue directly from its delivery. Such a view of information is characteristic of traditional library skills programs where the focus is on types of information resources, and on understanding the intricacies of classification and indexing schemes, and often limited to a specific library or system.

"Effects" Perspective of Information

This perspective presents information as intangible, personal, subjective, as something constructed by people and as a process of subjectively making sense of information. Although the things of information are important, the central components of this perspective are people and their knowledge structures. According to Brookes (1980) knowledge structures are what people already know and are capable of being modified or transformed by "information." This view of information focuses on the effect of information rather than on what it actually is and is faithful to the Latin roots of the word *information—in*=within, *formere*=to shape or form—that is, information is a process of "inward forming," a process of creating meaning in people. Meaning does not happen simply by transmitting information; rather, it is constructed by people by making links to their existing knowledge structures. Here is a relative view of information: information does not inform unless the person can make personal sense of it, and personal sense can only be made when information can be processed in the frame of already existing personal understandings.

In this view of information, the emphasis is on the recipient and not the source: sense-making, and this is what information literacy is all about. Conceptualizing information as it is internalized by people rather than as an objective product destined for passive recipients is a fundamental element of effective information literacy instruction. It shifts the focus of instruction from a concern for transmitting information to a concern for understanding where people are, what their learning needs and goals are, and the cognitive and physical processes by which they can move from their initial state of knowledge to their goal. It also shifts the focus beyond the use of libraries to abilities of people to define, analyze, synthesize, organize, present, and evaluate information. Information skills are the tools for constructing meaning, the skills that enable learners to add to their existing knowledge. This view of information has been embedded in the information literacy research reported in this article.

Information Literacy Research

In reviewing research on information literacy instruction, Eisenberg and Brown (1992) have identified four key assumptions that shape professional practice of teacher librarians. These assumptions are: information skills instruction is a vital part of schooling; these skills emphasize problem-solving skills and research processes and not merely location and access to resources; these skills should be taught within the context of the school's curriculum;

and teaching these skills can be enhanced by the use of innovative approaches. They conclude that there are only a limited number of empirical research studies relevant to these assumptions, and that it is not possible to make empirical generalizations beyond the immediate research environments. The impact of information skills on student learning is largely based on intuitive recognition and anecdotal reporting rather than on systematic investigation. Little is also known about the relationships of information skills and attitudes to other attitudes and abilities, and available research focuses on tertiary students. They claim that there is urgent need for research related to information skills instruction.

Since 1991, a research and development program has been under way at Marist Sisters' College, Woolwich, in Sydney, Australia. The college is an independent secondary girls' school with 750 students enrolled in Years 7 to 12. It is a regional, nonselective school operated by the Catholic Education Office. Its students are multicultural, with 55% of students speaking a language other than English at home. Its curriculum is varied, and its school library, with two qualified teacher-librarians, provides strong curriculum support.

The research program has three major objectives. The first was to set up an infrastructure in the school to facilitate the integration of information literacy competencies into all curriculum areas and levels of secondary schooling. The second and third objectives were to investigate the impact of integrated information skills instruction on student learning, through qualitative research and then through quantitative research.

The process of implementation of the first objective, begun in 1991 and consolidated in 1992, was based on Havelock's model of educational change and innovation. Emerging out of this process was a key question, posed by teaching staff in the school: does integrating information skills into curriculum content really make a difference to student learning? A major barrier to teachers accepting the information literacy challenge was the absence of research evidence to support the change.

Qualitative Research

The second objective, implemented in 1992, focused on undertaking qualitative research to investigate the impact of integrated information skills instruction on learning. One hundred and ten students in Years 7, 9, and 11 were involved in programs, at least four months in duration, where information skills were purposefully integrated into curriculum content. Qualitative data were collected over six months and came from participant observation, in-depth interviewing, course evaluations, assignments, and examination scores. A full report of this research and its outcomes was presented in a keynote address at the IASL conference in Belfast, Northern Ireland, and is available in the published proceedings from that conference (Todd, Lamb, &

McNicholas, 1993). The summary of findings presented here examines the impact of information literacy instruction on five aspects of learning.

Impact on perception of self as a learner

Vehicle for self-expression and active participation. Students expressed greater confidence in asking appropriate questions, in answering questions with less uncertainty, and in listening and observing more carefully.

Mechanism for self-analysis. Students demonstrated ability to reflect on their learning progress, to diagnose and express their needs in terms of the progress they had made with information.

Enhanced self-esteem. This was particularly expressed by lower ability students. Their enhanced self-esteem was quite obvious, and their sense of pride, belief in their abilities, and recognition of themselves as acceptable students gave them newfound confidence.

Sense of self-control. The lower ability students in particular willingly admitted that their past behavior was problematic and linked to having neither the skills to control their learning, nor the confidence to seek clarification. They acknowledged that their classroom behavior is much more positive now.

Independence and self-reliance. Information skills were seen to place emphasis on taking responsibility for learning, and learning from mistakes, although this did not come easily.

Positive attitudes. As well as developing more positive attitudes, some students indicated that information skills enabled them to learn at a deeper level and gave them confidence to explore the unknown.

Impact on the process of learning

Charting learning progress. Some students saw the skills as a way of mapping what was known in order to determine what they needed to know.

Time. Many students claimed they understood more subject content in a shorter time.

More accepting of learning as a challenge. Students identified the challenge that the process presents and were confident that they would manage the learning tasks, even though this initially seemed quite daunting.

Learning as a structured process. Students claimed that by breaking down tasks into information skills-related phases, and systematically applying these phases, they were more able to organize their ideas effectively.

Vocabulary control. Students generally seemed to use information skills terminology with ease, particularly when attempting to clarify their learning needs.

Responsibility for learning. There was some awareness that each information skill is important to the learning process, and that dealing with difficulties implies student responsibility.

Managing the quantity of information. Students indicated that learning to plan all aspects of the task enabled them to deal more adequately with the quantity of information located, and to manage their time accordingly.

Impact on view of information

More global view of information. Although students saw the school library and teacher-librarian as immediate sources of information, information skills were not viewed as location-specific "library skills."

Lateral information seeking. Some students had become active seekers of information beyond the library, using people, realia, and a variety of community information agencies as sources.

Impact on learning outcomes

Meaningful learning. Increased precision of meaning and ability to express what was learned provided a sense of motivation for further learning.

Develop reflective thinking. Students indicated that selecting and organizing skills helped them separate trivial from significant information, gave them more confidence in manipulating information, and encouraged them to assess information more critically rather than merely "copying it from encyclopedias."

Improved memory. The less able students expressed surprise at their ability to remember subject content. Improved short-term and long-term memory were evident in class tests and quizzes.

Increased concentration. Students said that because they understood ideas, they were able to focus on them with greater clarity and for longer periods.

Transfer of learning. There was some evidence of transfer of skills to other problem solving activities such as summarizing skills used in English and to coping with examinations.

Exchange of ideas. Students seem more willing to exchange viewpoints and initiate discussion. Some admitted that they have acquired a certain boldness in identifying missing links and misunderstandings.

Impact on the learning environment

Atmosphere of respect. Students sense that their responses are valued and that they can challenge their learning without being fearful of the consequences.

Collaboration. There was a certain cohesion, collaboration, and pastoral care evident in the classes, with brighter students less condescending toward others.

Identifying needs. Students stressed the importance of teachers knowing what skills they had acquired and what they needed to have to successfully complete learning tasks.

Interest. All students indicated that a skills approach reduced boredom and added greater vitality and interest to classes.

Timing of skills. Students in upper classes emphasized the importance of having skills introduced and supported by all teachers early in their schooling.

The viewpoints of teachers involved in programs of integrated information skills instruction were also explored.

Time. Teachers indicated that time is saved in preparation and delivery of content. They saw the information skills process as a "reusable" framework easily transferable to other learning tasks.

Responsive management. The process facilitates the handling of large groups while allowing students to work at their own pace and ability.

Sequencing and presentation of content. Teachers were able to sequence content more clearly and to conceptualize and present units and courses more effectively.

Added vitality to teaching. Teachers found the process energizing, keeping them on top of all student demands and alert and focused on teaching.

Professional rewards. With a more confident style of teaching, teachers felt that the process made them feel "good" as a teacher, promoting a higher enjoyment factor.

More effective assessment. Teachers indicated devising assessment criteria for student tasks was made easier, enabled a clearer differentiation of learning performance, and facilitated clearer student feedback.

Hard work. Initially teachers found information skills hard work, but this became easier with experience.

Quantitative Research

The qualitative research provided a rich basis for implementing the third objective of the program, to undertake more systematic quantitative analysis during 1993. This analysis specifically tested the assumption that integrated information skills instruction contributes to student achievement in specific subject areas, as well as to student attitudes to schooling. It also sought to provide some insights into how mastery of information skills can be measured.

The following specific questions were set.

1. Is there a difference between a conventional content approach and an integrated content-information skills approach to Year 7 science education in terms of level of mastery of science content and information handling skills?
2. Is there an interaction between level of ability, exposure to information skills instruction, and mastery of science content and skills?
3. Is there any impact of the integrated content-integrated information skills approach on attitudes to schooling?

The participants in this study were students from Year 7 at Marist Sisters' College, Woolwich. The sample consisted of 80 students randomly assigned

to two classes of 20 each as the treatment group and two classes of 20 each as the control group.

A posttest only comparison group experimental design was employed to measure the effect of the variable *method of instruction* on which the groups differed. Observed differences between the two groups were attributed to the effects of the different methods of instruction. The two control group classes received the prescribed science instruction without any formal attempt to integrate information skills into the content. Teachers assigned to these classes had no previous involvement in information literacy instruction. The two treatment group classes received science instruction using teaching-learning strategies that include information instruction in information skills based on *Information Skills in the School* (NSW Department of Education, 1988). Formal instruction in information skills was integrated into subject content and facilitated by cooperative teaching with the teacher-librarian.

An extensive range of instructional approaches was developed, based on careful diagnosis of learning needs and including the six stages of the information skills process.

Defining information. Activities included brainstorming to identify and define key words of a task; clustering ideas so as to establish what is already known about a topic; identifying gaps in understanding; concept mapping activities: learning to set directions for inquiring into the task and to set realistic limits; and learning to ask appropriate questions.

Locating information. Activities were built around learning to value self as a source of information; identifying a range of potential sources; learning to trace sources through computerized catalogues and CD-ROM databases; and using key words to locate potentially useful information in sources.

Selecting information. Activities included understanding information qualities and developing appropriate criteria for selecting information; learning to recognize fact and opinion and deciding what is required; detecting bias; learning to select resources that presented a level of detail appropriate to stage of understanding; learning to confirm outcomes of selecting and sorting with others; and learning to make judgments about the usefulness of information in relation to purpose.

Organizing information. Activities included developing strategies for recording information in organized and appropriate forms; learning to combine information taken from more than one source in meaningful ways; learning to group related ideas and the links between them; and learning to decide which information is significant and which can be discarded.

Presenting information. Activities included making sense of graphs and tables; converting raw information into a variety of forms; drawing diagrams and labeling them with key words; summarizing information in a variety of ways, including diagrams, tables, and concept maps; and developing confidence with oral communication skills.

Assessing information. Activities included diagnosing performance in learning tasks; critiquing processes; making judgments about progress and skills mastery; peer assessment; and analyzing audience responses.

It is recognized that different teaching styles, personalities, and experiences of the teachers may contribute to differences in findings. To minimize this, teachers were selected according to the following criteria: at least five years of teaching science; and recognized by the school executive as being "effective" teachers who created a positive learning environment and had a relationship of respect with students. In addition, one teacher was also identified as an experienced information skills teacher, having been involved in cooperative learning programs with the school's teacher-librarian for several years, and also recognized by teaching colleagues as an experienced information skills teacher. These teachers were randomly assigned to the four classes.

To measure the impact of the method of instruction on learning, two approaches were used. These were mastery of prescribed science content and skills, operationalized by the annual science score, based on marks of the mid-year and end-of-year science exams, and mastery of information skills. Given the absence of suitable information skills tests, a simple test was devised to measure the acquisition of information skills. Students were pretested to establish some benchmark of skills level and posttested on variations of this test in order to measure the impact of information skills instruction. The following problem was set: "A teacher gives you homework. You are to hand in some information on RUBRIC. Write down all the steps you would take to finish your homework. Give as much detail as you can." The term *rubric* was chosen deliberately on the assumption that students might not be familiar with it, thereby giving them the widest possible scope to respond without preconceptions of content, and to enable them to explore and present optional strategies in their responses. A similar problem was presented to the students at the end of the instructional period, this time using the term *gorse*. The groups were given 30 minutes to write their responses. Responses were examined through a content analysis process, and students were scored out of six: a point for each of the six stages of the information skills process as documented in *Information Skills in the School* (NSW, 1988). Students were awarded a point if they showed some evidence of defining, locating, selecting, organizing, presenting, and assessing information. Responses were scored independently by the researcher and teacher-librarian to establish interjudge reliability. There was a high level of correlation between the markers, and contentious scores were jointly assessed.

The researchers were also interested in establishing if there was an interaction between level of academic ability and mastery of information skills. The class groups were pretested to establish academic ability levels so that interactions could be determined using the ACER Intermediate Test F (De Lemos, 1982). This is a group test designed to assess the general reasoning

ability of students between the ages of 10 and 15 years, independent of specific learning in specific school subjects.

In order to measure differences of attitudes and perceptions about schooling, two standard attitudes tests were used: the ACER School Life Questionnaire (Ainley & Sheret, 1992), which examines specific domains of satisfaction, achievement, opportunity, identity, and teachers; and CAP: SAM Comprehensive Assessment Program: School Attitude Measure (Comprehensive Assessment Program, 1989), which evaluates motivation for schooling, performance-based academic self-concept, reference-based academic self-concept, sense of control over performance, and instructional mastery.

Findings

Academic Ability. At the outset of the teaching program, the groups did not show statistically significant variations in academic ability, based on the determination of normalized grades scores of the ACER Intermediate F Test. The treatment group mean score was 96.45, with a standard deviation of 12.168, and the control group mean score was 94.05, with a standard deviation of 10.585 (ANOVA: df=3, 76; F=0.54; p=0.654).

Mastery of science content and skills. The mean annual scores for each of these classes show that although there is no difference between the two classes receiving the information skills instruction, and no difference between the two classes receiving the traditional instruction, there are differences between classes in the control and treatment groups. Both treatment classes recorded higher scores than the control classes, something in the order of 7 marks out of 100. Treatment group mean score was 71.35, with a standard deviation of 13.11; the control group mean score was 62.2, with a standard deviation of 11.563. An analysis of variance of these mean scores shows that these differences are statistically significant (ANOVA: df=3, 76; F=3.76; p=0.014). Given the controls placed on the selection of teachers, it would appear that the variable method of instruction has made a significant impact on mastery of science content and skills.

Information skills scores. Scores were derived from the procedure discussed above. There was no significant difference in the entry information scores between the control and treatment groups at the 95% confidence interval. The treatment group mean score (out of 6) was 2.475, with a standard deviation of 1.432; and the control group mean score was 2.425, with a standard deviation of 1.448 (ANOVA: df=3, 76; F=0.37; p=0.778). Students primarily identified defining and locating skills, with lesser attention given to selecting and presenting skills. Few students showed evidence of using assessing skills.

In terms of the final information skills score, both treatment classes showed an increase in the number of stages identified in the content analysis of the information problem solving task given to them, with a mean score for

the treatment group of 3.75 stages identified, representing an average increase of 1.275 stages. The control group mean was 2.7 stages, with a standard deviation of 1.137. These differences are significant at the 95% confidence interval (ANOVA: $df=3,76$; $F=4.56$; $p=0.005$). The treatment group also showed an increase in the number of stages involving higher order skills, such as organizing, presenting, and assessing information. The data suggest that information skills instruction has a positive impact on students' abilities to identify information handling strategies to solve their information needs in a particular content area.

Interactive analysis of level of academic ability. Students were ranked into levels of academic ability to establish if the program of instruction was more effective for one level of academic ability than for another. The differential effect of having information skills instruction as opposed to not having information skills instruction does not remain constant between the levels of ability. However, the results of the two-way analysis indicate that there was not a statistically significant interaction among the levels of academic ability and the two types of instruction (group type * ability: $F=1.4$; $p=0.250$).

Attitudes to schooling: School life questionnaire. At a general level, given the positive scores in all categories, all the students seem satisfied with their schooling, express a sense of confidence in their ability to be successful in their school work, generally believe in the importance of schooling, relate well together socially, and are satisfied about the adequacy of the interaction between teachers and students. In all but one of the categories of school life, the treatment group has slightly higher mean scores, though there were no statistically significant differences between the groups. However, it cannot be concluded that any differences between the control and treatment groups can be attributed to information skills instruction, given that the questionnaire is a general school life questionnaire and not a specific questionnaire limited to the research context of science instruction in the school. The findings flag some variables that will be examined in more detail in a forthcoming longitudinal study.

Comprehensive assessment program: School attitude measure. In terms of motivation for schooling, performance-based academic self-concept, and instructional mastery, the treatment group scored higher, although there were no significant differences between the groups overall. These findings are consistent with the trends identified in the School Life questionnaire. In terms of reference-based academic self-concept where students assess the perceptions of how others view their school performance, the control group scored higher than the treatment group. The treatment group also scored less favorably in terms of their perceptions of their sense of control over learning. In this category, scoring pattern was reversed. Students in the treatment group appear to have less control over their learning. If this aspect is attributable to information skills instruction, this is cause for concern given

that information skills are touted to enhance students' ability to learn independently and to take charge of their learning.

The findings of this study are encouraging. Within the parameters of this research, information skills instruction integrated in the science curriculum does appear to have had a significant positive impact on students' learning of science content and on their use of a range of information handling skills. Although the findings make an important contribution to the knowledge base of information skills and provide a sound base for information provision in schools, there are difficulties in making any generalizations beyond this research context. Although some teacher-librarians may welcome these conclusions, there is an urgent need to test such conclusions in a range of school settings and across academic levels, and particularly to develop reliable and valid measures of information skills competence.

Principles for Effective Information Literacy Instruction

This ongoing program of information literacy research highlights the need for careful planning of any curriculum-integrated approach to the development of information literacy. From my experience, five key principles should guide the planning and implementation of information literacy programs. These are based in part on the work of Laurillard (1993). Although her writing is directed to university teaching, her underlying principles are relevant to school education.

Principle 1: Instruction is a conversation

Conceptualizing instruction as a conversation implies that teaching is more than transmission of information; rather, it is an active interchange to enable the construction of meaning. Teachers' knowledge of a subject area goes beyond the specific and concrete to the generalizable and comparative, whereas students' knowledge is largely made up of experiential, specific, and concrete knowledge. This suggests that there may be a mismatch between experts' understandings of knowledge and learners' conceptions of it. Effective teaching thus is about creating meaning rather than imparting information so that new understandings are constructed, thereby allowing students to acquire knowledge of someone else's way of experiencing the world. The conversational framework embeds information skills as process tools to enable learners to bridge the gap and arrive at a conceptual understanding of the topic they are studying.

Principle 2: Effective teaching of information literacy consists of four essential component processes: discursive, adaptive, interactive, and reflective

Discursive. The focus of this component is enabling discussion between student and teacher, where each expresses his or her conception of knowledge and reacts to the other's descriptions. It is all about knowing what students think and where they are in relation to the teacher's description of the world. Views are exchanged; gaps and discrepancies are identified. Only on this basis can realistic and authentic opportunities for learning be

designed. Implicit in this component is the diagnosis of learning needs—in terms of both knowledge and processes. Information skills that focus on identifying needs and developing an appropriate questioning base are important here.

*Adaptive.*The focus of this component is the teacher shaping the students' interaction with the world to enable them to experience it from a new perspective. In many teaching-learning sequences, this is done through interaction with information resources, such as books, journals, CD-ROM databases, and the like. Critical to this component is developing appropriate intellectual skills to enable students to interact with these information resources and to make sense of them. Skills of locating, selecting, and organizing information help students understand the structure of ideas so that they can find meaning, unravel complex arguments, and relate and distinguish evidence and argument. Developing skills of selecting, organizing, and presenting information also provides opportunities for students not only to describe their experiences relating to these ideas, but opportunities to reflect beyond that experience to the abstract ideas, to identify underlying assumptions and relationships so that they can produce new descriptions, and to organize the content into a coherent whole.

Interactive. The focus of this component is enabling students to interact with new knowledge in a way that extends or enhances their experiences by situating and contextualizing new knowledge in real-world activity. What is learned cannot be separated from how it is learned and used. Thus using mechanisms to enable students to make links is critical. Embedding all information skills tasks in familiar and authentic activities enables students to see the legitimacy of their own knowledge and its usefulness as a framework for unfamiliar activities. This can be done through a variety of strategies such as: using best examples to help students to establish clear abstracts of a domains concept; using expository examples that provide increasingly divergent applications; using worked examples that facilitate understanding of the process; providing practice strategies where students learn to apply knowledge to previously unencountered situations; and providing problem-oriented strategies that require students to conceptualize and analyze the problem, define specific goals for managing the problem, propose a solution, and establish connections between facts, concepts, rules, and assumptions.

Reflective. The focus of this component is helping students reflect on their experiences of learning, and thereby adapt their own understanding and description. This is an essential component so that students will not remain bounded in a particular context. It enables them to make generalizations and empowers them to use their immediate experience more effectively. Throughout the teaching sequences, encourage students to jot down what they have learned and their reaction to it. This is useful for diagnosing learning needs and constructing follow-on activities. Build in time for

retrospective analysis of tasks, goals, how these were accomplished, and problems with process and outcomes. Provide opportunities for students to reflect on the relations between theory and practice. Encourage them to reflect on their unknowns, ambiguities, and challenges.

Principle 3: Action without useable feedback is not productive for a learner
Feedback is important at all stages because it is a linking mechanism between the various descriptions of the world. It is vital that teachers provide a learning environment where students can receive, generate, and act on feedback so that they learn from their mistakes, deal with their misconceptions, and develop their ability to diagnose their misunderstandings. Effective feedback is not just informational, but formational, and implies careful monitoring of information skills outcomes.

Principle 4: The design of information literacy programs should be open
Information literacy programs should grow with the assimilation of the input by learners. Interesting new perspectives are always introduced by learners, and this implies negotiation of aims and outputs by both learners and teachers. It involves a great deal of "listening between the lines" and multiple approaches considering special needs, age, cultural, gender, language, and intellectual abilities to provide flexible learning situations and groupings.

Principle 5: Establishing an effective learning environment is critical to successful information literacy instruction
An effective learning environment is characterized by a high intensity of interaction and feedback, specific goals yet flexible procedures, and high levels of motivation. There is a continual feeling of challenge from tasks that are neither so difficult as to create a sense of hopelessness and frustration nor so easy as to produce boredom. There is a sense of direct engagement, of directly experiencing the environment, of directly working on the task, and of avoiding distractions and disruptions that could intervene and destroy the subjective experience. The uniqueness of each learner's experiences, values, beliefs, attitudes, and aspirations is recognized and incorporated into the entire learning process to establish a climate of mutual respect, trust, and open communication.

Information literacy is the key—now and in the future—to students being effective and purposeful consumers of information. A number of important challenges confront us in working toward this goal. There is need for more careful documentation of instructional principles and of broad strategies to implement information literacy programs. Particular attention needs to be given to understanding information seeking patterns of students in electronic environments and to how this understanding can inform the development of information literacy programs. Examination of social justice and equity issues in the context of information literacy is emerging as a critical issue. If programs of information literacy do have a positive impact

on student learning, then it might be argued that students not receiving such instruction are not being given equal educational opportunity. Putting mechanisms in place to address these challenges will be a forward movement for the profession.

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