

Educating Students to Think: The Role of the School Library Media Program

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A concept paper written for the National Commission on Libraries and Information Science

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All which the school can or need do for pupils, so far as their minds are concerned, is to develop the ability to think. (John Dewey, *Democracy and Education*, 1916)

Introduction

On July 6, 1985, the National Commission on Libraries and Information Science conducted an informal meeting of a small group of invited library media administrators, educators, concerned citizens and publishers.(1) The group was convened to discuss ways to define, develop, and promote the role of the library media program in teaching information-finding/utilization skills to children and young adults. After considering various alternatives, the participants recommended development of a document designed to provide a conceptual framework for examining this area in an organized way. We deal here with three principal components of such a framework.

- The role of school library media programs in helping students develop thinking skills;
- Theoretical implications of current research on how children and adolescents process information and ideas;
- Practical implications and applications of the concepts described in the first two parts of the paper as a basis for developing an educationally sound information skills program in all curricular areas.

Part One: The School Library Media Program's Role in Developing Thinking Skills

In recent years educators have directed considerable attention to perceived deficiencies in how students are taught to think. Thus, Lockhead has observed that our educational system focuses primarily on teaching youth what to think rather than how to think.(2) Goodlad's study of schooling supports this notion, in that he found that only 1 percent of the classroom time devoted

to student-teacher interaction required students to engage in anything more than mere recall of information.(3) Failure to help students develop higher-order thinking skills has seriously limited their ability to cope adequately in an increasingly complex society. Indeed the 1979–80 assessment of reading comprehension conducted by the National Assessment of Education Progress indicates:

While students learn to read a wide range of materials, they develop very few skills for examining the nature of the ideas that they take away from their reading. Students seemed satisfied with their initial interpretations of what they had read and seemed satisfied with their initial efforts to explain or defend their points of view. Few students could provide more than superficial responses to such tasks, and even the better responses showed little evidence of well-developed problem-solving strategies or critical thinking skills.(4)

It need hardly be stressed that in a society whose political foundation is built on an informed citizenry able to evaluate the merits and determine the consequences of various courses of action, an ability to think effectively is essential. Glaser logically observes that good citizenship requires the attainment of a working understanding of our social, political, and economic arrangements, and the ability to think critically about issues concerning which there may be an honest difference of opinion.(5)

A Rationale for Participating in the Development of Student Thinking Skills

An investigation of the literature on teaching thinking skills demonstrates remarkably few references to the role of the library media program. Further, major initiatives such as the establishment of a “Collaborative on Thinking,” which involves twenty-two national educational associations in a joint venture to study how to bring about improvements in student thinking, have failed to include any representation from the library media field. Circumstances such as these suggest the existence of serious problems related to general awareness of the degree and type of potential involvement of library media professionals in the development of student thinking skills. In providing a rationale for involvement of the library media specialist in this vital area, two basic questions will guide our discussion, viz:

- Under what circumstances is the development of thinking skills a central concern of the library media professional?
- What contributions can the school library media specialist make to the development of thinking skills?

Library media specialists have traditionally described their *raison d’être* as one of promoting access to a broad range of information and ideas, in order to assist students in acquiring the knowledge, skills, and attitudes necessary to function effectively in an information society. However, there has been disagreement among professionals in the field, as well as among educators in other areas, as to how this mission should be accomplished. A central issue is one of definition of the term access, and determination of how such access, however defined, can be translated into a program of library media services for students and teachers. In its narrowest sense, access to information and ideas has been interpreted as the provision of services that help

the user locate the physical unit containing the information or idea sought. Under a broader interpretation of the concept of access, a program emerges characterized by a wide range of resources and services designed to bring the user into contact with special information, whether in book, magazine, film, database, or other physical unit, and to help him/her evaluate and use the desired information or ideas effectively. Archibald MacLeish clearly distinguished between these two concepts of service, stressing that the former focuses on the “physical book,” while the latter provides entrée to the “intellectual book”; the first thus emphasizes the cover or package (that is, the book), the second emphasized its content. MacLeish points out that those concerned with content are constantly searching for ways to get young people as well as adults to examine critically the broad range of wares in the “marketplace of ideas”—the library.

Library media specialists who advocate the second, i.e., broader, concept of services realize that a major part of their time must be spent helping students develop the thinking skills that will equip them to not only locate but also evaluate and use information effectively and thereby become information-literate. Primary functions performed by the library media staff that contribute directly to the development of these skills include collection development, organization for retrieval of materials and information, information guidance services, materials production, student instruction, and instructional development services. The following examples of activities in each of these areas will clarify the fundamental role of the library media specialist in promoting positive outcomes in the development of thinking skills in the school.

1. *Collection Development.* Appropriate collection development efforts should result in a well-equipped information laboratory that can serve as a basic resource for students who require ongoing exposure to a wide range of different ideas. In such a facility students can practice problem-solving strategies and information finding and utilization skills, gain access to information not available elsewhere in the school, compare different points of view, and explore personal interests in an environment that is equipped to serve both individual and group needs. Simultaneously, teachers can secure relevant resources essential to teaching thinking skills.
2. *Organization for Retrieval of Information and Ideas.* Sophisticated organizational efforts are essential for adequate retrieval of information and ideas from any collection. In developing an information laboratory the library media specialist works with and selects information in a variety of formats, including books, magazines, pamphlets, films, filmstrips, audio- and videocassettes, etc., that are physically selected and brought into local collections, as well as providing options to information from remote databases that can be accessed electronically. The massive number of documents of all types that are available can only be successfully located and retrieved if systems are created to describe these resources in meaningful ways to library users. Organization of the materials within the local collection has, and continues to be, an important role of the professional library media specialist. Organizational schemes employed involve classification and cataloging of materials in order to enhance access opportunities, with a primary local tool being the card catalog. Recent technological developments such as the development of online catalogs and electronic networks now allow users to explore and perhaps access the collections of many libraries. In fact, technology is reaching the stage where it is not unrealistic to imagine a quantum leap in the ability to organize information to meet the personalized requirements of students and teachers.

3. *Information Guidance Services.* Information guidance services provided by trained intermediaries offer assistance to students as they attempt to find, interpret, and evaluate materials, information, and/or ideas. Liesener highlights the mediation function of the library media professional in this area.(6) He points out that the increasingly complex array of information options available to students and teachers often requires an intermediary to facilitate effective and efficient interaction with the information world.
4. *Materials Production.* Provision of production opportunities for students promotes the development of thinking skills in a variety of ways. Students develop an understanding of the different languages of communication offered by various media formats, and production experiences provide opportunities to code and decode ideas effectively and efficiently based on the format selected. In addition, the availability of production services to teachers means that they will have more flexibility in choosing and using the most effective format(s) for conveying information to their students. This assists them in providing various learning alternatives and accommodating individual and small-group needs.
5. *Student Instruction.* On both an individual and a group basis library media specialists systematically offer instructional opportunities to help students locate, organize, analyze, evaluate, synthesize, and utilize information as needed to make rational decisions for both formal educational and other more personal settings. These instructional activities are most effective when they are based on pedagogical or personal need as expressed by the individual student and closely integrated into classroom units.
6. *Instructional Development Services.* Vandergrift has reminded library media specialists that they are generalists in the areas of information, media, and materials, while most teachers are more specialized by virtue of curricular content, age level, and grade level.(7) As professionals dedicated to promoting access to information and ideas across curricular areas, library media specialists must therefore be responsible to a large extent for incorporation of critical thinking skills (organizing, analyzing, synthesizing, and evaluating information) throughout the curriculum. In addition, possessing specialized technical expertise in the use of media, library media specialists can and should act as process specialists to help teachers plan, implement, and evaluate learning alternatives that effectively communicate meaningful content. These brief explanations of some of the unique ways library media personnel can support programs dedicated to the development of thinking skills in the school indicate the need to insure their full participation in the planning, implementation, and evaluation of activities related to this important area. However, if library media professionals are to assist other educators effectively in providing sound educational programs, they must become more knowledgeable about the ways in which children and young adults actually process information. We shall therefore next consider the theoretical implications of relevant major research studies in furthering such an understanding of student information-seeking behavior and what these mean for the development of an information skills curriculum that achieves the school library media center's, and the school's, basic purpose: teaching students to think.

Part Two: The Research Basis for the Reconsideration of Information Skills Instruction

Information management skills instruction is essential if students are to exert control over school-related and lifetime information needs. Unfortunately, many existing programs are library-centered rather than information-centered, concentrating on the physical objects collected rather than their intellectual contents (i.e., stressing *cover* over *content*—see above). All too often they regrettably also provide instruction in every conceivable skill, and in every form of information source available. Individual student's fundamental mental processes, including their developmental aspects, are often neglected, and the implications for both teachers and students of helping the young develop the ability to think about how they are using information to solve problems are frequently ignored. Whatever the terminology traditionally used to describe programs over the years, the basis for library skills, or what are currently termed information management or utilization skills, lies in adding substance to John Dewey's belief that "all which the school can or need do for pupils, so far as their minds are concerned is to develop the ability to think." Contemporary library media programs have approached this task through concerted and articulated efforts designed not only to provide children with an appreciation of literature, but also to teach them how to locate, retrieve, and evaluate the worth of information contained in graphic, recorded, and printed records in the belief that such skills are essential for survival in a rapidly changing world. *Survival skills are thinking skills.* The literature that deals with these skills, i.e., those of critical thinking and metacognition, is therefore an essential starting point for consideration of a more effective approach to the education of students in management of their own information needs.(8)

Critical Thinking

Although there is no absolute agreement on a definition of critical thinking, much research addresses the issue of what students should be taught in order to be better observers, appliers, and evaluators of ideas and information, all areas fundamental to the process of thinking in a critical fashion. Norris points out that "students need more than the ability to be better observers; they must know how to apply everything they already know and feel, to evaluate their own thinking, and especially, to change their behavior as a result of thinking critically."(9) Such skill allows students to be more productive, in the sense of selecting alternative meaningful courses of action, and enables them to produce reliable observations, make sound inferences, offer reasonable hypotheses, and be able to think productively and critically about issues.(10)

Beyer has emphasized that critical thinking is not the same as problem solving per se. He sees agreement among specialists that critical thinking is "the ability to assess the authenticity, accuracy and/or worth of knowledge claims and arguments."(11) He perceives this as "a collection of discrete skills or operations, each of which to some degree or other combines analysis and evaluation." In setting up a core group of competencies related to the acquisition of the ability to think critically, Beyer focuses on those areas school library media specialists have consistently identified as central to their instructional programs. The ten skills that represent a consensus of scholarly reflection, as well as learning research and classroom experience, include:

- distinguishing between verifiable facts and value claims;
- determining the reliability of a source;
- determining the factual accuracy of a statement;
- distinguishing relevant from irrelevant information, claims or reasons;

- detecting bias;
- identifying unstated assumptions;
- identifying ambiguous or equivocal claims or arguments;
- recognizing logical inconsistencies or fallacies in a line of reasoning;
- distinguishing between warranted or unwarranted claims; and
- determining the strength of an argument.(12)

However, critical thinking is sensitive to context, and this list can be and has been expanded for its more specific implications in the various subject disciplines.(13)

Additional insights into this problem are provided from research on the modes of thinking of experts in particular areas compared to those of novices. Examining how experts think in a particular subject or discipline area provides an understanding applicable to educating novices in these or other fields. Two distinctive features of experts are that (1) they possess more information than novices; and (2) they have unconsciously automated many of the sequences in a problem solution.(14) By looking at what experts do in various disciplines it may be possible to derive ideas of how novices can become more critical in their own approaches. Recognition of the student's status as novice rather than experienced professional or scholar is a basic consideration in any instructional setting.

Since the ability to think critically appears to be cross-disciplinary, training approaches for students can and should be incorporated into many curricular areas. Students should be consciously taught to "think about their thinking." This process is referred to as *metacognition*.

Metacognition

Although there is no rigorous definition, metacognition, as noted above, is most simply explained as "thinking about thinking." Paris and Lindauer expand the definition to include "knowledge we have about people's mental states, abilities and processes of behavioral regulation . . . including our understanding of task goals and the strategies that are useful for accomplishing different purposes."(16) Consider this now in terms of a student's approach to solving a critical school-related problem, such as preparing a research paper. The interaction of three types of variables must be assessed: person, task, and strategy.(17) *Person variables* include beliefs (assessment of knowledge states) we have about ourselves and others as thinkers and about the amount of knowledge we have about a subject, such as a student's estimate of personal knowledge of a potential subject for a paper. *Task variables* are perceptions of the mental difficulties involved in a cognitive situation, e.g., perceptions of the difficulties in finding the information needed for a research paper. *Strategy variables* refer to knowledge of strategies available to carry out a cognitive activity, such as note-taking as an aid in gathering information for the paper in question.

Synthesizing research findings and their implications, Robinson raises the question of age-related and task-related differences in the amount of conscious processing individuals actually do.(18) In her overview of the findings of Brown and deLoache(19) she examines a critical point for information theorists: the novice-expert dimension, a point already touched upon above. She states: "Novices at any task not only lack the skills needed to perform it efficiently, but are also

deficient in self-conscious participation and intelligent self-regulation of their actions.” Robinson speculates on the existence of the same patterns both developmentally and within any task by which an individual progresses from being a novice to being an expert. First, there appears to be little or no intelligent self-regulation. This is followed by a period of deliberate self-regulation as the role and subprocesses become familiar, and eventually culminates in expert behavior as the necessary components are overlearned and become relatively automatic. A critical point in thinking about the education of children lies in the difference between what Robinson calls the “child novice” and the “adult novice,” the latter having available and using more general metacognitive skills which can be applied to a wide range of problems.

Unresolved questions focus on age-related and task-related differences in the amount of conscious processing individuals are capable of doing. In terms of information-processing capacity, Robinson calls attention to Shatz’ description of age-related differences: “conscious monitoring occurs only when capacity is not fully taken up with actually carrying out the task in hand. . . . Since adults have more well learned routines, they are more likely to have the space capacity for indulging in metacognitive activity.”(20) Here, metacognitive activity refers to the individual’s ability to give appropriate reasons for choices, with appropriateness more likely to occur when the task is less of a strain on the individual’s cognitive capacity. The implication of this for construction of an information skills curriculum lies in the importance of finding out what students already know about particular tasks. One approach is offered by verbal reports of how students remember, communicate, or solve information-related problems. Asking students “how would you do it better next time?” may help children develop their metacognitive knowledge verbally. (Robinson points out that telling children explicitly when and why their verbal communications were not understood helped them to understand that messages can be ambiguous and that ambiguity can cause communication failures.)

The pioneering work of the Soviet psychologist Vygotsky appears important in considering metacognitive research studies and their implications for targeting information skills instruction in the school setting. Vygotsky draws attention to the fact that young children appear to think without thinking about their own thought processes.(21) It is their response to schooling that moves their thought processes to a reflective level, one in which there is a new awareness of their own activity. But the “when” of this metacognitive development is not yet clearly defined. Vygotsky claims that in order to incorporate school-related concepts, children must become aware of their thought processes as well as products. The key for instruction in various areas appears to be identifying the point at which children develop this awareness. Vygotsky calls this the “Zone of Proximal Development”—a period in which a child is able to carry out a task with the assistance of an adult or a more capable peer which the child could not do alone.(22) This period represents a preview of what the child will eventually attain on his or her own, and is the time when instruction in a developing skill could be the most effective. If such instruction is to be effective, two conditions must be met: first, the student must be developmentally ready to learn the skill; and second, the student must realize that use of the skill will be effective in solving a personal cognitive problem. Isolated or premature approaches to teaching information use may not be effective in advancing the student in a development sense.

Bertrand’s review of metacognitive studies and their relation to information skills instruction stresses the fact that the question of precisely when children develop metacognitive abilities is

not yet clearly defined.(23) Studies have measured metacognitive activity either by looking at products produced by children as a result of a cognitive process or by actual analysis by students of what they did and the cognitive processes they followed. Elementary children appear to develop slowly in terms of being able to formulate strategies to test their own comprehension of gaps and inconsistencies in information in materials they read, with “total comprehension monitoring still not developed at the sixth grade level.” Information skills programs must consider levels of cognitive development and, as importantly, pay attention to the process skills students need to plan and evaluate all aspects of information utilization and retrieval.

General Suggestions for Educators

In offering suggestions to educators to help students to “think about thinking” Bondy(24) suggests that general awareness of metacognitive activity can be achieved through:

- Student-created learning logs that contain reflections and reactions to academic activities;
- Teacher-demonstrated and shared strategies for tackling the unfamiliar, including estimates of task difficulty, goals, strategies, action steps, and evaluation plans;
- Teacher-provided opportunities for feedback;
- Training of students in self-questioning of their own understanding;
- Teaching students how to summarize material in order to test their own understanding;
- Instructing students in how to monitor their understanding and comprehension of material;
- Developing a systematic approach to learning and problem solving that incorporates assessment of the nature of the material to be learned, the learner’s current skills and knowledge, activities necessary, and evaluation criteria.

Sancore extends these observations, suggesting that the focus should be on helping students develop conscious awareness of what is important to study, how to study, and how much studying is needed.(25) Useful strategies include teaching students to:

- generate questions as they read and study expository texts;
- create story-specific questions from schema, i.e., create general questions during reading of complex narrative texts;
- monitor and resolve blocks to comprehension; understand the structure of textbook chapters, i.e., guiding them to use strategies that increase comprehension and retrieval of information.

Berland also calls attention to what metacognitive research(26) indicates is essential for instructional practices. In her review of metacognitive studies as they relate to children’s use of the library she emphasizes that researchers believe that those who teach should act as models of metacognitive behavior. As such, they should:

- Think out loud about the processes in which they engage, in terms of planning their approach to a problem, monitoring their comprehension, developing strategies, and performing self-evaluation. Such an approach is easily translated to techniques for teaching students how to approach a research paper.

- Engage students in activities that force them to think about their own thinking. Help them to take a hard and clear look at what they know about a problem they are trying to solve; assist them in clearly spelling out what tasks are essential in solving the problem and in identifying the strategies they will use to perform the tasks.
- Allow students to teach each other by working in small groups. Have them keep records of their goals, the strategies used for reaching them, and evaluations of ongoing efforts. (In many ways this type of thinking copies what has already been proven successful by adult management teams).
- Provide opportunities for training in strategies that will help students monitor their own comprehension and planning activities.
- Help students develop the ability to ask the right question.
- Provide actual hands-on experience.
- Work with teachers on precise explanations of the exact nature of assignments so students are aware of the task parameters involved and the possible difficulties they may encounter along the way.

Metacognitive research thus carries important messages for information skills instructional programs. It is clear that greater attention should be paid to developmental levels of children in setting instructional goals and in helping them develop the ability to think.

The importance of the three basic components of *evaluation*, *planning*, and *regulation* in this process would be difficult to overestimate. These components are, of course, also the elements of the information search process in general. *Evaluation* may be simply defined as the ability of the individual to assess his/her own knowledge state and understanding of the tasks essential to solve a problem. In searching for information this element of the process includes topic definition or question analysis. The second component, *planning*, refers to the ability to select appropriate strategies to reach a desired goal. The obvious translation to information seeking is the development at this point of appropriate search strategies, including but not limited to strategic use of print and online tools in an appropriate sequence. The third component, *regulation*, implies the development of techniques to monitor the effectiveness of the steps essential to reaching a goal. In the information-seeking process this connotes evaluation of the results of each step in sequence.

Conscious control of knowledge may be the key to success in a rapidly changing world. Such control suggests that individuals are capable of thinking about their thought processes with the implication that those who are able to do this are in command of their ability to predict the consequences of their actions, check their own results, monitor ongoing activity, examine the sense of their actions, and coordinate and control their approaches to problem solving. Although such process skills are basic for lifelong learning, they are not the focus of many current educational efforts that instead place emphasis on what children can do at the moment (i.e., learning *outcomes* may be more highly prized than learning *processes*). The implication for information management skills instruction is that it must be broad and more process oriented. Focus must go beyond locational skills and “correct answers” and move to strategies that will help students to develop insight and facility in structuring successful approaches to solving their information needs. Although there is no commonly agreed upon theoretical base for the teaching

of what has been called library or information skills, these studies of the metacognitive process should force us to reexamine what we do.

Part Three: Practical Implications and Applications

The concepts identified in this paper have both political and instructional implications for building and district-level information management skills curricula that have been integrated with other content areas and for the library media programs that translate those curricula. From a *political* perspective, there has never been a more propitious time for school library media specialists to define and articulate the role that information management skills curricula and programs can serve in teaching critical thinking skills. For reasons well known to educators—declining test scores, critical national reports, and improved research on teaching critical thinking—the impetus to teach children to think critically has never been greater. As a result, the attention of administrators and other educational decision makers is easily directed to any vehicle within the educational setting that shows potential for delivery of a critical thinking skills component. Since research indicates that activities for teaching students to think critically should be incorporated into many curricular areas, no better vehicle exists to deliver a thinking skills initiative than an information management skills curriculum that has already successfully demonstrated its ability to function as an integral part of various other curricular areas, such as English and social studies.

From an *instructional* point of view, the time is appropriate to assess critically the information management skills curricula and programs that school library media specialists labored to put in place during the 1970s, even though admittedly many practitioners have only recently completed this process. The information world is one of constant change; the curricula and programs developed to teach management of that world must face continued revision to reflect those changes. School library media professional publications, as well as other current professional publications in other content areas, are beginning to reflect some concerns about how effectively current information management skills address the analysis, evaluation, and synthesis of information. The present critical-thinking skills initiative provides an excellent framework within which an assessment of existing information management curricula and programs may be structured.

The most pressing need and the *first task* in this assessment process is the examination of existing information management skills programs in light of the critical thinking skills impetus, with an eye toward effecting revision to accommodate a critical thinking skills component. That is, one must rethink the curriculum by posing the question Is this what a student must know to make a logical decision? The *second task* is to determine whether or not other library programming components are in place at levels of proficiency high enough to translate successfully the revised information management skills program. The remainder of this paper suggests an approach for such an assessment.

A Six-Step Curriculum Revision Process

In assessing and revising a curricular document, one basically follows the steps used to develop the document initially. Representatives of the groups originally involved in the development should be included in the assessment and revision.

The *first step* in the revision process is the analysis of the overall goal statement with the specific intent of rewording the statement, if necessary, to accommodate a critical thinking skills emphasis and process orientation. To achieve such an accommodation, the goal statement must address analysis, evaluation, and synthesis of information. An example of a goal statement that meets such criteria is *The student will identify, locate, utilize, analyze, and evaluate an information source, regardless of format, to meet a specific need or to create new information.*

The *second step* is to review the conceptual groupings of skills to ascertain that there are groupings that accommodate the higher-level thinking skills. *For example, in addition to identification, location, and utilization skills categories, there should be conceptual groupings to reflect analysis, evaluation, and synthesis skills.* Establishing a conceptual category of production skills is a good method of addressing the synthesis of information. If desirable, some of these groupings can be combined under generalized headings, such as “Comprehension of Information.”

The *third step* in the curriculum revision process is the assessment of the information management skills scope and sequence for the purpose of modification, specifically deletion, addition, and leveling changes. Of these three possible actions, deletion is the easiest to address. *Examine the list carefully to identify skills statements that do not contribute directly to information management.* A good indicator of skills that are candidates for deletion is failure to support any of the conceptual groupings determined in the previous step.

The next phase of the modification is the addition of skills where appropriate. Given recent technological developments and resulting enhanced access possibilities, this phase becomes most challenging, especially in the context of critical thinking. *Several areas of skills addition should be carefully considered, with final determination reflecting the local situation.* Specifically, skills categorized as study skills, computer literacy skills, thinking skills and search strategy skills, including online retrieval skills, should be scrutinized to identify those skills that directly affect a student’s ability to manage information.

Two recently published lists of skills related to social studies have implications for information skills instruction.(27, 28) Two of the three broad conceptual groupings presented relate to acquisition, organization, and use of information. The first of these two is entitled “Skills Related to Acquiring Information,” with specific subdivisions dealing with reading skills, study skills, reference and information search skills, and technical skills. Among the actual skills statements are:

- Evaluate sources of information—print, visual, electronic
- Recognize author bias
- Use picture clues and picture captions to aid comprehension

- Use a computer catalog service

The second relevant conceptual grouping is entitled “Skills Related to Organizing and Using Information,” with subheading for intellectual skills and decision-making skills. Some of the specific skills statements include:

- Compare and contrast credibility of differing accounts of the same event
- Combine critical concepts into a statement of conclusions based on information
- Propose a new plan of operation, create a new system, or devise a futuristic scheme based on available information
- Estimate the adequacy of information

The sequence, which is organized K–12, serves as a useful standard against which to measure a comprehensive information management skills curriculum. Skills or groups of skills, such as those reported above, that are not presently included in a local scope and sequence should be considered for inclusion in order to create a more process-oriented approach to teaching students how to manage the informational aspects of school-related work. The end result should be students who can evaluate the ideas and facts they retrieve and who can bring an understanding of how to apply what they already know to a new problem. In light of the research reported previously in this paper, it is probable that most expansion will occur at the secondary level and will reflect primarily the refinement and addition of search strategy/research skills. Brainstorming and classification skills, online retrieval skills, and critical viewing skills are examples.

The *fourth step* in the revision process is analysis of the leveling. Research findings imply that changes should specifically reflect developmental readiness of the student. Consideration should be given to emphasizing identification, location, and utilization skills during the elementary school years while evaluation and synthesis skills should be targeted for guided practice during the middle school/junior high years and then practiced independently during the senior high years. The guiding principle for leveling should be the premise that the information-processing capacity of a student comes into play only when the student reaches a developmental stage where the task at hand does not take all of the student’s time, energy, and effort. As an example, a third grader may be totally consumed in the attempt to handle the location of a resource using a call number from a catalog entry. Fourth graders work hard to make a conscious choice about author, title, or subject accessing of a resource. Fifth and sixth graders are ready with adult guidance to deal with the card catalog or its electronic equivalent as an index to a total collection of resources. Middle school/junior high school students may be ready to make some value judgments about that total collection. Finally, senior high students are ready to deal with how adequately the total collection meets an information need and to make conscious networking decisions.

Obviously, the above example is a generalization. Educators know there is no such thing as a generic seventh grader! The benefit of a sequential information management skills program based on developmental readiness is that a student can progress in the sequence when developmentally ready rather than remain confined to grade level entry.

The *fifth step* in the revision process is a final examination of the scope and sequence to ensure that skills grouped under a conceptual heading do indeed support that concept. A break out of the conceptual groupings that deal with analysis, evaluation, and synthesis of information will begin to address process orientation characteristic of critical thinking. Such as breakout also becomes an effective way to communicate to administrators and teachers how, when, and where the information management skills curriculum delivers to students some very vital components of a critical thinking skills initiative.

When the steps above have been completed, and all who were involved in structuring the original information management skills curriculum have reached agreement on suggested changes, the revised scope and sequence should be formalized by submitting it to the curriculum approval agency at the local level. Once the revised skills scope and sequence has been approved, mastery levels and evaluation strategies should be determined for the added skills in accordance with local policy. In assessing mastery, it is crucial to examine the process, including appropriate use of resources, that a student applies to complete an assignment as well as the end product produced. Therefore, it becomes more important than ever for librarians and subject area teachers to work as a team in determining mastery. Such an approach is a direct application of the novice/expert dimension discussed above. In assessing process the librarian will be looking at the student's search pattern as well as examining actual use of resources in terms of observable elements that are or are not congruent with those an expert might consider appropriate in seeking an answer to a similar information related problem.

The *sixth and final step* in the revision process involves the analysis of existing teaching activities, as well as the creation of activities for the added skills, to ensure that skill statements are addressed at the appropriate cognitive levels. The research cited in this paper probably holds more implications for this particular step than for those previously described. In examining the K-6 activities in light of the findings of metacognitive studies one should look for, and build in where necessary, opportunities for groups of students to brainstorm and to classify, with adult direction, while structuring a strategy to address an assignment. Such an approach enables elementary age students to practice these thinking patterns often and in a variety of contexts. Then, as students mature developmentally and are ready to evaluate their own information seeking behavior, they have already practiced patterns of thinking they are now ready to apply consciously in meeting information needs.

The research cited above holds additional implications for developing and revising activities for junior high school and senior high school students. First, junior high school activities should include, wherever possible, opportunities for students to analyze relevant resources in terms of synonyms, key words, identification of people associated with ideas presented, as well as the appropriateness of the currency of the information presented. At the senior high school level activities should provide students with opportunities to access appropriate resources by designing search strategies that reflect knowledge of the use of synonyms, key words, identification of particular people with ideas, and designation of desirable age range for information. Also, at the secondary level, assignment time lines must be expanded so students can reasonably build networking considerations into the design and evaluation of a search. Such networking would include use of appropriate local libraries as well as use of interlibrary loan. At the secondary level, too, and even in the upper elementary grades, assignments should be provided in written

form so students have the opportunity to analyze carefully the posed problem before they structure a strategy to find the information to solve it.

The last three implications to be addressed apply to all levels, K–12, and are perhaps the most important in preparing students to think critically about the process followed in accessing information. First, activities should provide frequent opportunities for students to develop questions relevant to an information related problem because the act of posing appropriate questions is basic to finding workable solutions. At the primary level, such opportunities can be built into pre- and postactivities for storytelling while at the senior high level students can be asked to develop a given number of questions that can be used to flesh out a thesis statement for completion of a research paper. Second, students should have opportunities to solve information related problems in groups. Again, at the elementary level, after posing an assignment, the teacher or librarian can solicit suggestions from the entire class on an appropriate approach, while at the junior high level small groups of students can generate a variety of approaches, ultimately to be shared with the entire class, to the same assignment. Even at the senior high level, where students work independently on individual assignments, it is important to structure opportunities for peer reaction to a suggested search strategy.

The final implication has the greatest potential to cause change in student information seeking behavior from a metacognitive perspective. Specifically, at increasing levels of complexity and reflecting developmental readiness, a requirement that students project strategies at the initiation of assignments and critique those same strategies at the completion of assignments, should be written into appropriate activities. Students in grades five or six through twelve should be asked to go through this process in a written form for every problem-solving assignment. The process need not be a burdensome one; it can be effected through development of a form that poses two questions:

1. How do you plan to complete this assignment? Specify the major steps and time you believe each step will take.

Step One:

Time Estimate:

Step Two:

Time Estimate:

Step Three:

Time Estimate:

Step Four:

Time Estimate:

Step Five:

Time Estimate:

2. Now that you have completed the assignment, what would you do differently?

The end result will be students who are not only able to project strategies that address information related problems, but who are also able to evaluate the success of their strategies in terms of time spent and end product produced. Frequent practice will increase the potential of evaluation, planning, and regulating functions becoming automatic processes for students.

Sternberg reinforces these suggestions as he calls attention to the errors he believes are being made in designing activities to teach critical thinking:

- Educators define problems for students to solve while in the everyday world the first and often most difficult step is recognition that a problem exists
- Educators pose well-structured problems while life poses ill-structured ones
- Educators provide in the problem information to solve the problem, while in everyday problem solving it generally is not obvious what information is needed or where it can be found
- Educators pose problems in isolation while solutions to everyday problems depend on context and interaction
- Educators endorse a “best” solution while everyday problems generally have no one right solution and no obvious criteria for a best solution
- Educators pose problems based on formal knowledge while solution of everyday problems requires as much informal as formal knowledge
- Educators design problems to be solved on an individual basis while everyday problem solving often occurs in groups.(29)

Sternberg’s points should serve as constant reminders to school library media specialists of pertinent current concerns as they design and evaluate activities. It seems clear that it is the process that is important, not the ability to perform isolated exercises correctly.

In summary, students need to know what information is available in their information universe, how to locate it, and most importantly, how to use it effectively. While school library media specialists are designing activities to teach information management skills, attention also must be directed to the teaching and learning strategies implied. Role modeling is essential. Those who teach information management skills must demonstrate and articulate for students appropriate search strategies whenever real or contrived information needs are being addressed. In addition, an information guidance function by the specialist should be part of the activities.

Finally, when the integrated, process-oriented information management skills curriculum is in place, the school library media specialist is ready to address the second assessment task, the reexamination of the total school library media program to see if it adequately corresponds to and supports the revised curriculum in much the same way a good curriculum writer examines a textbook to see if it supports the written curriculum. The alternative is not acceptable in either case; the library media program should not determine the vitality of the skills curriculum any more than the textbook should drive the written curriculum. Several programming areas that need to be in place, functioning, and adequately developed are:

- Resource collections to implement skills curriculum
- Technology to utilize resources

- Staffing to develop program and teach skills as well as administer and maintain facilities
- Local production capacity to provide synthesis options
- Flexible scheduling
- Staff development for school library media personnel in areas of collection development, questioning techniques, and technical skills

When a process-oriented, integrated information management skills curriculum is in place and based in a physical facility with services that are capable of translating that curriculum into active teaching and learning, library media specialists will be successful in providing to students access to information and ideas in the broadest sense of the word.

The interest of the National Commission in how students are taught to locate, evaluate, and use information is a timely and welcome one. The ability to find and use information effectively is fundamental for success in a rapidly changing, information-oriented society such as ours. Articulating what this means in terms of basic information management skills for students falls directly into the purview of the school library media program and fits well with the instructional role of the school library media specialist.

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