Information Literacy

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FINAL REPORT BY THE AMERICAN LIBRARY ASSOCIATION
PRESIDENTIAL COMMITTEE ON INFORMATION LITERACY

No other change in American society has offered greater challenges than the emergence of the Information Age. Information is expanding at an unprecedented rate, and enormously rapid strides are being made in the technology for storing, organizing, and accessing the ever growing tidal wave of information. The combined effect of these factors is an increasingly fragmented information base—large components of which are only available to people with money and/or acceptable institutional affiliations.

Yet in an information society all people should have the right to information which can enhance their lives. Out of the super-abundance of available information, people need to be able to obtain specific information to meet a wide range of personal and business needs. These needs are largely driven either by the desire for personal growth and advancement or by the rapidly changing social, political, and economic environments of American society. What is true today is often outdated tomorrow. A good job today may be obsolete next year. To promote economic independence and quality of existence, there is a lifelong need for being informed and up-to-date.

How our country deals with the realities of the Information Age will have enormous impact on our democratic way of life and on our nation's ability to compete internationally. Within America's information society, there also exists the potential of addressing many long-standing social and economic inequities. To reap such benefits, people—as individuals and as a nation—must be information literate. 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. Producing such a citizenry will require that schools and colleges appreciate and integrate the concept of information literacy into their learning programs and that they play a leadership role in equipping individuals and institutions to take advantage of the opportunities inherent within the information society.

Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand.

The Importance of Information Literacy to
Individuals, Business, and Citizenship

In Individuals' Lives

Americans have traditionally valued quality of life and the pursuit of happiness; however, these goals are increasingly difficult to achieve because of the complexities

of life in today's information and technology dependent society. The cultural and educational opportunities available in an average community, for example, are often missed by people who lack the ability to keep informed of such activities, and lives of information illiterates are more likely than others to be narrowly focused on second-hand experiences of life through television. On the other hand, life is more interesting when one knows what is going on, what opportunities exist, and where alternatives to current practices can be discovered.

On a daily basis, problems are more difficult to solve when people lack access to meaningful information vital to good decision making. Many people are vulnerable to poorly informed people or opportunists when selecting nursing care for a parent or facing a major expense such as purchasing, financing, or insuring a new home or car. Other information-dependent decisions can affect one's entire lifetime. For example, what information do young people have available to them when they consider which college to attend or whether to become sexually active? Even in areas where one can achieve an expertise, constantly changing and expanding information bases necessitate an ongoing struggle for individuals to keep up-to-date and in control of their daily information environment as well as with information from other fields which can affect the outcomes of their decisions.

In an attempt to reduce information to easily manageable segments, most people have become dependent on others for their information. Information prepackaging in schools and through broadcast and print news media, in fact, encourages people to accept the opinions of others without much thought. When opinions are biased, negative, or inadequate for the needs at hand, many people are left helpless to improve the situation confronting them. Imagine, for example, a family which is being evicted by a landlord who claims he is within his legal rights. Usually they will have to accept the landlord's "expert" opinion, because they do not know how to seek information to confirm or disprove his claim.

Information literacy, therefore, is a means of personal empowerment. It allows people to verify or refute expert opinion and to become independent seekers of truth. It provides them with the ability to build their own arguments and to experience the excitement of the search for knowledge. It not only prepares them for lifelong learning; but, by experiencing the excitement of their own successful quests for knowledge, it also creates in young people the motivation for pursuing learning throughout their lives.

Moreover, the process of searching and interacting with the ideas and values of their own and others' cultures deepens people's capacities to understand and position themselves within larger communities of time and place. By drawing on the arts, history, and literature of previous generations, individuals and communities can affirm the best in their cultures and determine future goals.

It is unfortunate that the very people who most need the empowerment inherent in being information literate are the least likely to have learning experiences which will promote these abilities. Minority and at-risk students, illiterate adults, people with English as a second language, and economically disadvantaged people are among those most likely to lack access to the information that can improve their situations. Most are not even aware of the potential help that is available to them. Libraries, which provide the best access point to information for most U.S. citizens, are left untapped by those who most need help to improve their quality of life. As former U.S. Secretary of Education Terrell Bell once wrote, "There is a danger of a new elite developing in our country: the information elite."[1]

In Business

Herbert E. Meyer, who has served as an editor for Fortune magazine and as vice-chairman of the National Intelligence Council, underscores the importance of access to and use of good information for business in an age characterized by rapid change, a global environment, and unprecedented access to information. In his 1988 book, Real World Intelligence,[2] he describes the astonishment and growing distress of executives who "are discovering that the only thing as difficult and dangerous as managing a large enterprise with too little information is managing one with too much" (p.29).

While Meyer emphasizes that companies should rely on public sources that are available to anyone for much of their information (p.36), it is clear that many companies do not know how to find and use such information effectively. Every day lack of timely and accurate information is costly to American businesses. The following examples document cases of such losses or near losses.

A manufacturing company had a research team of three scientists and four technicians working on a project, and at the end of a year the team felt it had a patentable invention in addition to a new product. Prior to filing the patent application, the company's patent attorney requested a literature search. While doing the search, the librarian found that the proposed application duplicated some of the work claimed in a patent that had been issued about a year before the team had begun its work. During the course of the project, the company had spent almost $500,000 on the project, an outlay that could have been avoided if it had spent the approximately $300 required to have a review of the literature completed before beginning the project.

A manufacturing company was sued by an individual who claimed that the company had stolen his "secret formula" for a product that the company had just marketed. An information scientist on the staff of the company's technical library found a reference in the technical literature that this formula was generally known to the trade long before the litigant developed his "secret formula." When he was presented with this information, the litigant dropped his $7 million claim.

When the technical librarian for an electronics firm was asked to do a literature search for one of its engineers, four people had already been working to resolve a problem for more than a year. The literature search found an article that contained the answer the engineer needed to solve his problem. The article had been published several years before the project team had begun its work. Had the literature search been conducted when the problem was first identified, the company could have saved four man-years of labor and its resulting direct monetary costs.[3]

The need for people in business who are competent managers of information is important at all levels, and the realities of the Information Age require serious rethinking of how businesses should be conducted. Harlan Cleveland explores this theme in his book, The Knowledge Executive.

Information (organized data, the raw material for specialized knowledge, and general wisdom) is now our most important, and pervasive resource. Information workers now compose more than half the U.S. labor force. But this newly dominant resource is quite unlike the tangible resources we have heretofore thought of as valuable. The differences help explain why we get into so much trouble trying to use for the management of information concepts that worked all right in understanding the management of things—concepts such as control, secrecy, ownership, privilege and geopolitics.

Because the old pyramids of influence and control were based on just these ideas, they are now crumbling. Their weakening is not always obvious, just as a wooden structure may look solid when you can't see what termites have done to its insides. Whether this "crumble effect" will result in a fairer shake for the world's disadvantaged majority is not yet clear. But there is ample evidence that those who learn now to achieve access to the bath of knowledge that already envelops the world will be the future's aristocrats of achievement, and that they will be far more numerous than any aristocracy in history.[4]

In Citizenship

American democracy has led to the evolution of many thousands of organized citizen groups that seek to influence public policy, issues, and community problems. Following are just a few examples.

A local League of Women Voters has been chosen to study housing patterns for low-income individuals in its community. It must inform its members of the options for low-income housing and, in the process, comment publicly on the city's long-range, low-income housing plans.

In an upper midwestern city, one with the highest unemployment rate in 50 years, a major automobile company offers to build a new assembly plant in the central city. The only stipulation is that the city condemn property in a poor ethnic neighborhood of 3,500 residents for use as the site of its plant. In addition, the company seeks a twelve-year tax abatement. Residents of the neighborhood frantically seek to find out how they might save their community from the wrecker's ball but still improve their tax base.

A group of upper-middle-class women in the Junior League has read about increased incidence of child abuse. They want to become better informed about the elements of child abuse: What brings it on? What incidents have occurred in their own community? What services are available in their community? What actions might they take?[5]

To address these problems successfully, each of these groups will have to secure access to a wide range of information, much of which—if they know how to find it—can be obtained without any cost to their organizations.

Citizenship in a modern democracy involves more than knowledge of how to access vital information. It also involves a capacity to recognize propaganda, distortion, and other misuses and abuses of information. People are daily subjected

to statistics about health, the economy, national defense, and countless products. One person arranges the information to prove his point, another arranges it to prove hers. One political party says the social indicators are encouraging, another calls them frightening. One drug company states most doctors prefer its product, another "proves" doctors favor its product. In such an environment, information literacy provides insight into the manifold ways in which people can all be deceived and misled. Information literate citizens are able to spot and expose chicanery, disinformation, and lies.

To say that information literacy is crucial to effective citizenship is simply to say it is central to the practice of democracy. Any society committed to individual freedom and democratic government must ensure the free flow of information to all its citizens in order to protect personal liberties and to guard its future. As U.S. Representative Major R. Owens has said: "Information literacy is needed to guarantee the survival of democratic institutions. All men are created equal but voters with information resources are in a position to make more intelligent decisions than citizens who are information illiterates. The application of information resources to the process of decision-making to fulfill civic responsibilities is a vital necessity."[6]

Opportunities to Develop Information Literacy

Information literacy is a survival skill in the Information Age. Instead of drowning in the abundance of information that floods their lives, information literate people know how to find, evaluate, and use information effectively to solve a particular problem or make a decision—whether the information they select comes from a computer, a book, a government agency, a film, or any number of other possible resources. Libraries, which provide a significant public access point to such information and usually at no cost, must play a key role in preparing people for the demands of today's information society. Just as public libraries were once a means of education and a better life for many of the over 20 million immigrants of the late 1800s and early 1900s, they remain today as the potentially strongest and most far-reaching community resource for lifelong learning. Public libraries not only provide access to information, but they also remain crucial to providing people with the knowledge necessary to make meaningful use of existing resources. They remain one of the few safeguards against information control by a minority.

Although libraries historically have provided a meaningful structure for relating information in ways that facilitate the development of knowledge, they have been all but ignored in the literature about the information society. Even national education reform reports, starting with A Nation at Risk[7] in 1983, largely exclude libraries. No K-12 report has explored the potential role of libraries or the need for information literacy. In the higher education reform literature, Education Commission of the States President Frank Newman's 1985 report, Higher Education and the American Resurgence,[8] only addresses the instructional potential of libraries in passing, but it does raise the concern for the accessibility of materials within the knowledge explosion. In fact, no reform report until College,[9] the 1986 Carnegie Foundation Report, gave substantive consideration to the role of libraries in

addressing the challenges facing higher education. In the initial release of the study's recommendations, it was noted that

> The quality of a college is measured by the resources for learning on the campus and the extent to which students become independent, self-directed learners. And yet we found that today, about one out of every four undergraduates spends no time in the library during a normal week, and 65 percent use the library four hours or less each week. The gap between the classroom and the library, reported by almost a half-century ago, still exists today.[10]

Statistics such as these document the general passivity of most academic learning today and the divorce of the impact of the Information Age from prevailing teaching styles.

The first step in reducing this gap is making sure that the issue of information literacy is an integral part of current efforts at cultural literacy, the development of critical thinking abilities, and school restructuring. Due to the relative newness of the information society, however, information literacy is often completely overlooked in relevant dialogues, research, and experimentation. Moreover, most current educational and communication endeavors—with their long-standing history of pre-packaging information—militate against the development of even an awareness of the end to master information management skills.

The effects of such prepackaging of information are most obvious in the school and academic settings. Students, for example, receive predigested information from lectures and textbooks, and little in their environment fosters active thinking or problem solving. What problem solving does occur is within artificially constructed and limited information environments that allow for single "correct" answers. Such exercises bear little resemblance to problem solving in the real world where multiple solutions of varying degrees of usefulness must be pieced together—often from many disciplines and from multiple information sources such as online databases, videotapes, government documents, and journals.

Education needs a new model of learning—learning that is based on the information resources of the real world and learning that is active and integrated, not passive and fragmented. On an intellectual level, many teachers and school administrators recognize that lectures, textbooks, materials put on reserve, and tests that ask students to regurgitate data from these sources do not create an active, much less a quality, learning experience. Moreover, studies at the higher education level have proven that students fail to retain most information they are "given."

> The curve for forgetting course content is fairly steep: a generous estimate is that students forget 50% of the content within a few months.... A more devastating finding comes from a study that concluded that even under the most favorable conditions, "students carry away in their heads and in their notebooks not more than 42% of the lecture content." Those were the results when students were told that they would be tested immediately following the lecture; they were permitted to use their notes; and they were given a prepared summary of the lecture. These results were bad enough, but when students were tested a week later, without the use of their notes, they could recall only 17% of the lecture material.[11]

Because of the rapidly shrinking halflife of information, even the value of that 17 percent that students do remember must be questioned. To any thoughtful person, it must be clear that teaching facts is a poor substitute for teaching people how to learn, i.e., giving them the skills to be able to locate, evaluate, and effectively use information for any given need.

What is called for is not a new information studies curriculum but, rather, a restructuring of the learning process. Textbooks, workbooks, and lectures must yield to a learning process based on the information resources available for learning and problem solving throughout people's lifetimes—to learning experiences that build a lifelong habit of library use. Such a learning process would actively involve students in the process of:

- knowing when they have a need for information;
- identifying information needed to address a given problem or issue;
- finding needed information;
- evaluating the information;
- organizing the information;
- using the information effectively to address the problem or issue at hand.

Such a restructuring of the learning process will not only enhance the critical thinking skills of students but will also empower them for lifelong learning and the effective performance of professional and civic responsibilities.

An Information Age School

An increased emphasis on information literacy and resource-based learning would manifest itself in a variety of ways at both the academic and school levels, depending upon the role and mission of the individual institution and the information environment of its community. However, the following description of what a school might be like if information literacy were a central, not a peripheral, concern reveals some of the possibilities. (While focused on K-12, outcomes could be quite similar at the college level.)

The school would be more interactive, because students, pursuing questions of personal interest, would be interacting with other students, with teachers, with a vast array of information resources, and the community at large to a far greater degree than they presently do today. One would expect to find every student engaged in at least one open-ended, long-term quest for an answer to a serious social, scientific, aesthetic, or political problem. Students' quests would involve not only searching print, electronic, and video data, but also interviewing people inside and outside of school. As a result, learning would be more self-initiated. There would be more reading of original sources and more extended writing. Both students and teachers would be familiar with the intellectual and emotional demands of asking productive

questions, gathering data of all kinds, reducing and synthesizing information, and analyzing, interpreting, and evaluating information in all its forms.

In such an environment, teachers would be coaching and guiding students more and lecturing less. They would have long since discovered that the classroom computer, with its access to the libraries and databases of the world, is a better source of facts than they could ever hope to be. They would have come to see that their major importance lies in their capacity to arouse curiosity and guide it to a satisfactory conclusion, to ask the right questions at the right time, to stir debate and serious discussion, and to be models themselves of thoughtful inquiry.

Teachers would work consistently with librarians, media resource people, and instructional designers both within their schools and in their communities to ensure that student projects and explorations are challenging, interesting, and productive learning experiences in which they can all take pride. It would not be surprising in such a school to find a student task force exploring an important community issue with a view toward making a public presentation of its findings on cable television or at a news conference. Nor would it be unusual to see the librarian guiding the task force through its initial questions and its multidisciplinary, multimedia search—all the way through to its cable or satellite presentation. In such a role, librarians would be valued for their information expertise and their technological know-how. They would lead frequent in-service teacher workshops and ensure that the school was getting the most out of its investment in information technology.

Because evaluation in such a school would also be far more interactive than it is today, it would also be a much better learning experience. Interactive tutoring software that guides students through their own and other knowledge bases would provide more useful diagnostic information than is available today. Evaluation would be based upon a broad range of literacy indicators, including some that assess the quality and appropriateness of information sources or the quality and efficiency of the information searches themselves. Assessments would attend to ways in which students are using their minds and achieving success as information consumers, analyzers, interpreters, evaluators, and communicators of ideas.

Finally, one would expect such a school to look and sound different from today's schools. One would see more information technology than is evident today, and it would be important to people not only in itself but also in regard to its capacity to help them solve problems and create knowledge. One would see the fruits of many student projects prominently displayed on the walls and on bookshelves, and one would hear more discussions and debate about substantive, relevant issues. On the playground, in the halls, in the cafeteria, and certainly in the classroom, one would hear fundamental questions that make information literacy so important: "How do you know that?" and "What evidence do you have for that?" "Who says?" and "How can we find out?"

Conclusion

This call for more attention to information literacy comes at a time when many other learning deficiencies are being expressed by educators, business leaders, and parents. Many workers, for example, appear unprepared to deal effectively with the

challenges of high-tech equipment. There exists a need for better thinkers, problem solvers, and inquirers. There are calls for computer literacy, civic literacy, global literacy, and cultural literacy. Because we have been hit by a tidal wave of information, what used to suffice as literacy no longer suffices; what used to count as effective knowledge no longer meets our needs; what used to pass as a good education no longer is adequate.

The one common ingredient in all of these concerns is an awareness of the rapidly changing requirements for a productive, healthy, and satisfying life. To respond effectively to an ever-changing environment, people need more than just a knowledge base, they also need techniques for exploring it, connecting it to other knowledge bases, and making practical use of it. In other words, the landscape upon which we used to stand has been transformed, and we are being forced to establish a new foundation called information literacy. Now knowledge—not minerals or agricultural products or manufactured goods—is this country's most precious commodity, and people who are information literate—who know how to acquire knowledge and use it—are America's most valuable resource.

Committee Recommendations

To reap the benefits from the Information Age by our country, its citizens, and its businesses, the American Library Association Presidential Committee on Information Literacy makes the following recommendations:

1. *We all must reconsider the ways we have organized information institutionally, structured information access, and defined information's role in our lives at home, in the community, and in the work place.*

To the extent that our concepts about knowledge and information are out of touch with the realities of a new, dynamic information environment, we must reconceptualize them. The degrees and directions of reconceptualization will vary, but the aims should always be the same: to communicate the power of knowledge; to develop in each citizen a sense of his or her responsibility to acquire knowledge and deepen insight through better use of information and related technologies; to instill a love of learning, a thrill in searching, and a joy in discovering; and to teach young and old alike how to know when they have an information need and how to gather, synthesize, analyze, interpret, and evaluate the information around them. All of these abilities are equally important for the enhancement of life experiences and for business pursuits.

Colleges, schools, and businesses should pay special attention to the potential role of their libraries or information centers. These should be central, not peripheral; organizational redesigns should seek to empower students and adults through new kinds of access to information and new ways of creating, discovering, and sharing it.

2. A Coalition for Information Literacy should be formed under the leadership of the American Library Association, in coordination with other national organizations and agencies, to promote information literacy.

The major obstacle to promoting information literacy is a lack of public awareness of the problems created by information illiteracy. The need for increased information literacy levels in all aspects of people's lives—in business, in family matters, and civic responsibilities—must be brought to the public's attention in a forceful way. To accomplish this, the Coalition should serve as an educational network for communications, coalescing related educational efforts, developing leadership, and effecting change. The Coalition should monitor and report on state efforts to promote information literacy and resource-based learning and provide recognition of individuals and programs for their exemplary information literacy efforts.

The Coalition should be organized with an advisory committee made up of nationally prominent public figures from librarianship, education, business, and government. The responsibilities of the advisory committee should include support for Coalition efforts in the areas of capturing media attention, raising public awareness, and fostering a climate favorable for information literacy. In addition, the advisory committee should actively seek funding to promote research and demonstration projects.

3. Research and demonstration projects related to information and its use need to be undertaken.

To date, remarkably little research has been done to understand how information can be more effectively managed to meet educational and societal objectives or to explore how information management skills impact on overall school and academic performance. What research does exist appears primarily in library literature, which is seldom read by educators or state decision makers.

For future efforts to be successful, a national research agenda should be developed and implemented. The number of issues needing to be addressed are significant and should include the following:

* What are the social effects of reading?
* With electronic media eclipsing reading for many people, what will be the new place of the printed word?
* How do the characteristics of information resources (format, length, age) affect their usefulness?
* How does the use of information vary by discipline?
* How does access to information impact on the effectiveness of citizen action groups?
* How do information management skills affect student performance and retention?
* What role can information management skills play in the economic and social advancement of minorities?

Also needed is research that will promote a "sophisticated understanding of the full range of the issues and processes related to the generation, distribution, and use of information so that libraries can fulfill their obligations to their users and potential users and so that research and scholarship in all fields can flourish."[12]

The Coalition can play a major role in obtaining funding for such research and for fostering demonstration projects that can provide fertile ground for controlled experiments that can contrast benefits from traditional versus resource-based learning opportunities for students.

4. State Departments of Education, Commissions on Higher Education, and Academic Governing Boards should be responsible to ensure that a climate conducive to students' becoming information literate exists in their states and on their campuses.

Of importance are two complementary issues: the development of an information literate citizenry and the move from textbook and lecture-style learning to resource-based learning. The latter is, in fact, the means to the former as well as to producing lifelong, independent, and self-directed learners. As is appropriate within their stated missions, such bodies are urged to do the following:

* To incorporate the spirit and intent of information literacy into curricular requirements, recommendations, and instructional materials. (Two excellent models for state school guidelines are Washington's "Information Skills Curriculum Guide: Process Scope and Sequence" and "Library Information Skills: Guide for Oregon Schools K-12.")

* To incorporate in professional preparation and in-service training for teachers an appreciation for the importance of resource-based learning, to encourage implementation of it in their subject areas, and to provide opportunities to master implementation techniques.

* To encourage and support coordination of school/campus and public library resources/services with classroom instruction in offering resource-based learning.

* To include coverage of information literacy competencies in state assessment examinations.

* To establish recognition programs of exemplary projects for learning information management skills in elementary and secondary schools, in higher education institutions, and in professional preparation programs.

5. Teacher education and performance expectations should be modified to include information literacy concerns.

Inherent in the concepts of information literacy and resource-based learning is the complementary concept of the teacher as a facilitator of student learning rather than as presenter of ready-made information. To be successful in such roles, teachers should make use of an expansive array of information resources. They should be familiar with and able to use selected databases, learning networks, reference materials, textbooks, journals, newspapers, magazines, and other resources. They also should place a premium on problem solving and see that their classrooms are extended outward to encompass the learning resources of the library media centers and the community. They also should expect their students to become information literate.

- To encourage the development of teachers who are facilitators of learning, the following recommendations are made to schools of teacher education. Those responsible for in-service teacher training should also evaluate current capabilities of teaching professionals and incorporate the following recommendations into their programs as needed.

- New knowledge from cognitive research on thinking skills should be incorporated into pedagogical skills development.

- Integral to all programs should be instruction in managing the classroom, individualizing instruction, setting problems, questioning, promoting cooperative learning—all of which should rely on case studies and information resources of the entire school and community.

- Instruction within the disciplines needs to emphasize a problem-solving approach and the development of a sophisticated level of information management skills appropriate to the individual disciplines.

- School library media specialists need to view the instructional goals of their schools as an integral part of their own concern and responsibilities and should actively contribute toward the ongoing professional development of teachers and principals. They should be members of curriculum and instructional teams and provide leadership in integrating appropriate information and educational technologies into school programming. (For further recommendations regarding the role of library media specialists, consult Information Power: Guidelines for School Media Programs prepared by the American Association of School Librarians and the Association for Educational Communications and Technology, 1988.)

- Exit requirements from teacher education programs should include each candidate's ability to use selected databases, networks, reference materials, administrative and instructional software packages, and new forms of learning technologies.

- A portion of the practicum or teaching experience of beginning teachers should be spent with library media specialists. These opportunities should be based in the school library media center to promote an understanding of resources available in both that facility and other community libraries and to emphasize the concepts and skills necessary to become a learning facilitator.

- Cooperative, or supervising, teachers who can demonstrate their commitment to thinking skills instruction and information literacy should be matched with student teachers, and teachers who see themselves as learning facilitators should be relied upon to serve as role models. Student teachers should also have the opportunity to observe and practice with a variety of models for the teaching of critical thinking.

6. *An understanding of the relationship of information literacy to the themes of the White House Conference on Library and Information Services should be promoted.*

The White House conference themes of literacy, productivity, and democracy will provide a unique opportunity to foster public awareness of the importance of information literacy. (The conference will be held sometime between September 1989 and September 1991.) The American Library Association and the Coalition on Information Literacy should aggressively promote consideration of information literacy within state deliberations as well as within the White House conference itself.

Background to Report

The American Library Association's Presidential Committee on Information Literacy was appointed in 1987 by ALA President Margaret Chisholm with three expressed purposes:

(1) to define information literacy within the higher literacies and its importance to student performance, lifelong learning, and active citizenship;

(2) to design one or more models for information literacy development appropriate to formal and informal learning environments throughout people's lifetimes; and

(3) to determine implications for the continuing education and development of teachers.

The Committee, which consists of leaders in education and librarianship, has worked actively to accomplish its mission since its establishment. Members of the Committee include the following: Gordon M. Ambach, Executive Director, Council of Chief State School Officers; William L. Bainbridge, President, School Match; Patricia Senn Breivik, Chair, Director, Auraria Library, University of Colorado at Denver; Rexford Brown, Director, Policies and the Higher Literacies Project, Education Commission of the States; Judith S. Eaton, President, Community College of Philadelphia; David Imig, Executive Director, American Association of Colleges

for Teacher Education; Sally Kilgore, Professor, Emory University, (former Director of the Office of Research, U.S. Department of Education); Carol Kuhlthau, Director, Educational Media Services Programs, Rutgers University; Joseph Mika, Director, Library Science Program, Wayne State University; Richard D. Miller, Executive Director, American Association of School Administrators; Roy D. Miller, Executive Assistant to the Director, Brooklyn Public Library; Sharon J. Rogers, University Librarian, George Washington University; Robert Wedgeworth, Dean, School of Library Service, Columbia University.

This report was released on January 10, 1989, in Washington, D.C.

Further Information Further information on information literacy can be obtained by contacting: Information Literacy and K-12, c/o American Association of School Librarians, American Library Association, 50 East Huron Street, Chicago, IL 60611; Information Literacy and Higher Education, c/o Association of College and Research Libraries, American Library Association, 50 East Huron Street, Chicago, IL 60611.

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Information literacy: An introductory reading list

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A literature review on this year's presidential theme.

Information literacy is a hot topic. Articles and books both inside and outside librarianship address the subject. ACRL vice-president/president-elect Barbara Ford has declared information literacy to be the theme of her 1990–1991 presidency, and *College & Research Libraries News* issued a call for articles on information literacy in its May 1990 issue. This article will attempt to sort and categorize the literature on information literacy and provide an introductory bibliography for novices in the field. The reading list is divided into sections on the definition of information literacy, publications aimed at nonlibrarians, publications for librarians, information literacy in schools, and articles describing specific information literacy programs.

What is information literacy?

Zurkowski in 1974 first used the phrase "information literacy,"[1] but its current meaning and use came in response to national education reform reports, including *A Nation at Risk*,[2] that ignored the role of libraries in an information society. The 1989 *Final Report of the American Library Association Presidential Committee on Information Literacy* is the basic document to read on information literacy. The report acknowledges the exclusion of libraries from most educational reform reports, makes recommendations to educators and administrators, and defines an information-literate person: ". . . 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. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision."[3]

In addition to defining information literacy, the report describes the importance of information literacy in individuals' lives, in business and in citizenship. It stresses that education on all levels should be based on the resources of the real world (not textbooks, lectures, and reserve readings) and

that learning should be active and integrated not passive and fragmented.[4]

Spreading the word outside the library profession

Information literacy advocates agree that librarians will not succeed in taking an active role in information literacy education unless they can create partnerships with teachers and policy-makers. At the National Symposium on Libraries and the Search for Academic Excellence held in March 1987, a topic discussed by participants was the means to promote more effective use of libraries: "While there was concern for the need to 'fundamentally and expansively' redefine the role of libraries and librarians in terms of teaching and research, there seemed to be broader consensus that more action and dialogue with higher education communities was needed before redefinition could occur in any meaningful way."[5]

One method the ALA Presidential Committee used to increase the dialogue with nonlibrary constituencies was to distribute its final report widely to many groups and individuals outside librarianship. Committee Chair Patricia Senn Breivik has led the way in taking the message of information literacy to other audiences. Breivik's 1987 article in *Change* reported on the National Symposium on Libraries and the Search for Academic Excellence and described innovative programs at Auraria Library in Denver, at St. Louis Community College in Missouri, at Earlham College in Indiana, and at the University of California-Berkeley University Library.[6]

A short article by Breivik and Shaw that one might send to a busy administrator appears in *Educational Record*. The article explains why the status quo can no longer be maintained in libraries and discusses four changes that will be confronting libraries in the 1990s: "A growing emphasis on access to resources rather than ownership; the integration of campus information resources [libraries, computer centers, and media centers]; bringing the library to the user [through campus and national networks]; and a growing concern for information literacy."[7] Breivik and Shaw discuss the implications—of these changes on budget and

physical plant and explain the need for information literacy.

Aimed at higher education administrators and faculty, *Information Literacy: Revolution in the Library*, by Breivik and E. Gordon Gee, president of the University of Colorado, expands upon the message in *Educational Record*, and it is the best work to recommend to those who need to be convinced of the important role of the library in higher education reform. Chapters in the work address the role libraries can play in reforming instruction, in improving research productivity, in enhancing service to the community, and in assisting administrators in areas such as planning, fundraising, and recruiting and retaining students.[8]

The ALA Presidential Committee, Breivik, and others in the information literacy movement have used one reform report, *College: The Undergraduate Experience*, a Carnegie Foundation-sponsored report by Ernest Boyer, as a major source document. It is a book that anyone concerned with undergraduate education should read. Boyer indicts higher education for the low use of libraries by undergraduates, and in a chapter on resources provides a challenge to librarians, faculty and administrators: "On many campuses, libraries are directed with no connection to other learning institutions on the campus. Computer centers operate in isolation. And most classrooms do not yet integrate the resource of these facilities. To improve the undergraduate experience—and strengthen the community of learning—the challenge is to build connections. The strategy we have in mind is to link technology to the library, to the classroom, and—in the end—to college goals."[9]

In *Library Issues*, a newsletter intended for faculty and administrators in higher education, Kirk summarizes a Conference on Teaching and Technology that was held at Earlham College in 1989. Although information literacy is not explicitly discussed in the article, it is especially interesting because it presents the faculty point of view on the impact of information technology on teaching. Kirk also raises questions that are probably more interesting to librarians than to those outside the field: "Will academic librarians view the provision of these technologies as the full extent of their responsibilities? Will academic librarians envision a role for their instruction programs in teaching students how to use information and not just how to retrieve it? Will academic librarians take a leadership role in

[1] Paul G. Zurkowski, *The Information Service Environment: Relationships and Priorities* (Washington, D.C.: National Commission on Libraries and Information Science, 1974). ED 100391.

[2] U.S. National Commission on Excellence in Education, *A Nation at Risk* (Washington, D.C.: GPO, 1983).

[3] American Library Association Presidential Committee on Information Literacy, *Final Report* (Chicago: American Library Association, January 1989), 1. Copies of this report are available from the ALA office in Chicago.

[4] *Final Report*, 7.

[5] Patricia Senn Breivik and Robert Wedgeworth, eds., *Libraries and the Search for Academic Excellence* (Metuchen, N.J.: Scarecrow, 1988), 191.

[6] Patricia Senn Breivik, "Making the Most of Libraries in the Search for Academic Excellence," *Change* 19 (July/August 1987): 44–52.

[7] Patricia Senn Breivik and Ward Shaw, "Libraries Prepare for an Information Age," *Educational Record* 70 (Winter 1989): 14.

[8] Patricia Senn Breivik and E. Gordon Gee, *Information Literacy: Revolution in the Library* (New York: American Council on Education/Macmillan, 1989).

[9] Ernest L. Boyer, *College: The Undergraduate Experience in America* (New York: Harper, 1987), 172.

educating the academic community about the impact of this technology on teaching, learning, and scholarship?"[10]

Two ERIC documents, also written for readers outside librarianship, are frequently cited on bibliographies on information literacy. Johnson's report, sponsored by the National Institute of Education, expresses a limited view of "computer/information literacy" that mostly concentrates on discussing hardware and software tools that are available.[11] Demo's review is more useful. He criticizes the view that information literacy will naturally grow from technology and instead, considers how technology may impede information literacy. He discusses how schools, academic libraries, and public libraries can promote information literacy.[12]

Publications for librarians

In "Hard Facts, Hard Work: Academic Librarians and A Nation at Risk," Martell and Ware provide a tidy summary of the major education reform documents, as well as the library reports that were issued in response. The authors conclude that in spite of the plethora of reports, academic libraries are not acting differently. They list actions libraries can undertake to help meet the needs delineated in reform reports, actions which will bring librarians into a more active role both within and without the academic community.[13]

The earlier mentioned Symposium on Libraries and the Search for Academic Excellence commissioned papers "to address the overriding themes of the educational reform reports and to explore how institutions were using or could use their libraries to achieve related campus objectives."[14] The papers, which were published along with other materials from the Symposium by Scarecrow in 1988, examine libraries in relation to topics such as non-traditional and minority students, the humanities, teacher education reform, the fostering of re-

search, and curriculum policies in higher and will provide librarians with many examples of innovative programs and projects.

Philip Tompkins, deputy university librarian and associate dean of libraries at the University of Southern California, provides a concrete example of a new library that seeks to meet the description of active resource-based learning found in the ALA Presidential Committee *Final Report*. He calls this new concept a "teaching library" and outlines generic goals and specific objectives that are based on the planning for the new library for undergraduates that will open at the University of Southern California in the fall of 1992. According to Tompkins, "The challenge of reconceptualizing the library is to invent an integrated environment, replete with information specialists working in concert with teaching faculty and rich in courseware and information resources—a facility in which text, animation, graphics, sound, and video (and professional support) are configured to meet the needs of the independent learner, which is, after all, the primary goal of an information-literate society."[15]

Bibliographic instruction librarians have been active in promoting information literacy, and the recent BIS Think Tank Executive Summary Report addresses the topic.[16] Hannelore Rader considers the relationship between bibliographic instruction and information literacy and concludes that "information literacy is a broader concept than bibliographic instruction. Information literacy extends the process of learning information skills to all ages and at all times, so that it become part of lifelong learning. Information literacy is meant to prepare people for lifelong self-education in a global, electronic environment; it extends beyond the library by preparing people to handle information effectively in any given situation."[17] She concludes that bibliographic instruction is part of an evolution towards information literacy and that bibliographic instruction experience will help librarians build strong information literacy programs.

Breivik spoke to bibliographic instruction librarians on the topic of information literacy in a paper that was presented at the 1989 LOEX Library Instruction Conference. At the same conference other papers examine computer literacy and

information literacy, information literacy and learning theory, and teaching short-term or long-term competencies.[18]

Information literacy in the schools

In seeking to understand the information literacy movement, it is useful to dip one's toes into the school library literature, and two documents are most helpful. Carol Kuhlthau, who also served on the ALA Presidential Committee on Information Literacy, has produced a masterful summary of the literature, covering topics such as definition and characteristics of information literacy, the library media center as information center, integrating information skills in the curriculum, information technologies in schools, and means of achieving information literacy.[19] *Information Power: Guidelines for School Media Programs* urges an expanded role for the school media specialist and a partnership of media specialists, teachers and administrators to help all students become information literate.[20]

Program descriptions

For librarians seeking to implement an information literacy project, there are many publications that describe programs whose objectives include information literacy. Articles address such topics as programs for the basic reader/writer at the University of Illinois;[21] bibliographic instruction for adult students at the University of Evansville;[22] an Ohio Task Force on Library Instruction: High School to College;[23] Washington State University's efforts to

identify library/research skills for college-bound students and to communicate their findings to their school library colleagues;[24] and peer counseling in library and microcomputer skills for minority students at the University of Michigan.[25]

The previously cited 1989 LOEX proceedings, entitled *Coping with Information Illiteracy: Bibliographic Instruction for the Information Age*, also contains descriptions of many individual programs. The paper by Olsen and Coons of Cornell describes an information literacy project that is integrated in the curriculum and strongly supported by faculty and administration.[26]

Other programs described in the LOEX volume include the inception of a library literacy course at Piedmont Virginia Community College, use of the online catalog at Mankato State University to teach information organization and access, tabloid literature as a vehicle to promote critical reading skills at Virginia Commonwealth University, and a graduate course in information literacy at Virginia Tech. In addition, material from five information literacy poster sessions are also in the LOEX proceedings.

This reading list does not attempt to treat all the writing on information literacy but seeks only to provide an introduction. It is safe to predict that many more publications on this subject will be forthcoming since the exact role of librarians in the information literacy movement is a hotly debated topic. Additionally, the *Final Report of the ALA Presidential Committee on Information Literacy* calls for more research and demonstration projects. New groups and coalitions have been formed to work on information literacy advocacy and education. Information literacy is also a top item on the agenda of the next White House Conference on Library and Information Services. And, as the ALA Presidential Committee's Final Report noted, information still continues to expand exponentially, and the technology to deal with that information grows more and more complex.[27] ■■

[10]Thomas Kirk, "Teaching and Technology: The Impact of Unlimited Information Access on Classroom Teaching," *Library Issues: Briefings for Faculty and Administrators* 9 (July 1989): 4.

[11]Jerome Johnston, *Information Literacy: Academic Skills for a New Age* (Ann Arbor: University of Michigan Institute for Social Research, 1985). ED 270042.

[12]William Demo, "The Idea of 'Information Literacy' in the Age of High-Tech." Unpublished paper, Tompkins Cortland Community College, Dresden, N.Y., 1986. ED 282537.

[13]Charles Martell and Jennifer Ware, "Hard Facts, Hard Work: Academic Libraries and *A Nation at Risk*—A Symposium," *Journal of Academic Librarianship* 14 (May 1988): 72–76.

[14]Breivik and Wedgeworth, 1.

[15]Philip Tompkins, "New Structures for Teaching Libraries," *Library Administration & Management* 4 (Spring 1990): 78.

[16]ACRL Bibliographic Instruction Section, "Think Tank Executive Summary Report, ACRL-BIS, 1989." Available from Betsy Baker, Northwestern University.

[17]Hannelore Rader, "Bibliographic Instruction or Information Literacy," *C&RL News* 51 (January 1990): 20.

[18]Patricia Senn Breivik, "Information Literacy: Revolution in Education," in Glenn E. Mensching and Teresa B. Mensching, eds., *Coping with Information Illiteracy: Bibliographic Instruction for the Information Age* (Ann Arbor, Mich.: Pierian, 1989).

[19]Carol Collier Kuhlthau, *Information Skills for an Information Society: A Review of Research* (Syracuse, N.Y.: Eric Clearinghouse on Information Resources, 1987). ED 297740.

[20]American Association of School Librarians and Association for Educational Communications and Technology, *Information Power: Guidelines for School Library Media Programs* (Chicago: American Library Association, 1988).

[21]Mary Beth Allen, "Information Literacy, the Library and the Basic Reader/Writer." Paper presented at the Annual Meeting of the Conference on College Composition and Communication, Atlanta, Ga., March 19–21, 1987. ED 284580.

[22]Betsy N. Hine, et al., "Bibliographic Instruction for the Adult Student in an Academic Library," *Journal of Continuing Higher Education* 37 (Spring 1989): 20–24.

[23]Jill B. Fatzer, Noelle Van Pulis, and Marilee Birchfield, "Toward Information Literacy in Ohio," *Journal of Academic Librarianship* 14 (May 1988): 76–78.

[24]Barbara E. Kemp and Mary M. Nofsinger, "Library/Research Skills for College-Bound Students: Articulation in Washington State," *Journal of Academic Librarianship* 14 (May 1988): 78–79.

[25]Barbara McAdam and Darlene P. Nichols, "Peer Information Counseling at the University of Michigan Undergraduate Library," *Journal of Academic Librarianship* 14 (May 1988): 80–81.

[26]Jan Kennedy Olsen and Bill Coons, "Cornell University's Information Literacy Program" in Mensching, *Coping*, 7–20.

[27]*Final Report*, 1.

Information Based Education: An Investigation of the Nature and Role of Information Attributes in Education

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Introduction

Education is fundamentally affected by a series of events that can be grouped under the general heading of "the information explosion." Articles in professional journals as well as popular lay publications reflect the general uneasiness and initial attempts to come to grips with the implications of trying to educate in a rapidly changing environment in terms of information systems, resources, technologies, processes, and skills. In *Megatrends*, Naisbitt points out that 6,000 - 7,000 scientific articles are written each day, while science and technology information increases 13% each year, doubling every 5.5 years! (Naisbitt, 1982) Educators join a wide range of persons throughout business, government, and society in general, concerned about the role and impact of information on people and environments, technologies, systems, and skills. The information explosion has serious implications for educational content, teaching processes, and skills needed by learners.

While most would agree that the information explosion has major significance for education, there is little basic research on specific information attributes that influence teaching and learning. Unfortunately, serious research into the relationships between various information attributes and education is limited, narrow, haphazard and unconnected, at best. The problem is that there is no body of research for considering the nature and impact of information attributes in education.

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The educational research community and educational practitioners (teachers, administrators, instructional designers, library and information specialists) are also faced with significant issues related to the use of information resources, the implementation of information technologies (e.g., computers), and the teaching of information skills in schools. For example, there are important decisions to be made about the purchase of expensive computer systems, the design or adoption of a textbook series to cover specified subject matter, or the approach to be taken for the development a new K-12 curriculum in research skills. While perhaps not apparent at first glance, these decisions all focus on the information side of education. Educational computer systems offer new approaches to presenting and transferring information to students; textbooks are pre-packaged information resources aimed at specific subjects; and research skills involve locating, accessing, using, analyzing and presenting information.

Typically, educators make *curriculum* decisions regarding the selection of content to be taught and its overall sequence and *instructional* decisions about which organizational, delivery, and management strategies should be employed when presenting that content. Some examples of instructional decisions are: the sequence of topics for an instructional course, the use of examples, practice and feedback within a lesson, the selection of appropriate media, how to individualize instruction. (Reigeluth, 1983). Rarely considered, in any formal way, are the *information needs and requirements* of curriculum and instruction.

Dick and Reiser (1989) state that "(t)he critical issue [of instructional design] is usually not whether the topic itself is covered, but whether the information is sufficient for the learner to actually learn the skills described in the objective. If it is not sufficient, how much additional instruction must be provided by the instructor?" (p. 62) Instructional design decisions, therefore, center on the *quantity* of instructional strategies used to facilitate learning. Rarely addressed are such issues as: Is the information accurate? up-to-date? comprehensive? relevant? clearly articulated? unbiased? complete? easy to understand?

In order to make systematic and rational decisions about these and other questions, researchers and practitioners must be able to draw on a body of knowledge about the effective use of information for teaching and learning. The lack of documented research focusing on the nature and implications of information based attributes in education, may be due to the absence of a unifying framework, model, theory, methodology, or even vocabulary for considering the nature and impact of information attributes in education, with applications across educational levels (pre-school through adult), across groups (gifted through at risk), and across subject areas.

This paper provides an *initial* attempt to identify and classify the attributes of information based education. It represents a selected, rather than comprehensive, survey of the literature. In addition to a continuing review of the literature, it is expected that this effort will lead to empirical research in order to validate these attributes as well as to identify others.

A Conceptual Framework

Information based education is an approach to learning and instruction that focuses on the information attributes of *educational situations*. Educational situations are considered in a broad sense and exist across:

- educational environments (e.g., elementary and secondary schools, mid-career centers, job training centers, colleges and universities)
- educational settings (e.g., day-care centers, classrooms, learning laboratories, computer clusters)
- educational programs (e.g., management training programs, K-12 curriculum, degree-granting programs)
- educational structures (e.g, 3-day workshops, semester-long courses, 2-year courses of study).

In elementary and secondary schools, curriculum and instruction are most commonly organized as a series of units. For higher education or training

situations, a series of related sessions on a common topic or skill fulfills the same function. Units and related sessions are educational situations and they frequently encompass a number of class sessions, tasks, and activities.

Examples of educational situations include:

- an elementary school unit on the solar system
- a junior high school unit on careers
- a high school drama production of *Romeo and Juliet*
- an undergraduate art course segment on the Renaissance
- a corporate training seminar on time management.

In order to better study what is actually taking place in the classroom or educational setting, it is useful to focus on a more detailed level of educational activity. Therefore, in the information based approach, educational situations are viewed as a series of *learning events*. A learning event is generally no longer than one or two class sessions, and can be described in terms of measurable *learning objectives*. In addition to learning objectives, elements of learning events include: the *learner(s)., teacher(s), instructional methods*, and *content..* The most familiar form of a learning event is the "lesson."

Examples of learning events related to the the educational situations above are:

- an elementary lesson on the orbit of the earth
- an introductory lesson to career information sources
- a workshop class on scenery and props
- a presentation and discussion of Michelangelo's sculptures
- a session on time planning tools.

The view of education as comprised of broadly defined units and lessons involving the interaction of learners, teachers, content, methods and objectives is common to most instructional models. The key additional component in information based education is recognition of the *information base* as a central and essential element of the learning event.

One of the fundamental assumptions of the information based education perspective is that the information base of learning events in all educational situations - from corporate training sessions to third grade classes to university lectures - can be described in terms of common and essential sets of information-related characteristics. Therefore, it should be possible to describe the information base of a given educational situation in terms of a combination of *information attributes or characters*. For our purposes, the terms information attribute and character are used synonymously to indicate some information related characteristic of educational situations. Borrowing from the field of numeric taxonomy, an attribute or character may be defined as a feature that varies from one information base to another. (McKelvey, 1982) The attributes of an information base may relate to any of the elements of the learning event (i.e., the learner, teacher, content, objectives) as well as the relationships among elements.

Information attributes in education may be derived from such areas as library and information skills, information transfer, instructional methods, instructional design systems, content, information roles, and information resources. These information attributes may include information needs, information-related roles for learners, teachers, and information specialists, information resources and systems, information skills, and information processes.

Examples of general information attributes include:

- the quantity and diversity of information resources and systems
- computer-based information technologies
- the information-related roles of learners, teachers, and information professionals
- information transfer and value added processes.
- the nature and types of information needs and skills of learners.

Some illustrative examples of specific information attributes are:

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A high school social studies lesson on U.S. Supreme Court cases might involve such information attributes as:

- multiple and diverse information sources,
- requiring students to use analytical information skills
- an information mediator role for the teacher
- information processes of filtering and synthesizing.

The same Supreme Court lesson in a different setting might involve:

- a single textbook as information source
- requiring students to use memorization information skills
- a content provider role for the teacher
- information processes of sending and receiving.

These two lessons clearly rely on two decidedly different information bases. The development of an information based education classification scheme would allow the identification, categorization, and differentiation between these two information bases. Furthermore, it should be possible to group together situations with similar combinations of attributes or characters.

Related Research

To date, there is no single research effort focusing on overall questions relating to information use in education for studying globally the nature and influences of information attributes in education. There are, however, a number of areas of interest and research that focus on specific information-oriented issues and their relation to education. For example, investigations and discussions on the information age and information overload, information skills instruction, computer-assisted instruction and instructional design, and resource-based education all point to specific information-related attributes that potentially impact on education. These attributes need to be integrated into the conceptual framework

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for information based education.

In addition, there is no existing classification scheme that embodies all of the qualities that would be necessary to describe the information base of educational or learning situations. Some studies have attempted to classify learning and information use qualities in a systematic manner, but few of these classifications have been subjected to rigorous field testing. Typically, a list or schema of attributes is postulated, *a prior*, by researchers and then used to describe particular situations or methods. The schema have questionable validity and generalizablity.

The need for classification schemes has been noted by researchers not only for descriptive purposes to improve our understanding of phenomena, but for providing a means to quantitatively compare different learning environments with any degree of consistency. (Reigeluth, 1983) Many existing classification systems are vague or loosely defined and describe a learning situation in a manner that allows for quantitative analysis. (Gagne, 1977)

The development of an information based education classification scheme represents a pioneering effort to study globally, the nature and influences of information attributes in education. Before embarking on that effort, however, it is useful to identify possible attributes identified in the literature that may apply to the information base conceptualization. As Bloom (1956) observed "(b)efore one can build a classification scheme it must be clear what it is to be classified." (p.11) This paper represents an initial effort to identify those attributes.

A survey of various writings in education, library science, and information science revealed several perspectives on information, instruction, and learning. This initial effort, involving a review of papers from the fields of instructional design and technology, educational research and learning theory, library media studies, and information science, was intended to identify and describe information-related attributes, some of which are reported in this paper. It is anticipated that consideration of these attributes, combined with empirically-derived attributes, will form the basis of the conceptual framework for information based education.

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Information Age and Information Overload

Vast increases in the amount and availability of information through traditional publishing channels, computerized databases, and telecommunications has led to an" explosion" of information. Not only has the sheer amount of available information increased, but users are offered improved access and delivery mechanisms for information. The use of computer technologies and online databases is becoming particularly attractive to educators for information as well as instructional purposes.

By introducing a greater number and variety of information resources and systems into the learning environment, there is the likely risk of creating a state of "information overload" in the learner. Information overload, a concept that is receiving considerable attention in the popular press and research journals, is described as a stress induced by an "overload" of information that exceeds the users ability to deal with it. "Information has become the driving force of our lives, and the ominous threat of this ever-increasing pile demanding to be understood has made most of us anxious." (Wurman, 1990, p. 32)

It is speculated that this stress reduces a person's ability to effectively deal with their information environment, thereby reducing both productivity and accuracy. Emerson and Cooper (1983), for example, found that users refined their decision-making processes (i.e. employed coping mechanisms) in the face of high levels of information. However, their study did not measure the *quality of decisions* or the effect on the *quality of decision-making* as a result of high information loads.

The literature does point to two concerns in dealing with information overload: (1) teachers must be able to sift through the morass of information available and select what is to be available to or required of students in given educational situations, and (2) learners must be prepared to exist in this information rich environment. Both concerns center on changing roles for teachers and students in terms of dealing with information. Irving (1986), for

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example, discusses the degree of control over information resources by teachers and students. What alternative roles exist for teachers, students (as well as librarians and information specialists) in terms of managing, using, and controlling information?

Some of the information attributes related to information overload include:

- information load
- the quantity and diversity of information resources
- information related roles of learners, teachers and information professionals

Library and Information Skills

As previously stated, the skills associated with dealing with the wealth of information available is becoming a central concern in education, business, and society at large. The timeliness, applicability and overall value of sources may change, however skills should provide the means for personal development.

Most educational efforts in the area of information skills have grown out of the school library area and attempts to develop library skills curricula and instructional programs (although critical thinking and problem-solving are certain two closely related areas). While traditionally focusing on the skills of location and access, school library media specialists are increasing concerned with a broad range of information skills totally integrated with instruction in subject areas.

A number of information attributes have been identified in the area of library and information skills. Kuhlthau (1991) and Eisenberg and Berkowitz (1988) both advocate approaches that emphasize broader, *problem-solving* views of library skills. Kuhlthau describes an information search process in terms of six stages: Initiation, Selection, Exploration, Formulation, Collection, and Presentation. Eisenberg and Berkowitz determined that learning outcomes and objectives relating to information extend beyond mere location and access to resources to include an understanding and use of a systematic process for information problem solving.

This process is composed of six skills: Task Definition, Information-seeking Strategy, Location and Access, Use of Information, Synthesis, and Evaluation.

Irving (1985) describe a nine step process for completing assignments that proceeds from formulation and analysis of an information need through the identification, location, and selection of resources, to the storing, analysis, synthesis, evaluation and presenting of the information and the evaluation of the assignment. Stripling and Pitts (1988) present a ten-step research process that includes choosing, getting an overview of and narrowing a topic, developing a thesis, formulating research questions, planning the research, finding, analyzing and evaluating sources, evaluating and documenting evidence, organizing information and establishing conclusions, and creating and presenting a final product.

These and other authors point to a range of information skills in terms of levels and types of skills. There are also questions about whether students are expected to have certain information skills or if the skills are to be developed as part of the learning experience. Skill levels, types, and expectations are all important information attributes in learning events. Information based education provides a context (that has not existed previously) for considering information skills as essential information attributes in learning.

There is also evidence of a relationship between information skills instruction and other elements of learning. Irving (1986), for example, found that the relationship between teaching and information skills appears more complex than was previously assumed. Indeed, in some cases direct skills instruction may actually hinder skills development, particularly if students are effortlessly guided through tasks without ever having to reflect on their aims and how they might best be achieved.

In summary, some information attributes related to library and information skills include:

- information skills

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- information search process

Information Transfer

Research on information-seeking behavior revealed classifications on the nature (or levels) of the information itself. Horton (1983) contends that it is possible to juxtapose human physiological and psychological needs and values with human information needs. He created a hierarchy of information needs, developed on the pyramidal construction of Maslow's Hierarchy of Needs, which includes Coping Information, Helping Information, Enlightening Information, Enriching Information, and Edifying Information.

Taylor (1986) describes four dimensions of information need: Visceral Information (actual but unexpressed); Conscious Information (ill-defined need); Formation Information (the area of doubt may be described in concrete terms); and Compromised Information (the information need becomes what the resources or files can provide). Taylor's value-added model specifies a number processes that add value to the information system. Some of those processes are Highlighting, Filtering, Editing, and Updating.

Some identification information attributes associated with information transfer are:

- Information Needs
- Value-added Processes

Computer Based Education and Instructional Design

Computers are increasingly becoming the key devices for providing information to society. They have altered the way that society looks upon both the delivery of information and the delivery of instruction. The nature and degree of use of computer technology are two key attributes when considering the information base of an educational situation.

Rapid advances in technologies have resulted in the availability of a wide variety of new computer-based educational tools. Computer mediated communications (e.g., electronic mail, voice messaging, electronic bulletin boards), local area networking, teleconferencing, online full-text databases, and interactive multimedia technologies (e.g., hypermedia) are just some of the technological innovations currently being used in educational settings which provide new opportunities for enriching student learning and additional instructional options for teachers (Doss & Rhodes, 1989-90).

Because of the capability of computers to provide an interactive and manipulatable environment for presenting information and instruction to the learner, computer technology poses new concerns for instructional designers who are often the key developers of computer assisted instruction. With the development of new technological capabilities have come increased opportunities for learner control with greater responsibilities for learners to manage information and solve their information problems (Doss & Rhodes, 1989-90). Artandi (1979) noted that "information technology represents a significant attribute in the rapidly changing relationship between the individual and information as well as in society's ability to use or misuse information" (p. 15).

Instructional designers have drawn primarily from traditional education theory for their development of technology-based instruction. However little work has been done that would assist designers in solving the problems presented by the availability of technologies for the *information* side of instruction. Recent efforts such as the Education Utility (Gooler, 1987) tend to focus on the engineering and feasibility aspects of creating systems for delivering information to learners rather than on the need for such systems and questions relating to how the systems will be used in instruction.

- nature of computer technology
- degree of use of computer technology
- learner control

Resource Based Education

Resource based education refers to a body of work promoting the use of library media resources, personnel and services in educational settings. Resource-based education fosters a certain approach to the use of information in education. It encourages "better" use of library media resources and services. Henry (1990) describes resource based education as educational programs which involve the use of a wide variety of resources to meet curriculum objectives. These resources consider learning styles and rates, creativity, enhancing learning of facts, motivating lifelong learning, developing learner independence and self-confidence, using technology, increasing appreciation of artistic expression, and providing a link to the outside world.

Loertscher's (1988) listing of levels of involvement for library media programs in instruction is particularly relevant to the information based approach as library media program involvement can be considered as an attribute and the levels as possible attribute states. Loertscher's taxonomy considers levels of involvement as: No Involvement, Self-Help Warehouse, Individual Reference Assistance, Spontaneous Interaction and Gathering, Cursory Planning, Planned Gathering, Evangelistic Outreach, Scheduled Planning in Support Role, Instructional Design (Levels 1 & 2), and Curriculum Development. Turner (1985) defined the levels of involvement in instructional design by library media specialists as ranging from No Involvement to Passive Participation and Reaction to the highest level of team involvement called "action education."

The focus of information based education is broader than the resource based concerns. Information based education involves no *a priori* judgments on the value of one approach vs. another, and all information attributes (library centered or not) are considered. Also, future research will investigate the relationships between various information attributes and learning.

However, there are important commonalities between resource based

education and IBE. First of all, they both recognize the importance of information to the educational process. Second, they both seek to document and describe important information attributes related to the role of information professionals, library resources library services, and instructional approaches.

In summary, the information attributes associated with resource based education include:
- variety of resources
- library media program involvement

Conclusions

Information based education views education from an "information perspective." It represents an attempt to advance educational theory and practice in terms of the role and impact of information attributes as they relate to teaching, learning and the attainment of learning objectives, and instructional processes and materials. IBE also brings in seemingly diverse aspects of the study of information in education, such as information skills instruction, computer use in education, and resource based learning in order to develop a framework, common vocabulary and diagnostic tools.

Information based education is founded on a number of understandings:
- Education is fundamentally information-oriented.
- Educational situations are composed of a series of learning events.
- The most important element of a learning event is the set of learning objectives.
- In addition to learning objectives, most learning events involve learners, teachers, curricular content, instructional methods, and a pervasive *information base*.
- It should be possible to identify the various information attributes of the information base.

Persons concerned about education are increasingly focusing on information

attributes relating to better educating learners in an information rich environment. These attributes, only some of which have been identified in this paper, may have far-reaching implications for learning environments and the achievement of learning objectives.

IBE seeks to use a taxonomic approach to raise an awareness of the information base of learning events, provide a preliminary vocabulary to talk about information in education, and establish a methodology for studying the information base of learning events. In a broad sense, the information base can be considered in terms of information structures, information processes, and information roles of those "players" involved in the learning event. It differs from some of the existing approaches and taxonomies related to information in education because it (1) focuses on just the information characters and (2) is intended to utilize operational classification, testing meaningful questions and hypotheses about the information base by observation and experiment. Although not intended to be prescriptive, IBE would provide educational planners with an *information profile* that describes the information needs and requirements for a given educational situation.

Development of an IBE taxonomy offers a systematic and unifying approach to study the nature and impact of information attributes on learning. In this paper, we have attempted to develop a *theoretical* taxonomy, based on the literature of education, library science and information science. The goal of future efforts is to continue the evolution of a comprehensive theoretical classification scheme and to test that scheme *empirically* in order to ultimately identify the relationships among individual information attributes, the information bases of educational situations, and other elements of learning events (particularly the attainment of learning objectives).

Research on information based education is expected to provide a framework for studying information in education by

- investigating the relationships between information and education

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- providing a conceptual foundation for considering information use in education
- furthering our understanding of the role and impact of information attributes in education
- linking various information attributes and information bases to meeting learning objectives in any educational situation.

This research agenda seeks to provide (1) a listing of information attributes and associated character states; (2) a tested data collection instrument for gathering data on the information base of learning events; (3) baseline data on the information aspects of a range of learning events; (4) a validated classification scheme for categorizing the information bases of learning events; (5) a model taxonomic methodology for creating classification schemes; and (6) a method for using the classification scheme to isolate various information attributes in order to study their impact on the achievement of learning objectives.

Future research questions related to these goals are:

- What are all the possible information attributes of IBE?
- What are the key attributes (i.e., those that always occur with others and are easily measured)?
- What is the classification scheme?
- What is the relationship between various information attributes (or clusters of attributes) and the achievement of learning objectives?
- Beyond obvious content differences, does the information base differ for different learner levels, learning objectives, subject matter disciplines, and groups of learners? (For example, does the information base profile of a high school-level biology unit differ from its college-level counterpart? What are the differences in the IBE when learners are required to memorize facts versus synthesize information? Are there differences

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between the information base attributes of an integrated unit on research skills in a fifth grade science class and a fifth grade social studies class? Does IBE differ for a unit on managing competitive strategy for corporate executives vs. MBA students?)

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A MODEL FOR INFORMATION LITERACY
by David V. Loertscher

It is difficult to argue against the existence of an information society. While there are still many people who insulate themselves from modern information systems and services, most are not only affected by these systems and services, but are employed to create, maintain, or disseminate some form of artificially created information bank. An insurance agent quotes rates from a computer terminal, an operator provides a telephone number, a sales clerk puts a price tag on a dress, a worker installs a traffic light, a technician repairs a copy machine—and so it goes ad infinitum. Two other concepts about information are now making their way into the world of children: information pollution (garbage information) and information overload (too much information too fast).

At a recent ASCD conference, Lee Iacocca pleaded with the audience of teachers and administrators to provide him workers at age eighteen who could at least read the diploma they received at graduation from high school. Another company executive asked that educators provide his company with young people who could think: who have and can apply good old-fashioned common sense. Iacocca reminded his audience that educators are the only "industry" that asks for more money to produce an inferior product.

Both library media specialists and teachers face the task of preparing a generation of young people to face a world they can only guess about. They realize that expectations for what a literate student is expected to know are rising. They also realize that the decline of family units and other environmental social problems cast doubts on the quality of the "natural resource" schools have to work with.

In the past ten years, the role of the library media specialist in teaching information literacy has expanded. Two major patterns seem to have emerged. In the elementary school and many middle schools, library media specialists emphasize teaching library skills consisting largely of information location methods. As young people grow older, the emphasis turns toward teaching the research process, the product of which is usually a research paper or a report. Such emphases, when practiced exclusively, are at best too narrow and at their worst destroy the interest of young people in using information sources and libraries. Producing a nation of young people who can gather information, stir it up, and then regurgitate it in paraphrase form is not particularly appealing. Providing intense instruction on research paper construction to everyone when only a small minority will need this skill seems pointless. This is not to say that the research and efforts to teach the research process by library media professionals has been a waste of effort. Quite the contrary, the progress made in knowing how and when to teach research has been extremely valuable. To repeat, it is only when this process is the only one taught that the problem arises.

For half a century, public school teachers taught reading skills through the use of recitation. In the next half century, when teachers abandoned that method, no one missed it. It is fascinating to hear college librarians claim that students come to them with fewer library and information skills than ever before, yet the generation now in college has had more instruction in those skills than any generation in world history. What does this mean? Should we abandon all we do with young people in libraries in terms of library skills? Who would miss it if we stopped? There are many things young people can do in libraries besides learn library skills and the research process. If, for example, students used their library skills

time to read, what would the result be? We know they would become better readers, but what about library use skills? A lively debate on this topic ought to be the focus of a profession-wide forum.

For the purposes of discussion, let us assume that the profession would continue to support the idea that young people need to be taught information literacy; that information *literacy* is not a natural consequence of day-to-day living; that we must make an intervention to assist the youth of this country *in preparing* for their future. Thus this paper proposes that library media specialists expand their view of what constitutes information literacy and how that literacy might be nurtured. This expanded view does not come with the recommendation that library media specialists work harder, for they already fill days and evenings with taxing work. It does plead, however, for library media specialists to reexamine current beliefs and visions and then use common sense practices to work smarter, not harder.

The library profession is not the only group interested in information literacy. In fact, the rest of the education profession is usually surprised to find out that we have any interest whatsoever in such matters. Discussions in professional literature about the needs for information literacy usually bypass the library, since libraries are thought to only store retrieval materials. Enough of our professionals confine their activities to warehousing that the stereotype continues to be entrenched in popular thinking, particularly in the minds of the young people currently being educated. Library media specialists who have broken out of that mold find that patrons do respond in meaningful ways to new roles, sometimes with almost too much enthusiasm.

If we step back to look at information as a commodity and ask the question, "What do people do with information?," an interesting and enlarged view soon appears. For example, people can find it, ignore it, translate it, laugh at it, steal it, erase it, judge it, hide it, falsify it, act on it, fight for it, encrypt it, dispose of it, treasure it... Frank Smith, in his book <u>To Think</u>,[1] lists 75 words that are related to thinking. This set of words look suspiciously like what we are talking about when we say information literacy. The words are:

analyze	conjecture	fabricate	organize
anticipate	consider	fantasize	plan
apprehend	contemplate	foresee	plot
argue	create	guess	ponder
assert	deduce	hypothesize	postulate
assume	deem	imagine	predict
attend	deliberate	induce	premeditate
believe	determine	infer	presume
calculate	devise	intend	presuppose
categorize	discover	introspect	project
classify	divine	invent	propose
cogitate	empathize	judge	rationalize
comprehend	estimate	know	reason

[1] Smith, Frank. <u>To Think</u>. New York: Teachers College Press, 1990, p. 1-2.

conceive	examine	meditate	recall
concentrate	expect	muse	reflect
conceptualize	explain	opine	remember
review	scheme	suspect	wonder
revise	speculate	systematize	
ruminate	suggest	theorize	
schematize	suppose	understand	

If we classify (as librarians love to do) all these and other words about information, we might build a model of information literacy which would show what educators might do to nurture the concept of information as a commodity to be managed throughout life. The model follows:

| Finding Information
Navigating Information Systems
Recognizing Information Types | Creating Information |

↓   ↓

| Information Analysis |

↙   ↓   ↘

| Discarding Information | Using Information | Communicating Information |
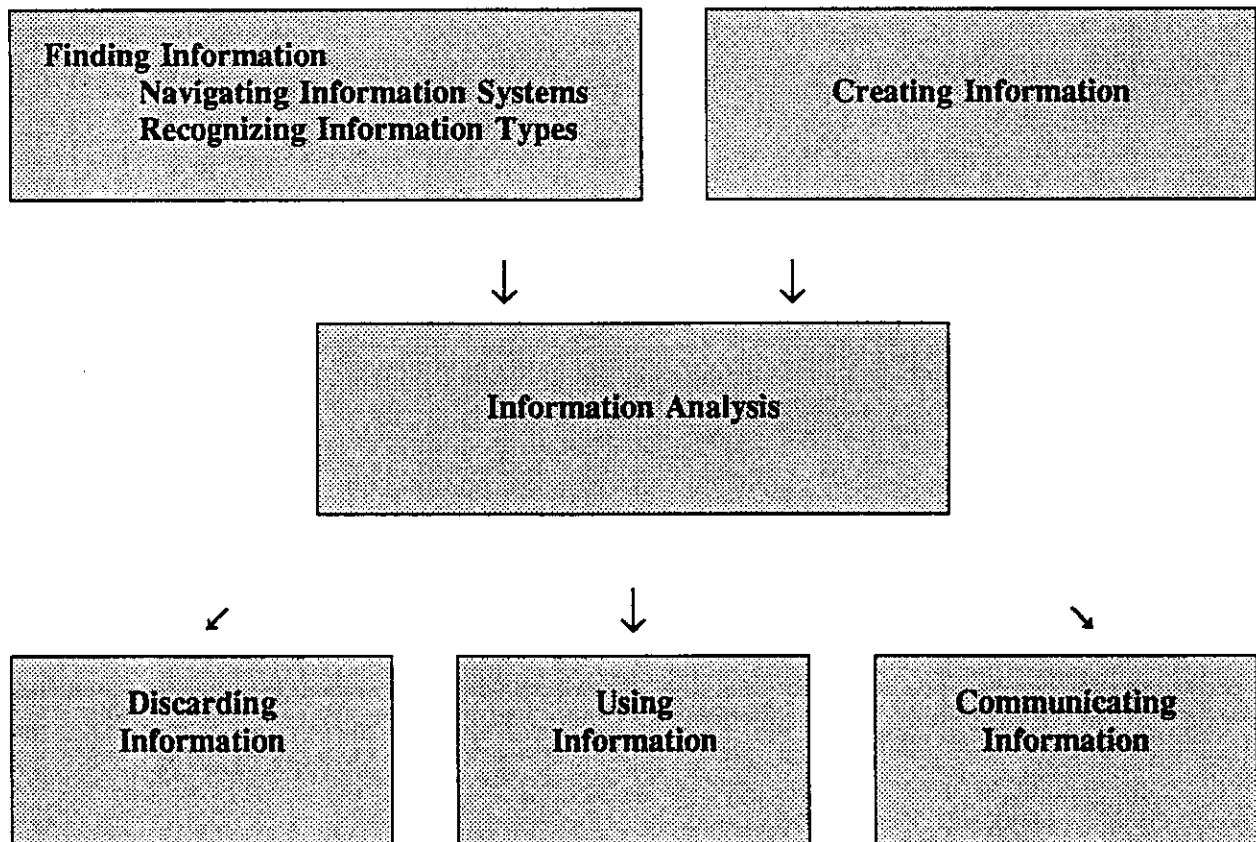
Each segment of the model could be further broken down into smaller components which would then begin to form a larger mental concept from which daily interaction with students could proceed.

FINDING INFORMATION

Navigating Information Systems

<u>Characteristics of media</u>

Printed Media
  Books and periodicals
  Printed indexes (card catalogs, periodical indexes, poetry indexes, etc.)
Oral media
  Lectures
  Conversation
Electronic information systems
  Online catalogs
  Databases
  Hypermedia
  Visual media (film and television)
  Audio media

<u>Skills</u>

Background knowledge and terminology building
Browsing skills using text or media structure
TACCL (pronounced *tackle*) information searches (a la Wurman)[2]
  <u>T</u>ime
  <u>A</u>lphabetical   (subsumes what we usually
  <u>C</u>ategory (subject)   call author, title and subject
  <u>C</u>ontinuum (scales)   searches)
  <u>L</u>ocation
Using Boolean searching and other machine assists
Using multiple attack strategies (keep trying using different methods)
Using vantage points (a la Wurman)[3] (examining data from different perspectives)

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[2] Wurman, Richard Saul. <u>Information Anxiety</u>. New York: Doubleday, 1989, p.8, 59-65.

[3] Wurman, p.8, 65-67.

<u>Attitudes</u>

Work ethic (information searching can be tough!)
Independence/asking for assistance (knowing when to ask, whom to ask, how to ask)
Resilience (don't quit at the first disappointment)
Flexibility (being willing to try again and again with different methods)
Enjoyment (it may be work, but it can be and often is fun and exciting)

Recognizing Information Types

Truth ⇔ falsehood
Nonfiction ⇔ faction ⇔ fiction
Facts ⇔ possible answer ⇔ hint/guess
Fact ⇔ opinion ⇔ propaganda
Fact ⇔ summary ⇔ narrative
Clear and simple ⇔ complex
Easy-to-use ⇔ difficult and time consuming to use

CREATING INFORMATION

Accidental discovery (many useful products come about this way, e.g., Post-it notes)
Experimentation (purposeful discovery of information by systematic methods)
Direct experience (using all faculties)
Insight (the aha!/Eureka syndrome)
Reorganization of the known (the Japanese seem to do this one well in the high-tech arena)
Innovation (new thoughts on old problems; new thoughts period)

INFORMATION ANALYSIS

<u>Thinking about information</u>

Accepting/rejecting (this is or isn't exactly what I need)
Organizing and restructuring (classifying, charting, reanalyzing)
Reasoning (is there any sense here?)
Synthesis (putting it all together)
Drawing conclusions (this is what I should do)
Problem solving (working toward a solution)

Judging information

      Criticizing information
            Accuracy
            Currency
            Relevancy
            Omissions (what's not there is as important as what is)
      Recognizing effective and defective reasoning
      Testing facts, outcomes, conclusions

DISCARDING INFORMATION

Forget/overlook information
Discard by non-citation
Cite, but reject critically
Eliminate information

USING INFORMATION

Practical uses
      Making decisions
      Creating a product
      Guiding action/strategies
      Experimenting
      Clarifying concepts
      Changing behavior

Political uses
      As the basis of positions taken
      As power

COMMUNICATION OF INFORMATION

By medium
      Written
      Oral
      Visual
      Electronic
      Kinesthetic

<u>By purpose</u>
        To inform
        To report
        To persuade
        To achieve results
        To pursue scholarship
        To entertain

A temptation in model building is to translate the ideas into K-12 continuums from which systematic lessons could be constructed.[4] While this could be done, I would argue that holding the model in memory and allowing it to generate ideas for daily common sense practice would be a superior method to employ.

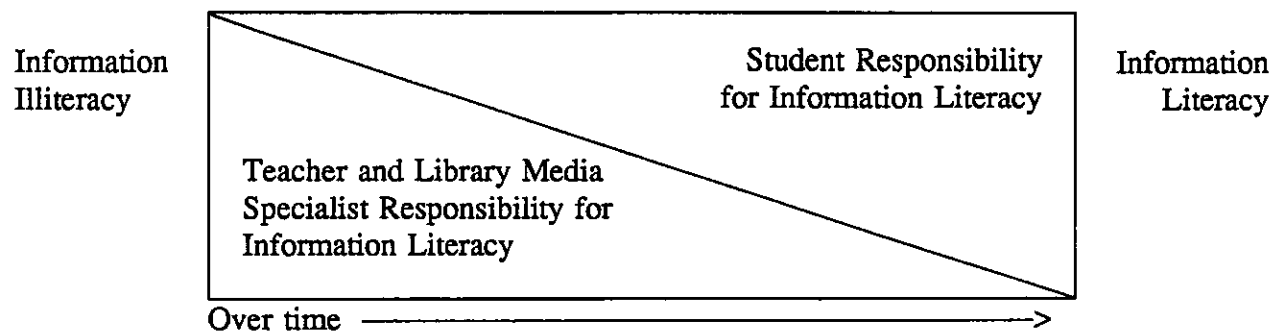Two simple approaches could guide daily practice:

1. With a teacher and as a part of resource-based teaching, construct/invent problems/activities which will cause students to confront different parts of the model. Students might have to discover solutions to information problems as groups or as individuals.

2. Allow students to create, or assign them products to create, the antecedent of which requires information skills of varying difficulty. For example, design projects on the Foxfire model which have powerful motivation for the student to meet information problems squarely as a natural part of progress toward some fascinating end.

Pearson and Gallagher constructed a model a few years ago which forms the basis of the above approach to information literacy instruction.[5] They titled their model "The Gradual Release of Responsibility Model on Instruction" which seems to fit so well into the thinking of library media specialists for many years. I have adopted their model as follows:

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[4] One of the best attempts to teach much of the model is the following college text: Chaffee, John. <u>Thinking Critically</u>. 2nd ed. Boston: Houghton Mifflin Company, 1988.

[5] Pearson, P.D., and M.C. Gallagher. "The Instruction of Reading Comprehension," <u>Contemporary Educational Psychology</u>, 8(1983).

Gradual Release of Responsibility Model of Instruction
The Ideal

Information
Illiteracy

Student Responsibility
for Information Literacy

Information
Literacy

Teacher and Library Media
Specialist Responsibility for
Information Literacy

Over time ————————————————————>

The model urges library media specialists and teachers to try to work themselves out of the picture—to build independence on the part of the learner. That's not new, but many of our professionals feel differently. They may fall into two dangerous modes of working as pictured in the following two models:[6]

Dangerous
(Teachers and Library Media Specialists Assume Too Much Responsibility)

Student Responsibility for Information Literacy

Teacher and Library Media Specialist Responsibility for Information Literacy

Over time ————————————————————————————————>
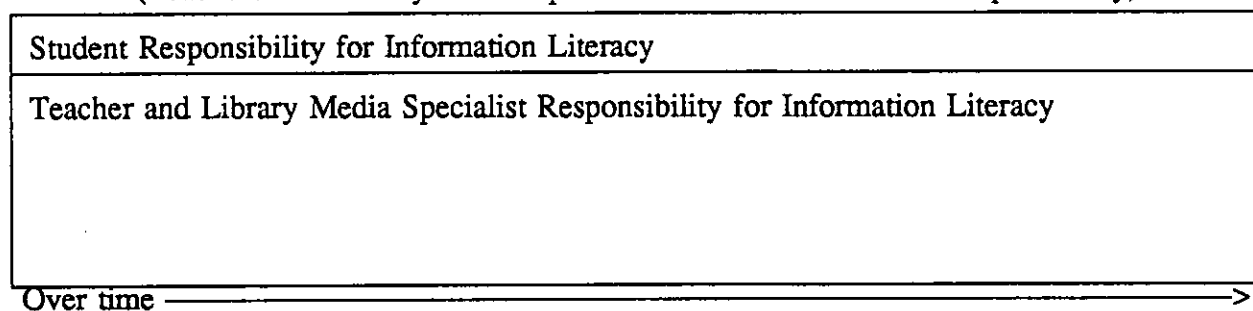
Dangerous
(Teachers and Library Media Specialists Abdicate Responsibility for the Most Part)
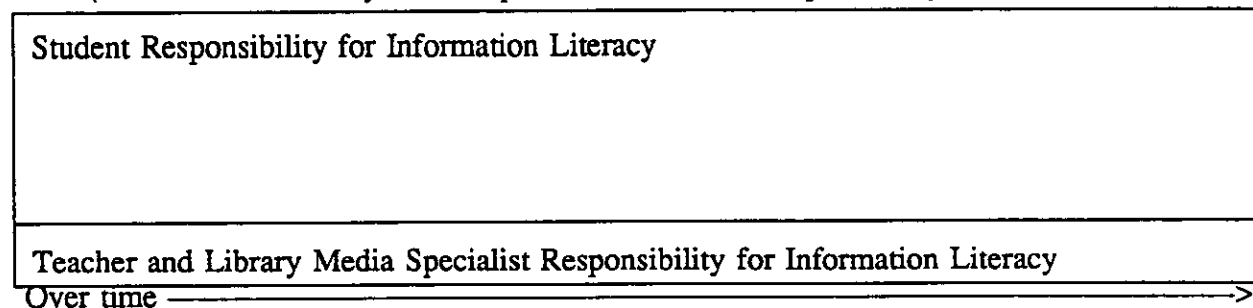
Student Responsibility for Information Literacy

Teacher and Library Media Specialist Responsibility for Information Literacy
Over time ———————————————————————————————————>

In the first model, the library media specialist and the teacher fear the test or perhaps feel that students need their constant tutoring to succeed. In the second model, teachers and library media specialists may not consider information literacy an essential part of their responsibility. They may have not thought about it seriously or have purposely rejected it as a suitable role to play.

If, however, library media specialists and teachers were to internalize the complete information literacy model and then allow and guide students to confront different parts of it on a regular basis, I think they would make a great discovery. When young people are set upon a fascinating task and forced to interact with the model, that technique would have the greatest impact on reluctant and slow learners, non-readers, the bored, the alienated, the disinterested, and the cast-outs. Gifted students use much of the model instinctively. Should the teacher and the library media specialist discern or anticipate common information skill problems, then small- or large-group instruction could be designed. However, these formal efforts should be of secondary priority. Again, letting the natural interest of students create a problem which they would then solve for themselves. That would be the ideal. In no case should library media specialists pursue the model without a sense of shared responsibility with the teacher.

If library media specialists really think about the model, I believe many of them will recognize that they already perform many of the functions listed. They will recognize that much of the model is done with an individual student working on a project. What they don't realize, I believe, is that if they internalize the model and then use it in their daily regimen, they will be more systematic about their interventions and thus will do all young people a great favor. During the reference interview, they will perceive where the student is on the model and will be able to know when to provide information, withhold it and challenge the student to find it, verbalize a search strategy as an information quest is taken together, or simply ask a thought-stimulating question. The same process would hold as teachers and library media specialists planned instruction; together, they would plot a course which would lead students down the road one more inch toward information literacy. It isn't that difficult.

(TREASURE MOUNTAIN RESEARCH RETREAT II)

EDUCATIONAL CHANGE AND ITS IMPACT ON SKILLS INSTRUCTION

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INTRODUCTION

Information literacy and information skills are topics of discussion and debate among school library media specialists and school administrators. This paper looks at the information literacy/skill level of high school students, what the skill level should be, and how these skills relate to bibliographic instruction in the college setting.

Changes in society, i.e. the information explosion and rapid advances in technology, coupled with a major economic upheaval, have placed American public education in a precarious position. Several states, Kentucky being one, have reacted by passing legislation mandating education reform.

THE 1990 KENTUCKY EDUCATION REFORM ACT

The Kentucky Education Reform Act (KERA) of 1990 has been labelled as probably the most radical attempt at state-wide education change in this country in decades. Kentucky is attempting to completely rebuild its system of public education. Kentucky has traditionally had a poor reputation for educational excellence but with KERA, the Bluegrass state is now on the cutting edge in the reform of the public school system (Harrington-Lueker, 1990).

The Kentucky Education Reform Act of 1990 is the Kentucky General Assembly's response to a 1989 State Supreme Court decision that ruled the funding system of Kentucky schools unconstitutional. The legislature took the opportunity not only to address the fiscal inequity among local districts but also to create an entirely new system of public education (Harrington-Luecker, 1990).

The education reform law specifies six goals for the schools of Kentucky. Schools of the Commonwealth of Kentucky are to prepare students to (KDE, 1990):

1. Apply basic communication and math skills.
2. Use and apply core concepts in all major subject matter disciplines.
3. Become a self-sufficient individual.

4. Become a productive group member in the family, at work, or in the community.
5. Think and solve problems in school situations and life.
6. Integrate knowledge from all subject matter fields and life experiences.

KERA charged the Council on School Performance Standards, which was created in 1989 by an executive order of the governor, to develop measurable outcome assessment criteria for each of the aforementioned goals. Sixty-eight valued learning outcomes are identified in the current draft of the Council's assessment document. A valued outcome is defined as the completion of "authentic," practical tasks with quality performances. Such tasks require application of knowledge and skills to the completion of a project or designated activity in which learning is demonstrated and can be documented. The assessments will be conducted by the state in grades 4, 8, and 12 to measure the effectiveness of schools and districts (CSPS, 1991).

There are only two specific references to school libraries and related information skills in the 272 page draft document from the Council on School Performance Standards. Both are under the first goal category, Basic Communication and Math Skills. The first reference is the outcome "Accessing Sources of Information and Ideas" with the general assessment statement requiring students to use research tools to locate sources of information and ideas relevant to a specific need or problem. The other reference to skills instruction is the outcome "Use of Electronic Technology" which requires students to gather, organize, manipulate, and/or express information and ideas using appropriate electronic technology. Assessment categories are stated for outcomes, and sample tasks for demonstrating achievement of the outcome are presented (CSPS, 1991)

No information skills are labelled beyond the two just identified. Even so, the need for skills instruction is clearly implied, at least to an information specialist/school media librarian who reads the document. Some examples of statements which indicate the presence of and need for information skills instruction are:

Develop a written plan for ....
Compare the operation of body systems to that of ....
Write a short narrative describing how ....
Prepare a speech on the value of ....
Write a newspaper article on ....
Research and compare two folk dances of ....
How has the interpretation of the U.S. Constitution changed ....
Locate a city on a map using ....
Prepare a speech on two possible careers that ....

While there will no longer be a state prescribed curriculum per se, the required educational outcomes to be assessed by the state will form a framework for the curricula in the schools. In fact, the outcome assessments may be incorporated into lesson planning.

School libraries and/or media centers and professional positions are not mentioned specifically anywhere in the Kentucky Education Reform Act. By implication, the continued importance of information skills instruction is assumed. For example, many of the outcome assessments imply mastery of the skills needed to locate information to complete a task.

LIBRARY MEDIA/RESEARCH SKILLS AT THE SECONDARY LEVEL

Turning now to a discussion of bibliographic instruction at the secondary level, we need first of all to clarify terminology. At the secondary level this process is typically referred to as the teaching of library media/research skills.

Since libraries play a leading role in the larger educational drama, school library media specialists must alter their role to accommodate the changes called for under education reform movements. School library media specialists, more than ever before, must become active participants in the educational process. Those who fail to do so may find their names on the list of those marked for extinction. Library media specialists must help in teaching students to be lifelong learners, to become independent thinkers, and to view libraries as providers of information. If students in the decades ahead are to survive at all, much less well, in the society in which they find themselves, they must become information literate. The ability to access information will be a necessary function of daily life, and no child should be allowed to leave school without having mastered this skill.

As fellow participants in the pursuit of excellence in education, you are now asked to view the process of teaching library media/research skills in the secondary school as a joint library media specialist-teacher partnership. In program development from this perspective, two major questions emerge: (1) How much do high school students know about libraries and the research process? and (2) What should high school students know about libraries and the research process? We will try to answer these two questions and then consider what implications our answers have for future planning.

The first question, if one expects an answer based on pure research, can be dealt with in short order. Research studies dealing with the assessment of how well high school students have mastered library media/research skills are practically nonexistent. The work of Kuhlthau (1989) in the development of a model of the information process stands as an uncommon effort to conduct serious research and to discuss its implications for high school library media specialists. An earlier study which also builds on prior research is that by Mancell and Drott (1983), a study which attempts to measure student use of information.

In general, school library media specialists have not been actively engaged in research projects. While many of them undoubtedly have collected data about their students' use of

library media/research skills, such statistics tend to focus on product rather than process and are not widely disseminated.

Another way to determine what high school graduates know about libraries and the information gathering process would be to examine studies of what college freshmen know. Here again we run into a brick wall. First of all, not all high school students make it to college and further, as pointed out by Adams (220), "There are no studies of what the 'average' college freshman (if there is such a thing) knows about libraries."

On the other hand, some colleges--as a part of their bibliographic instruction program--regularly pretest freshmen. It is informative, therefore, to read articles which report the results of such testing by individual institutions. It is also enlightening to read descriptions of the design of various types of bibliographic instruction programs (Currie, 1982; Kohn and Wilson, 1986; Sugranes and Neal, 1983; Kaplowitz, 1986).

In a similar vein, a search of the literature reveals several articles, written by high school library media specialists, which describe library media/research skills instruction from a personal point of view. For example, an entire issue of The Book Report (Jan.-Feb. 1987) was devoted to descriptions of innovative methods of teaching library media/research skills. These articles make no claim to be other than what they are -- personal reports of successful methods of teaching library media/research skills. They should not, however, be viewed disdainfully. They are well worth reading for the insight which they provide into what is being taught. These articles are also a valuable resource for ideas for developing new strategies for teaching library media/research skills.

For those willing to acknowledge observation as a legitimate information gathering technique, we can describe the status quo, at least in one rather wide geographic area, and offer certain generalizations about both content and methodology of library media/research skill classes. From our experiences as a high school teacher, library media specialists in middle and secondary settings, from recent experience as director of a public library heavily used by high school students, and from our numerous visits to various high school library media centers to supervise the work of field experience and practicum students in library media education, we have had ample opportunity to observe library media/research skills instruction in progress. Comments about these programs are offered as an additional indication of what high school students are being taught. Notice, that we did not say anything about what students are learning. As educators, all of us are acutely aware that there always exists a possible nine mile chasm between what a student is taught and what a student learns.

The need for the teaching of library media/research skills across the curriculum is widely accepted. In actual practice integration of library media skills into the curriculum at the secondary level falls short of being universally practiced. Although secondary school library media centers have flexible

schedules and many are open for extended hours (before and after school, evenings, and weekends) far too many still serve primarily as a materials storehouse, as a study hall, and/or as a dumping ground for students from driver's education and other classes.

While a few secondary library media specialists regularly plan with teachers to ensure a comprehensive and systematic approach to the teaching of library media/research skills, many others conduct a series of orientation and/or basic skills sessions at the beginning of the school year and stop there. Nothing else is done about teaching library media/research skills unless the library media specialist receives a specific request for assistance to a class or to individual students, usually from the English or social studies classes.

Other schools still endorse the traditional approach. They relegate the teaching of library media/research skills to the English teachers, with perhaps an occasional research paper requirement in social studies or science. It is an an accepted assumption that only these classes lend themselves to the teaching of library media/research skills.

In a few schools, some progress is evident. Library media/research skills are regularly being integrated into the curriculum, with team teaching by a library media specialist and a teacher or teachers. Many such programs, however, integrate library media/research skills only with instruction in the traditional disciplines of English, social studies, and science. In these situations, only the traditional basic skills such as use of the catalog, Readers' Guide, and general reference materials are stressed. Methodolgy is likewise traditional with little or no evidence of innovation.

As for the topic of what high school students should know about libraries and the information gathering process, the jury has not yet reached a decision. There is obviously no research study with findings which clearly set forth exactly what library media/research skills a high school graduate should have. Wonderful as it would be, such a list does not exist and such a list is, in fact, an unrealistic expectation. There are, however, documents which provide a broad philosophical framework which individual schools can use to form the foundation for an effective library media/research skills instruction program. These three documents are: Information Power, the Kentucky Education Reform Act 1990, and the American Library Association Presidential Committee on Information Literacy: Final Report.

First, every educator, not just library media specialists, should take another hard look at Information Power (1988) and some of the suggested readings found in its excellent bibliographies. Information Power clearly and strongly advocates that school library media centers realign their mission to coincide with the expansion of information resources and the development of new technologies.

Second, the previously described Kentucky Education Reform Act 1990, while a document specific to the state of Kentucky, may

well become a blueprint for other states looking toward education reform. Its message is that the skills needed to access information are critical and information gathering is a process which is at the very heart of education reform (KDE, 1990). Educators should readily recognize that libraries are chockful of information to be accessed and that the skills needed to access information are none other than library skills.

Third, the final report of the ALA Presidential Committee on Information Literacy (1989) is a document which also advocates revamping the learning environment. This report states that "information literate people are those who have learned how to learn."

The aforementioned documents, although vastly different in format and sponsorship, share a common theme. Information is a tool for empowerment. Their message is clear. Knowing where to find information is much more vital than knowing facts. These documents individually and collectively are of enormous importance in helping educators to decide what it is that high school students should know.

We have looked at what high school students know about libraries and the information gathering process and what they should know. We have discovered, to our dismay, that we have very limited quantitative data. Before giving up on the topic, we should consider the matter of what this means for future planning. Here, we find that our less-than-satisfactory answers to our two basic questions contain enormous implications for planning.

One obvious implication is that more research is needed. For example, we need more information about what is being taught by library media specialists at the secondary level as well as about what methods are being used to teach library media/research skills. We need to know student reaction to and success with various instructional techniques. We need hard data about skill retention over time and what seems to promote or retard retention. We also need to know what library media/research skills are expected of students entering college.

The collection of baseline data about the teaching of library media/research skills at the high school level is essential if we expect to assess accurately the impact of education reform on school library media centers. For library media specialists in schools in which education is already underway, it may be too late to collect baseline data. In schools not yet into education reform, it is wise to collect as much information as possible. Evaluation of the status quo is essential. For this purpose, Loertscher's (1988) step-by-step guide will prove very useful.

Closely related to the need for increased research activity is the need for school library media specialists to become aware of and use research findings as tools for solving problems. This involves the regular reading of journals not only in the library field but in such related fields as education, psychology, technology, and sociology.

Another implication is the need for expanded cooperation and coordination in the development of plans for teaching library media/research skills. There is a pressing need to integrate critical thinking skills and research strategies into every curricula area, including home economics, industrial arts, physical education, health and family living, business, art, music, drama, foreign languages, and so on. Students need to have a broad view of libraries as sources of information and need to develop, through practice in every class, the critical thinking and information gathering skills needed to access information in all kinds of libraries. The key to developing an integrated program with appropriate scope and sequence is through collaboration between library media specialists and classroom teachers at the high school level. There are a number of sources useful for promoting cooperation and for the development of integrated programs of library instruction. For example, an article by Robbins (1984) offers timely strategies for the creation of a viable and effective program. Van Vliet's (1984) <u>Media Skills for Middle Schools</u>, complete with integrated lesson plans, is adaptable for use with high school students. Another good source too useful to ignore is <u>Reaching Out</u> (1989).

Cooperation and coordination among secondary school library media specialists and academic librarians are also important, particularly in articulation programs designed to ease the transition from high school library use to academic library use. Calls for closer cooperation among high schools and colleges by several prestigious educational groups (the American Association for Higher Education, the Carnegie Foundation for the Advancement of Teaching, and the Libraries and a Learning Society) have already caused a flurry of cooperative projects among secondary school libraries and academic libraries. Articles describing these efforts shed light on the entire area of bibliographic instruction and should be carefully scrutinized for the important information which they provide about what needs to be taught, when, and by whom (Kemp, Nofsinger, and Spitzer, 1986; Canelas and Westbrook, 1990).

Library educators also need to jump on the bandwagon. They need to team with school library media specialists to conduct research. Furthermore, library education programs need to emphasize the importance of research and the application of research findings to problems encountered in working situations.

In summary, school library media centers are in a crucial stage of development. We all need to work together to answer the questions generated by a discussion of information literacy and the teaching of information skills as well as to solve the problems in other areas of the library profession. Why are librarians so fond of beating dead horses?

BIBILIOGRAPHIC INSTRUCTION AT THE COLLEGE LEVEL

The incoming freshmen at Western Kentucky University are undergoing tremendous personal and academic changes. Some of

them are on their own and for the first time are completely responsible for their academic successes or failures. This situation creates challenges to college instructors--we have academic standards that must be met while remaining sympathetic to the unique freshman experience.

Diversity is the best description of the freshman student body at WKU, as well as at other institutions of higher learning. More than ever before the incoming freshmen range widely in age, ability, background, experience, and motivation (Adams, 1989). With the growing numbers of non-traditional students, this trend will continue to produce educational challenges for universities.

Freshmen come to the university campuses with a wide variety of library experiences and skills. Some come from rural areas with very limited library resources and some come from urban areas with extremely sophisticated public and school libraries. We have had some students tell us that they have not been in a library since elementary school while other students demonstrate very advanced research skills. This diversity of library abilities is a very real challenge.

We do see that the incoming freshmen are computer literate. That is, they may not be proficient with the technology we have at WKU, but neither are they intimidated by it. Yet, freshmen generally have had no formal information skills instruction beyond the Readers' Guide (Gavryck, 1986). As we see it at Western Kentucky University, our instructional challenge is to require the student to recall these previously learned skills and build on and strengthen new skills that are essential to college level research.

But why should we invest the time, talent and cost needed to teach students how to use a library? Do they not already know how to use their high school libraries? Our students and instructors alike agree that a working knowledge of a high school library is not sufficient to do college level work.

We at WKU believe in and are committed to bibliographic instruction for freshmen. There are several reasons for our commitment to libray instruction. Just because students can use their high school libraries of one card catalog and librarians know them personally does not mean they can transfer that knowledge to a large, complex, computerized library staffed by several dozen busy librarians. We sympathize with overwhelming personal and academic changes that freshmen experience.

We are constantly bombarded with the sights and sounds of useless information. We must be able to select and use quality information that is relevant to our information needs. In a college library, the increased diversity, specialization, and complexity of resources make that task increasingly difficult. Entering college students need assistance in the selection and analysis of this material.

University students must be independent learners and thinkers. To be independent, they need the knowledge and skills to find their own way. Bibliographic instruction helps create independent learners and thinkers.

All of us, by virtue of our role as educators, should believe that education is for life. We realize the importance of teaching the process of lifelong learning. This is especially important today because the current rapid growth of information requires the ability to learn throughout life.

The objectives of WKU's Library Media Education 101 course reflect these beliefs. The objectives of the LME 101 course state that students will (Pike, 1991):

1. Apply appropriate cognitive and manipulative skills to retrieve and analyze information.
2. Utilize current and new information technology available in academic libraries.
3. Develop and utilize research strategies relevant to their academic careers and life long learning.
4. Learn independently.

Currently, the LME 101 program at Western Kentucky University teaches 3,000 students annually, approximately eighty per cent of whom are freshmen. LME 101 is an eight week required, formal course of one semester hour credit with assigned letter grades. The one hundred sections of this course are taught not only to the campus university students but to community college and extended campus students as well.

To accommodate these numbers of students, the classes meet twice a week. Classes run concurrently in two classrooms in the main library from 8:00 a.m. through 4:20 p.m., Monday through Thursday. All classes are on different schedules because of scheduling within the library itself.

The classes are taught by seven graduate assistants and the program coordinator. All graduate assistants are from the Department of Teacher Education and are trained by the staff librarians. They observe a lecture by a librarian or the program coordinator in each subject area before assuming classroom responsibility. Before each semester begins, the graduate assistants are provided with a detailed teacher's manual. They prepare their own tests and maintain their own grade records under the supervision of the program coordinator. The grading policy is very strict with emphasis on consistency which is necessary because so many students are inolved.

A variety of teaching methods is used to accommodate the diverse learning styles and backgrounds of the students enrolled in the classes. A textbook is developed by the library staff and the program coordinator outlining the use of every area of the main library and its four branches. Most of the classes are conducted with a combination of lecture and videotapes. Tours of the library facilities are conducted and worksheets require the students to apply learned skills.

Basically, at the university level we see our mission as encouraging the recall and strengthening of the library skills the incoming freshmen already possess, and helping them build on these skills in order to function in an academic setting.

Some examples of what the freshmen in the LME 101 classes already know and what the course adds are:

The purpose of the <u>Readers' Guide</u> and the parts of a citation-- added is knowledge of specialized indexes in their major fields.

The purpose of an encylopedia article-- added is the value of the bibliography and/or cross references for the article.

The value of popular news magazines as an information source-- added is the value of professional journal articles.

The logic and sequence of research-- added is the preparation of an appropriate search strategy.

Choice of a research topic-- added is the delimitation and selection of appropriate search terms.

The existence of U.S. government documents-- added is the extent, value, and availability of local, state, and federal government documents.

The use of computers to locate information-- added are the protocols for using Infotrac, TOPCAT (the university's online catalog), and Newspaper Abstracts on Disc with an overview of the protocols for other information systems such as ERIC, Agricola, PsycLit, Dissertation Abstracts, etc.

As one can see, we at the university level build on the library media/information skills which are taught in the secondary schools. We continue the job you have begun. As instruction in the secondary school is never complete, neither is it at the university level. Our common goal is to develop proficient, information literate lifelong learners.

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A PROPOSED MODEL FOR DIAGNOSING INFORMATION NEEDS

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Introduction

Promoting information literacy is central to the mission of the school library media program and to the three roles of the school library media specialist identified in Information Power: Information specialist, teacher, and instructional consultant. In each of these roles the library media specialist is attempting to fulfill the mission of the library media center, i.e., "To ensure that students and staff are effective users of ideas and information."[1]

In these roles as information specialist, teacher, and instructional consultant, the library media specialist must engage a fundamental professional skill, diagnosis of information need, before suggesting a course of action. The purpose of this paper is to explore the concept of diagnosis and to suggest implications for practitioners and researchers. A theoretical model for studying diagnosis is proposed.

Role of the Professional

A professional of any kind possesses knowledge which enables that individual to apply that professional knowledge with a service as the product. The role of any professional, e.g., physician, librarian, teacher, or financial planner, is that of diagnosing needs, prescribing a service which meets those needs, implementing that service, and evaluating the outcome of this interaction[2]. In most professions, this process is accomplished at two levels--with individuals and with groups, as indicated below:

For Individuals	For Groups
Diagnosis	Analysis
Prescription	Recommendation
Treatment	Implementation
Evaluation	Evaluation

This process will be described below as it applies to an information professional and is based on the medical model for diagnosis. The reader is urged not to dwell on the different terms used to distinguish the diagnostic processes for individuals and groups. The different terminology is used merely to emphasize the distinction between individual and group services.

Diagnosis/analysis

The professional must be able to assess the information needs of clientele at two levels: (1) analyzing the characteristics of the community served, and (2) analyzing the needs of specific individuals at the point when and where they seek information from the library media center.

The purpose of the first level of analysis, i.e., community analysis, is to provide the professional, as manager, with specific data about the community and its residents. Knowledge acquired through a systematic process of data collection and analysis will enable the library media specialist to understand the environment in which the library media center will operate. The school, too, is a community which must be analyzed to determine the needs of the various groups which make up the school. An understanding of the community and the school will provide a conceptual framework for customizing collections, services and space allocations. This level of analysis is a first critical step in customizing library media service for individuals and groups within the school, and a great deal of literature exists on the assessment of user needs from the group perspective. For more detail on needs assessment, see Greer and Hale.[3]

The second level of analysis is the one-on-one interaction with a user at the point when the decision has been made to seek information. The professional must diagnose the information needs of the user as the first step in the professional/client interaction. At this point, the professional initiates a diagnostic process with the client as well as accepting responsibility for the outcome. This interaction must begin with the basic questions of "What, why, how, when, and where" and narrowed to match the professional's perceptions of such client characteristics as level of literacy, cognitive style, and social construction of reality. Once this level of needs assessment is completed, the professional will proceed to the next stage of the service cycle, i.e., prescribing or recommending the source or sources from which the appropriate information may be acquired.

Prescription/recommendation

The professional, in a one-on-one relationship with a client, will prescribe appropriate information sources in which the desired information may be located to satisfy the diagnosed need. The professional as a manager approaches the diagnosis/prescription process from an organization perspective. That is, the process is not intended to serve the needs of a single person, but rather, the entire population within the library service area. The needs assessment is an analysis of aggregate data about the population of the service area and is used to create an organization customized in its design, collections, and services to fit the characteristics, behaviors, and idiosyncrasies of that population. Conclusions from this analysis can lead to informed decisions about such specifics as the size and scope of collections and services or the number and type of video and audio cassettes in the collection.

Treatment/implementation

The "treatment" or "implementation" is the organization and application of the service which has been prescribed or recommended. At the individual level of service, the treatment brings the client and the needed information together. This service requires a knowledge of various information sources and services which are available within the system, as well as those located elsewhere. With the advancement of more complex and sophisticated technology, the library and information professional must be aware of (1) the array of information sources available, (2) the "best use" of a particular information package for meeting client needs, (3) the preferred formats of the client, and (4) the information needs of the client. This phase of professional service relies heavily on the diagnosis in order to determine client preferences and information needs. As a manager, the library and information professional organizes a service which addresses the information needs of a group, employing knowledge of the group's characteristics to provide the information, staff, and facilities to offer the service.

Evaluation

After the information service has been implemented, the outcome must be evaluated in terms of clientele satisfaction. An unsatisfactory resolution of the original need should trigger a repetition of the entire cycle. The second cycle may amend a part of the sequence, or it may require an entirely new approach. In a reference situation, for example, the library media specialist would observe and query the client after presenting information to assess the appropriateness of the information provided. Likewise, a service should be evaluated and modified according to the findings of an evaluative process. Similarly, allocation of organization resources for specific purposes should be evaluated after implementation. Methods for collecting and analyzing data for purposes of evaluation can range from simple verbal inquiries to sophisticated quantitative and qualitative analyses, depending on the circumstances.

Whether applying this process of prescription/analysis, diagnosis/recommendation, treatment/implementation, and evaluation to an individual or group, a critical component is the diagnosis of the individual's need, preferences, and cognitive style. This aspect of the professional's role is extremely important, yet how do we treat that role in our professional literature? The role of the professional and what we know about the diagnostic process now will be explored.

The Diagnostic Process

Diagnosis of information need typically occurs through a communication process with the individual information user. Usually called "the reference interview," this process is perceived as a communication process during which the library user's needs can be

identified and a source, or sources, of information can be recommended. The standard text for many schools of library and information science is Katz's <u>Introduction to Reference Work</u>, where the reference interview is defined as follows:

> The primary purpose of the reference interview, whether it be brief or long, is to help the librarian answer some questions. Answers to the questions clarify the problem(s) of the user, and bring to the user the type and amount of information needed.[4]

Furthermore, Katz lists what "the librarian wants to learn":

(1) The kind of information needed . . . .
(2) How much is needed--a simple fact, a book, or a mass of material?
(3) How is the information going to be used--for a talk, to answer an idle question, as a beginning for research?
(4) What degree of sophistication is required--a beginning article or an advanced monograph?
(5) How much information does the user already have about the topic? It helps to know this in order to avoid duplication.
(6) How much time does the user wish to spend (a) finding the information and b) using the information.[5]

This view of the reference interview is a good beginning to the process of diagnosing information needs; however, the interview, as portrayed here, concentrates on the sources of information with regard only for user's perception of need (questions 1 and 2), use (question 3), level of sophistication (question 4), quantity of information required (question 5), and amount of time available to the client (question 6). While this is a systematic approach, the diagnosis does not take into account the individual differences of the individual, such as cognitive style and preferences for format, nor does it entail data for a thorough diagnosis by the information professional. The client is expected to provide most of the data required by the diagnosis. The reference interview usually has not been viewed from the perspective of the user. As noted recently by Kuhlthau, information systems typically have been guided by the bibliographic paradigm which views information use from the system's perspective.[6]

The reference interview has been the subject of numerous studies by researchers in library and information science. Bunge's review of literature[7] provides an historical perspective, and Dervin, noted below, has applied communication theory to the question negotiation process.[8]

The issue in this paper is the following: How can this diagnostic process be improved? How can the library media specialist better address the unique information requirements of the individual client? How can information literacy be promoted with individuals by more effectively diagnosing information needs and using results of that diagnosis for recommending information sources?

The reference interview as described above can be improved with a thoughtful approach which employs knowledge of human behavior in the individual's use of information. Diagnosis may occur at various points in a client's search and use of information. The client's perspective and proposed use of information must be carefully analyzed in order to better discern what the client considers "the right answer" to his/her questions or needs. Also, the communication process is more that the verbal exchange described above. Because much communication is nonverbal, methods of involving nonverbal communication in the process must be explored. Following is discussion of a model for the diagnostic process in an expanded definition of the concept of the reference interview.

An Overview of Information Psychology

Professional practice is enabled by application of knowledge shared by the profession; this knowledge enables the professional to diagnose information needs, recommend information sources and services, implement those recommendations, and evaluate them. The professional knowledge required of information professionals has been articulated by Greer as a conceptual framework for the discipline of information science, which is multi-disciplinary.[9] The fields of study encompassed by the discipline of information science, and addressing the various roles of information professionals are:

Information psychology--how individuals seek, acquire, organize, process, utilize, and store information;

Sociology of information--how society, and groups within society, create, produce, disseminate, organize, diffuse, utilize, preserve, and discard information;

Information organization management--how to create and manage an organization designed to support and enhance the information transfer process; and

Information engineering--how to design data bases library collections, and other information systems customized to meet the needs of a client population.

Although each of these fields of study is distinctive enough to be considered separately, interrelationships of the four fields are profound, and no field can be understood without consideration of the impact by the other fields.

Of special interest in the consideration of information literacy, is information psychology. This study of human behavior draws heavily upon the behavioral sciences, similar to the way that educational psychology applies behavioral theory to the learning environment. Following is a discussion of the elements of information psychology which might contribute to a better understanding of the diagnostic process.

5

Diagnosing Information Use Behaviors

The model for information user behaviors is found in the framework for information psychology noted above. The library media specialist may be called upon to diagnose information need at any of the following points in the behaviors of acquiring information: Awareness of need, action decision, strategies for search, behaviors in search, evaluation, assimilation, memory, and utilization. Following is a brief description of these actions:

Awareness of need: A client determines a need for information. The need may be for educational, recreational, decision-making, or research purposes. The first stage in the information use behavioral process is becoming aware of a need for information.

Action decision: After becoming aware of need, a client may elect to act on the need by seeking to satisfy that need. Also, the client may decide to forego an information search.

Strategies for search: If a decision is made to search for information, the client will employ his/her unique strategies for locating information. A plan of action is formulated, usually very informally.

Behaviors in search: The search strategies are enacted by the client. These behaviors might include consulting indexes, consulting with a librarian, asking a friend, etc.

Evaluation: The results of the search are evaluated by the client to determine if the search should be modified, if the search should continue, or if the search should be terminated.

Assimilation: If the results of the search are deemed satisfactory, the information may be assimilated into the client's information system, e.g., the information may be copied for further use, notes taken, or input into a word processor.

Memory: If the information is pertinent, the client may memorize the information; therefore, the information will be learned, becoming a part of the individual's knowledge.

Utilization: If learned, the information may cause behavioral changes which cause the client to use the information.

At any of the stages above, the client may consult with a library media specialist in order to solicit help in information seeking. The library media specialist must identify the stage of information seeking as part of the diagnostic process, using knowledge based on the theories below in order to complete the diagnosis.

Theory Base for Diagnosis

Information psychology applies theories of human behavior to the information transfer process. Following is a discussion of selected theories which could be applied to diagnosis.

Cognitive development theories, particularly the work of Piaget, have application to the diagnosic process.[10] Knowing the stage of cognitive development, e.g., stage of concrete operations (about ages 7-12), or formal operations (about ages 11-15), would enable the professional to suggest different levels of information sources. Age of individual is an indicator of cognitive development, but Piaget points out that individuals can progress through the cognitive stages at vastly different rates.

While Piaget's work is useful for understanding the cognitive development of children and young adults, studies of the developmental stages of adults is helpful for understanding the interests and life stages of adults. The work of Levinson[11] and Sheehy[12], for example, suggest the patterns of development experienced by adults.

Research and theory on learning styles can contribute to the understanding of information needs and information processing for students in school library media centers. For example, the work of Titus, Bergandi, and Shryock[13] suggested that the learning styles of adolescents differed from that of adults.

Brain research, especially the study of brain hemisphericity, has application to understanding cognitive styles. Dominance of one side of the brain can suggest learning preferences, e.g., linear or holistic, symbolic or concrete, sequential or random, logical or intuitive, verbal or nonverbal. There are implications, then for preferred types of learning modes--visual, auditory, or experiential. The work of Edwards[14] and Vitale[15,16] are examples of application of cognitive theory.

Psychological type also is related to information processing preferences. Based on Carl Jung's theory of personality types, the Myers-Briggs Type Indicator has been developed to indicate four basic psychological dimensions:

Energizing--how and where you get your energy
Attending--what you pay attention to when you gather information
Deciding--what system you use when you decide
Living--what type of life you adopt[17]

Each of the above preferences have two possibles choices:

Energizing: introversion and extraversion. Introversion relates to drawing energy from a person's inner world of emotions, impressions and ideas. Extraversion relates to drawing energy from outside oneself in the world of people, activities, and things.

Attending: sensing and intuition. Sensing is the preference for paying attention to information which is derived from the five senses. Intuition refers to the preference for paying attention to an intuitive "sixth sense" and noting what could be, rather than what is.

Deciding: thinking and feeling. Thinking relates to a preference for organizing information to decide in a logical, objective manner. This preference is similar to left-brain dominant preferences. Feeling is related to organizing information in a personal, values-oriented manner, similar to the behavior of a right-brain dominant person.

Living: judgment and perception. The judgment preference suggests a person who lives in a planned, organized way. Perception refers to the preference for flexibility and spontaneity.

Life types theory suggests tendencies toward behavior. People may consciously alter their preferences but tend to rely on their natural preferences. Type preferences can be determined by using the Myers-Briggs Type Indicator, an easily administered and scored test. A person's preferences can be used to suggest search strategies, sources of information, and planning of information services. Grindler and Stratton have applied type indicator research to teaching and learning styles, as an example of application for diagnosis.[18]

Role theory also provides a theory base for understanding information needs in the process of diagnosis. The key concept in role theory is that roles suggest certain patterns of behavior which can be expected. Each person assumes many roles, and in that role exhibits certain behaviors which accompany those roles. Biddle gave examples:

Children are constantly enjoined to act in a more grown-up fashion; new recruits into the armed services must learn roles of deference and deportment; the young lady who is to make her debut will adopt the style and manners of the event; predictable patterns of behavior appear within the school, the factory, the office, the sports arena . . . the summer camp. Some of us, in fact, spend a good deal of time talking about roles. Parents, teachers, psychiatrists, social workers may sometimes feel as if there are no other topics of conversation at the end of their working days.[19]

Another attribute of roles is the limited context of role. No one role is exhibited by an individual at work and at home 24 hours a day. A role is a sometime thing which may be dictated by the variety of environmental factors which cause an individual to assume the role of such role as teacher, parent, friend, golfer, spouse, etc.

Role, then, produces expectations for behavior. The danger is that we may stereotype individuals upon identification of role. Stereotype may be defined, in terms of role theory, as " . . . the degree to which an expectation is based on hearsay rather than evidence."[20] Consequently, application of role theory requires

awareness of behaviors which have been observed and associated with role--not merely those behaviors which we believe to be associated.

Expressed in another way, role suggests behavior which is considered acceptable for membership in a certain social group. Membership in that group requires learned behaviors, knowledge, and attitudes. If a person is known to be a member of a certain group, that person may be expected to possess certain knowledge and have the ability to perform certain tasks usually associated with that group. For example, membership in the school library media profession assumes certain knowledge, attitudes, and skills which can be attributed to all who assume that role. By identifying an individual by role, one can make certain assumptions about that individual's information needs for that role.

While role theory may be applied to people who are members of various groups, the individual still possesses a unique perspective which is solely that individual's. Symbolic interactionists have studied the constant interaction between the individual and that person's interaction with groups. Therein lay the challenge in diagnosing information need; the individual information user represents a confluence of individual preferences and abilities for information processing, combined with a set of roles which predetermine certain behaviors. The purpose of diagnosis is to determine the role for which the information is intended and to prescribe an information package which addresses the preferred information processing style of the individual.

Information theory has been developed for library and information professionals. Among those theories with implications for the diagnostic process are the theories of Kuhlthau and Dervin. Kuhlthau's research on the search process contributes both to the development of theory in information psychology and to diagnosis; her work has defined the search process as follows:

> . . . it is a complex learning process involving thoughts, actions, and feelings that takes place over an extended period of time, that involves developing a topic from information in a variety of sources, and that culminates in a presentation of the individual's new perspective of the topic.[21]

Kuhlthau's findings regarding the feelings, thoughts, and actions of students during the search process can be very helpful to library media specialists so that they can more effectively diagnose information needs and strategies, depending on the student's progress in the search.

Dervin's application of communication theory has resulted in the application of "neutral questioning" to the reference interview. Dervin's perspective is "that information does not have an independent existence but is rather a construct of the user."[22] Dervin proposed open-ended questions to attempt to understand the purpose and use for the information requested by the client; Dervin's approach was to understand how the user will "make sense" of the information.

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Implications for Practitioners

Library media specialists work with individual students in the roles of teacher, information specialist, and instructional consultant. In order to diagnose information need, the practitioner must be able to apply relevant behavioral theories to the diagnostic process to recommend appropriate information sources or services to the individual.

This paper has articulated several theories which can be applied to the diagnostic process, including cognitive theory, learning theory, brain hemisphericity theory, life types theory, role theory and information theory by way of suggesting elements of a model for diagnosing information need. The challenge is to sharpen the diagnostic process through application of these theories.

As discussed above, the diagnosis typically occurs during a "reference interview," a conversation between the library media specialist and the client. This communication process might be considered data-gathering in order to expand the concept, just as a physician gathers data on a patient before diagnosing treatment for an illness. For example, a physician interviews a patient regarding symptoms of the malady ("How are you feeling? When did you first notice this problem? Have you ever experienced this condition before?") The physician may also observe the patient, e.g., condition of skin, eyes, throat, etc., and may routinely administer appropriate tests (blood pressure, blood test) during the diagnosis.

Likewise, a library media specialist might employ other data gathering mechanisms to enhance diagnosis. Questions might be expanded to elicit more information about the individual's information processing style. Observation of age and information use patterns based on past experience might be applied to determining preferred information style. As an example, Vitale applied results of brain research to indicators of hemispheric dominance which can be observed or determined through interviews with children. Indicators include eye dominance, hand dominance, hand position, muscle testing, body symmetry, and eye movements. For example, the the left side of the brain controls the right side of the body, and the right side of the brain controls the left side of the body; a left-handed child is usually right-brain dominant, but a right-handed child may be either left or right brain dominant. Vitale reported research which enables one to determine dominance through observation as follows:

> If a right-handed child holds his pencil in a straight position with the wrist straight and the pencil aimed toward the shoulder, the left hemisphere is probably dominant. If a right-hander rotates his hand or aims the pencil at a right angle to the body, he is probably right-hemispheric.[23]

Vitale provided numerous additional observational tests for determining hemispheric dominance and learning styles. Likewise,

Vitale suggested questions to explore learning preferences. Following is an example:

> Question: I want you to see your favorite ice-cream cone in your head. Where do you see it? (Be sure the child is familiar with the object you ask him to visualize.)

> Interpretation: If the child points between the eyes or a litte to the right, I have found it indicates he is a visual learner. If he points to the top of his head or puts his whole hand on his head, he probbably is a haptic learner. Both of these responses indicate a right-hemispheric learning style.[24]

In addition to interviews and observations, tests might be administered in a school setting to determine life type. The Myers-Briggs Type Indicator (MBTI) test can be administered in 20-30 minutes to older children and adults, and it can be easily scored.[25] Clients who complete the test might be counselled in the results to better understand their psychological type and information processing styles. Library media specialists might use results in their diagnosis, especially with those who provide exceptional "challenges" to use of the library media center. Test results might be kept on file with other tests administered by the school.

Implications for Research

The diagnostic process, as noted above, relies upon knowledge from several disciplines in the behavioral sciences. This paper has discussed briefly the contributions of learning theory, cognitive theory, life type theory, brain theory, information theory, and role theory to enhance the diagnosis of information need. These fields are but a beginning. Other areas for further investigation might include various fields of psychology and sociology, social psychology, linguistics, physiology, cultural anthropology, ethnography, cybernetics, and others.

Research of the field of diagnosis also must examine the influence of environmental and policy context. This environmental context includes the following:

1. Culture--language, philosophical and moral values, history, and all of those valued characteristics as they influence the individual's information processing style;

2. Geography--aspects such as climate and physical environment which can influence information processing;

3. Political structure of society--the system for governance and underlying values regarding the role of government in the society served by the information agency; in a school library media center, the school's governance system as it influences the flow of information to individuals;

4. Legislation and regulations issued by legislative and regulatory agencies of the government which govern access of information to individuals, e.g., copyright, intellectual freedom;

5. The economic system under which the individual functions;

6. Technology as it is utilized by the client and as it influences information transfer;

7. Information policy--policies regarding secrecy, censorship, privacy, the public's right to know, government responsibility to inform, and other policies which influence the transfer of information to individuals.

Research needs to be done in all of these areas as they influence diagnosis. This research can be done applying theory from the disciplines noted above. For example, learning theory and information psychology (theory base) can be applied to the search process (behavioral process) in a secondary school which employs an electronic data base (environmental context). Similarly, diagnosis of information need can be investigated from the perspective of any of the behavioral processes, within an environmental context, applying appropriate theory from the theory base.

Following is a model which might facilitate investigation of the diagnostic process. This model is a first attempt to define the diagnostic process and to suggest ways to study and refine this fundamental professional task. Additional exploration and application of behavioral and social theory will enable library media specialists, and other information professionals, to enhance their roles in promoting information literacy.

PROPOSED MODEL FOR DIAGNOSIS OF INFORMATION NEED

Behavioral Processes	Environmental Context
Awareness of need	Culture
Action decision	Environment
Strategies for search	Political structure
Behaviors in search	Legislation
Evaluation	Economic system
Assimilation	Technology
Memory	Information policy
Utilization	

Theory Base

Information psychology
Sociology of information
Information engineering
Information organization management
Role theory
Learning theory
Brain theory
Life type theory
Information theory
Cognitive theory
Communication
Linguistics
Physiology
Social psychology
Information theory

Notes

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20. <u>Ibid</u>., p. 157.

21. Kuhlthau, Carol C. "Information Search Process: A Summary of Research and Implications for School Library Media Programs," <u>School Library Media Quarterly</u> (Fall) 1989), p. 19.

22. Dervin and Dewdney, "Neutral Questioning," p. 507.

23. Vitale, <u>Unicorns Are Real</u>, p. 36.

24. <u>Ibid</u>., pp. 42-43.

25. The MBTI is available from Consulting Psychologists Press, Inc., 577 College Avenue, Palo Alto, CA 94306.

A STUDY OF THE TEACHER ROLE IN THE ELECTRONIC INFORMATION SEARCH PROCESS

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Introduction

School library media centers have begun to acquire new technologies which represent tools for information access. Included in these emerging technologies are online databases, CD-ROM software, and automated catalogs. These tools have a computer or electronic orientation rather than print and provide the searcher with the opportunity to access information in a nonlinear manner in contrast to the linear path of print materials. Access time is greatly reduced and the subject searching capabilities enable researchers to combine terms and focus on relationships rather than simply accessing information.

Researchers have begun to examine these technologies in relation to information literacy skills, focusing on information retrieval characteristics of the technologies and the competencies students need to be successful electronic information access searchers (Kuhlthau, 1987; Liebscher and Marchionini, 1988; Fidel, 1989; Bombach, 1990). Inherent in these discussions is the role of the library media specialist (LMS) within the realm of the search process and as teacher of these information access skills. The other individual who is often omitted from this dialog is the teacher. What is the role of the teacher in the electronic information access process? This paper will examine the literature and raise some implications for both the practitioner and researcher.

Electronic Information Access Tools

School library media centers have utilized the services on online databases since 1980 and those most frequently used include DIALOG and BRS, utilizing Classmate and BRS/After Dark Unlimited (Aversa, et al., 1989). Loertscher (1988a) suggests "some small library specialists advise using online services rather than investing in hard copy references that can't fully satisfy to-the-day needs of information-hungry users" (p. 24). Epler points out some advantages of online searching are access time, the convenience of searching multiple databases simultaneously, immediate feedback on search strategy, positive attitude of searchers, searches that

link multiple terms, currency of information, and expanded resources possibilities (1989). Accessing online databases teaches students skills they will need at the college level and lifelong learning skills. The Aversa study addresses the issue of disadvantages with online databases and ost often becomes the inhibiting factor with online database access. Databases available online are not always appropriate for K-12 students and collections do not contain all the journals listed in the citations. Also, problems with hardware and telecommunications can provide inopportune interruptions (Aversa, et al. 1989). A relatively new online service, PRODIGY, offers instructional and communicative possibilities beyond the database. Through PRODIGY searchers can access the full text Academic American Encyclopedia (updated monthly), along with information possibilities which include: current news, weather information, science and creative writing activities, and electronic mail; all for only $13.00 a month.

Databases and other research tools are available on CD-ROM discs and the expansion of this technology into schools has been dramatic. In 88/89, 429 school districts reported CD-ROM units available for students, and by 90/91 this number has increased to 1376 (Quality Education Data, 1991). A sampling of potential discs includes encyclopedias (Comptons, Groliers, and World Book), periodical indices (Newsbank, Magazine Article Summaries, TOM, etc.), and general reference tools. A CD-ROM disc has tremendous storage capacity, with a single disc holding over 250,000 pages of text (Baumbach, 1990). Advantages of the CD-ROM technology as an electronic information access tool are similar to those of the online databases but there are some unique characteristics. Once the start-up costs have been expended, the continued operational fees are reduced, which means searchers can browse and explore without concern for online costs. The issue of currency becomes a negative one for this technology, since updates are not as frequent as online databases. However, Aversa suggests "the ability to store vast quantities of information . . . on a single laser disk--a disk that can be acquired and accessed in-house--will certainly cause changes in the configuration of online services in the near future" (Aversa, et al., 1989, p. 1). Workstations with the capability to run multiple discs provide opportunities to search various databases and research tools. This presents a challenge, however, because the protocols and screen designs are often different, which has the potential to frustrate searchers (Baumbach, 1990).

The online public access catalog or OPAC has the potential to combine the above two technolgies depending upon the size of the library and the software package in use. Some OPACs store the

collection database on a CD-ROM disc while others use a hard drive. OPACs that are networked are typically online to a mainframe. Consortiums of libraries have begun to network their OPACs which provides the researcher with opportunities to access collections in various libraries, representing different focuses and size of collection. For example, Ohio is currently working on a project that would link the state universities' academic libraries together. Ultimately, the plan will include other college and university libraries as well as public libraries and schools. Discussion has also centered on the purchase of licensing agreements which would make many of the CD-ROM and online databases available on the same system.

There are some common problems with all of these technologies which impact the researcher as well as those who teach research skills. Searches often net a large number of citations and many of these are not available in LMCs. Interlibrary loan and facsimile machines will provide assistance in this area. Whether students are searching online or through a CD-ROM disc, they are still reading text-based information from a video monitor. Research in this area suggests students read at a slower rate from a video monitor than from a printed source (Gould, et al., 1984).

Electronic Information Access Searching Skills

When the technology is in place, what skills do students need to be effective researchers and consumers of information? From a broad perspective electronic searching is part of information literacy which Breivik defines as " (t)he ability to effectively access and evaluate information for a given need" (Breivik, P., 1985, p. 723).

Information literacy is influenced today by both problem solving and critical thinking which have fostered more of a process approach. This is characterized by the pedagogies of inquiry and discovery learning where students are encouraged to become independent researchers (Kuhlthau, 1987a).

Sheingold (1987) envisions the library as the center of inquiry learning where

the child is an active constructor of his/her own understandings, which result from interactions with the human, physical, and symbolic world (e.g., books, media). In

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> this model, the library is a place where the child's active engagement with a process of inquiry can be supported. This library is more like an apprentice's workshop for thinking—a place where the child carries out research, and where he/she has multimedia tools, information resources, and human experts on hand, and perhaps also online, who can help him/her. (p. 80)

This is a learning environment which fosters knowledge navigation and discovery.

What skills does a student need to pursue individual inquiry and access information electronically? Kuhlthau (1987b) suggests "the tools of technology require new skills which are defined by what a person will need to know and be able to do to take advantage of information technology" (p. 6).

High school students develop online information retrieval skills with multiple experiences over a period of time. Students are positively motivated by searching for information using online databases which helps them through the early stages of a search. Instruction in online searching should be designed to be similar to previous library skills/information skills lessons and include the components of clarifying the search and developing a search strategy (Kulhthau, 1987b).

Specific goals and objectives have been developed as a part of formal courses of study which reflect skills for electronic information access. Anderson, et al. (1989) defined a three phase search process which focuses initially on the "preparation for the search stage" which includes the following procedures:

1. Determining the information need
2. Identifying potential sources
3. Defining the topic or subject
4. Identify the key concepts
5. Choose the database(s) to search
6. Assign synonyms and related terms
7. Consolidate with truncation
8. Apply logical operators to the search words
9. Prepare alternative strategies

Phase II Conducting the Search

10. Know how to operate the communications software for the microcomputer station being used.

11. Be familiar with the search commands of the database
12. Perform the search
13. Locate the information

Phase III   Utilizing the Information

14. Evaluate the information
15. Apply the information (p. 43-49)

This model incorporates a focus on the need for information, designing a search strategy based on boolean operators, distinguishing between various databases, identifying keywords, familiarization with the software design, and information evaluation.

Epler (1989) has also developed a model online curriculum and the following are the broad goals:

Goal 1: To identify and define the role of information in our society and explain the impact that technology has had on the research process.

Goal 2: To identify and define the scope of online reference services.

Goal 3: To develop the sequential skills necessary to conduct online research.

Goal 4: To conduct an online search to retrieve information to fill a research need.

Goal 5: To practice fair use of copyrighted materials and follow security measures involved in using online computerized databases.

Goal 6: To apply critical thinking and problem-solving skills in locating, selecting, retrieving, and evaluating online information (p. 70-73).

Epler's model is more global than the Anderson model and incorporates the concepts of critical thinking and problem solving which were discussed by Kuhlthau and Sheingold. Inquiry is not specifically identified.

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The Teacher's Role in Electronic Searching

Much has been written concerning the partnership role between LMSs and teachers in the design of instruction (Turner, 1985; Information Power, 1988; Loertscher, 1988). The perspective in this discussion ends to focus on the role of the LMS.

What about the role of the teacher? If s/he is to be a partner with the LMS, is this a passive or active role? What about the attitude of the teacher toward resource-based teaching and the new technologies? In recent discussions with high school LMSs, they raised the issue of teachers' attitudes toward electronic encyclopedias, suggesting teachers perceive this tool as a toy rather than a research tool.

A Symposium sponsored by the U.S. National Commission on Libraries and Information Science and the American Association of School Librarians (1989) recommended that the AACTE and NCATE agencies should change their certification requirements to "require teachers to demonstrate competency in helping students develop their abilities to use information (p. 9)." The report also recommended "(an) implement(ation of) Information Literacy programs through an interdisciplinary process across curricula that stimulates creativity and encourages active learning (p. 9). The first recommendation, over time might impact the teacher's role in the electronic information search process.

What do teachers need to know about electronic searching? What is the role of teacher education programs in this process? One research report (Power on, 1988) suggests

> (t)rying to infuse technology into the traditional methods
> course remains a difficult task, due to faculty reluctance and
> inexperience with computers (p. 101).

Teaming student teachers with experienced field supervisors who regularly use technology is another strategy for expanding the skills of preservice teachers.

If teachers are to be partners with LMSs they must have some understanding of skills involved with electronic information access. In the online implementation design model, Aversa (1989) suggests there should be a plan for training school personnel which should be conducted by the LMS.

In Sheingold's (1987) discussion of inquiry learning she distinguishes between "knowledge telling" (p. 81-2) and inquiry. "The problem with knowledge telling," Sheingold states, "is that it is a strategy that tends to keep the child's knowledge inert and immovable" (p. 82). In a recent study (Pappas, 1990-91), teachers who used a computer problem-solving game with middle school students perceived their role very differently. One became a facilitator or coach fostering a discovery environment. The other followed a very structured approach which led students step-by-step into the game-playing process. These two differing perceptions are often replicated by other teachers. If inquiry and discovery learning is an important pedagogy with electronic information technology, then perhaps teachers will need to adjust their teaching mode from teacher-centered to student-centered.

Cleaver (1987) effectively underscores the importance of the teacher as a partner in this learning process by suggesting:

> The school library media specialist can be a catalyst, encouraging others to think about information in the teaching and learning situation, but information isn't a subject or technique to be isolated in the school library media center. Media specialists must learn all they can about information access and then use their understanding, knowledge, and skills to provide a base for cooperation with teachers and administrators. Access to information, whether electronic or manual, begins in the media center. It is through the cooperative efforts of media specialists and teachers that information retrieval skills will be integrated in the curriculum (p. 30-31).

Implications for Practitioners

If teachers are to be an integral part of the teaching process in electronic information skills, they need to be informed about these new technologies, what databases and electronic tools are available, the unique characteristics of each, and the possibilities these present for altering information access. To deepen their skill with this technologies teachers will need opportunities to conduct their own searches. There will be those teachers who have computer anxiety and they will need a user-friendly guide through the challenge of learning to use this technology.

As with other computer software, documentation is often obtuse and difficult to follow for the novice. Practical guides and

sample activities would be helpful for teachers who are just beginning to use electronic searching. Where appropriate, post easy to-follow instructions near the workstation.

Teacher education programs need to develop and expand their course offerings to cover these new technolgies for both preservice and graduate students. In addition, methods courses and field experiences should provide opportunities for students to observe and participate in lessons which integrate these technologies into the curriculum. Those who teach methods courses need to model the appropriate teaching strategies.

Teachers need opportunities to discover the differences between knowledge inquiry using electronic information access and those skills incorporated with a print reference tool. Once all are familiar with these, teacher and LMS teams might develop a cooperative plan for appropriate classroom activities versus those which must occur in the LMC. For example, defining the topic or subject could take place in the classroom.

Implications for Researchers

Although some studies have been conducted, additional research is necessary to explore the search strategies involved with electronic information access tools. Are there differences between the searching of students versus adults? How would these affect the role teachers might play in this instructional process? If teachers become coaches and facilitators, what are some questioning techniques to foster the inquiry approach? What are the differences in search strategies across various levels? What are important competencies for elementary students to develop vs those of junior high students and then high school students? Will the teacher's role vary at each of these levels? Will electronic information access tools change the curriculum? Has that change begun to occur? Have textbook companies begun to incorporate these technologies into new publications? Who will be the content experts to assist with the development process? Will students who learn electronic nformation access skills from a LMS and teacher team develop different understandings of the process than those students who learn from only a teacher or only a LMS?

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TESTING OF INFORMATION LITERACY SKILLS

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Foreword

When I proposed a paper for the first Treasure Mountain, I selected a topic of much interest to me, assuming that others would have been and would be as interested as I. While others may have had a great deal of interest in facilities, they had not chosen to focus their research agenda on that topic. To locate research, it became necessary to broaden the search to building or remodeling all types of facilities rather than a narrow focus on libraries in general and school library media centers in particular.

For the second Treasure Mountain, I again chose a topic that was of much interest to me, testing. (Two of my closest friends had participated in test preparation for Educational Testing Service, one of whom invited me to join her team for dinner one evening in Washington, D.C.) Again, I found little research done on my chosen topic, testing in the context of information literacy skills. With little research available on the effectiveness of teaching information literacy skills or the impact of school library media skills in increasing information literacy, it was necessary to widen this search. This suggests the broad area of tests and measurement with little direct application to testing the effect of teaching information literacy.

For the third Treasure Mountain, this author will certainly look before she leaps.

Introduction

Information literacy is a relatively new concept in the literacy movement. According to the Final Report of the American Library Association's Presidential Committee on Information Literacy, to be information literate, a person "must be able to recognize when information is needed and have **the ability to locate** (author's emphasis), evaluate, and use effectively, the needed information." Kulthau suggested that "ability to locate" includes library skills and computer literacy. These are in combination, "skills necessary for the interpretation and use of information."(1) This paper will address developing ways and means to determine if students have achieved the library skills necessary for the interpretation and use of information and not the computer skills.

Few tests are available to determine if or how our students are becoming information literate. School library media specialists can have little confirmation that this is happening through use of school library media centers. The need for research on the effectiveness of teaching information literacy in the library media center is evident, and it will be our responsibility to determine exactly how this should be done. In order to set the stage, a brief introduction is given to testing, and the history of national and statewide testing will be reviewed with emphasis on standardized tests and how they are developed. The criticisms of national tests for diverse individuals will be given, and teaching to the test will be discussed as a means to emphasize learning. The final section will provide suggestions for developing tests.

Why Test?

"Accurate, dependable measurement is a fact of life in our modern, technical society."(2) Certainly, the most popular form of measurement is the test. Individual school programs and rankings of school districts are based on test performance of students; change is identified as success or failure depending upon students' ranking above or below a national norm in whatever area is being tested. High school faculty point with pride to their National Merit Scholarship winners while college coaches wait impatiently for S.A.T. scores for potential athletes. In some school districts, salary increases for teachers may be predicated upon the performance of their students on achievement tests.

Schools use tests to place children into reading groups and to track them both by grade and ability levels. The results of a standardized test are used in decisions on whether children will be held back, promoted, placed in special education programs, gifted programs, or graduated. "As a rationale for their decisions . . . tests, not school personnel, are the ultimate and infallible arbiter of these matters."(3) Tests may be used to sort people into or out of groups. Students and adults are tested for such decisions as whether or not they will be given a license to drive, cut hair, practice law or medicine, or many other groups. The actual score on "sorting" tests is not important except that it must be high enough to allow one to enter the group. The single score of any interest is the cut-off between pass and fail.

More attention is paid to scores with a categorization process. Tests are used to determine who are the best candidates to enter a school or special program. In this case, the higher the score, the more likely that you will be chosen. "ETS gives tests that help determine where more than a million young Americans will go to college each year...help decide who will enter the nation's most elite secondary schools, who will be a certified teacher, an attorney, or enter graduate school or business school...ETS even has a test to select golf pros and a test to certify picture framers."(4) Tests are used to determine who should be exempt from beginning foreign language or other advanced placement classes for freshmen entering colleges. Tests are used to determine if international students can enter U.S. colleges and universities and when they will need additional English classes.

One might ask, "Is this what tests meant to do? In which context and whose purposes do they or should they serve? Are large-scale testing programs necessary? Are tests that are designed to monitor teacher accountability actually harmful to education?" While this paper does not attempt to answer such philosophical questions, they are important considerations for those who become a part of the test development process.

Tests are used for the assessment of student performance. The word *test* comes from *testum*, a porous cup for determining the purity of metal. This later stood for any procedures for determining the worth of a person's effort, and for generations of students through the centuries, this has meant rote memorization and recall. "To prove the value or ascertain the nature of a student's understanding implies that appearances can deceive. A correct answer can disguise thoughtless recall."(5) The word, *assessment*, suggests an assessor who sits with students to confirm that their answers *really* mean what they seem to mean.

Neill and Medina propose that properly conducted assessment can be "of great help to instruction and learning."(6) Using this assessment, teachers can determine how a student learns best as well as what each student may know, thereby encouraging critical thinking and creativity.

Testing can be positive when it 1) aids student motivation, 2) aids retention and transfer of learning, 3) aids student self-understanding, and 4) provides feedback concerning

instructional effectiveness.(7)   Rankin described a primary purpose of testing, to improve instruction."   Test development should "force teachers to look at those things that are most important in the curriculum and to focus teaching in those areas."(8)   Tests are developed to test the achievement of students toward meeting objectives, and instruction is "targeted toward mastery of those objectives."

According to Wood, students who expect a test will often do more studying and, in the process, learn more than would otherwise be the case.   While she does not advocate the encouragement of cramming merely for the purpose of passing a test, "even this approach to learning undoubtedly results in more knowledge than would no studying at all."(9)   Students who regularly prepare for periodic tests can be positively motivated.

Tests are also used to determine intellectual ability, although many question which tests can do this.   Wiggins believes that a "true" test of intellectual ability "requires *the performance of exemplary tasks*."(10)   Assessment should provide the challenges and standards of performance that is expected by students who have received instruction just as standards of performance ar expected by adults in the workforce including people in business, science, community leaders, teachers, and school library media specialists, among others.   Tests should include writing essays and reports, conducting individual and group research, designing proposals, assembling portfolios, all practical applications of information.

Types of Tests

Identification of types of tests provides a brief review.   Included in the discussion are standardized tests and the strengths and weaknesses of true-false, multiple choice, matching, rank-order, completion, and essay.   Considering the statistics of the numbers of standardized tests given each year, it would be difficult to imagine anyone who has attended a U.S. elementary or secondary school for any length of time who has not been given a standardized test.   What makes a test "standardized?"   According to Noll, a standardized test "is one that has been carefully constructed by experts in the light of acceptable objectives or purposes, procedures for administering, scoring and interpreting scores are specified in detail so that no matter who gives the test or where it may be given, the results should be comparable; norms or averages for different age or grade levels have been predetermined." (11)   This uniform procedure concerning the test site, time, or persons being tested, rather than appeal to numbers of person previously tested or historical precedence, is, according to Willson, the true characteristic of standardized tests.(12)   When test authors are not able to demonstrate these three components of uniformity, their test cannot be referred to as standardized.

Achievement tests are standardized, but they emphasize the content and process of knowledge that are amendable to change in students due to instruction.   Results are used to establish national norms of expectations of student performance in content areas.   School districts use test data with national norms to compare the performance of their students with others across the nation.

Other definitions of tests include the following:

Comprehensive battery: Tests most students are given in over 90% of U.S. school districts each year.   The term, *comprehensive*, means just that--all inclusive.(13)   Examples of this type of test include "Iowa Test of Basic Skills" and "Comprehensive Test of Basic Skills."

Content-Specific: Tests developed for one subject, for example "Stanford Diagnostic Mathematics Test" and "Cooperative Mathematics Tests."

National, state, and local assessment: Tests developed to provide demographics such

as the "National Assessment of Educational Progress (NAEP)." Results of this test of 9-13-17 year olds is reported regionally with factors such as males/females, major ethnic groups, and large cities or small towns.

Perhaps the "grandfather" of all state examinations has been The New York Regents' Examination. Teachers in New York state admit freely to maintaining files of information that has appeared on past tests and of teaching the test.

Some schools, school districts, state agencies, and research centers are working to design alternatives to the standardized test. An example of this is The MAP (Monitoring Achievement in Pittsburgh) testing program. "Tests of critical thinking and writing that rely on essay questions are specifically designed to provide diagnostic information to teachers and students. Pittsburgh is also working, through its Syllabus-Driven Exam Program, to devise exemplary test items that are based more closely on the curriculum."(14)

Minimum competency test: Tests designed to assess basic skills. They were popular during the 70s because of pressures to demonstrate accountability. Examples of this would include the "Richmond Tests of Basic Skills." Minimum competency tests are sometimes developed within a single state. Two examples of state tests are the Texas Assessment of Minimal Skills (TEAMS) and the California High School Proficiency Examination required for high school graduation.

Tests may be made up of all, some, or one type of the following: true-false, multiple choice, matching items, rank-order items, completion items, and essay. Problems are associated with the development of each of these. True-false tests were first written to allow a single response that could be graded uniformly and one that removed identification of handwriting (and thereby bias toward individual students) as a factor. However, it is difficult to remove "ambiguity" from true-false questions.(15) Not everything is black or white, yes or no. Responses that are "too true" or "too false" are pointless, yet others may be misinterpreted. When math calculations fit better into true-false or multiple choice because a single answer is correct and other answers are incorrect.

Shavelson, Carey, and Webb consider multiple choice tests to be "cheaper to develop, administer, and score than such alternative forms of testing as hands-on performance assessments in science," yet "difficult to monitor what the student does."(16) However, choosing carefully worded responses is no easier for multiple choice than for true-false tests. If responses are not similar, the test is pointless. Selections must be either so impossibly different that they become easy to answer or they may be confusingly similar. If two answers are similar and correct, the "difference" may be difficult to judge from the standpoint of degree of correctness. Test takers are then asked to choose the "best" answer as that one that is "more nearly correct." Not all areas lend themselves to multiple-choice answers. "Whatever one may think of whole language instruction as a means of teaching reading and writing, the kind of information these teachers want is clearly not available from any multiple choice test."(17)

Matching items have some of the same vocabulary problems as true-false and multiple choice for they must have several responses that are similar for their "match" but dissimilar for the other items in the matching list. Rank-order items require special scoring techniques and very careful consideration when constructing the items. The essay and completion item tests allow for grading bias, something test developers have tried to eliminate with short answers in true-false, multiple choice, and matching tests.

School Library Media Activities Monthly published a chart comparing the strengths, weaknesses, ability level required, and modifications to four types of tests, true-false, matching,

multiple choice, and essay. This article suggests that there are alternative ways for evaluating students including "observation of students working productively." The authors close with "Let common sense be your guide. Remember too, that assessment can be fun, and that puzzles and games can tell you as much about your students' progress as tedious written tests."(18)

Historical Development of National Tests

In the 19th Century, written exams were developed for high schools in Boston to substitute for "visiting committees that did not have enough time to hear the recitations and performances of the increasing numbers of students."(19) While standardized tests as commonly used today were unknown at the turn of the century(20), the College Entrance Examination Board was founded in 1900 and began developing examinations to decide which students would be admitted to colleges. "By 1920 the first standardized tests of intelligence and personality, a number of tests in school subjects, some aptitude tests, and some general survey tests of school achievement had appeared."(21) The S.A.T. test was developed in the first quarter of this century and first given in 1926 to college applicants. The Educational Testing Service (E.T.S) was founded in 1947 and is the "nation's largest nonprofit educational research organization, with over 2,400 employees ... and it boasts that its international activities 'extend to every continent, to nations ranging alphabetically from Argentina to Zaire.'"(22) The College Entrance Examination Board currently has 2,500 colleges, schools, and educational associations in its membership.(23)

Standardized Testing Today

Almost every school district in the United States makes use of standardized tests as a part of their testing program. The steadily increasing use over the last few decades, has been attributed "in part due to the requirements in over 40 states for statewide testing of minimal skills at various grades."(24) However, it is difficult to determine how many tests are actually administered "because so many different tests are used for so many different purposes by so many different sponsoring agencies."(25) In a recent study conducted by the National Center for Fair and Open Testing (Fair Test), their estimate was 105 million standardized tests to 39.8 million students during the 1986-87 school year in U.S. schools, "an average of more than 2 1/2 standardized tests per student per year. At that rate, by the time a student graduates, he or she has been forced to take 30 standardized tests."(26)

Developing Standardized Tests

Many organizations publish tests, and for many of these, the development and publication of tests is a major or significant part of their business. A good list may be found in Willson's *Academic Achievement and Aptitude Testing: Practical Applications and Test Reviews*. For each test he gives the developer's names, the audience (e.g., Child Grades 1 and above or Adolescent, Grades 9-10), the purpose, a brief description, the time needed to take the test, how scored, the cost, and the publisher. Further, Willson traces the sequence of test development as follows:

1) Decide on grade and age level.
2) Examine tests, curriculum guides, state guides, and research

3) Develop objective tests on domains (domains of knowledge)

Although the domains initially may be comprehensive, they are pared down to make the tests manageable in size and to gain the greatest commonality across regions of the U.S. For many test developers, the domain is based on objectives, for others, on concept lists.

4) Reduce lists in Step 3 to a common set

5) Design test blueprints (also determine the items

(usually 20 are written for each one selected)

6) Write items

Item writers may be staff, or consultants may be used.

7) Give items to students (usually convenient samples of students.)

8) Analyze items and revise

9) Select a national sample for bias, difficulty, and discrimination studies

This may be difficult since "regular" school districts may refuse to participate in testing the test.

Further, "Perhaps the major criticism to be made of the standardized achievement test development procedure is in its item refinement process. Although a domain or objective list may be quite comprehensive and specific initially, the actual selection of items due to requirements for a narrow range of item difficulty (usually between .4 and .6), discrimination ability, and differential functioning for any identified subgroups (such as minorities or females) serve to change the composition of content the items represent."

10) Print final forms

11) Select national norm sample

12) Administer final form

13) Analyze results, develop norm, tables, and technical data

14) Publish tests and support materials

Advertise in professional media. Advertising is usually vigorous!(27)

Tests Under Criticism

The literature has a great deal of critical appraisal of standardized testing, and it is under even more severe criticism today. Lawsuits in the hundreds have been brought against testing in both education and employment. Yet, test developers still have major impact and control over education in the United States today. "Developers of scholastic tests have inadvertently become the overseers of a very powerful instrument of education policy making: achievement tests."(28) Further, "local control over the schools is also being lost to private organizations, namely the test developers. Despite the significant and growing role that their products play in educational decisions, these testing companies face little government regulation or supervision....governed by virtually no regulatory structures at either the federal or state levels."(29)

Standardized achievement tests developers create their tests on a generally similar curriculum scope and sequence found only in some U.S. elementary and secondary educational programs(30) because we do not have a national curriculum. Arbitrarily dividing children "can get a little tricky, especially when the standardized tests used do not overlap entirely with the materials taught in the particular school or class that the child has attended."(31)

Critics charge that standardized tests 1) give false information about the status of

learning in the nation's schools; 2) are unfair to (or biased against) some kinds of students (e.g., minority students, those with limited proficiency in English, females, and students from low-income families); 3) tend to corrupt the processes of teaching and learning, often reducing teaching to mere preparation for testing; and 4) focus time, energy, and attention on the simpler skills that are easily tested and away from higher-order thinking skills and creative endeavors--the Achilles' heel of the nation's education system today.(32)

One major charge against standardized tests has been that of racism and sexism. While proposing to be objective, these tests may produce inaccurate and inconsistent results that are biased against minorities, females, and students from low-income families. They cause frustration in teachers who narrow their focus on the curriculum. This identification of students as inadequate causes them to have lowered self-esteem and contributes to their dropping out of school. "Standardized tests undermine school improvement instead of advancing its cause. Instead of promoting accountability, tests shift control and authority into the hands of an unregulated testing industry. Therefore, using standardized test scores as the primary criteria for making important educational decisions will lead to *less* public understanding of the schools and a *weaker* educational system."(33) Test taking is a skill that some students never accomplish; they are students who "freeze" at the thought of taking a test. Minorities and students from low-income families "are less apt to perform well when they do not know the person who administers the test--although an anonymous administrator does not affect the performance of middle-class white students.(34)

The point that standardized tests are unfair to or biased against some kinds of students has meant recent changes in the S.A.T and brought a critical response from a test taker. David Reich, a junior student at Georgetown Day High School complains that he "emerged from the three-and-one-half hour ordeal struck by the too large number of questions that emphasized the achievements of minorities, women, and third world countries; bemoaned the shortcomings of American society, and advanced fashionable careers."(35) He continues, "African-Americans, women and Asians should complain because the E.T.S., in so pointedly turning stereotypes upside down, highlights them. Jews should complain because Albert Einstein and Saul Bellow seem not to be subjects of questions. Men should complain because they rarely seem to achieve anything unless they're of minority origin. Everyone should complain because, in one way or another, the S.A.T. distorts reality."(36)

Errors in testing and reporting occur in the scoring key. Content of tests may change so that the results may seem to be higher or lower than a previous test causing recipients of test scores to mis-interpret current scores sent to their schools until a new scoring guide arrives. New tests are often sent some time before the scoring information. Computer error may indicate that an individual did not pass an exam when in fact this person did. Since many persons are known not to have passed such examinations, those who are sent failing scores may be reluctant to have them rechecked to see if the score they received was a mistake.(37)

After six years of research, Crouse and Trusheim, have shown that Scholastic Aptitude Test scores contribute little, if any predictive power to high school grades in helping colleges and universities make admissions decisions. Their concern is that the College Board and E.T.S have not "completely appraised the usefulness of the S.A.T"(38) Further, they suggest that "the College Board and E.T.S could themselves achieve an impressive public relations move by calling for a panel to study the S.A.T and admissions testing." (39)

Complaints are made concerning the lack of relevance to students as individuals or to teachers and their quality of teaching. Wiggins states, "Mass testing as we know it treats

students as objects--as if their education and thought processes were similar and as if the reasons for their answers were irrelevant."(40) Haney suggests that "the term *educational testing* is something of a malapropism, since most standardized testing has far less to do with the teaching of individual teachers and the learning of individual students than it does with the bureaucratic organization of schools;"(41) and Wiggins says "that a standardized test of intellectual ability is a contradiction of terms."(42)

The National Association for the Education of Young Children (NAEYC) suggests that

> Many of the important skills that children need to acquire in early childhood-
> -self-esteem, social competence, desire to learn, self-discipline--are not easily measured
> by standardized tests. As a result, social, emotional, moral, and physical development
> and learning are virtually ignored or given minor importance in schools with mandated
> testing programs.
>
> States and school districts have neither the expertise nor the resources to develop
> and validate the standardized tests that they need. Nor are states and school districts
> equipped to adequately investigate the claims of test developers regarding the validity
> of their products or to review the validation process.
>
> Even if the necessary expertise and resources were available, states and school
> districts would probably be unable to conduct effective outside evaluations because of
> the secrecy that characterizes the testing industry."(43)

Shavelson, Carey, and Webb suggest that "there simply has not been sufficient funding for research on achievement testing, and so the development of achievement indicators has received low priority...Achievement test scores fit the American belief in a simple dimension of ability that distinguishes winners from losers.(44)

School districts have difficulty choosing a suitable test. Willson has a developed a "Criteria Checklist for the Selection of Standardized Achievement Tests."(45) However, it is almost impossible "for a competent test technician or test consumer to make a thorough appraisal of the construction, validation, and use of standardized tests... because of the limited amount of trustworthy information supplied by the test publishers."(46)

Developing Tests

If change is to occur in this cycle, school library media specialists must learn a little about the basics of test development . As they participate in the creation of tests that will help analyze the degree to which students are acquiring information literacy skills, they should consider the following:

"Alternatives to standardized testing must be carefully designed to avoid producing the biases, the inaccuracies, and the damage to students and curricula that standardized tests have wreaked. Replacing the biases inherent in standardized tests with the biases of individual teachers or schools would not be progress."(47)

"Tests should be central experiences in learning. The problems of administration, scoring, and between-school comparisons should come on after an authentic test had been devised--a reversal of the current practice of test design. If we want to design an authentic test, we must first decide what are the actual performances that we want students to be good at. We must design those performances first and worry about a fair and thorough method of grading them later. Do we judge our students to be deficient in writing, speaking, listening,

artistic creation, finding and citing evidence, and problem solving? Then let the tests ask them to write, speak, listen, create, do original research, and solve problems. Only then need we worry about scoring the performances, training the judges, and adapting the school calendar to insure thorough analysis and useful feedback to students about results. This reversal in thinking will make us pay more attention to what we mean by *evidence of knowing*. Mastery is more than producing verbal answers on cue; it involves thoughtful understanding as well."(48)

"We typically learn too much about a student's short-term recall and too little about what is most important: a student's habits of mind. In talking about *habits of mind*, I mean something more substantive than 'process' skills divorced from contest......The practical problems of test design can best be overcome by thinking of academic tests as the intellectual equivalent of public 'performances.' To enable a student is to help him or her make progress in handling complex tasks. The novice athlete and the novice actor face the same challenges as the seasoned professional. But school tests make the complex simple by dividing it into isolated and simplistic chores--as if the student need not practice the true test of performance, the test of putting all the elements together....Coaches of musicians, actors, debaters, and athletes know ..what one learns in drill is never adequate to produce mastery.(49)

Teachers *should* teach to the test. Obviously it would not be fair to test the student over information not covered in the instruction or assignments. Teachers do teach to the test; however, this does not mean teaching *the* test. That become mere memorization and, as stated earlier, "a correct answer can disguise thoughtless recall."(50) Tests must offer students a genuine intellectual challenge, and teachers and school library media specialists must be involved in designing the test if it is to be an effective point of leverage.

Implications for the Practitioner and Researcher

In a lengthy conversation, the Director of Testing in a major metropolitan school district, reflected on test development. Tests are usually created by technicians who work with experienced professionals. Technicians need professionals who have the content expertise, and technicians are needed for their expertise in item construction. Both groups need to have some of the skills and information of their counterparts, and this is seldom the case. In developing tests at any level, but particularly on the national scene, it is often the technical that overwhelms the "conversation" rather than professional judgment. Technicians who are expert in highly disciplined measurement devices will spend too much time on what are right and wrong answers. Professional judgment issues are much less clear, and answers are less often right or wrong, but these must be considered in test development. These issue should dominate testing conversation and not what is a single right answer.

School library media specialists and researchers need to learn the basics of the test developer's craft. Until we become more skillful in the technical, we must act with assurance that our contributions are more important than that of the technician. We must have the confidence that we have knowledge to participate, and we must share our knowledge with technicians if they are to do their job adequately. Our knowledge is an empowerment issue.

Alternatives Paper and Pencil Tests

In preparing tests of information literacy, alternatives to paper and pencil tests should be considered. Some of these alternatives include, among others, 1) professional judgment of

teachers, 2) samples of student work, 3) contracts with students, 4) interviews, 5) teacher-made tests, and 6) criterion-referenced tests.(50) Information may provide "a means to improve instruction and testing in one of the ultimate aims of education--the ability to address more complex problems of the sort encountered in work and in personal life.(51) If so, testing at a computer can offer a simulation with open-ended decision making of the sort that might be encountered in real life. "Computer and other information technology might break the strangle-hold that the multiple-choice format has had on large-scale testing programs for 50 years or more."(52)

It seems to this author that school library media specialists have been appropriately testing information literacy skills when they have students conduct a search, find materials, and prepare research papers. Students are exhibiting their abilities to locate information effectively. It is our task to create the means to understand when students are becoming information literate in the evaluation and use of the information they find. We are in the appropriate location to help develop situational tests that allow students to problem solve and to find the mechanisms to collect data that can be reported of their degree of success in this endeavor. If this is to happen, school library media specialists need to be aggressive participants in the assessment of student performance. "...what is needed--more than alternative instruments--is a critical attitude toward assessment and a wider appreciation of its effects on teaching and learning." (53)

Implications for the Practitioner

In our response to the need to become knowledgeable and acquainted with technology, to keep up with constantly changing technologies, and to expand our efforts in integrating the school library media center into the curriculum, we have been very busy. The current whole language movement in the elementary school has further impinged on already overcrowded responsibilities. Yet, we need to learn how to evaluate learning in our students, so we can be helpful to teachers who are no more knowledgeable in this area than we are.

We must become proficient not only in teaching to the test, but also in testing what is taught. It is imperative that we develop testing devices that will further increase learning rather than belittle students or increase their anxiety and decrease their sense of self-worth.

School library media specialists should become active participants in the assessment of all facets of information literacy programs. If we do not help develop the tests, they will be developed to cover information that we do not regularly provide, and we will continue to be asked to teach _the_ test or that small part of it that covers the school library media center.

Research Needs

Research on information literacy skills has more often been search strategies than on the quality of information located for a final project. Analysis of citations has provided information on what articles are used by students, but no one has actually looked at the quality of the search in relation to the student's final product. This is not an easy problem to solve. It may very well be that a student can write a fine paper using a minimum of resources collected using little critical judgment because that student uses excellent writing skills. Yet, if students are to demonstrate the ability to locate the best sources, evaluate what is relevant, and then interpret the information to fit the assignment, we must assume the responsibility for confirming that they have, in fact, done this.

Models that test the gains in information skills should be available so that districts can use these with or in lieu of those developed by national testing agencies. In some cases, this may used to awaken companies who develop national tests to the need to test information literacy skills.

It is time to return to the assessment of students as individuals and develop tests that confirm that answers mean what they seem to mean. "In testing, the temptation to relegate the human factor to minor significance is a growing trend. The trend is most visible in the administrative use of multiple-choice tests to make automatic policy decisions about such things as high school graduation, grade-to-grade promotion, teacher certification, and merit pay. Policymakers do not trust teachers' judgments about student achievement, or college professors' assessment of pre-service teachers, or administrators' evaluation of in-service teachers. Using tests this way is widely taken for granted by policymakers, the media, and the general public. Consequently, if a person falls below the magic cut-score, then he or she, *ipso facto*, is incompetent; the person--not the test--is automatically called into question. Performance on these tests become the operational definition of what is valued in education."(54)

Let us, in a profession that is supposed to be user-friendly and dedicated to improving the human condition through the provision of needed information, consider how to change the operational definition of what is valued in education. School library media specialists need confirmation that the school library media center program and collection contribute to building information literacy skills. Comparative studies of collection strengths that help in building information literacy, analysis of the quality of information used by students, as well as the quality of their search strategies can serve as a beginning of this process.

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(27) Willson, *op. cit.*, p. 6.

(28) Neill and Medina, *op. cit.*, p. 688.

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(31) Strenio, *op. cit..*, p. 103.

(32) Haney and Madaus, *op. cit.*, p. 684.

(33) Neill and Medina, *op. cit.*, p. 688.

(34) *Ibid.*, p. 690.

(35) Reich, David. "The S.A.T. Goes P.C." *The New York Times*. Op-Ed. Monday, June 3, 1991. p. A11.

(36) *Ibid.*

(37) Strenio, *op. cit..*, pp. 13-15.

(38) Crouse and Trusheim, *op. cit.*, p. 14.

(39) *Ibid.*, p. 173.

(40) Wiggins, *op. cit.*, p. 708.

(41) Haney, Walter. "Making Testing More Educational," *Educational Leadership* (October 1985): p. 4.

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(44) Shavelson, Carey, and Webb, *op. cit.*, p. 693.

(45) Willson, *op. cit.*, pp. 24-25.

(46) Neill and Medina, *op. cit.*, p. 695.

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Information Skills for Hypermedia Environments:
Using Emerging Information Resources in the School Library Media Center

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Introduction

> One of the great ironies of the information age is that as the technology of delivering information becomes more sophisticated, the possibility that we can process it all becomes more remote. It is as if we are at one tail end of an assembly line that is cranking out data at an alarming rate, and the machine has no off button (Wurman, 1989, p. 294).

Emerging technologies have brought a wealth of new information resources to school library media centers. Along with these new resources have come new ways of organizing and accessing information. Unlike traditional reference sources that often provide only an index for access, hypermedia formats allow users to access information in a variety of ways. In addition, users are not limited to printed-based reference sources. Graphics, sound, video, still images, and text may all be combined within a single hypermedia reference source. Regardless of whether the learner is looking for a quotation by Abraham Lincoln for a speech, or analyzing international geographic data for a report on global warming, library media specialists need to understand how students use and learn from these new information resources.

Hypermedia environments can provide an abundance of information resources for students; however, students need skills in the use of these emerging technologies. According to Ray (1991, p. 12), our learners need to become generalists, "with the ability to learn many specifics on an 'as needed' basis." The ability to locate information rapidly is becoming an increasingly important skill for the success of students and adults today (Chow, Tresvant & Rutherford, 1987, p. i). According to Kuhlthau (1987, p. 5), "information skills combine a broader view of library skills with computer skills to develop competencies for the information age." This paper will examine the area of information skills needed for hypermedia environments. First, it will provide general information about hypermedia and its use in school library media centers. Second, it will address some of the key issues regarding the development and use of hypermedia by students, teachers, and media specialists.

Hypermedia

Hypermedia can be defined as a type of software that combines text (words & numbers), audio (music & speech), and visuals (still images, movies & animation) (Ambron, 1988). Users are not required to follow a predetermined organizational scheme when searching for information in a hypermedia environment. Instead, users may branch instantly to related facts. The information is externally cross-referenced, with fact linked to fact, linked to fact (Sculley, 1987). A hypermedia environment then provides a user with an atmosphere for selecting, arranging, organizing, and even modifying information that is under his or her individual control. Carlson (1990) has described hypermedia environments as providing "round" books for students. Where square books are frozen in sequence, round books provide rich environments for the exploration of information.

The foundations of hypermedia can be traced back the work of Bush in the 1940's. Nelson (1987) coined the term "hypertext" to describe the nonlinear arrangement of information for reading and writing. In addition to accessing information, the system allows users to reorganize or modify information to suit his or her needs. According to Chandler (1990), a hypermedia environment provides users with a collection of information using multimedia technology. This environment goes beyond text-based resources and offers resources greater than the sum of the previously unconnected parts (Maule, 1990).

In a hypermedia environment, information is organized in nodes and connected by links. Links determine the sequence of information presentation. Authoring tools may be included that allow users to build their own links. In some cases, multiple windows can displayed at the same time to allow the user to draw associations between sets of information. The advantage of this type of system is that it allows users to associate and integrate diverse information and media (Richards, Chignell & Lacy, 1990). This information may be stored in a variety of formats including floppy disks, hard disk drives, CD-ROM, and laserdiscs.

Hypermedia environments can be organized in a number of ways. For example, some systems contain a "mainline" of information that is organized in a chronological or alphabetical manner. Other systems are developed as hierarchies or webs. For example, a history resource may allow users to access information alphabetically, numerically or chronologically. They may also be able to access information by political issue, by geographic location, or by subject. While one user may access the information resource for a study of political issues in presidential campaigns, another user may use the same resource for the study of clothing fashion history. Each user may access graphics, sounds, as well as, still and motion video segments related to his or her particular area of interest.

Gluck (1990) has identified four primary types of hypermedia systems. First, the modified database management system features linking and

navigating. Second, the large-scale literary system is designed to handle large collections of information linked together. Users are encouraged to read, edit, and critic the information. Third, issue investigation systems are designed to support brainstorming and unstructured thinking. Finally, fourth, browsing systems are designed as small-scale literary systems that are mainly for information viewing such as public information and reference sources. According to Gluck (1990), the traditional ways of linking information include the use of a table of contents, indexes, footnotes, and sidebars. Hypermedia provide a wealth of information access; the option of personalization and annotation; ease of organization; data reliability; promotion of collaborative work; and simulations.

Beyond the Textbook

Hypermedia can provide an environment to explore all types of information. These environments can go beyond the scope of traditional textbooks and reference sources by providing users access to information in a nonlinear manner. In the past, the large amount of reference information available across subject areas has required a limit on the content of textbooks for the sake of readability. Hypermedia environments "provide space for volumes of additional information while retaining an easy-to-read general format for the text" (Higgins & Boone, 1990, p. 28). Higgins and Boone state that features are available in a hypermedia environment that are not possible in traditional print on paper. For example, an American history lesson might include actual speeches and a series of photographs in addition to traditional types of printed information. A geography lesson can be brought alive through the use of animation, graphics, databases, and locational resources. In addition, students are able to manipulate and change the information to meet their needs.

Hypermedia in the School Library Media Center

Many hypermedia resources have been developed as information resources for library media centers. For example, *The Magic Flute* by Warner Notes Audio is a hypermedia environment that provides a wealth of information on this famous opera by Mozart. This particular package combines HyperCard stacks and compact disc based audio. An assortment of hypermedia products that access laser disc technology are currently available. Reader's Guide and many popular reference tools (i.e., electronic encyclopedias) are available on compact disc. Limited budgets have prevented many school libraries from providing these information resources for their students. Before schools invest in these resources, school library media specialists need to know how students can use these resources and what they will learn from them. Specialists also need to identify those skills that students need to make use of this emerging technology.

Information skills are necessary tools that help learners to acquire, organize, and use an existing body of knowledge to internalize the meaning of any subject area (Chow, Tresvant & Rutherford, 1987, p. 23). According to Kuhlthau (1987), contemporary information users should seek evidence to shape a topic rather than merely to answer a question. Students need skills in preparing for a search, gathering relevant information, interpreting and evaluating information and applying information.

Key Issues In Hypermedia Research

Hypermedia, Disorientation and User Interfaces
A primary goal of hypermedia environments is to make a large amount of information available to users without overwhelming them (Richards, Chignell & Lacy, 1990). Students are sometimes unaware of the structure of the hypermedia environment and are unable to see "the forest for the trees." As a result, user disorientation is a primary concern in hypermedia environments. Researchers have found that some users get disoriented and distracted in hypermedia environments (Conklin, 1987; Tripp & Roby, 1990). According to Conklin (1987), this disorientation is a tendency to lose one's sense of location and direction in a nonlinear document. According to Richards, Chignell and Lacy (1990, p. 26), poorly designed hypermedia environments tend to be unusable. Just as reference books can be poorly organized, hypermedia resources can provide inadequate tools for accessing information. There is a need to develop guidelines that identify effective metaphors and navigational tools that will maximize the effectiveness of navigating in a hypermedia environment. This includes all levels of student-computer interface including the content, the software tools, and the hardware.

Just as the authors of textbooks and reference materials must know their audience, hypermedia designers need to be aware of the characteristics of their audience as well as implications of these characteristics for the development of hypermedia materials. There is a need to determine individual differences in the use of hypermedia environments and apply this information in organizing hypermedia materials and providing navigational tools for users. For example, age, maturation, learning styles, and other factors may contribute to a learner's ability to effectively access and manipulate information in a hypermedia environment.

It is critical that the hypermedia environment be user-friendly. In other words, the interaction between the information resource and the learner must be intuitive, efficient, and effective. The student should be able to concentrate on their information task rather than on manipulation of the computer system. The introduction of graphic and mouse-based interfaces has increased the effectiveness of information access systems. Straub and

Wetherbe (1989) stress that the existing computer environments are still too confusing for students. For example, students need to easily associate information and see related information on the screen at the same time through the use of multiple windows. However, according to Conklin (1987), it is difficult for some students to keep track of more than one task at a time. Gluck (1990) noted that the interruptions that occur when recording information can interfere with a student's train of thought. Students need to know where they are within the program similar to the way people like to know what page they are on in a book. They need to be able to easily access information through clicking a button or entering a key word. The use of webs, outlines, maps, and other resources as vehicles for accessing information and understanding relationships has been advocated as a way to increase user-friendliness and reduce confusion.

Hypermedia and Information Attitudes

For the most part, students enjoy using computers. However, when it comes to information skills in a hypermedia environment, students also need to develop information-related attitudes. According to Kuhlthau (1987), persistence, attention to detail and skepticism are among the attitudes that students need to develop for an information age. Traditionally, students have complained, "I can't find anything on my topic." With the introduction of hypermedia resources, students are often overloaded by the volume of information available on their topic. Students need to learn strategies for dealing with information overload. There is a need to examine these attitudes as they relate to work in a hypermedia environment.

Hypermedia, Problem Solving, and Metacognition

According to Carlson (1990), it is in the realm of problem solving that hypermedia may have its greatest impact. Hypermedia environments can provide a useful mediator for the process of designing and understanding information. It is possible for students to trace their own paths and consider the process they used in accessing information. Problem-solving, decision-making, and critical thinking are all important information skills. There is a need to study whether hypermedia environments can provide a vehicle for developing these important skills.

Information sources are rarely organized in ways that exactly match our end use of their content (Chow, Tresvant & Rutherford, 1987). Students can easily learn to use hypermedia tools for writing, organizing and presenting information (Lamb & Myers, 1991; Ray, 1991; Thomas & Knezek, 1991). These types of experiences allow students to develop self-expression, interpersonal communication skills, critical thinking, and group problem-solving skills by analyzing information and goals, then applying technology skills across the curriculum (D'Ignazio, 1989). Through manipulation of existing hypermedia environments and development of their own

materials, students have the opportunity to learn for themselves how knowledge is creating from connecting various pieces of information. Through the use of case studies and journals, students can reflect on their own problem solving strategies (Linn & Clancy, 1990). There is a need to examine how students synthesize information for documents and presentations that inform, persuade, or entertain.

Learning in a Hypermedia Environment

According to Wolk (1991, p. 4), these new learning environments can "accommodate individual interests and learning styles....(They) will give students the opportunity to become active participants in the learning process, take more responsibility for their own education, and work cooperatively with fellow students." Hypermedia environments allow students to explore information and discover relationships. Students can selectively study the information that is necessary for their task (Jonassen, 1989). Proponents of hypermedia learning environments suggest the option to move freely through text will bolster learning for three reasons (Carlson, 1990). First, a hypermedia environment provides flexibility and ease of use. Text is networked rather than presented in a linear fashion. Second, learners spend more time processing information. Hypermedia materials are more engaging than traditional print materials. Third, there is increased motivation to use hypermedia materials because the learner is in control. Because hypermedia environments offer flexibility and control to learners, there is a need to study the effectiveness of this approach in learning (Friend & Cole, 1990).

This approach to learning has been criticized by others who believe students don't always make wise decisions about their own learning. Tennyson and others (Tennyson, 1981) have found that students make better decisions about their own learning when some advisory function is incorporated into hypermedia environments. Advice strategies have been advocated by a number of researchers to overcome this type of concern in computer-based learning (Dunn & Taylor, 1990). Lamb and Myers (1990) have advocated the use of a mentor system that is designed to give students some control over their own learning without letting students get in over their head. There is a need to identify what types of advising or mentoring strategies are effective in guiding student learning in hypermedia environments.

Users of hypermedia environments must develop search strategies in order to make effective use of these new tools of technology. For example, students may run into trouble when they search for information without a clear idea of what they are searching for. They need to be able to identify key words and names associated with their information search. Students need skills in evaluating the currency, authority, objectivity, consistency, and relevance of the information they find. There is a need to identify exactly what skills students need to be effective users of hypermedia.

Managing Hypermedia Environments

Many hypermedia environments provide options to reorganize and modify information. This modification process may cause concern among media specialists who may equate this to "writing" in a book. Although students need skills in accessing information, they also need skills in reorganizing and modifying information. Unlike traditional resources that are read and put away, hypermedia environments can be thought of as "living" resources, or dynamic documents, that are ever changing. How do we teach students to use and not abuse this new type of resource? Many ethics questions may arise as library media specialists examine this issue. These collaborative work environments allow users to criticize and annotate each other's work to form a history of ideas (Gluck, 1990). There is a need to explore how students use these hypermedia environments for collaborative work. In addition, there is a need to examine issues related to reorganizing, modifying, and adding to reference sources. Plagiarism becomes an increasing concern as the volume of information and ease of duplication increases.

Teacher and Library Media Specialist Development and Use of Hypermedia

According to Gluck (1990), school library media specialists have a wonderful opportunity to lead in the development of small yet effective hypermedia applications. These systems would have the ability to individualize and allow students to take different paths to understanding. Sponder and Scall (April 1990) coordinated a project that taught teachers to develop hypermedia materials on the topic of Eskimo culture. Rather than relying on purchased materials, the teachers developed hypermedia materials that were then used by their students as an information resource. Although this is a good example of what can be done using existing technology, it may be unrealistic to expect every teacher and library media specialist to become a developer given the authoring tools that are currently available. There is a need to examine methods for automating the development of hypermedia materials to increase the productivity of those interested in developing hypermedia environments. There is also a need to examine in-service and pre-service programs to determine whether teachers and library media specialists are getting the skills need to be users and developers of hypermedia.

Hypermedia Research

Both qualitative and quantitative research must be done in the area of student use and learning from hypermedia resources in school library media centers. Story and Harvey (1990) have advocated the use of transparent automatic systems for the collection of data for hypermedia-based research. Information collected includes dates and times of use, time on task, sequence, use of navigational aids, exposure to information related

to specific learning objectives, and modules completed. As part of the ongoing "Cities in Schools" project, they have identified the need for four types of information regarding hypermedia use. First, how learners use hypermedia. Second, how learners respond to hypermedia. Third, what is learned from hypermedia. Fourth, what factors influence the effectiveness of hypermedia.

Conclusion

Today's educational environment challenges us to find vehicles to enable students to see patterns of meaning in experience through a guided-inductive approach that simultaneously empowers and encourages (Carlson, 1990).

Hypermedia environments can provide these kinds of experiences for learners. However in order to make the most of these environments, school library media specialists need to understand how hypermedia systems can be most effectively used in their centers as information resources. They also must know what information skills students require in order to use these systems effectively.

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A SUMMARY OF RESEARCH AND IMPLICATIONS REGARDING THE ROLE OF CURRICULUM MATERIALS CENTERS IN DEVELOPING INFORMATION LITERACY SKILLS IN PRESERVICE TEACHERS

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Introduction

In order to meet accreditation requirements and to improve K-12 teacher preparation, colleges and schools of education usually house and/or facilitate a curriculum materials center. Lehman and Kiewitt identified 170 curriculum materials centers in education programs accredited by the National Council for Accreditation of Teacher Education.[1] Not only are these curriculum materials centers called by different names according to McGiverin 's 1988 study, a confused picture has emerged making it "impossible to develop an accurate comparison of curriculum materials centers."[2] Teacher education faculty frequently view the development of research skills as peripheral to teacher education.[3] This is especially distressing in light of educational reform movements that stress the need for "... teacher education to provide opportunities for teachers to reflect on the concept of information; the decision making processes at work, and the sources on which they can draw to foster their continuing professional development."[4] Faculty vary in their use of curriculum materials centers even though there is agreement that preservice teachers need to be taught how to teach by instructors that model that best practices.

In order to advance the cause of K-12 school library media centers and information literacy skills, others besides the school library media specialist must feel a need for the existence of a school library media center, its services, and take an active role in the selection and use of its collection. It would seem logical to assume that preservice teachers that come from programs with curriculum materials centers that take a proactive position in the integration of information access, materials analysis and instructional design skills will expect and use library media centers within their future school sites. There is a connection between the education of educators and the later behavior of the graduates.

The research summarized in this paper focuses on the role of curriculum materials centers in the preparation of classroom teachers and investigates the connection between the use of these centers in preservice education and later use of school library media centers by students who become practitioners.

Theoretical Basis

The theoretical foundation for this paper is drawn from two sources: the work of John I. Goodlad who has researched, studied and written extensively about schools and teacher training programs and Peter M. Senge who has developed the premise that institutions and corporations must become "learning organizations" to survive and prosper. Goodlad argues that the reconstruction of teacher education must work hand in hand with the restructuring of public education. He suggests that new centers and institutes must be created within the higher education sector that will provide needed curriculum development, pedagogical experimentation, and evaluative inquiry.[5]

Senge is committed to collective aspirations, collaborative experiences, and cooperative endeavors in order to empower the individual and to tap people's commitment and capacity to learn at all levels in an organization. His idea of a learning organization is a place where people "... continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together."[6]

Among the four dimensions of teaching discussed by Goodlad in *Teachers for Our Nation's Schools,* providing access to knowledge is the most pertinent to this study. "The school is the only institution in our society specifically charged with providing to the young a disciplined encounter with all the subject matters of the human conversation ..."[7] A re-examination of knowledge, skills, attitudes and values and how these are conveyed in the classroom whether it is in the K-12 sector or in higher education is necessary. Faculty members are encouraged to demonstrate a "... reasoned, collegial approach to the continuous improvement of the enterprise to which they are committed".[8]

Senge echoes Goodlad's call for collaborative and team learning. His learning organization encompasses the disciplines of systems thinking, shared vision, mental models, team learning, and personal mastery. "Building shared vision fosters a commitment to the long term. Mental models focus on the openness needed to unearth shortcomings in our present ways of seeing the world. Team learning develops the skills of groups of people to look for the larger picture that lies beyond individual perspectives. And personal mastery fosters the personal motivation to continually learn how our actions affect our world. ... systems thinking makes understandable the way individuals perceive themselves and their world".[9]

Summary of Studies

The first study addresses the need for an alliance between the school, the family and the library in order for the United States to become a part of the learning society. As a result of the 1983 *Nation At Risk* study, leaders in

the library and information science community organized a process bringing together educators and librarians in order to make the two stronger allies of American education. The report *Alliance For Excellence* presented thirteen recommendations. [10] Two of these recommendations are pertinent to this paper.

Recommendation E

"We recommend that school library media centers and public and academic libraries develop the collections needed to inform educators and librarians about developments in education and the library and information science field, and about new or expanded professional concepts and practices in those fields"[11]

Colleges and schools of education can provide access to resources that inform educators about the latest products, information and research. Curriculum materials centers and academic libraries can share in improving access to the most current innovations and developments in their fields.

Recommendation H

"We recommend that candidates for teacher or school administrator receive meaningful instruction in the role and activity of a school library media center".[12]

Educators often have had minimal or poor experiences with library media centers. "The full school organization and the community must be brought to a better understanding of the teaching and learning functions of the school library media center; this should be amplified by far larger exposure to the concept of this center in schools of education".[13]

The report concludes with a message to all citizens. "As citizens of the world's longest-lasting democracy, we must have easy access to libraries more than ever before. How well we govern, how intelligently we think through one difficult issue after another, how rationally we perform at center stage on the planet, will depend of our taking advantage of that resource".[14]

The second study *Library Skills, Critical Thinking, and the Teacher-Education Curriculum* by Nancyanne O'Hanlon presents the results of a survey of elementary education faculty at teacher-training institutions.[15] She explored attitudes toward the elementary school teacher's role in research skills instruction and toward library instruction in teacher-training programs.

Liesener's belief that "teachers must be information literate if kids are to be information literate" motivated the study. [16] Data was collected from 170 faculty in 38 institutions that prepare teachers. Institutions varied in enrollment, public and private, undergraduate and graduate programs. Frequency tables and chi-square analysis were done using the SAS statistical analysis program.

Four results were determined focusing on a) the role of library instruction, b) responsibility for development of library skills, c) research skills of education students and d) research skills for elementary students.

While the teaching of independent learning skills was indicated as a top priority in teacher-training curriculums, respondents did not seem to recognize the relationship between life-long learning and information skills. Even though most agreed that information skills enhanced the teacher's ability to solve job-related problems and to teach these skills to pupils effectively, half of the respondents felt inadequately prepared. While there was a clear indication that information skills benefit preservice teachers, there was varied opinion on how and who should provide this instruction. A contradiction surfaced with problem analysis identified as the most important research skill but selected least frequently as a skill essential for future elementary teachers.

"Respondents also indicated that analytical or conceptualization skills and search strategy or planning skills should be taught to elementary-school pupils as a part of the research process. These same skills were described earlier ... as some of the higher order, critical-thinking skills that educational reform strategists believe are crucial to the improvement of schooling".[17]

The third report *Academic Libraries and Teacher Education Reform: The Education of the Professional Teacher* by Jo Ann Carr and Kenneth Zeichner discussed the reform of teacher education as envisioned by the Carnegie Task Force, Holmes Group and the National Commission for Excellence in Teacher Education.[18] The academic library was noted as a partner in providing a collaborative model for integrating information access skills into the curriculum.

Three areas were cited by reform reports that have impact on libraries serving teacher education programs:

1. Teacher education as a graduate program
   "Education libraries will work with a substantially different student population. ... the multiple roles these students play place greater demands upon their time and necessitate efficient use of library resources ... Differing perceptions of the technological changes which affect information access also leads to a relationship between the student and the education librarian that is more personal, ongoing, and detailed than that of the undergraduate user".[19]

2. Strengthening academic and field experience components of teacher education
   "College instructors must incorporate the same principles of instruction in their own teaching that they wish to engender in students ... Professional programs must place the same emphasis on learning how to learn and critical thinking skills as is required for the successful elementary or secondary classroom".[20]

3. Professional Autonomy of Teachers
   "... the integration of information access skills must go beyond a mere exposure to sources of information. ... Essential to an

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understanding of the meaning of curriculum materials is an awareness of theoretical "choice points." ... understanding for the meaning of curriculum materials requires abilities in materials evaluation and analysis and knowledge of the principles of instructional design".[21]

The fourth paper discussed in this study, *Teachers and Library Awareness: Using Bibliographic Instruction in Teacher Preparation Programs* by Frances F. Jacobson, emphasized motivation provided by bibliographic instruction programs and the subsequent library awareness of teachers.[22] "Fundamentally, the problem of encouraging a library-minded way of teaching lies in the teacher's own experiences with libraries and library research. ... Teachers who have not internalized the principles and skills involving library research during their own training are unlikely to value such skills and pass on the value of such skills to their students. ... If one assumes that a student's ability to perform library research depends upon a teacher's ability to do the same, the attitude of a teacher education faculty member is of paramount importance".[23]

The study notes that while most reports for education reform call for the development of higher level skills such as critical thinking and problem solving few if any make any connection between learning such skills and the library research process.

The fifth and last study, *A Marriage That Works; An Approach to Administrative Structure in Curriculum Centers* by Mary Jane Scherdin, reviewed curriculum libraries in academic institutions.[24] Physical facilities, funding sources, and organizational structures were found to be quite varied. "In addition to administering the myriad of elementary and secondary instructional materials used by prospective teachers, they support the academic needs of education faculty and provide specific services to both students and faculty for evaluating and updating materials in order to reflect new methodologies in education".[25] Issues regarding the quality of curriculum centers and the need for high quality and efficient leadership were noted. A model of a successful learning materials center that served 2,700 education students was discussed in some detail. An effective curriculum materials center must provide programs for preservice teachers that "includes the use of teacher-learning materials and instructional media in two important ways: prospective teachers are instructed in how to devise and use modern technologies in their teaching, and modern technologies are utilized by the faculty in teaching students ..."[26]

Implications for Practitioners

For purposes of this paper practitioners will be considered both the classroom teacher and the education faculty member. Obviously it is

imperative that schools and colleges of education find ways to assist faculty in demonstrating "best" practices to preservice teachers. Curriculum materials centers can provide leadership in this task by developing pertinent collections, promoting and providing access to new technologies, and assisting in the teaching of information skills. It is additionally important that the curriculum materials center maintains a high profile within the college and school. High quality curriculum materials centers could be utilized by K-12 settings as both an extension for classroom teachers and as a role model.

Reform in the preparation of teachers suggests that well-prepared teachers are essential for exemplary schools. Goodlad's studies have shown that "What future teachers experience in schools and classrooms during their years as students profoundly shapes their later beliefs and practices."[27]

Unless preservice teachers come from settings that value and utilize a curriculum materials center, the impetus to use school library media centers as a classroom teacher is less and may in fact have a detrimental effect on that teacher's involvement in information literacy skills. When classroom teachers have been trained in programs that have caused them to use such centers as students, they will feel the need to more effectively involve their classes in their school library media center.

Implications for Researchers

Research in the field of curriculum materials centers has not focused on these centers' impact on the resultant teaching of their users. As colleges and universities react to educational reform movements, all elements involved in teacher preparation are being scrutinized and evaluated in terms of effectiveness and appropriateness. Surfacing problems not addressed in research concern the collaborative possibilities of the academic library and the curriculum materials center, the training and use of curriculum center personnel in the teaching of information literacy skills, the teaming of education faculty and curriculum center personnel in curriculum and collection development, and the physical facilities necessary to nurture, enhance and promote a shared vision of information literacy.

Quantitative methodology has been applied in most research in this area and provides only one aspect of the use of curriculum materials centers. Circulation figures, psychological measures, survey instrument responses and collection inventories cannot alone measure the experiences, the fears, anxieties, emotions, beliefs, reactions, behaviors and irrationalities that may arise in either the preparation of classroom teachers and their use of curriculum materials centers or the use of school library media centers by classroom teachers.

A qualitative look at the abovementioned research questions may provide us with countless rich examples of the diversity and depth of the human condition as it relates to the preparation of teachers and the acquisition of information literacy skills. The depersonalized objectivity of

quantitative research is discarded when the researcher begins to collect vignettes, descriptions of clinical and field experiences, and their own reactions to events. Those who are promoting acquisition and use of information literacy skills need to gain an emphatic understanding of how it was that practitioners responded to the situations they were experiencing. One can consider various means to conduct qualitative research. Observations, interviews, document analysis, historical research, inductive analysis, and the study of people's perceptions can provide a broader and necessary view of the role and impact of the curriculum materials center and the preparation of classroom teachers.

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11.   U.S. Department of Education, 1984, pp. 20-21.

12.   U.S. Department of Education, 1984, pp. 22-23.

13.   U.S. Department of Education, 1984, p. 20

14.   U.S. Department of Education, 1984, p. 45.

15.   O'Hanlon, 1987, pp. 17-26.

16.   Liesner, James W. "Learning at Risk: School Library Media Programs in an Information World," in *Libraries and the Learning Society: Papers in Response to A Nation at Risk*, Chicago: American Library Association, 1984, p. 79.

17.   O'Hanlon, 1987, p. 25.

18.   Carr, Jo Ann and Kenneth Zeichner. "Academic Libraries and Teacher Education Reform: The Education of the Professional Teacher, " in *Libraries and the Search for Academic Excellence*, Metuchen,N.J.: The Scarecrow Press, Inc., 1988.

19.   Carr, 1988, p. 86.

20.   Carr. 1988, pp. 87-88.

21.   Carr, 1988, pp. 88-89.

22.   Jacobson, Frances F. "Teachers and Library Awareness: Using Bibliographic Instruction in Teacher Preparation Programs," *References Services Review* 16:4, 1988. pp. 51-55.

23.   Jacobson, 1988, pp. 51-52.

24.   Scherdin, Mary Jane, "A Marriage That Works: An Approach to Administrative Structure in Curriculum Centers," *College & Research Libraries* 45 (March), 1984, pp. 140-147.

25.   Scherdin, 1984, p. 140.

26.   Scherdin, 1984, p. 142.

27.   Goodlad, 1990, p. xiii

How reading and writing make you smarter, or, how smart people read and write

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To explain how reading and writing make you smarter, I first have to discuss how we get smart. To do this, I present a model derived largely from some current work in cognitive psychology, Graham Wallas's *The Art of Thought*, published in 1926 (with some help from Frank Smith's *Comprehension and Learning*). According to this model, we go through five stages[1] in thinking and creating new ideas:

(1) Gathering ideas. This takes place through reading and listening, or may be the result of the entire five-stage thinking process.

(2) Preparing ideas. In order to come up with new ideas, we first have to prepare, or clarify, our current ideas and the problem we are working on. Wallas (1926:44) states: "our mind is not likely to give us a clear answer to any particular problem unless we set it a clear question." Elbow (1972:129) may be referring to the same stage when he discusses "wrestling with ideas" and "perception of a major mess" (131).

(3) Incubation. In this stage, the mind goes about solving the problem. Elbow (1972, 1981) refers to this as 'cooking'. Incubation occurs subconsciously and automatically. When given a clearly stated problem, we involuntarily attempt to solve it.

(4) Illumination. Illumination is the emergence of a new idea, the result of incubation. It is often perceived by the thinker as a sudden insight ('Eureka').

(5) Verification. Ideas that emerge from the incubation stage are 'fragile' and easily forgotten. To enter long-term memory they need to be confirmed. This happens when the thinker notes that he or she has arrived at the same idea from a different source, or when he or she discovers that someone else has the same idea, through reading or listening.

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[1] Actually, stages 2-5 come directly from Wallas (1926), and Wallas credits Helmholz for stages 2, 3 and 4. I added stage 1.

Wallas (1926:42) points out that the five stages can overlap:

. . . a physiologist watching an experiment, or a business man going through his morning's letters, may, at the same time be 'incubating' on a problem which he proposed to himself a few days ago, be accumulating knowledge in 'preparation' for a second problem, and be 'verifying' his conclusion on a third problem. Even in exploring the same problem, the mind may be unconsciously employed in preparing or verifying another aspect.

A very exciting hypothesis is that the five-stage process outlined here is the gateway to long-term memory and the development of new cognitive structures. In other words, we learn by solving problems, and not by deliberate study.

There is both informal and formal evidence supporting this hypothesis. I begin with the informal evidence because, in my opinion, it is much more convincing.

The Fox Hills Mall. It has been said that if Americans are not at home or at work, the third most likely place you will find them is in a shopping mall. I live near the Fox Hills Mall in Culver City, California, and my experiences in this mall lend support to the hypothesis that we learn by problem solving.

After some reflection, I have come to the conclusion that I probably know about 1,000 facts about the Fox Hills Mall (and I am sure that you know about 1,000 facts about your shopping mall). I won't list them all, just enough to make the point:

- I know where the Fox Hills Mall is (corner of Slausen and Sepulveda, underneath the world's shortest freeway). Nearby is a Shakey's Pizza and a branch of First Federal Bank.
- I know where to park at the Fox Hills Mall. There are at least 20 options for parking, and each option has its own consequences.
- I know where the telephones are (the ones in the center of the mall are usually either broken or in use; I recommend you use the ones in May Company), and I know where the bathrooms are (actually, I only know where the men's rooms are; there is one in the baby section of Penney's).
- I know a great deal about some of the stores in the mall, and practically nothing about the others. Of course, I know about the stores I have shopped in. I know how much it costs to rent a tuxedo, how to order a pizza at Round Table Pizza, where the fiction section is in two different bookstores, and whether Lenscraft will really give you a new pair of glasses in one hour.

Where did I get this encyclopedic detailed knowledge? I never studied! The manager of the mall does not give shoppers a manual describing the mall,

and require them to get at least 80% correct on a test before they are allowed to shop. I got my knowledge of my mall the same way you learned about your mall—by finding a telephone, by buying things . . . by solving problems.

This is clearly the way all experts gain their detailed knowledge of their fields. Linus Pauling, I am sure, did not gain his encyclopedic knowledge of chemistry by studying flashcards.

As Frank Smith has pointed out (Smith 1988), the 'laws of learning' are irrelevant when we are involved in real problem solving: The man proposes to the woman. He doesn't ask her, five minutes later, what her answer was, claiming he forgot. When the information solves a problem, when it is relevant, one repetition is often enough.

Research evidence. Scientific evidence for the hypothesis that we learn by problem solving comes from studies of 'incidental learning'. Here are some examples of this research.

Hyde and Jenkins (1969) presented subjects with written words that were flashed for a brief amount of time, not long enough for the subjects to examine the words in detail. One group of subjects was asked to estimate the number of letters in the word (the 'count' group). A second group was asked to determine whether the letter *e* was in the word (*e-search*). A third group was asked to rate the words as to their 'pleasantness' (e.g. people would probably rate *tree* as more pleasant than *tire*). Hyde and Jenkins then surprised their subjects by asking them to recall as many of the words as they could. As you might expect, the 'pleasantness' group remembered the most words.

The pleasantness group also did just as well as a fourth group that deliberately tried to remember the words. In other words, 'incidental' learning was shown to be just as effective as 'intentional' learning, if the problem that the incidental learners are solving is interesting enough.

Wilson and Bransford (reported in Bransford 1979) did a similar study, but added another condition, the 'desert island' condition: They asked subjects to rate how important the objects denoted by the presented words (nouns) would be on a desert island. The 'desert island' subjects remembered the words better than the group that deliberately studied.

Wilson and Bransford's results are very important: They show that incidental learning can be more effective than intentional learning. In other words, they broke the intentional learning barrier.

In my opinion, it is very easy to break the intentional learning barrier. Many things we do in everyday life, many problems we solve (such as

shopping in the Fox Hills Mall), are more interesting than the 'desert island' condition in Wilson and Bransford's study.[2]

We now turn to the main point of this paper: how reading and writing make you smarter. To reveal the punch line early, I am going to claim that to at least some extent, 'smart people' are people who have learned to read and write in ways that are consistent with the five-stage process. They use reading and writing, in other words, to solve problems. And in order to do this, they have had to overcome the lessons they learned in school.

Reading and cognitive development. There is little doubt that reading influences cognitive development, but surprisingly, it is difficult to find direct evidence. Ravitch and Finn (1987), in their study *What Do Our 17-Year-Olds Know?*, found that those 17-year-olds who knew more, read more: Those who lived in a richer print environment did better overall on tests of history and literature, and there was a clear relationship between amount of reported leisure reading and performance on the literature test.

Studies of 'good thinkers' also give us some reason to believe that reading makes you smarter. Good thinkers, however they are defined, read a great deal and have read a great deal. Simonton (1988:111) concludes that 'omnivorous reading in childhood and adolescence correlates positively with ultimate adulthood success." Schaefer and Anastasi (1968) reported that high school students considered to be creative read more than average students, with more creative students reporting that they read over 50 books per year. Emery and Csikszentmihalyi (1982) compared 15 men of blue-collar background who became college professors with 15 men of very similar background who grew up to be blue-collar workers. The future professors lived in a much more print-rich environment and did far more reading when they were young.

It thus appears to be the case that good thinkers, as a group, read more than the general population does. After a certain point, however, the relationship between amount of reading done and thinking is less clear. Goertzel, Goertzel and Goertzel (1978) studied 300 "eminent personalities of our age" (subjects of biographies published after 1962 in the Menlo Park Library), and reported that almost half of the group were "omnivorous readers" (11). Simonton (1984) did a reanalysis of this data, however, and found only a 0.12 correlation between "achieved eminence" and amount of reading done. Van Zelst and Kerr (1951) reported a modest 0.26 correlation between number of professional journals read regularly and productivity (published papers and inventions) in a sample of scientists (age partialed out). They also reported that the relationship between reading and productivity

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[2] Experimental evidence also suggests that problem solving is more potent for learning than additional effort or 'hard work' (Walsh and Jenkins 1971), than additional 'time on task' (Craik and Tulving 1975), than additional exposures, or repetitions of a stimulus (Bobrow and Bower 1969), and is more potent than additional reward (Craik and Tulving 1975).

resulted in a bimodal curve—some less productive scientists read a great deal. Apparently, good thinkers do read a lot, but it is possible to overread. Wallas (1926:48) was aware of this, noting that "industrious passive reading" may interfere with incubation.

What may be crucial is not simply reading a lot—but rather, reading selectively—reading what you need to read to solve the problem you are working on now. Brazerman (1985) provides support for this idea. Brazerman examined the reading habits of top physicists, and reported that they read a great deal, visiting the library frequently to keep up with current research literature. They distinguished, however, between "core" and "peripheral" reading, reading carefully only what was relevant to their interests at the time.

It may be the case that reading is only useful to us when it is relevant to a problem we are working on, when it functions as either stage 1 (gathering ideas) or stage 5 (verification). When we read selectively to solve a problem, and we go through Wallas's stages, we remember what we read. When we read material that is irrelevant, we don't remember it. This is certainly my experience. I have, it seems, nearly total recall for some articles and books I read years ago. Quite often, however, I run across an article or book on my shelf that has my underlining in it, my notes in the margin, and I have no conscious memory whatsoever of having read it, even if the book or journal is fairly recent. Whenever this happens, it is something I read because I felt I should read it, not something that related to a problem I was working on at the time.

Glueck and Jauch (1975) provide evidence that suggests that good thinkers read primarily for stage 5, not stage 1. They found that productive scientists did get some ideas from professional journals, but relied more on their own ideas and previous work as input for their thinking.

School. School tells us the opposite. School does not encourage selective reading for problem solving, but tells us that all reading is core reading, and that we should deliberately try to remember what we read. School does this by assigning a certain amount of reading for each class, and by testing us on our reading. This works against cognitive development. Consider what happens when you have a 25-page assignment to read in one evening. You read the first paragraph on the first page, and, stimulated by what you read, you get an idea: incubation takes place. Ideally, you should stop reading and write the idea down (see discussion of the role of writing in stage 4, illumination, below). But you have 24 and a half pages to go! You can't stop, or you won't finish the assignment on time.

The problem is, in other words, that incubation and illumination occur beyond our conscious control and can happen any time. When we have rigid reading assignments, new ideas, instead of being welcomed, are an annoyance. Good thinkers need to overcome the lessons they learned in school.

Writing and cognitive development. Writing makes its contribution to cognitive development in stage 2, preparation. When we write, we attempt to represent our cognitive structures, our current thoughts, on the page. The act of doing this is a powerful stimulus toward creating new cognitive structures, new ideas. In terms of Wallas's model, writing prepares our thoughts for incubation.

Growing evidence suggests that certain writing activities such as note taking, summary writing, and answering comprehension questions help learning. According to Ladas (1980:616), "the preponderance of evidence strongly favors note taking"; students who take notes during lectures typically retain more than those who do not. Similarly, several studies show that students who write summaries of what they read or hear remember more than those who do not (Doctorow, Wittrock, and Marks 1978; Bretzing and Kulhavy 1979; Peper and Meyer 1986); studies also show that answering comprehension questions is more effective in promoting learning than requiring multiple-choice responses (Anderson and Biddle 1975, cited in Langer and Applebee 1987). In these studies, however, the full benefit of writing is not tapped, since real problem solving is typically not involved.

In a series of studies, Langer and Applebee (1987) came closer to showing the impact of writing on thinking. Their third study is, in my view, the most revealing. Ninth and eleventh graders were asked to read two social studies passages. One group simply read the passages (READ & STUDY), another answered comprehension questions, another wrote a summary of each passage, and another wrote an essay that required them to "reformulate and extend" the material from the passage (104).

Subjects were given a variety of tests, including a "topic knowledge" test developed by Langer. In this test, subjects were asked to provide written associations to concepts selected from the passages they read, and their responses were scored for both amount of knowledge and organization (117). The topic knowledge test was given the day after the reading and again five days later.

The results for passage 1 (Table 1, Langer and Applebee's Table 20) appear to be contrary to the hypothesis that writing leads to more learning. Those who simply read the text and did not write (READ & STUDY) did just as well as those who wrote essays, and nearly as well as the comprehension question and summary groups. Langer and Applebee point out, however, that passage 1 was fairly easy to understand. Passage 2 was harder, and the results were different. On passage 2, essay writers did the best, and the read and study group actually did worse than those who didn't read the passage at all (control group). These results suggest that writing, especially essay writing, works best when problem solving is involved. As Langer and Applebee

conclude, "if content is familiar and relationships are well-understood, writing may have no major effect at all" (131).[3]

Table 1. Results of "topic knowledge" test.[4]

	CONTROL	READ & STUDY	COMPREHENSION QUESTION	SUMMARY	ESSAY
PASSAGE 1 CONCEPTS					
Day 2	4.3	7.5	8.2	8.4	7.3
Day 6	4.7	7.6	7.8	6.4	7.4
PASSAGE 2 CONCEPTS					
Day 2	4.9	3.7	9.4	7.3	12.1
Day 6	4.7	3.7	9.2	6.3	11.8

Even the essay written in response to the second passage does not reveal the full power of writing, however. Subjects were given only 20 minutes to write the essay, and the topic was assigned. We would get a better picture of what writing can do if we examine real writing, done by real writers, solving real problems that are important to them. The framework presented here predicts that this kind of writing results in exceptional learning, both of new concepts and new facts.

Some evidence that appears to support this prediction comes from studies of scientific and artistic achievement. It is well established that good thinkers produce a great deal: "Voluminous productivity is the rule and not the exception among the individuals who have made some noteworthy contribution" (Barron, cited in Simonton 1988:60).

Simonton (1988:60) provides some striking examples: "Darwin could claim 119 publications at the close of his career, Einstein 248, and, in psychology Galton 227, Binet 277, James 307, Freud 330 and Maslow 165. . ." Simonton also reports (84) that correlations between total productivity and

citation counts range from 0.47 to 0.76 and provides additional data showing that quality and quantity of work are related. Is this also evidence that writing makes you smarter?

There are some problems with this hypothesis. An obvious one is that good thinkers are typically recognized as good thinkers early in their careers, before producing much for public view. It may be the case, however, that these good thinkers wrote a great deal privately before their work was known.

Another problem is the common perception that good thinkers do their best work when they are young. Simonton (1984:94-99), however, reports that quantity of work declines only slightly with age, and quality remains constant. It may be that quality actually increases with age. Simonton suggests that earlier contributions simply get more attention:

. . . later creative offerings may not be perceived by the scientific community to be nearly as innovative as the initial milestones, yet this perception may be partly an illusion of contrast. It may be precisely because the early efforts have revolutionized the field so thoroughly that the later works, being interpreted in the new context, may seem to lack any revolutionary quality (1984:99).

Simonton notes that Einstein's general theory of relativity is "a contribution no less revolutionary than the special theory," produced ten years earlier. But the special theory "had changed the way scientists viewed the universe," making the general theory "look less momentous than it was" (100).

An aspect of the 'composing process' that appears to be particularly effective for problem solving and thinking is revision. Sommers (1980) has confirmed that experienced writers understand that their early drafts are tentative, and that as they go from draft to draft they come up with new ideas. Average and remedial writers don't know this. They think that all of their ideas are in their outline or first draft, and regard revision as simply making a neater version of the first draft. They do not know that in writing, "meaning is not what you start out with but what you end up with" (Elbow 1973).[5]

Some good advice. We can supplement the empirical evidence on the impact of writing on thinking with some advice offered by Elbow and Wallas.

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[3] Results of think-aloud protocol analysis done with eight subjects revealed that those who answered comprehension questions simply "searched the passage for the correct response, copied it . . . and never rethought that response or returned to it to change an answer . . ." (121). Summary writers searched for more relationships than did those who answered comprehension questions, but tended to maintain the temporal order of the text in their summary. Essay writers, however, used the text "to corroborate rather than find the ideas they wanted to write about" (121), thus using reading for stage 5, verification. Langer and Applebee also reported that while essay writers "dealt directly with a smaller proportion of the content in the original passage, they worked more extensively with the information they did use." Results of Langer and Applebee's second study showed that essay writers paid more attention to "generating, integrating, and evaluating the ideas they were considering . . ." (98) and "engaged in more complex thought" (101).

[4] From Langer and Applebee 1987:129.

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[5] Not all creators engage in extensive revision, however. Mozart remarked that: "When I proceed to write down my ideas, I take out of the bag of my memory, if I may use that phrase, what has been previously collected into it . . . for this reason the committing to paper is done quickly enough, for everything is . . . already finished; and it rarely differs on paper from what it was in my imagination" (from Vernon 1970:55-56). Tchaikovsky, on the other hand, revised a great deal, but his efforts were largely directed at conforming to standard musical form. His musical thoughts always appeared "exactly as you heard it," but later, "what has been set down in a moment of ardour must now be critically examined, improved, extended, or condensed, as the form requires" (Vernon 1970:59).

Elbow (1981) discusses the value of writing for stage 2, preparation. He advises writers to start writing before gathering data, noting that the writing itself will encourage incubation:

> ... if there's something you know you have to write, it pays to start it as early as you can. ... Having done this, you'll find that many extraneous events during the next few days or weeks will trigger new thinking about your topic (1981:354).[6]

Wallas (1926) makes a similar point. If you are writing, for example, part 2 of a four-part paper or report, and you get an idea that belongs in part 4, Wallas advises you to write this "fringe-thought" down:

> Sometimes the mere fact of writing the fringe-thought down seems to set the subconscious mind to work on it; and the thought reappears at the end of the week further developed, and accompanied by an indication of its place in the main problem on which one is engaged ... thoughts which first appeared to be scattered and unconnected will often tend to grow out towards each other and to form new and unexpected connections (1926:84).

In other words, by the time you get to part 4, incubation will have taken place.

Until now, I have been discussing the role of writing in stage 2, preparation. Wallas points out that writing is also valuable in stage 4, illumination. When a new idea first occurs to a thinker, before it is verified it is fragile, and should be recorded:

> In modern life, the range of observations and memory which may start a new thought-train is so vast that it is almost incredibly easy to forget some thought and never again pick up the train which led to it. The story may be true which tells of the man who had so brilliant an idea that he went into his garden to thank God for it, found on rising to his knees that he had forgotten it, and never recalled it (85).

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[6] Elbow (1981:64) also points out that early writing also helps writers overcome a common problem: "The more research you do, the more impossible it is to start writing. You already have so much material ... that you can't find a place to start, you can't find a beginning to grab hold of in that tangled ball of string ... Writing first thoughts or prejudices or an instant version keeps you from falling into this research paralysis. Have the sense to realize it's easier to write now when you know less. You can then use subsequent research to check your thinking and to revise your writing to any level of sophistication that you wish. If you do write first thoughts or prejudices or an instant version ... you will be able to get much more out of any reading and research you have to do for your paper."

School. School teaches us the opposite. School teaches us that we write to display what we already know, not to discover new ideas. In-class essays and essay exams that need to be done, start to finish, in one class period, actually penalize students for coming up with new ideas while writing.

Recall your history class in high school. Your sit-down exam question was to give three reasons for the start of World War II. You thought of three reasons and began to write. Midway through your second reason, stimulated by your writing, incubation and illumination took place, and you thought of three better, more valid reasons for the start of World War II. You look at the clock, however, and see that you have only ten minutes left. You have to suppress your new ideas and finish writing out the original three reasons, or you will fail the exam.

This kind of thing happens in school not once, but thousands of times, and students learn that writing functions merely to show what they already know. Once again, good thinkers need to overcome the lessons they learned in school.[7]

Conclusions. I have argued elsewhere that reading is the primary source of our competence in writing style and grammar (Krashen 1984) as well as vocabulary and spelling (Krashen 1989). Figure 1 attempts to combine these hypotheses with the hypotheses presented in this paper. What remains to be discussed is what goes to the left of Reading and Writing in Figure 1: what we should do in class. Certainly, we need to encourage a great deal of free reading. Reading stimulates language development, and makes a significant contribution to cognitive development.

But what do we read about in school, what do we write about, what do we discuss? Smith (1988) suggests the answer: "Enterprises." Enterprises are problems—real, not realistic, problems that students genuinely want to solve, problems that naturally entail reading, writing and discussion (see footnote 7).

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[7] Some may argue that since students will be forced to do timed writing later on, they should get practice in doing it in school. This argument does not hold, in my view. In the real world, writing under extreme time pressure is rare. Usually, only journalists have to do it. Moreover, even if writing under time pressure is demanded, the way to develop strategies for doing it is, I suspect, through plenty of motivated reading (for the acquisition of style; Krashen 1984) and untimed writing that is aimed at real problem solving.

The focus of this paper is on reading and writing, but I do not mean to discount the value of oral language for problem solving. There is good reason to believe that discussion can serve problem solving very well. We can get new ideas in discussion (stage 1), verify our ideas (stage 5), and, as Elbow (1973:49) points out, we can also prepare ideas for incubation in discussion:

> If you are stuck writing or trying to figure something out, there is nothing better than finding one person, or more, to talk to. If they don't agree or have trouble understanding, so much the better—so long as their minds are not closed. This explains what happens to me and many others countless times; I write a paper; it's not very good; I discuss it with someone; after fifteen minutes of back-and-forth I say something in response to a question or argument of his and he says, "But why didn't you say that? That's good. That's clear."

Figure 1.
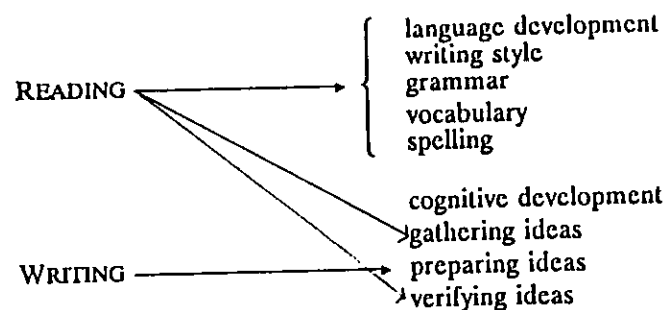
Finding the right enterprises is, in my view, a major goal of the teaching profession. Enterprises may include a chemistry class project in which students analyze the water in the community (and publish the results in the local newspaper), writing a history of the community that will become the official history and be on public record, running a small business (and keeping the profits), and writing book reviews that remain in the school library permanently for student use, rather than writing book reports.

Figure 2 expands Figure 1, adding enterprises and free reading. An important characteristic of Figure 2 is that the arrow goes from left to right, not from right to left. As Smith (1988) has pointed out, we have confused cause and effect in education. We do not learn parts of language and 'facts' so that we can eventually read and work on problems. We read for interest and pleasure and we engage in problem solving, real enterprises; language acquisition and intellectual development occur as a result.

Figure 2.
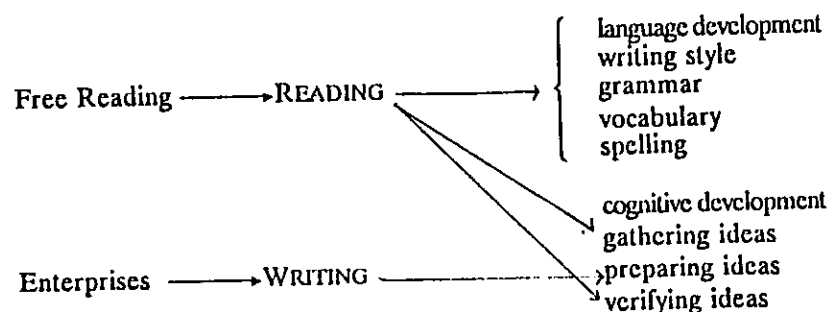
Obstacles. If we are going to use enterprises in school, we face tremendous obstacles. The major obstacle is that most people, the

professionals as well as the public, have a view of learning that is quite different from the one presented here.

Danskin and Burnett's (1952) article, "Study techniques of those superior students," illustrates the point of view of some professionals. Danskin and Burnett analyzed the study habits of 37 university students. Every student in their sample was an excellent student, ranking in the top 12 of the class.

Danksin and Burnett were quite disappointed with these students' study habits. Contrary to what is advised in study-skill courses and books, 81% of the students waited until the last minute to study before tests, and only 8% attempted to guess the questions on the test. While most study-skills books recommend that students study in a hard chair, 41% of this sample said they studied in an easy chair or in bed, while 14% said they didn't care where they studied. While most study-skills books recommend that students carefully schedule their time, 48% of this sample said they studied when they had the time, and only 11% said they had a schedule.

In the face of this contradictory data, Danskin and Burnett, undaunted, concluded that these students, even though they were successful, could use a good course in study skills!

According to the framework presented here, Danskin and Burnett's results confirm that "study skills" are not crucial. Far more important than how students schedule their day, when they study, and what kind of chair they sit in, is what they focus on mentally—whether or not they are involved in real problem solving. This was confirmed by Bloom (1963), who studied former graduate students at the University of Chicago who finished their Ph.D.s and went on to successful research careers. Bloom reported that one characteristic of these successful students was an involvement with problem solving during their graduate school careers, a "preoccupation with problems rather than with the subject matter of courses . . . the relatively complete acceptance of the role of research worker and scholar (rather than the role of student) . . ." (257-58).

The public seems to equate reading and writing with study, not problem solving. (Perhaps they get this attitude from TV; Captain Kirk and Mr. Spock solved their problems by discussion and by action, not reading and writing.) I see evidence of this all the time. I do a fair amount of reading and writing in public, on airplanes, while waiting in offices, etc. Occasionally, a friendly person will see me working, or just see my books and notebook, and ask: "Are you studying for a test?"[8]

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* Or, more recently: "Are you in law school?"

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Why teach gramma

Louis G. Alexander
Author, London, England

0 **Trouble-shooting.** The publishing event: the appearan. *Portuguese and English* by Pe America simultaneously. No le first American edition in the fol there is, at any rate, one thing certainty: and that is, that thi while the English language lasts immortal phrase *English as she* remembered.

I would like to begin with terms we would describe as a master of the house is still in b The visitor is admitted by a serv the following conversation take *in the morning.*

—Is your master at home?
—Yes, sir.
—Is it up?
—No, sir, he sleep yet.
—I go make that he get u
—It come in one's? How
—Yesterday at evening, I soon that morning.
—Well! What you done
—We have sung, danced,
—What game?
—To the picket.
—Whom I am sorry do r
—I had gained ten lewis

Margaret Kantz

Helping Students Use Textual Sources Persuasively

Although the researched essay as a topic has been much written about, it has been little studied. In the introduction to their bibliography, Ford, Rees, and Ward point out that most of the over 200 articles about researched essays published in professional journals in the last half century describe classroom methods. "Few," they say, "are of a theoretical nature or based on research, and almost none cites even one other work on the subject" (2). Given Ford and Perry's finding that 84% of freshman composition programs and 40% of advanced composition programs included instruction in writing research papers, more theoretical work seems needed. We need a theory-based explanation, one grounded in the findings of the published research on the nature and reasons for our students' problems with writing persuasive researched papers. To understand how to teach students to write such papers, we also need a better understanding of the demands of synthesis tasks.

As an example for discussing this complex topic, I have used a typical college sophomore. This student is a composite derived from published research, from my own memories of being a student, and from students whom I have taught at an open admissions community college and at both public and private universities. I have also used a few examples taken from my own students, all of whom share many of Shirley's traits. Shirley, first of all, is intelligent and well-motivated. She is a native speaker of English. She has no extraordinary knowledge deficits or emotional problems. She comes from a home where education is valued, and her parents do reading and writing tasks at home and at their jobs. Shirley has certain skills. When she entered first grade, she knew how to listen to and tell stories, and she soon became proficient at reading stories and at writing narratives. During her academic life, Shirley has learned such studying skills as finding the main idea and remembering facts. In terms of the relevant research, Shirley can read and summarize source texts accurately (cf. Spivey; Winograd). She can select material that is relevant for her purpose in writing (Hayes, Waterman, and Robinson; Langer). She can make connections between the available information and her purpose for writing, including the needs of her readers when the audience is specified (Atlas). She can make original connec-

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tions among ideas (Brown and Day; Langer). She can create an appropriate, audience-based structure for her paper (Spivey), take notes and use them effectively while composing her paper (Kennedy), and she can present information clearly and smoothly (Spivey), without relying on the phrasing of the original sources (Atlas; Winograd). Shirley is, in my experience, a typical college student with an average academic preparation.

Although Shirley seems to have everything going for her, she experiences difficulty with assignments that require her to write original papers based on textual sources. In particular, Shirley is having difficulty in her sophomore-level writing class. Shirley, who likes English history, decided to write about the Battle of Agincourt (this part of Shirley's story is biographical). She found half a dozen histories that described the circumstances of the battle in a few pages each. Although the topic was unfamiliar, the sources agreed on many of the facts. Shirley collated these facts into her own version, noting but not discussing discrepant details, borrowing what she assumed to be her sources' purpose of retelling the story, and modelling the narrative structure of her paper on that of her sources. Since the only comments Shirley could think of would be to agree or disagree with her sources, who had told her everything she knew about the Battle of Agincourt, she did not comment on the material; instead, she concentrated on telling the story clearly and more completely than her sources had done. She was surprised when her paper received a grade of C−. (Page 1 of Shirley's paper is given as Appendix A.)

Although Shirley is a hypothetical student whose case is based on a real event, her difficulties are typical of undergraduates at both private and public colleges and universities. In a recent class of Intermediate Composition in which the students were instructed to create an argument using at least four textual sources that took differing points of view, one student, who analyzed the coverage of a recent championship football game, ranked her source articles in order from those whose approach she most approved to those she least approved. Another student analyzed various approaches taken by the media to the Kent State shootings in 1970, and was surprised and disappointed to find that all of the sources seemed slanted, either by the perspective of the reporter or by that of the people interviewed. Both students did not understand why their instructor said that their papers lacked a genuine argument.

The task of writing researched papers that express original arguments presents many difficulties. Besides the obvious problems of citation format and coordination of source materials with the emerging written product, writing a synthesis can vary in difficulty according to the number and length of the sources, the abstractness or familiarity of the topic, the uses that the writer must make of the material, the degree and quality of original thought required, and the extent to which the sources will supply the structure and purpose of the new paper. It is usually easier to write a paper that uses all of only one short source on a familiar topic than to write a paper that selects material from many long sources on a topic that one must learn as one reads and writes. It is easier to quote than to paraphrase, and it is easier to build the paraphrases, without comment or with random comments, into a description of what one found than it is to use them as

evidence in an original argument. It is easier to use whatever one likes, or everything one finds, than to formally select, evaluate, and interpret material. It is easier to use the structure and purpose of a source as the basis for one's paper than it is to create a structure or an original purpose. A writing-from-sources task can be as simple as collating a body of facts from a few short texts on a familiar topic into a new text that reproduces the structure, tone, and purpose of the originals, but it can also involve applying abstract concepts from one area to an original problem in a different area, a task that involves learning the relationships among materials as a paper is created that may refer to its sources without resembling them.

Moreover, a given task can be interpreted as requiring an easy method, a difficult method, or any of a hundred intermediate methods. In this context, Flower has observed, "The different ways in which students [represent] a 'standard' reading-to-write task to themselves lead to markedly different goals and strategies as well as different organizing plans" ("Role" iii). To write a synthesis, Shirley may or may not need to quote, summarize, or select material from her sources; to evaluate the sources for bias, accuracy, or completeness; to develop original ideas; or to persuade a reader. How well she performs any of these tasks—and whether she thinks to perform these tasks—depends on how she reads the texts and on how she interprets the assignment. Shirley's representation of the task, which in this case was easier than her teacher had in mind, depends on the goals that she sets for herself. The goals that she sets depend on her awareness of the possibilities and her confidence in her writing skills.

Feeling unhappy about her grade, Shirley consulted her friend Alice. Alice, who is an expert, looked at the task in a completely different way and used strategies for thinking about it that were quite different from Shirley's.

"Who were your sources?" asked Alice. "Winston Churchill, right? A French couple and a few others. And they didn't agree about the details, such as the sizes of the armies. Didn't you wonder why?"

"No," said Shirley. "I thought the history books would know the truth. When they disagreed, I figured that they were wrong on those points. I didn't want to have anything in my paper that was wrong."

"But Shirley," said Alice, "you could have thought about why a book entitled *A History of France* might present a different view of the battle than a book subtitled *A History of British Progress*. You could have asked if the English and French writers wanted to make a point about the history of their countries and looked to see if the factual differences suggested anything. You could even have talked about Shakespeare's *Henry V*, which I know you've read—about how he presents the battle, or about how the King Henry in the play differs from the Henrys in your other books. You would have had an angle, a problem. Dr. Boyer would have loved it."

Alice's representation of the task would have required Shirley to formally select and evaluate her material and to use it as proof in an original argument. Alice was suggesting that Shirley invent an original problem and purpose for her paper and create an original structure for her argument. Alice's task is much more sophisticated than Shirley's. Shirley replied, "That would take me a year

to do! Besides, Henry was a real person. I don't want to make up things about him."

"Well," said Alice, "You're dealing with facts, so there aren't too many choices. If you want to say something original you either have to talk about the sources or talk about the material. What could you say about the material? Your paper told about all the reasons King Henry wasn't expected to win the battle. Could you have argued that he should have lost because he took too many chances?"

"Gee," said Shirley, "That's awesome. I wish I'd thought of it."

This version of the task would allow Shirley to keep the narrative structure of her paper but would give her an original argument and purpose. To write the argument, Shirley would have only to rephrase the events of the story to take an opposite approach from that of her English sources, emphasizing what she perceived as Henry's mistakes and inserting comments to explain why his decisions were mistakes—an easy argument to write. She could also, if she wished, write a conclusion that criticized the cheerleading tone of her British sources.

As this anecdote makes clear, a given topic can be treated in more or less sophisticated ways—and sophisticated goals, such as inventing an original purpose and evaluating sources, can be achieved in relatively simple versions of a task. Students have many options as to how they can fulfill even a specific task (cf. Jeffery). Even children can decide whether to process a text deeply or not, and purpose in reading affects processing and monitoring of comprehension (Brown). Pichert has shown that reading purpose affects judgments about what is important or unimportant in a narrative text, and other research tells us that attitudes toward the author and content of a text affect comprehension (Asch; Hinze; Shedd; Goldman).

One implication of this story is that the instructor gave a weak assignment and an ineffective critique of the draft (her only comment referred to Shirley's footnoting technique; cf. Appendix A). The available research suggests that if Dr. Boyer had set Shirley a specific rhetorical problem such as having her report on her material to the class and then testing them on it, and if she had commented on the content of Shirley's paper during the drafts, Shirley might well have come up with a paper that did more than repeat its source material (Nelson and Hayes). My teaching experience supports this research finding. If Dr. Boyer had told Shirley from the outset that she was expected to say something original and that she should examine her sources as she read them for discrepant facts, conflicts, or other interesting material, Shirley might have tried to write an original argument (Kantz, "Originality"). And if Dr. Boyer had suggested that Shirley use her notes to comment on her sources and make plans for using the notes, Shirley might have written a better paper than she did (Kantz, "Relationship").

Even if given specific directions to create an original argument, Shirley might have had difficulty with the task. Her difficulty could come from any of three causes: 1) Many students like Shirley misunderstand sources because they read them as stories. 2) Many students expect their sources to tell the truth; hence, they equate persuasive writing in this context with making things up. 3) Many

type of discourse may pertain more to a particular point of the triangle than to the others, e.g., a diary entry may exist primarily to express the thoughts of the writer (the Encoder); an advertisement may exist primarily to persuade a reader (the Decoder). Following Kinneavy, I posit particular goals for each corner of the triangle. Thus, the primary goal of a writer doing writer-based discourse such as a diary might be originality and self-expression; primary goals for reader-based discourse such as advertising might be persuasion; primary goals for topic-based discourse such as a researched essay might be accuracy, completeness, and mastery of subject matter. Since all three aspects of the rhetorical situation are present and active in any communicative situation, a primarily referential text such as Churchill's *The Birth of Britain* may have a persuasive purpose and may depend for some of its credibility on readers' familiarity with the author. The term "rhetorical reading," then (cf. Haas and Flower), means teaching students to read a text as a message sent by someone to somebody for a reason. Shirley, Mary, and Charlie are probably practiced users of rhetorical persuasion in non-academic contexts. They may never have learned to apply this thinking in a conscious and deliberate way to academic tasks (cf. Kroll).

The concept of rhetorical situation offers insight into the nature of students' representations of a writing task. The operative goals in Shirley's and Alice's approaches to the term paper look quite different when mapped onto the points on the triangle. If we think of Shirley and Alice as Encoders, the topic as Reality, and Dr. Boyer as the Decoder, we can see that for Shirley, being an Encoder means trying to be credible; her relationship to the topic (Reality) involves a goal of using all of the subject matter; and her relationship to the Decoder involves an implied goal of telling a complete story to a reader whom Shirley thinks of as an examiner—to use the classic phrase from the famous book by Britton et al.— i.e., a reader who wants to know if Shirley can pass an exam on the subject of the Battle of Agincourt. For Alice, however, being an Encoder means having a goal of saying something new; the topic (Reality) is a resource to be used; and the Decoder is someone who must be persuaded that Alice's ideas have merit. Varying task representations do not change the dimensions of the rhetorical situation: the Encoder, Decoder, and Reality are always present. But the way a writer represents the task to herself does affect the ways that she thinks about those dimensions—and whether she thinks about them at all.

In the context of a research assignment, rhetorical skills can be used to read the sources as well as to design the paper. Although teachers have probably always known that expert readers use such strategies, the concept of rhetorical reading is new to the literature. Haas and Flower have shown that expert readers use rhetorical strategies "to account for author's purpose, context, and effect on the audience . . . to recreate or infer the rhetorical situation of the text" (176; cf. also Bazerman). These strategies, used in addition to formulating main points and paraphrasing content, helped the readers to understand a text more completely and more quickly than did readers who concentrated exclusively on content. As Haas and Flower point out, teaching students to read rhetorically is difficult. They suggest that appropriate pedagogy might include "direct instruction . . . modeling, and . . . encouraging students to become contributing and

committed members of rhetorical communities" (182). One early step might be to teach students a set of heuristics based on the three aspects of the communicative triangle. Using such questions could help students set goals for their reading.

In this version of Kinneavy's triangle, the Encoder is the writer of the source text, the Decoder is the student reader, and Reality is the subject matter. Readers may consider only one point of the triangle at a time, asking such questions as "Who are you (i.e., the author/Encoder)?" or "What are the important features of this text?" They may consider two aspects of the rhetorical situation in a single question, e.g., "Am I in your intended (primary) audience?"; "What do I think about this topic?"; "What context affected your ideas and presentation?" Other questions would involve all three points of the triangle, e.g., "What are you saying to help me with the problem you assume I have?" or "What textual devices have you used to manipulate my response?" Asking such questions gives students a way of formulating goals relating to purpose as well as content.

If Shirley, for example, had asked a Decoder-to-Encoder question—such as "Am I in your intended audience?"—she might have realized that Churchill and the Guizots were writing for specific audiences. If she had asked a Decoder-to-Reality question—such as "What context affected your ideas and presentation?"—she might not have ignored Churchill's remark, "All these names [Amiens, Boves, Bethencourt] are well known to our generation" (403). As it was, she missed Churchill's signal that he was writing to survivors of the First World War, who had vainly hoped that it would be war to end all wars. If Shirley had used an Encoder-Decoder-Reality question—such as "What are you saying to help me with the problem you assume I have?"—she might have understood that the authors of her sources were writing to different readers for different reasons. This understanding might have given her something to say. When I gave Shirley's source texts to freshmen students, asked them to use the material in an original argument, and taught them this heuristic for rhetorical reading, I received, for example, papers that warned undergraduates about national pride as a source of authorial bias in history texts.

A factual topic such as the Battle of Agincourt presents special problems because of the seemingly intransigent nature of facts. Like many people, Shirley believes that you can either agree or disagree with issues and opinions, but you can only accept the so-called facts. She believes that facts are what you learn from textbooks, opinions are what you have about clothes, and arguments are what you have with your mother when you want to stay out late at night. Shirley is not in a position to disagree with the facts about the battle (e.g., "No, I think the French won"), and a rhetorical analysis may seem at first to offer minimal rewards (e.g., "According to the Arab, Jewish, and Chinese calendars the date was really . . .").

Alice, who thinks rhetorically, understands that both facts and opinions are essentially the same kind of statement: they are claims. Alice understands that the only essential difference between a fact and an opinion is how they are received by an audience. (This discussion is derived from Toulmin's model of an

argument as consisting of claims proved with data and backed by ethical claims called warrants. According to Toulmin, any aspect of an argument may be questioned by the audience and must then be supported with further argument.) In a rhetorical argument, a fact is a claim that an audience will accept as being true without requiring proof, although they may ask for an explanation. An opinion is a claim that an audience will not accept as true without proof, and which, after the proof is given, the audience may well decide has only a limited truth, i.e., it's true in this case but not in other cases. An audience may also decide that even though a fact is unassailable, the interpretation or use of the fact is open to debate.

For example, Shirley's sources gave different numbers for the size of the British army at Agincourt; these numbers, which must have been estimates, were claims masquerading as facts. Shirley did not understand this. She thought that disagreement signified error, whereas it probably signified rhetorical purpose. The probable reason that the Guizots give a relatively large estimate for the English army and do not mention the size of the French army is so that their French readers would find the British victory easier to accept. Likewise, Churchill's relatively small estimate for the size of the English army and his high estimate for the French army magnify the brilliance of the English victory. Before Shirley could create an argument about the Battle of Agincourt, she needed to understand that, even in her history textbooks, the so-called facts are claims that may or may not be supported, claims made by writers who work in a certain political climate for a particular audience. She may, of course, never learn this truth unless Dr. Boyer teaches her rhetorical theory and uses the research paper as a chance for Shirley to practice rhetorical problem-solving.

For most of her academic life, Shirley has done school tasks that require her to find main ideas and important facts; success in these tasks usually hinges on agreeing with the teacher about what the text says. Such study skills form an essential basis for doing reading-to-write tasks. Obviously a student can only use sources to build an argument if she can first read the sources accurately (cf. Brown and Palincsar; Luftig; Short and Ryan). However, synthesizing tasks often require that readers not accept the authors' ideas. Baker and Brown have pointed out that people misread texts when they blindly accept an author's ideas instead of considering a divergent interpretation. Yet if we want students to learn to build original arguments from texts, we must teach them the skills needed to create divergent interpretations. We must teach them to think about facts and opinions as claims that are made by writers to particular readers for particular reasons in particular historical contexts.

Reading sources rhetorically gives students a powerful tool for creating a persuasive analysis. Although no research exists as yet to suggest that teaching students to read rhetorically will improve their writing, I have seen its effect in successive drafts of students' papers. As mentioned earlier, rhetorical reading allowed a student to move from simply summarizing and evaluating her sources on local coverage of the championship football game to constructing a rationale for articles that covered the fans rather than the game. Rhetorical analysis enabled another student to move from summarizing his sources to understanding

why each report about the Kent State shootings necessarily expressed a bias of some kind.

As these examples suggest, however, rhetorical reading is not a magical technique for producing sophisticated arguments. Even when students read their sources rhetorically, they tend merely to report the results of this analysis in their essays. Such writing appears to be a college-level version of the knowledge-telling strategy described by Bereiter and Scardamalia (*Psychology*) and may be, as they suggest, the product of years of exposure to pedagogical practices that enshrine the acquisition and expression of information without a context or purpose.

To move students beyond merely reporting the content and rhetorical orientation of their source texts, I have taught them the concept of the rhetorical gap and some simple heuristic questions for thinking about gaps. Gaps were first described by Iser as unsaid material that a reader must supply to/infer from a text. McCormick expanded the concept to include gaps between the text and the reader; such gaps could involve discrepancies of values, social conventions, language, or any other matter that readers must consider. If we apply the concept of gaps to Kinneavy's triangle, we see that in reading, for example, a gap may occur between the Encoder-Decoder corners when the reader is not a member of the author's intended audience. Shirley fell into such a gap. Another gap can occur between the Decoder-Reality corners when a reader disagrees with or does not understand the text. A third gap can occur between the Encoder-Reality points of the triangle if the writer has misrepresented or misunderstood the material. The benefit of teaching this concept is that when a student thinks about a writer's rhetorical stance, she may ask "Why does he think that way?" When a student encounters a gap, she may ask, "What effect does it have on the success of this communication?" The answers to both questions give students original material for their papers.

Shirley, for example, did not know that Churchill began writing *The Birth of Britain* during the 1930s, when Hitler was rearming Germany and when the British government and most of Churchill's readers ardently favored disarmament. Had she understood the rhetorical orientation of the book, which was published eleven years after the end of World War II, she might have argued that Churchill's evocation of past military glories would have been inflammatory in the 1930s but was highly acceptable twenty years later. A gap between the reader and the text (Decoder-Reality) might stimulate a reader to investigate whether or not she is the only person having this problem; a gap between other readers and the sources may motivate an adaptation or explanation of the material to a particular audience. Shirley might have adapted the Guizots' perspective on the French civil war for American readers. A gap between the author and the material (Encoder-Reality) might motivate a refutation.

To discover gaps, students may need to learn heuristics for setting rhetorical writing goals. That is, they may need to learn to think of the paper, not as a rehash of the available material, but as an opportunity to teach someone, to solve someone's problem, or to answer someone's question. The most salient questions for reading source texts may be "Who are you (the original audience of

Decoders)?''; ''What is your question or problem with this topic?''; and ''How have I (the Encoder) used these materials to answer your question or solve your problem?'' More simply, these questions may be learned as ''Why,'' ''How,'' and ''So what?'' When Shirley learns to read sources as telling not the eternal truth but a truth to a particular audience and when she learns to think of texts as existing to solve problems, she will find it easier to think of things to say.

For example, a sophomore at a private university was struggling with an assignment that required her to analyze an issue and express an opinion on it, using two conflicting source texts, an interview, and personal material as sources. Using rhetorical reading strategies, this girl discovered a gap between Alfred Marbaise, a high school principal who advocates mandatory drug testing of all high school students, and students like those he would be testing:

> Marbaise, who was a lieutenant in the U.S. Marines over thirty years ago . . . makes it very obvious that he cannot and will not tolerate any form of drug abuse in his school. For example, in paragraph seven he claims, ''When students become involved in illegal activity, whether they realize it or not, they are violating other students . . . then I become very, very concerned . . . and I will not tolerate that.''
> Because Marbaise has not been in school for nearly forty years himself, he does not take into consideration the reasons why kids actually use drugs. Today the social environment is so drastically different that Marbaise cannot understand a kid's morality, and that is why he writes from such a fatherly but distant point of view.

The second paragraph answers the So what? question, i.e., ''Why does it matter that Marbaise seems by his age and background to be fatherly and distant?'' Unless the writer/reader thinks to ask this question, she will have difficulty writing a coherent evaluation of Marbaise's argument.

The relative success of some students in finding original things to say about their topics can help us to understand the perennial problem of plagiarism. Some plagiarism derives, I think, from a weak, nonrhetorical task representation. If students believe they are supposed to reproduce source material in their papers, or if they know they are supposed to say something original but have no rhetorical problem to solve and no knowledge of how to find problems that they can discuss in their sources, it becomes difficult for them to avoid plagiarizing. The common student decision to buy a paper when writing the assignment seems a meaningless fill-in-the-blanks activity (cf. Schwegler and Shamoon) becomes easily understandable. Because rhetorical reading leads to discoveries about the text, students who use it may take more interest in their research papers.

Let us now assume that Shirley understands the importance of creating an original argument, knows how to read analytically, and has found things to say about the Battle of Agincourt. Are her troubles over? Will she now create that A paper that she yearns to write? Probably not. Despite her best intentions, Shirley will probably write another narrative/paraphrase of her sources. Why? Because by now, the assignment asks her to do far more than she can handle in a single draft. Shirley's task representation is now so rich, her set of goals so many, that she may be unable to juggle them all simultaneously. Moreover, the rhetorical reading technique requires students to discover content worth writing

about and a rhetorical purpose for writing; the uncertainty of managing such a discovery task when a grade is at stake may be too much for Shirley.

Difficult tasks may be difficult in either (or both of) two ways. First, they may require students to do a familiar subtask, such as reading sources, at a higher level of difficulty, e.g., longer sources, more sources, a more difficult topic. Second, they may require students to do new subtasks, such as building notes into an original argument. Such tasks may require task management skills, especially planning, that students have never developed and do not know how to attempt. The insecurity that results from trying a complex new task in a high-stakes situation is increased when students are asked to discover a problem worth writing about because such tasks send students out on a treasure hunt with no guarantee that the treasure exists, that they will recognize it when they find it, or that when they find it they will be able to build it into a coherent argument. The paper on Marbaise quoted above earned a grade of D because the writer could not use her rhetorical insights to build an argument presented in a logical order. Although she asked the logical question about the implications of Marbaise's persona, she did not follow through by evaluating the gaps in his perspective that might affect the probable success of his program.

A skillful student using the summarize-the-main-ideas approach can set her writing goals and even plan (i.e., outline) a paper before she reads the sources. The rhetorical reading strategy, by contrast, requires writers to discover what is worth writing about and to decide how to say it as or after they read their sources. The strategy requires writers to change their content goals and to adjust their writing plans as their understanding of the topic develops. It requires writers, in Flower's term, to ''construct'' their purposes for writing as well as the content for their paper (for a description of constructive planning, see Flower, Schriver, Carey, Haas, and Hayes). In Flower's words, writers who construct a purpose, as opposed to writers who bring a predetermined purpose to a task, ''create a web of purposes . . . set goals, toss up possibilities . . . create a multi-dimensional network of information . . . a web of purpose . . . a bubbling stew of various mental representations'' (531–32). The complex indeterminacy of such a task may pose an intimidating challenge to students who have spent their lives summarizing main ideas and reporting facts.

Shirley may respond to the challenge by concentrating her energies on a familiar subtask, e.g., repeating material about the Battle of Agincourt, at the expense of struggling with an unfamiliar subtask such as creating an original argument. She may even deliberately simplify the task by representing it to herself as calling only for something that she knows how to do, expecting that Dr. Boyer will accept the paper as close enough to the original instructions. My students do this frequently. When students decide to write a report of their reading, they can at least be certain that they will find material to write about.

Because of the limits of attentional memory, not to mention those caused by inexperience, writers can handle only so many task demands at a time. Thus, papers produced by seemingly inadequate task representations may well be essentially rough drafts. What looks like a bad paper may well be a preliminary step, a way of meeting certain task demands in order to create a basis for think-

ing about new ones. My students consistently report that they need to marshal all of their ideas and text knowledge and get that material down on the page (i.e., tell their knowledge) before they can think about developing an argument (i.e., transform their knowledge). If Shirley's problem is that she has shelved certain task demands in favor of others, Dr. Boyer needs only to point out what Shirley should do to bring the paper into conformity with the assignment and offer Shirley a chance to revise.

The problems of cognitive overload and inexperience in handling complex writing tasks can create a tremendous hurdle for students because so many of them believe that they should be able to write their paper in a single draft. Some students think that if they can't do the paper in one draft that means that something is wrong with them as writers, or with the assignment, or with us for giving the assignment. Often, such students will react to their drafts with anger and despair, throwing away perfectly usable rough drafts and then coming to us and saying that they can't do the assignment.

The student's first draft about drug testing told her knowledge about her sources' opinions on mandatory drug testing. Her second draft contained the rhetorical analysis quoted above, but presented the material in a scrambled order and did not build the analysis into an argument. Only in a third draft was this student able to make her point:

> Not once does Marbaise consider any of the psychological reasons why kids turn away from reality. He fails to realize that drug testing will not answer their questions, ease their frustrations, or respond to their cries for attention, but will merely further alienate himself and other authorities from helping kids deal with their real problems.

This comment represents Terri's answer to the heuristic "So what? Why does the source's position matter?" If we pace our assignments to allow for our students' thoughts to develop, we can do a great deal to build their confidence in their writing (Terri raised her D+ to an A). If we treat the researched essay as a sequence of assignments instead of as a one-shot paper with a single due date, we can teach our students to build on their drafts, to use what they can do easily as a bridge to what we want them to learn to do. In this way, we can improve our students' writing habits. More importantly, however, we can help our students to see themselves as capable writers and as active, able, problem-solvers. Most importantly, we can use the sequence of drafts to demand that our students demonstrate increasingly sophisticated kinds of analytic and rhetorical proficiency.

Rhetorical reading and writing heuristics can help students to represent tasks in rich and interesting ways. They can help students to set up complex goal structures (Bereiter and Scardamalia, "Conversation"). They offer students many ways to think about their reading and writing texts. These tools, in other words, encourage students to work creatively.

And after all, creativity is what research should be about. If Shirley writes a creative paper, she has found a constructive solution that is new to her and which other people can use, a solution to a problem that she and other people share. Creativity is an inherently rhetorical quality. If we think of it as thought

leading to solutions to problems and of problems as embodied in questions that people ask about situations, the researched essay offers infinite possibilities. Viewed in this way, a creative idea answers a question that the audience or any single reader wants answered. The question could be, "Why did Henry V win the Battle of Agincourt?" or, "How can student readers protect themselves against nationalistic bias when they study history?" or any of a thousand other questions. If we teach our Shirleys to see themselves as scholars who work to find answers to problem questions, and if we teach them to set reading and writing goals for themselves that will allow them to think constructively, we will be doing the most exciting work that teachers can do, nurturing creativity.

Appendix A: Page 1 of Shirley's paper

The battle of Agincourt ranks as one of England's greatest military triumphs.

It was the most brilliant victory of the Middle Ages, bar none. It was fought

on October 25, 1414, against the French near the French village of Agincourt.

Henry V had claimed the crown of France and had invaded France with an army

estimated at anywhere ~~between~~ *from* 10,000[1] ~~and~~ *to* 45,000 men[2]. During the seige of Marfleur

dysentery had taken 1/3 of them[3], his food supplies had been depleted[4], and the fall

rains had begun. In addition the French had assembled a huge army and were marching

toward him. Henry decided to march to Calais, where his ships were to await him[5].

He intended to cross the River Somme at the ford of Blanchetaque[6], but, falsely

informed that the ford was guarded[7], he was forced to follow the flooded Somme up

toward its source. The French army was shadowing him on his right. Remembering

the slaughters of Crecy and Poictiers, the French constable, Charles d'Albret,

hesitated to fight[8], but when Henry forded the Somme just above Amiens[9] and was just

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1. Carl Stephinson, Medieval History, p. 529.

2. Guizot, Monsieur and Guizot, Madame, World's Best Histories-France, Volume II, p. 211.

3. Cyril E. Robinson, England-A History of British Progress, p. 145.

4. Ibid.

5. Winston Churchill, A History of the English-Speaking Peoples, Volume I: The Birth of Britain, p. 403.

6. Ibid.

7. Ibid.

8. Robinson, p. 145.

9. Churchill, p. 403.

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Expository text structure: Teaching and learning strategies

Teachers can use expository text structure to improve the reading comprehension and writing of intermediate grade students.

Jo Anne Piccolo

"For homework tonight, class, I'd like you to read Chapter 17 about nutrition in your science textbook. Be prepared to discuss the chapter's major points. There may be a pop quiz." The next day the pop quiz is a disaster because not one of the students earns a passing score. The discussion is even worse. After the bell rings, the frustrated teacher exclaims "I know that class can do better. If they could only read!"

If this scenario sounds at all familiar, then you have probably heard or even asked these questions yourself: "How can I help my students deal with content area texts?" "How can I help them improve their comprehension?" "Why don't or can't students understand what they read?"

Johnston (1985) would reply that teachers should not only want to aid

the student in comprehending specific subject matter, but also should strive to help them develop an ability to comprehend. When students improve their comprehension ability, it means that they have learned a strategy to use on their own. Direct instruction of a strategy through repeated modeling by the teacher is imperative (Flood, Lapp, and Farnan, 1986; Johnston, 1985; McGee and Richgels, 1985).

Research by Englert and Hiebert (1984), Horowitz (1985a, 1985b), Slater (1985), and personal experience indicate that using knowledge of text structure as a teaching and learning strategy helps students comprehend content area texts.

In this article I will report on how expository text structure can be taught to intermediate grade students (5th to 9th school year) by using an adapted version of a process developed by McGee and Richgels (1985). I will

also discuss the teacher's uses of expository text and students' uses of text structure for reading and writing in the content area.

What is expository text structure?

Expository text structure refers to the patterns an author uses to represent ideas and to achieve a particular purpose (Horowitz, 1985a, 1985b). B.J.F. Meyer's classification system for expository text (reported by Englert and Hiebert, 1984) includes these basic structures: covariance (cause/effect), attribution (description), sequence (collection), comparison (adversative), and response (problem/solution).

These structures are signaled to the reader by various semantic and syntactic techniques. A semantic technique employs words that signal the reader that the author is using a particular pattern, such as *first, second*, or *finally*. Syntactically, topic sentences can clue the reader that an author has used a particular structure.

In this article I will address the following structures as they relate to instruction beginning in the intermediate grades. Each structure is labeled and defined; signal words used by some authors are also listed.

(1) The *descriptive paragraph* presents a specific topic and addresses its attributes. There are no specific signal words.

(2) The *enumerative paragraph* states its main topic in the topic sentence and has a list of examples in the text to support the topic sentence. Some of the signal words are *first, second, third*, etc., *next, last, finally*.

(3) The *sequence paragraph* has a main topic supported by details which must be in a specific order to convey the correct meaning. The signal words are *first, second, third*, etc., *then, next, before, after, finally*.

(4) The *cause/effect paragraph* makes a statement in the topic sen-

tence; supporting details tell why the statement was made. The signal words or phrases are *so, so that, because of, as a result of, since, in order to*.

(5) The *comparison/contrast* paragraph names the subjects that are to be compared, contrasted, or both; supporting details show how the subjects are either alike (comparison), or different (contrast), or both. The signal words or phrases are *different from, same as, alike, similar to, resembles, compared to, unlike*.

(6) The *problem/solution* paragraph states a problem in the topic sentence; supporting details describe the problem, its causes, and the solutions. The signal words or phrases are *a problem is, a solution is, the problem is solved by*.

What does research say about text structure?

When you tell the class that they will be reading a story, the students know that they will be reading about characters performing actions in a setting which leads to a desired goal. By preschool, many children have already acquired a schema for the structure of a story (Stein and Glenn, 1979). Because basal texts are collections of stories and poems, primary school children have many opportunities to refine and expand their story schemata (Hennings, 1982).

In contrast, very few students are aware of expository text structure (Englert and Hiebert, 1984). In other words, most students do not possess a schema for expository text, due to limited exposure to good models of such text. The expository selections in basal texts often lack the "main and subheads that characterize conceptual and relational content" (Hennings, 1982, p. 8). Some selections resemble a narrative because content area information is reported by the voice of a fictional character. Englert and Hiebert (1984) note that Gallagher and Pearson refer to it

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as a "pseudo-narrative."

Teaching expository text structure can begin the process of developing a schema for this type of discourse. Then the class will know what to expect when a teacher tells them that they are going to read an article on nutrition in their science books—they will expect a collection of descriptive, sequential, enumerative, cause/effect, comparison/contrast, or problem/solution paragraphs.

"Recent research based on schema theory has shown that the structure of text and how adeptly a reader recognizes that structure affects the amount of information the student remembers" (McGee and Richgels, 1985, p. 739). Instruction in the recognition of expository text structures has been proven to aid comprehension (Horowitz, 1985a). Students with a knowledge of text structure have better recall (Horowitz, 1985b, Englert and Hiebert, 1984).

Text structure
in the intermediate grades
Teaching text structure is effective at various grade levels. Most studies on this for expository text have been done with either secondary or college level subjects, but a study which included 3rd and 6th graders showed that "children who were more in tune to the various text structures performed significantly better on a measure of reading comprehension" (Englert and Hiebert, 1984, p. 71).

Additionally, McGee and Richgels (1985) note that 5th graders who are good readers have begun to develop an awareness of text structure, and middle school children who were trained to write summaries following the headings and subheadings in a social studies chapter remembered better than untrained students.

From the research, one can conclude that instruction of expository text structure should begin in the intermediate grades.

Writing to learn the
expository structures
First, when teaching expository structure to intermediate grade students, teachers must include writing as an instructional technique (Flood, Lapp, and Farnan, 1986; Hennings, 1982; Horowitz, 1985a, 1985b; McGee and Richgels, 1985). Second, it is essential to have good models to demonstrate the structure of each type of paragraph (Flood, Lapp, and Farnan, 1986; McGee and Richgels, 1985). Third, a graphic organizer used in conjunction with each structure aids the student in writing and visualizing the text (McGee and Richgels, 1985; Slater, 1985).

Writing paragraphs which employ a specific structure is the best way for students to recognize the pattern of the text. "As students attempt to control structure through writing they gain insight into the fact that writers organize their information to maximize the reader's comprehension" (Flood, Lapp, and Farnan, 1986, p. 558). Once students practice writing these structures, they can more easily recognize the patterns. Then this knowledge can be used as they attempt to comprehend what textbook authors are saying (Hennings, 1982).

To teach expository text structure, teachers must have well structured model paragraphs from which students will glean the critical attributes of each structure. As McGee and Richgels note, finding good models in elementary texts is difficult because descriptive and collection (enumerative) passages dominate; passages often lack the appropriate signal words; and causation, problem/solution, and comparison passages are almost nonexistent. Therefore, teachers do best to compose original paragraphs and graphic organizers which demonstrate each structure.

Graphic organizers are used by McGee and Richgels to help students

visualize the patterns of expository text and organize their own compositions. I have found these organizers an important component in students' composing process. Students report that organizers are easier to use than the traditional outline.

Teaching expository text structure
First, gather or compose at least three model paragraphs and corresponding graphic organizers. When composing these paragraphs, choose topics that will be schematically appropriate for the class.

The graphic organizers should be composed of boxes and lines that show the students the pattern of the text (Figures 3 and 4). Lines in an organizer show the connection between related ideas. The best order in which to teach the structures (based on research and personal experience) is (1) sequence, (2) enumerative, (3) cause/effect, (4) descriptive, (5) problem/solution, and then (6) comparison/contrast.

The sequential pattern is the best to introduce first because of children's familiarity with time based structures in narratives (Englert and Hiebert, 1984). Because the pattern of the sequential text so closely resembles the enumerative text, the latter should be taught next. The critical attribute that distinguishes one from the other is that the sequential pattern must be in temporal order, whereas the enumerative pattern has no specific order.

Before teaching the cause/effect pattern, make sure the students know the difference between a cause and an effect. My experience with 5th graders indicates that it is necessary to teach single sentences that illustrate cause/effect relationships prior to introducing the cause/effect paragraph structure.

Research has shown the descriptive pattern to be one of the most difficult for students to recognize in content area texts because "they occur in short

segments or within other structures" (Englert and Hiebert, 1984, p. 71). However, 5th graders wrote descriptive paragraphs with relative ease. They figured that if they did not want to put something in order (sequential), make a list (enumerative), or show a cause/effect relationship, then it must be descriptive.

Lesson plans
Teaching text structure should include the following lessons for each structure. (1) Define and label the structure. (2) Examine model paragraphs and the corresponding graphic organizer to find the critical attributes of each. (3) Model the composition of an original paragraph that follows a graphic organizer. (4) Compose an original organizer and paragraph. (5) Read expository texts to find which patterns the author used.

Lesson 1

Step 1: Explain to the class that expository text structure is a name given to the organization of paragraphs that give the reader specific information about a topic. Just as a story contains characters, setting, episodes of the plot, and a goal, expository paragraphs contain a topic sentence with supporting details. And, just as there are different types of stories like fairy tales, tall tales, myths, there are different types of paragraph structures.

Step 2: Introduce the label and define it. Explain that each text structure answers a specific question (Figure 1). After this, show the class the graphic organizer for the paragraph on the overhead projector (Figure 2). Explain that the graphic organizer is used to show the pattern of a paragraph.

Step 3: Distribute copies of the paragraph that corresponds to the graphic organizer. Read the paragraph together. Then ask the class to try to locate the signal words or phrases in the paragraph that clue the reader to the organization of that structure. Make a

Figure 1
Questions students can use to help identify text structures or write original paragraphs

Descriptive
Do you want to tell the reader what something is?

Sequence
Do you want to tell someone how to do something or make something?

Enumerative
Do you want to give a specific list of things that are related to the topic and tell about each?

Cause/effect
Do you want to give reasons why something happens or exists?

Problem/solution
Do you want to state some sort of problem related to your subject and offer some solutions?

Comparison/contrast
Do you want to show the similarities or differences between a certain topic and the topic you are writing about?

---

list of these words on a chart that gives the name of the structure and its definition along with a picture of the graphic organizer.

Step 4: Explain that topic sentences clue the reader that a particular structure is being used by the author. Sequential paragraphs, for example, have topic sentences that may include the word "steps," or phrases like "In order to make...you must follow these directions."

Step 5: Using another example of a paragraph with that same pattern, give the class a copy of the graphic organizer. The graphic organizer will include the topic sentence. Then, on the overhead, model the writing of a paragraph that follows the graphic organizer. Do this as a class. Make sure that the students use the appropriate signal words or phrases in the paragraph.

Lesson 2

Step 1: Instruct the students to choose a topic about which they want to write. For example, when using the sequential structure, this topic can be how to make something.

Step 2: Have each student make a jot list which contains all the details that

are to be included in the paragraph. A sequential jot list, for example, may contain all the needed materials and the steps involved in the process.

Step 3: Give each student a copy of the graphic organizer and instruct them to organize a paragraph on the organizer. If they need practice in writing topic sentences, it should be done at this point through modeling.

Step 4: When the organizer has been completed, have the students compose original paragraphs.
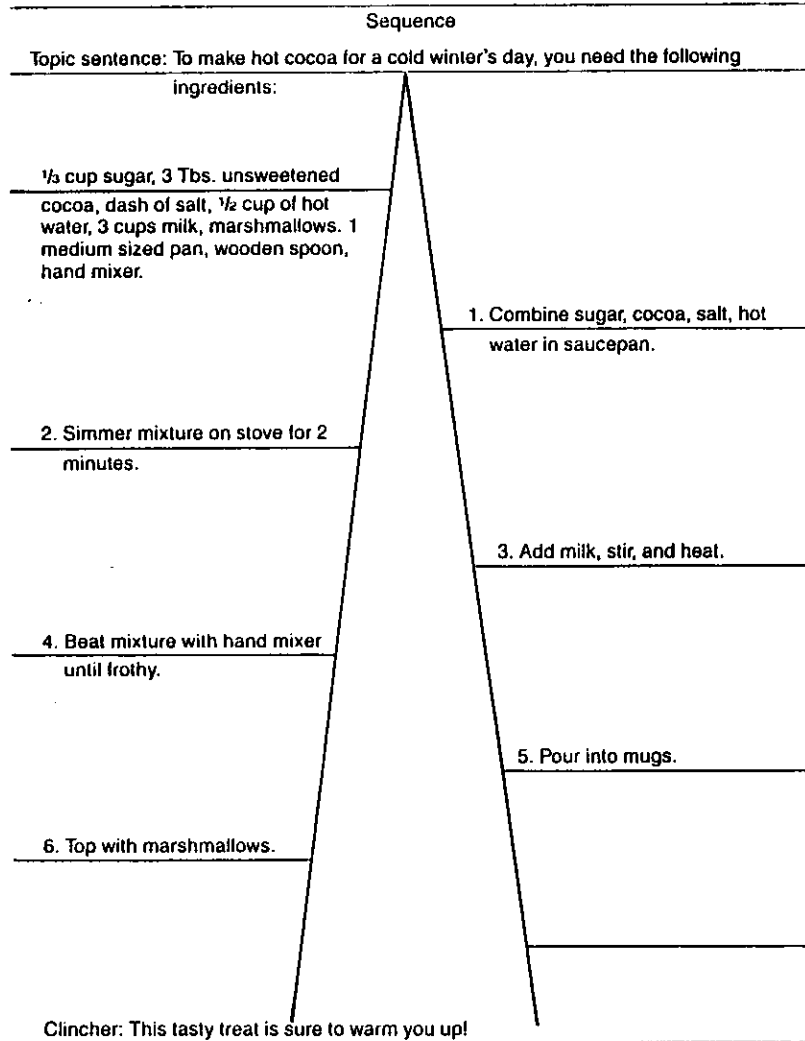
Lesson 3

Step 1: From the class collection of paragraphs, choose good examples and poor examples and share them. With the good ones, point out the strength of the topic sentence and the use of appropriate signal words. With the poor samples, have the students participate in the revision process by making suggestions for changes.

Step 2: Following the group activity, hand the papers back so the students can revise and correct their own paragraphs.

Lesson 4

The purpose of this lesson is to show the students how to extract information from a paragraph and put it into simple

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Figure 2
Sample graphic organizer and the corresponding sequential paragraph

Sequence

Topic sentence: To make hot cocoa for a cold winter's day, you need the following ingredients:

⅓ cup sugar, 3 Tbs. unsweetened cocoa, dash of salt, ½ cup of hot water, 3 cups milk, marshmallows. 1 medium sized pan, wooden spoon, hand mixer.

1. Combine sugar, cocoa, salt, hot water in saucepan.

2. Simmer mixture on stove for 2 minutes.

3. Add milk, stir, and heat.

4. Beat mixture with hand mixer until frothy.

5. Pour into mugs.

6. Top with marshmallows.

Clincher: This tasty treat is sure to warm you up!

How to Make Hot Cocoa
To make hot cocoa for a cold winter's day, you need the following ingredients: ⅓ cup of sugar, 3 tablespoons of unsweetened cocoa, a dash of salt, ½ cup of hot water, 3 cups of milk, and some miniature marshmallows. You will also need a medium sized saucepan, a wooden spoon, a hand mixer, and mugs. First, combine the sugar, the cocoa, a dash of salt and the hot water in the saucepan. After you do this, put the mixture on the stove and simmer for 2 minutes. Next, add the milk, stir, and heat. Finally, beat this mixture with a hand mixer until frothy. You are now ready to pour the hot cocoa into mugs and top with the marshmallows. This tasty treat is sure to warm you up!

Figure 3
Model organizer for enumerative paragraph

Enumerative

Topic sentence: William Shakespeare wrote three kinds of plays and a form of poetry called sonnets.

1. Comedy
Hero always won the battle over evil.

2. Tragedy
Hero is defeated by the evil force.

3. Histories
Stories about the lives and adventures of England's kings and queens.

4. Sonnets
It had 14 lines.
Every other one rhymed.
He became a poet when he couldn't get a job as a playwright.

Clincher: Shakespeare wrote 38 plays and numerous sonnets.

Figure 4
Model organizer for descriptive paragraph

Descriptive

Topic sentence: The prairie dog is an American ground squirrel.

They are different from other ground squirrels.
They have small cheek pouches.
They hibernate.

How it got its name.
It sounded like it barked.

Prairie dogs

One squirrel stays on mound.
This squirrel gives warning.
Others hide until the danger is over.

The prairie dog hole.
6 yards from main nest.
Topped by mound of soil.
One exit for each animal.
Each one houses 15 animals.

Clincher: The prairie dog is an interesting kind of squirrel.

---

terms using the graphic organizer to guide them. Using another model, copy the paragraph for each student and make a transparency of a blank organizer. As a class, read the paragraph and fill in the organizer. This activity also prepares them for using graphic organizers for notetaking, which will be discussed later.
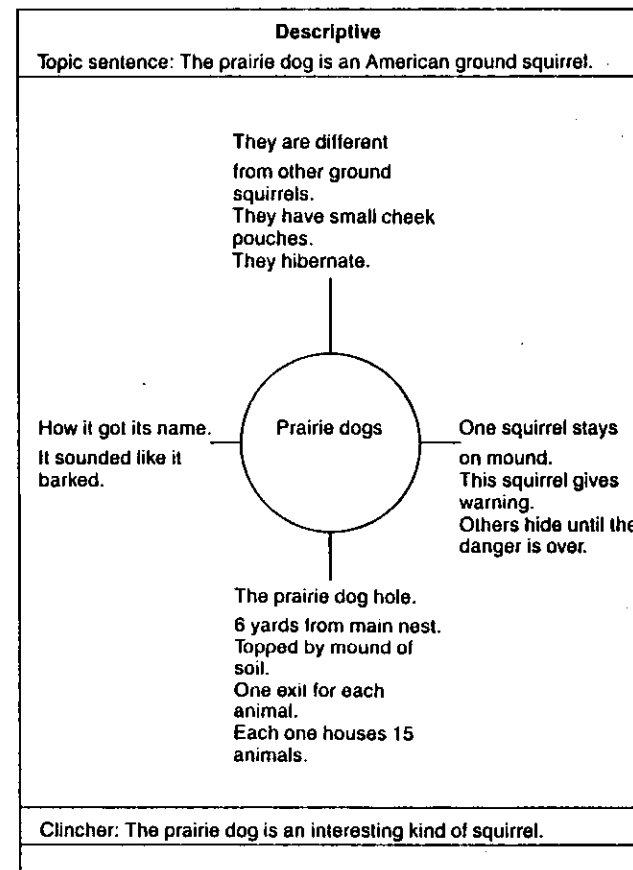
Lesson 5

When the students are familiar with the text structures, the signal words, the graphic organizer, and the corres-ponding text structure question, give them practice in locating and naming patterns used by authors in content area texts, encyclopedias, or other reference books. This activity will show the students that text book authors use these structures to organize information. Additionally, it builds a foundation for notetaking.

Suggested teaching strategies

Once students can identify and write paragraphs following a specific pat-tern, you can use that skill to teach students strategies that will improve their comprehension of content area texts. Some suggested strategies are as follows:

(1) Write your prereading questions in a format that suggests a pattern of expository text. For example, if the students are going to read a science unit on nutrition, the prereading questions could be these: Description: What is protein? Enumerative: What are the different sources of protein in our diet? Cause/Effect: Why is protein important to our bodies? Comparison/Contrast: How is protein different from a carbohydrate? Problem/Solution: If people are allergic to milk products, what other sources of protein are available to them?

(2) With proper modeling, the students should be able to examine headings and subheadings in a content area text, encyclopedia, or other reference book and predict what question each selection should answer or what the se-

lection is going to be about. The questions in Figure 1 serve as good reference questions.

(3) Students' skimming skills can be enhanced by the use of signal words. When skimming the chapter for a particular section that is written in a recognizable pattern, the reader can look for the signal words and topic sentences associated with that pattern.

(4) During oral reading, model the uses of text structure. Point out topic sentences which signal that a certain text pattern is to follow. For example, a prereading question asks the reader "What are the three kinds of rock that make up the earth's surface?" Then a section heading reads "Kinds of rock," or a topic sentence reads "There are three kinds of rock on the earth today." Point out that this is probably where the student can find the answer to this question.

(5) For each reading of new material, have a graphic organizer ready on an overhead transparency or chart, to answer each prereading question or act as a set of notes for postreading discussion. These graphic organizers can be copied by the students as a study guide for a test.

Suggested learning strategies

(1) When answering questions for a test, the student can examine the question to see if it suggests a text pattern which is appropriate for the answer.

(2) During silent reading, the reader can take notes on graphic organizers using headings and subheadings to form topic sentences.

(3) Following a lecture, students can reorganize their notes using the graphic organizers.

Writing a report

After showing students that text in social studies books, science books, or encyclopedias is a collection of expository text structures, why not have them learn how to write reports using com-

binations of all the types?

Writing a report on any subject makes the student take on the role of reader and writer simultaneously (Beach, 1983). Students need to gather data, organize it, and write the drafts in their own words. Knowledge of text structure can help them with this task when the following steps are added to any writing process:

Step 1: Before the student writes a report, questions should be posed about the topic that are to be answered in the report. To answer these questions, students read a reference source to gather data. Knowledge of the text structures helps make skimming the source easier.

Consider this probable question: "What methods of transportation are used by commuters in Toronto?" The writer should look for the signal words and a topic sentence which would suggest the enumerative style since a list would be associated with text that would answer this question.

Step 2: After the student reads the headings and subheadings of the reference article and is acquainted with the content, a decision can be made as to what information will be included in the report. Then the student can read specific sections and collect the data by taking notes on the appropriate graphic organizers. For example, if the information is sequential in nature, the corresponding sequential organizer should be used.

Step 3: Following the composition of the first draft, a conference between student and teacher is a good way to suggest changes or revisions. Text structure provides a point of reference for the teacher. If the student decides to use a sequential organizer to explain how to do an experiment, you can recognize what the student is trying to do and guide the student to make corrections independently. You will also be able to make suggestions for revision without rewriting the section for the

student.

Step 4: The corresponding text questions (Figure 1) are valuable for writer and teacher. These questions provide a point of reference which helps the student decide how to pattern the material that is to be included in the report, or you can use them to help a student who is having trouble.

Text based skills help comprehension

Research has raised more questions than it has answered concerning the instruction of expository text structure, but in particular, "Should expository text structure be taught to students?" can be answered with a resounding "Yes!" Informal evaluation by myself and other teachers in grades 5 though 9 of a program that I wrote to teach expository text structures shows that (1) students can learn to write paragraphs which employ a specific text pattern, (2) after receiving the proper training, they can identify paragraph structures in expository texts, (3) they are able to take notes using appropriate organizers when reading expository text, and (4) writing a report is much easier when both teacher and student have a knowledge of text structure.

When teachers and students possess these new expository text based skills, old problems about ways to improve comprehension in the content area disappear.

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Marie Clay gets top honor

Marie Clay, former member of the Board of Directors of the International Reading Association and world famous reading educator, has been made a Dame Commander of the Most Excellent Order of the British Empire. Clay is a native of New Zealand, where she is a professor at the University of Auckland. Her best known book is perhaps *Early Detection of Reading Difficulties*; she is also the author of *Sand: The Concepts About Print Test*. She served the IRA as a member of the Board from 1983 to 1986.

ETHNIC STUDENT LEARNING:
A REVIEW OF RESEARCH ON STYLES,
PREFERENCES AND CHARACTERISTICS

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Introduction

Cited as the first of several challenges facing school library media specialists as they seek to fulfil the mission of library media programs in Information Power: Guidelines for School Library Media Programs is the commitment "to provide intellectual and physical access to information and ideas for a diverse population whose needs are changing rapidly" (AASL & AECT, 1988, p.3). This statement recognizes the fact that American demographics are in constant change. More importantly, the Guidelines introduce cultural diversity as a condition "now widely perceived as desireable" (AASL & AECT, 1988, p. 3).

The classroom diversity is confirmed by the most current statistics published by the United States Department of Education (1991). Based on 1986 summaries, the following ethnic representation in public schools was reported:

White (Anglo American)	–	70.0%
Black (African American)	–	16.1%
Hispanic (Latino)	–	9.9%
Asian or Pacific Islander	–	2.8%
American Indian/ Alaskan Native	–	.9% (p. 43).

These figures reflect a precedent indicator of increasing minority presence between the years 1974-1986. The trend is expected to continue through the nineties and into the twenty-first century.

The primary responsibility of education is to teach--to impact the body of knowledge determined appropriate by educational specialists, corporate leaders, curriculum developers and others with vested interests. Because of the metamorphic student population, the issue of equity in education is one receiving considerable attention as professionals attempt to meet the academic needs of the increasing culturally diverse student enrollments. Fundamental to this position is the insurance that each student has an equal opportunity to learn regardless of race, color, religion, creed, or gender. Equity can be completely assumed if distinctive ways in which students learn are identified and addressed individually and not collectively as in the

prevailing prescriptive approach to teaching. Customarily, the classroom organization does not accommodate unique learning preferences. Marshall (1990) delineated elements of the "traditional" school structure and implicitly clarified the differences in the two approaches:

> Students in rows
> Quiet learning environment
> Formal classroom design
> Teacher dominant
> Whole-group instruction
> Textbook/lecture format
> Learning by looking/listening
> Low/no mobility
> Paper and pencil emphasis.

According to Dunn and Griggs (1990), analyses of the learning styles of at-risk and dropout students who are most likely African American, Latino and American Indian have revealed that these students learn in a processing style and with instructional strategies that differ significantly from students who perform well in high school.

The complementary roles of the school library media specialists: information specialist, teacher, instructional consultant must be expanded if the library media specialist is to successfully meet the first challenge of the mission. Especially in assumption of the second role is the requisite for the library media specialist to be knowledgeable about activities and conditions which can maximize student performance and reduce "at risk" and dropout rates. In an attempt to better understand how ethnic minority students learn best, this review of research was initiated.

It became clear early in the search for reported research that the learning process is described and defined in a variety of ways. Within a singular discussion it not unusual to find "learning style" synonymously used with "cognitive style." Attempts have been made to clarify the distinction and one such effort was undertaken in 1982 when a task force of the National Association of Secondary School Principals (NASSP) began development of a learning style paradigm and validation of an accompanying instrument for assessment. It has been described by Keefe and Ferrell (1990) as evolving from three precursors which include personality theory; the information processing aspect of cognitive style research; and research on aptitude-treatment interaction (ATP), a systematic attempt to relate individual differences in aptitude, including aspects of cognitive and affective style, to instructional method.

Because the two labels essentially are concerned with the

learning process, this review reports pertinent findings of both cognition research and learning style investigation. Ultimately, the findings are more important than the nomenclature if the research can yield information about how ethnic students learn.

Most often research in ethnic learning assumes a cross-cultural methodology. Cross-cultural investigation examines constant variables among one or more cultural groups and reports the findings in a comparative analysis. The majority of research identified in this paper contains such a design and usually compares the ethnic student groups(s) with Anglo American (white) students. The findings of studies in both of the categories identified above are reported and followed by discussions of implications for the practitioner and relevant research needs.

Cognitive Styles

H.A. Witkin, C.A. Moore, D.R. Goodenough, and P.W. Cox. (1977) reported extensive examination and wide application of the field-dependence-independence dimension of cognitive style. More currently, it is still broadly used for assessment and as the basis for comparative study. At the conclusion of several years of development, the researchers submitted that the common denominator underlying individual differences in performance of a series of tasks in perception was the extent to which the subject perceived part of a field as discrete from the surrounding field as a whole rather than embedded in the field. Shade (1982) explained it further by identifying field-dependent individuals as those who are unable to distinguish necessary parts in order to solve the problem. These persons are more global and interrelated in their approach to visual information. In contrast, individuals who can abstract the necessary parts from the totality of the material regardless of the distracting elements in the visual field are said to be field-dependent.

Influenced by Witkin's concepts, Ramirez and Castaneda (1974) substituted the term "field-sensitive" for field-dependent" in their study of Mexican American students. Linking culture to learning, the spirit of this substitution was based on the premise that differences in learning between members of different ethnic groups are the result of socialization practices reflecting the values of these groups. "Sensitivity" as a term better describes the behavior of people with the field-dependent style because it is their greater sensitivity to the social and physical environment which distinguishes them generally from field independent individuals (Ramirez, 1973). Generally, findings along ethnic lines are consistent.

In reported research, African Americans and Mexican Americans are more field-dependent/sensitive than Anglo-Americans (Bice,

1984; Kush, 1984; Ramirez & Price-Williams, 1974; Robinson, 1980).
Rivas (1978) found no differences in cognitive styles of Mexican
American and Anglo American five, eight and ten year old students.

Compared to Anglo Americans, Japanese American students scored
higher on field independence than whites in a study conducted by
Vaughn (1988). Orumchian's (1984) research revealed that recent
Indochinese immigrant high school students demonstrated a distinct
preference for field-sensitivity compared to 'traditional'
students.

A single study on American Indians was located. In a review
of learning and teaching styles literature, Swisher and Deyhle
(1989) confirmed the scarcity of reports devoted to the field
dependent/sensitive-independent dimension of cognition with
American Indian students. Dinges and Hollenbeck (1978) studied
Navajo children and found them to be higher than Anglo students in
field-independence.

Learning Styles

Rita and Kenneth Dunn were the first to use the label,
"learning style" in about 1969 (Fizzell, 1984). A definition
developed by the NASSP Learning Style Task Force described learning
styles as "characteristic cognitive, affective, and physiological
behaviors that serve as relatively stable indicators of how
learners perceive, interact with, and respond to the learning
environment." (Keefe, 1979, p.4) The Dunn and Dunn (1978) model
is multidimensional and includes five categories of stimulus and
relevant variables:

1. environment - sound, light, temperature, design
2. emotional - motivation, persistence, responsibility, structure
3. sociological - self, pair, peers, team adult, varied
4. physical - perceptual, intake, time, mobility
5. psychological - global vs. analytic, hemisphericity, impulsive
      vs. reflective.

An individuals learning style is composed of unique reactions
to the 21 elements of the stimuli. Apparently no one is affected
by all; most persons have between 6 and 14 elements that constitute
strong style preferences (Dunn, R., Gemake, J., Jalali, F.,
Zenhausern, R., Quin., & Spiridakis, J. (1990). Administering the
Learning Style Inventory (LSI) based on the model used at more than
60 institutions of higher education, researchers have been able to
determine learning styles of special populations and document the
efficacy of matching teaching and learning styles. When students
are taught in environments and with approaches that complement
their learning styles, they achieve statistically higher test and
attitude scores and demonstrate better behaviors then when their

styles were mismatched (R. Dunn, Beaudry, & Klavas, 1989).
Probably the most comprehensive cross-cultural analysis and use of this model was conducted in 1984 when the profile was administered to more than 4,500 students in 40 schools throughout the nation: (Griggs & Dunn, 1989). The ethnic composition in the sample consisted of:

1.9%	Asian American
8.9%	African American
1.9%	Latino
2.0%	American Indian
84.0%	Anglo American
1.3%	Other.

Eighteen variables were determined to be discriminately significant among the groups. The summary follows:

1. Sequential processing skills: Whites scored higher than blacks
2. Verbal spatial preference: Blacks scored higher than whites
3. Pattern recognition: Whites scored higher than blacks
4. Visual perceptual preference: Asian Americans scored higher than blacks
5. Auditory preference: Blacks scored higher than others
6. Cool temperature preference: Blacks higher than Native Americans
7. Warm temperature preference: Hispanics scored higher than blacks
8. Manipulative preference: Blacks cored higher than Asian Americans
9. Analytic skills: Asian Americans scored higher than Native Americans
10. Spatial relational skill: Asian Americans scored higher than Native Americans
11. Bright light preference: Native Americans scored higher than Hispanics
12. Prefer evening study: Whites scored higher than Asian Americans
13. Persistence orientation: Blacks scored higher than Asian Americans
14. Prefer quiet: Whites scored higher than Native Americans
15. Prefer morning study: Others scored higher than Native Americans
16. Prefer late-morning study: Asian Americans scored higher than Native Americans
17. Need mobility: Hispanics scored higher than whites
18. Formal design: Blacks scored higher than Native Americans.

Other cross-cultural studies utilizing LSI substantiated clear

differences among ethnic groups. Dunn and Griggs (1990) compared
results of eight studies of which five were pertinent for this
review. Jalali (1989) studied African American, Chinese American,
Mexican American and Greek American children in grades 4,5, 6 in
New York and Texas. Third and fourth grade African American,
Mexican American and Anglo American children in California and
Anglo American children in California and Oregon were the subjects
in Sims' study (1988). Elementary school age Cree Indians were
investigated by Mariash (1983). Jacobs (1987) concentrated his
attention on middle school Southern African American, Mexican
American, Euro-American, and Anglo American students. With minimal
contrasts, selected highlights of general group characteristics are
as follows:

> Sound while learning - Chinese Americans (Jalali, 1989),
>   Anglo Americans (Sims, 1988)
>
> Warmth - African Americans (Jalali, 1989)
>
> Lights
>   bright - Chinese Americans, African
>   Americans (Jalali, 1989)
>   low - Mexican Americans (Jalali, 1989; Sims, 1988)
>
> Higher degree of structure - Mexican Americans,
>   Chinese Americans, African Americans, (Jalali, 1989)
>
> Learning alone - Greeks, African Americans (Jalali, 1989)
>
> Peer-orientation - Chinese Americans, Mexican Americans
>   (Jalali, 1989); Anglo Americans (Sims,
>   1988)
>
> Parent-teacher motivation - African Americans (Jalali,
>   1989, Jacobs, 1987)
>
> Evening learning - African Americans, Greek Americans
>   (Jalali, 1989)
>
> Early morning learning - Mexican Americans (Jalali, 1989;
>   Sims, 1988); Chinese Americans
>   (Jalali, 1989)
>
> Intake while learning (snacking, smoking, etc.) -
>   high - Anglo Americans (Sims, 1988)
>
>   low - Chinese Americans (Jalali, 1989); 75%
>   Cree (Mariash)

Auditory - Greek Americans (Jalali, 1989); Euro-
     Americans (Jacobs, 1987)

Visual - African Americans (Sims, 1988); 44% Crees
     (Mariash, 1983)
Mobility - Greek Americans, African Americans (Jalali,
     1989)

They concluded that variances do exist between and among
different cultural groups within the United States (Dunn & Griggs,
1990). They also attributed some of the contradictory findings to
geographic location and suggested that there are as many within-
group differences as between-group differences.

In a cross cultural investigation of participants drawn from
the previously cited Jalali (1989) study, Dunn et al., (1990)
concluded that children from different areas of the American
subculture have different patterns of preferred learning strategies
and stated an implication that classroom environments should be
varied.

Two other studies used the LSI as a basis of assessment. Clyne
(1984) discovered differences in a comparison of learning styles
of Native Americans and Anglo Americans in fourth through sixth
grade students. He concluded that Native American students were
less persistent, preferred the presence of teachers, desired less
intake and preferred working in late morning. High school seniors
were subjects in the study by Wauters, Bruce, Black, and Hocker
(1989). In identifying preferences between Native American and non
Native Americans, they discovered significant differences between
selected aspects of the two groups but only on the variable of
authority was the distinction large enough between the groups.

Other aspects of style using other measurements were explored
by six researchers. Caringer's sample was comprised of Japanese,
Anglo American and Hawaiian groups (1985). All three groups
expressed the strongest preference for reasoning by applying rules,
implying a need for structure in the learning environment. In an
examination of gifted and non gifted African American and Anglo
students, Hackman (1988) observed that in every case gifted African
American students expressed stronger preferences for self-directed
activities than their gifted Anglo American peers. African
American students also expressed strong positive preferences for
a cluster of teacher-directed activities (programmed instruction,
teaching games, and lecture) and milder preferences for
instructional activities which can be either student initiated or
teacher directed (projects and discussion). The major findings of
research on Pueblo, Navajo and Apache seventh grade students showed
that peer teaching, teaching games and programmed instruction were
consistently the preferred learning styles of all three tribal
groups (Martinez, 1987). Discussion, simulation and

drill/retention were the most generally disliked preferences of all three tribes. Naylor (1971) examined six year old Mexican American and Anglo American children and reported findings that failed to support the hypothesized learning style differences between the two groups. Using the Experiential Learning Theory as basis for investigation, Tucker (1983) compared preferences of African American and Anglo American eighth grade students. The data generated revealed no significant difference African American and Anglo American participants. As a group, students preferred Active experimentation over Reflective Observation and Concrete Experience over Abstract Conceptualization. Walker, Dodd, and Bieglow (1989) sought to assess learning preferences of Cheyenne and Crow adolescents enrolled in an Upward Bound Program. Using the Walker Learning Preference Scale, results indicated that the sample had a preference for Pattern-Symbol learning, a process in which meaning is gained from personal associations developed through patterns of communication that are both verbal and nonverbal.

Use of computers to enhance the learning experience has been the subject of two studies. When combined with the specific learning style strengths of individual students, the computer becomes a powerful instructional tool (Dunn & Geisert, 1991). Both studies focused on African American children and computer technology as a viable complement to the learning teaching strategy. Webster's (1990) sample of African American fifth graders were subjected to Computer-Assisted Instruction (CAI) in mathematics classes. The findings indicated that CAI as a supplement to teacher directed classroom instruction was as effective as teacher-directed instruction in producing student mathematics achievement. African American and Anglo American first graders worked on computers in CAI and Logo instruction. (Emihovich & Miller, 1988) in computer literacy. Although the Anglo American group significantly out performed the African American group in CAI and regular classroom instruction, the African American students out performed the Anglo American students on Logo.

Implications for Practitioners

Research has confirmed that students perform best under conditions - whether they are physical, psychological, sociological, environmental - which accommodate their specific style of processing information. Theorists through their diverse models and foci attempt to clarify the process and provide guidance for educators who are challenged by the responsibility to maximize the learning experiences for students. R. Dunn, T. DeBello, P. Brennan, J. Krimsky, P. Murrain (1981) compared the approaches of eight researchers and concluded that although uniquely different in some ways, the studies of the writers can contribute

substantially toward understanding how students learn. It is imperative for educators including library media specialists to recognize the existence and validity of learning style and cognitive style research.

In considering the ethnic perspective, one is advised to consider implications of the findings with caution. It is important not to generalize and make assumptions about an ethnic group. The research itself has not yielded conclusive results about any singular group, but instead, has revealed variation within the groups. An important factor in geographic location which has been suggested as a variable which can impact results of any research. For example, African Americans native to the South may have a preference for temperature in the environment that differs that of from African Americans who are native northerners. A viable and worthwhile solution for any educator would be to make a local assessment of a multiethnic situation and then create an environment which can best accommodate as many of the varied preferences among students as possible. Cox and Ramirez (1981) suggest the following field tested process which guides their multiethnic education framework:

1. Assess students' preferred ways of learning and the way(s) in which students' behaviors change from situation to situation.

2. Plan learning experiences that address conceptual goals or skills or other objectives that incorporate the student's preferred ways of learning, using teaching methods, incentives, materials, and situations that are planned according to student preferences.

3. Implement the learning experiences that were planned.

4. Evaluate the learning experience in terms of attainment of conceptual or other goals as well as in terms of observed student behaviors and involvement.

5. As the year progresses, plan and implement student participation in learning experiences, that require behaviors the student has previously avoided. Incorporate only one aspect at a time of the total experience from the less familiar behaviors--focusing on only the reward, the materials, the situation, or the task requirements--so that the student utilizes what is familiar and comfortable or motivating as support for the newer learning experience aspects.

6. Continue to provide familiar, comfortable, successful experiences as well as to gradually introduce the children to learning new ways.

Specifically, the challenge for library media specialists is to assist the classroom teachers, school administration and other staff such as guidance counselors and social workers in implementing the school's program of assessing, designing, and implementing instruction conducive to maximized learning on the part of all students. Roles of the media specialists in this responsibility include collection development for both curriculum and professional literature and instruction in information skills which reflects knowledge and implementation of cognitive and learning styles.

Implications for Researchers

From this survey of research literature in this area, four observations and recommendations are offered:

1. Experimental design is the most frequently used methodology and lends itself well to study of the subject.

2. Ethnic groups most often investigated are African Americans and Mexican Americans along with Anglo Americans in cross-cultural studies. Native Americans and Asian Americans have received attention, but to a lesser degree. As the fastest growing segment of the population is Asians, more examination is needed of this group. Samples need to be extended so that information can be disseminated on the learning and cognitive styles of groups other than the four predominant ones.

3. Although some research has been conducted on matching teacher and student styles, an investigation of ethnicity as a variable in the "match" and its impact on student achievement could be investigated. Such findings could illuminate ethnic perspectives of student-teacher interaction and their significance in student achievement.

4. Studies have been completed which are subject oriented, e.g., student learning in mathematics. A critical examination of information literacy, how students conduct themselves in the information search process and the inherent ethnic variables could provide insight on students' acquisition of information skills.

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