A Guide to the Programs for

TREASURE MOUNTAIN 10
At the ELMS

Excelsior Springs, MO
May 31 and June 1, 2002

A Research Retreat on Student Achievement, Diversity in Learning & School Library Media Programs

Funding for Scholarships and Mentors provided by
The United States Institute of Museum and Library Services
Washington, D. C.

Additional funding provided by these Corporate Partners:
The American Association of School Librarians, The Association for Educational Communications and Technology, Highsmith, Libraries Unlimited, LMS Associates and *Crinkles*, and *Teacher Librarian*
And by these University Partners:
Clarion University, Emporia State University, Indiana University at Indianapolis, Kent State University, University of Washington
And by Individual Partners:
Ken Haycock and Yvonne B. Carter

Program and Proceedings Planned by
Daniel Callison, Indiana University Indianapolis
Nancy Pickering Thomas, Emporia State University

TM Mentors and Scholars
Treasure Mountain at the Elms 2002
Mentors and Scholars

Ruth Small, mentor in instructional design and experimental methods
Kym Kramer future scholar in instructional design and curriculum integration
Leslie Preddy future scholar in collaboration, inquiry learning, curriculum

Danny Callison, mentor in inquiry learning, collection and program management
Gabriella Miller future scholar in collection development and information literacy
Deborah Levitov future scholar in information skills and student achievement

Cecilia Salvatore, mentor in communications and diversity of learning styles
Candace Aiani, future scholar in information literacy, cultural differences

Julie Tallman, mentor in I-search and information use behavior
Joquetta Johnson, future scholar in innovative approaches to information skills
Lourdes Cervantes, future scholar in IR, information literacy and technology

Kathy Latrobe, mentor in program evaluation, media standards, children's literature
Erin Meyer Blasing, future scholar in library service to children and literature
Sharon McQueen, future scholar in children's literature and illustration
Claudette McLinn, future scholar in behavior and diversity issues

Delia Neuman, mentor in qualitative research and instructional design
Mary Long, future scholar in instructional technology, hypermedia
Cory Little, future scholar in collaboration, technology, curriculum

Nancy Everhart, mentor in program evaluation, professional development
Nancy McGriff, future scholar in program evaluation and effectiveness
Lorine Sweeney, future scholar in professional development

Mary Ann Fitzgerald, mentor in information analysis, instructional methods
Judah Hamer, future scholar in information seeking behaviors
Joan Bessman, future scholar in reading, information seeking as a social behavior
Stephen Del Vecchio, future scholar in children's information seeking behavior

James O. Carey, mentor in information behavior, information literacy models
Christine Putrus, future scholar in collaboration, pre-service teacher education
April Hatcher, future scholar in pre-service education, administration of LMC

Pat Tarin, mentor in diversity, research in minority communities
Janet Martin, future scholar in racial diversity issues related to LIS education

Ross Todd, mentor in evidence based research, information search and use theory
Marcia Mardis, future scholar in technology and staff development
Jinsoo Chung, future scholar in information seeking and use, young adults

Treasure Mountain at the Elms 2002
Program Schedule

Thursday May 30

Afternoon

Most participants will arrive at the Kansas City International airport. Three vans (Ford Windstar) will circle terminals A, B and C to pick up participants at the ground level shuttle kiosks. Please do not call the Elms unless there is an emergency. A TM van should come by within each hour. The Elms resort is a 30 to 45-minute drive from KCI. Room check-in at the Elms is 3:00.

Dress for all TM functions is business casual.

Noon to 5:00 Registration — Regent Ballroom
Greetings from Paula Montgomery, LMS Associates
Nancy Thomas, Emporia State University
Linda Lillard, University of Kentucky

5:00 to 6:00 TM and Pitts Scholars Meet Mentors — Empire Room
Facilitated by Nancy Thomas and Paula Montgomery

Thursday May 30

Evening

7:00 to 8:30 Dinner (buffet served at 7:15) — Elms Ballroom

Evening meals (May 30, 31, June 1) are included with the registration for the conference. All other meals, unless designated for scholars and mentors, are "on your own". Dining areas at the Elms open at 6:30 each morning for breakfast.

7:45 to 8:30 Welcome and Introduction of Scholars (see pages 13 – 24) — Elms Ballroom
Nancy Thomas, Emporia State University (see page 263)
Danny Callison, Indiana University (see page 263)

8:30 to 10:00	General Reception, open bar "pay for your own drinks"	Elms Ballroom

Friday May 31

Morning

6:30 to 7:30	Scholar and Mentor Breakfast	Empire Room

Opening General Session

8:00 to 9:20	*Analyzing Relationships Between School Libraries and Academic Achievement* Keith Curry Lance, see pages 46-69, 252	Regent Ballroom

Concurrent Sessions

9:30 to 10:50	*Experimental Methods to Test Instructional Design* Ruth Small, see pages 70, 252	Regent Ballroom
9:30 to 10:20	*Illiterate or Aliterate? Information Literacy Challenges* Lisa Hinchliffe, see pages 252 - 253	Empire Room
9:30 to 10:20	*School Librarians and Evidence-Based Practice: Concepts, Conundrums and Challenges* Ross Todd, see page 253	Leadership Room
11:00 to 12:20	*Action Research Methods: Evaluation of School Library Media Programs* Kathy Latrobe and Anne Masters, see page 254	Regent Ballroom
11:00 to 11:50	*A Comparison Study of Library Media Students' Perceptions of Their Learning Experiences in Online and Face-to-Face Classrooms* Julie I. Tallman, Sandy Geisler, and Mary Ann Fitzgerald, see pages 71-93, 254-256	Empire Room

Lunch is "on your own"

Friday May 31

Afternoon

Concurrent Sessions

1:30 to 2:50	*Development and Implementation of a National Survey: Methods and Limitations* Joan Michie, see pages 94, 256	Regent Ballroom
1:30 to 2:20	*Learning in an Information-Rich Environment* Delia Neuman and Cindy Krimmelbein, see pages 95, 249-251, 256	Empire Room
3:00 to 4:20	*The Texas Study: Methods for How it was Conducted and Conclusions* Ester Smith, see pages 96 - 110	Regent Ballroom
3:00 to 3:50	*GirlsTech: Gender Considerations in the Evaluation of Digital Information* Denise Agosto, see pages 111 – 133, 257	Empire Room
4:45 to 5:45	*Diversity in Children's Services: From a Child's Perspective* Pat Tarin, see page 257	Regent Ballroom
4:45 to 5:45	*Communicative Competence in the Classroom and in the Library* Cecilia Salvatore, see pages 257 - 258	Empire Room

Friday May 31

Evening

7:00 to 8:30	Dinner (buffet served at 7:15)	Elms Ballroom
8:30 to 9:30	IMLS Projects and Funding Report	Regent Ballroom

	Jeanne McConnell, see pages 33 - 45 *Teacher's Palette: Collaboration in Creative Expressions* Diana Rennels and Jill Taylor, see pages 134 - 141	
10:00 to 11:00	Scholars and Mentors Debrief	Empire Room

Saturday June 1

Morning

6:30 to 7:45	Future E-lms Forum What Format should Future Research Retreats Take? Nancy Thomas, Danny Callison, Della Neuman, and others who wish to join in the discussion.	Empire Room

Concurrent Sessions

8:00 to 9:30	*Collaborative Research Methods in Information Literacy* Julie Tallman and Mary Ann Fitzgerald, see pages 142, 255 - 256	Regent Ballroom
8:00 to 8:50	*Time to Learn: Optimizing Students' Learning Time on Information Literacy Tasks* James Carey, see pages 258 - 259	Empire Room
9:30 to 10:50	*Methods in Case Study Research for School Library Media Evaluation* Norman Webb, see pages 259 - 260	Regent Ballroom
9:30 to 10:20	*Think About It: Using Think Alouds Think Afters, and Think Togethers* Jennifer Branch, see pages 143 – 172, 260	Empire Room
9:30 to 10:20	*Teaching Students the Ethical Use of Information and Communication Technologies* Frances Jacobson Harris, see pages 173, 260	Leadership Room
11:00 to 12:20	*Publication Options for School*	Regent Ballroom

	Media Researchers Nancy Everhart, see pages 174 – 176, 260	
11:00 to 11:50	*Children's Choice of Information Sources and Their Perception On Information* Jinsoo Chung, Diane Barlow, and Anne MacLeod, see pages 177 – 193, 17	Empire Room

Lunch is "on your own"

Saturday June 1

Afternoon

Concurrent Sessions

1:30 to 2:50	*Methods for Measuring the Influence of Concept Mapping On Student Information Literacy Achievement* Carol Gordon, see pages 194 – 220, 260 - 261	Regent Ballroom
1:30 to 2:20	*S.O.S. for Information Literacy* Ruth Small, see pages 221, 252	Empire Room
3:00 to 4:20	*Research Methods to Measure Student Achievement and School Media Programs* James Baughman, see page 261	Regent Ballroom
3:00 to 3:50	*Information Literacy Skills of College-Level Virtual Library Users* Mary Ann Fitzgerald and Chad Gallaway, see pages 222 – 245, 256, 261	Empire Room
4:30 to 5:45	*Qualitative Research Methods: An Opportunity for School Library Media Researchers* Delia Neuman, see pages 246 – 248, 256	Regent Ballroom
	Gender Issues in the Design and Analysis of an Instructional Web Site Rebecca Scheckler and Anna Martinson, see pages 262 - 263	Empire Room

Saturday June 1

Evening

7:00 to 8:30	Dinner (buffet served at 7:15)	Elms Ballroom
8:30 to 10:00	Scholars and Mentors Debrief	Leadership Room

Sunday June 2

Morning

9:00 to 11:30	Scholar's Brunch	Empire Room

7:00 am to 5:00 pm shuttles available to KCI

HOME
CONFERENCE DESCRIPTION
CONFERENCE SESSIONS
REGISTRATION
CONFERENCE PARTNERS
CONFERENCE READINGS
QUESTIONS AND COMMENTS

TM and Judy Pitts Scholars Selected!

TM10
May 30 - June 2, 2002

A Conference and Research Forum on Assessment of Student Achievement and Information Literacy Education with emphasis on Children and Youth in a Multicultural Context. Participants include University Researchers, Doctoral Students, Practicing School Media Specialists, and Information Educators in College and Research Libraries

The Elms Resort and Spa, Excelsior Springs, Missouri

Reservations Begin December 1, 2001

To receive notice of conference updates, please subscribe to the Treasure Mountain listserv.

Dr. Daniel Callison Dr. Nancy P. Thomas

Last Updated: Friday, May 10, 2002

8

HOME
CONFERENCE DESCRIPTION
CONFERENCE SECTIONS
REGISTRATION
DOCTORAL STUDENTS
CONFERENCE PARTNERS
CONFERENCE READINGS
QUESTIONS AND COMMENTS

Conference Description | Rationale | Strands

TM 10 Description

Treasure Mountain 10 is a research conference that provides an opportunity for researchers in education, library and information science, communication, ethnic and gender studies and related disciplines to come together to consider research themes related to information literacy, student achievement and assessment, and information skills instruction. This conference is a forum for the presentation of finished research, the reporting of research in progress, the discussion of research trends and future directions, and guidance for student research. Participants will also consider a variety of methods and frameworks for research that will enrich scholarship and increase understanding of literacy education.

Treasure Mountain History

The first "Treasure Mountain" research retreat was created in 1989 by David Loertscher, Blanche Woolls, and Philip Turner. Their dream was to provide researchers in the field of school library media studies an opportunity to share their research, gather ideas, and interact with practitioners "in the field." Involving library professionals in the retreat was thought to be key in ensuring that basic research could produce benefits and applications with meaning and value for school librarians.

Named after Treasure Mountain Inn in Park City, Utah where the first research "retreat" was held, the Treasure Mountain retreat has been held on six occasions since, to explore trends, discuss methodologies, float ideas, examine the goals and directions, and the stimulate thinking of its academic/research and professional participants.

Each of the seven TM retreats has had a theme: these include:

- The Research of School Library Media Centers
  TM I October 1989 (Park City, UT)
- Information Literacy
  TM II June, 1991 (Atlanta GA)
- Researcher Practitioner Partnerships: Applying Qualitative Methodologies to School Settings
  TM III October, 1992 (Annapolis MD)

9

- The Power of Reading: The effect of Libraries and Reading Promotion on Reading Competence
  TM IV June, 1993 (New Orleans, LA); December 1993 (New Brunswick, NJ)
- Future Scenarios for School Library Media Programs
  TM V November, 1994 (Nashville, IN)
- Instructional Interventions for Information Use
  TM VI March/April 1997 (Portland Or)
  TM VII AASL Birmingham
  Treasure MT VIII January 2000 (San Antonio, TX)
- TM IX Information Rich Environments (Nashville, IN)

Conference Papers or summaries of papers for Treasure Mountain retreats I-VI have been published by Hi Willow Research and Publishing and School Library Media Annual (vols: 10-13).

In the past, Treasure Mountain has been informally "linked' to national conferences of American Association of School Librarians (AASL). Treasure Mountain 10 marks the first time that Treasure Mountain has been planned as a "stand alone" forum for researchers and professionals who share an interest and a concern for information literacy issues and instruction and student achievement and assessment across library contexts and academic disciplines.

Top

Dr. Daniel Callison Dr. Nancy P. Thomas

HOME
CONFERENCE DESCRIPTION
CONFERENCE SESSIONS
REGISTRATION
DOCTORAL STUDENTS
CONFERENCE PARTNERS
CONFERENCE READINGS
QUESTIONS AND COMMENTS

Conference Description | Rationale | Strands

Rationale & Focus

Information literacy and information skills instruction, student achievement, and designing instruction in a context of diversity are themes with special resonance for scholars interested in public education and higher education across academic disciplines. In technological and social environments, demands for accountability of teachers and library media specialists, designing culture and gender fair instruction and measuring outcomes are challenges to which the scholarly community is bound to respond. Indeed, the academic community must assume a measure of responsibility for conducting research related to these themes and complexities.

Treasure Mountain 10 is the latest in a series of research conferences addressing research issues in the intersection of information skills instruction, school librarianship, and information literacy.

Top

Dr. Daniel Callison Dr. Nancy P. Thomas

Last Updated: Friday, May 10, 2002

HOME
CONFERENCE DESCRIPTION
CONFERENCE SESSIONS
REGISTRATION
DOCTORAL STUDENTS
CONFERENCE PARTNERS
CONFERENCE READINGS
QUESTIONS AND COMMENTS

Conference Description | Rationale | Strands

Research Strands

Academic Achievement in the School Library media Center

Instructional Design and Technology

Youth Issues in Education, Information, Communication, and School Libraries; The Social/Cultural Context

Research Methods and Analytic Approaches

I. Academic Achievement in School and College Library Contexts

- Suggested topics and questions related to Academic Achievement and Assessment in the School Library Media Center/Academic Library
- The relationship between student performance and resource-based education;
- The role of the school librarian in student evaluation and the impact of such evaluation on student performance/achievement;
- Measuring critical thinking and creativity within the context of information literacy skills instruction;
- Information literacy skills/information fluency of college freshmen; collection of baseline data;
- Authentic measures for authentic learning; Applications in real world settings;
- User and collection analysis techniques leading to creation of new information curricula; beyond integration toward innovation;
- Seeking new standard exam measures that clearly display information literacy skills;
- Impact of teacher modeling information literacy on measures of student practice and performance;
- Multidimensional, multi-intelligence's approaches to information literacy and Assessment.

Top

II. Instructional Design and Technology

- Suggested topics and questions related to Instructional

Design and Technology:

- Technology, literacy, and student achievement: Issues for youth
- Design issues related to Distance Education, Instructional Technology, and Collaboration
- Designing for difference; culturally responsive approaches to information skills curriculum, library instruction, and the creation of instructional settings.
- Media Literacy; Implications for LIS Curriculum and Information Skills Instruction

Top

III. Youth Issues in Education, Information, Communication, and School Libraries

- Suggested topics and questions related to Education, Information, Communication, and School Libraries: The Social/Cultural Context
- Library use and information skills instruction;
- Diversity Issues related to Gender and Ethnicity;
- Educating Generation X Student in Information Literacy Skills;
- Information Needs, the Information Search Process for Information;
- Information Seeking Strategies;
- Issues for Children and Youth;
- The social construction of "Competence" and "achievement."

Top

IV. Research Methods and Analytic Approaches

- Suggested topics related to Research Methods and Analytic Approaches
- Problems and prospects for studying information seeking of children and youth in naturalistic settings;
- Assessing student achievement: Contemporary research design approaches;
- Philosophical and ethical issues in research and research design

Top

Dr. Daniel Callison Dr. Nancy P. Thomas

Last Updated: Friday, May 10, 2002

Judy Pitts

Judy M. Pitts, Ph.D. joined the faculty of Emporia State University as an assistant professor in 1994, shortly after completing her doctorate in library and information studies at Florida State University. She was a former school librarian and the co-authored *Brainstorms and Blueprints: Teaching Library Research* (Libraries Unlimited, 1988) with Barbara Stripling.

Pitts' dissertation "Personal Understandings and Mental Models of Information: A Qualitative Study of Factors Associated with the Seeking and Use of Adolescents" centered on adolescent information seeking and use. In particular, Pitts looked at how students solve information problems, focussing especially on their knowledge of both the subject matter (content knowledge) and the process of information seeking as these are applied to research tasks. Pitts' research convinced her of the importance of teaching information seeking process skills, critical thinking skills, and problem solving skills. Her dissertation study, which received the 1993-94 AASL/Highsmith Research Award, was published in *School Library Media Quarterly* in 1995.

Pitts' bright academic future was cut tragically short when, in the fall of 1994, she was diagnosed with a brain tumor. She died in the spring of 1995.

HOME
CONFERENCE DESCRIPTION
CONFERENCE SECTIONS
REGISTRATION
DOCTORAL STUDENTS
CONFERENCE PARTNERS
CONFERENCE READINGS
QUESTIONS AND COMMENTS

Doctoral Students | Home

Pitts and TM Scholars

Funding to support doctoral students awarded! Sponsored by the Institute of Museum and Library Services.

These awards will cover expenses for travel and lodging (approximately $900-$1,000 each).

Judy Pitts Scholars
Awards have been made to current doctoral students who demonstrate research interests in school library media programs and student achievement. These awards will be designated as "Judy Pitts Scholars," in honor of Judy's research contributions to the school library media field.

Joan Celeste Bessman Champaign, IL	Mary Frances Long Plano, TX
Lourdes S. Cervantes Kyle, TX	Janet E. Martin Augusta, GA
Jinsoo Chung College Park, MD	Claudette S. McLinn Simi Valley, CA
Stephen Del Vecchio Seattle, WA	Marcia A. Mardis Ann Arbor, MI
April M. Hatcher Riverhead, NY	Sharon McQueen Milwaukee, WI
Cory Little Payson, UT	Lorine P. Sweeney Vermilion, AB Canada

Treasure Mountain Scholars
Additional awards have been granted to individuals who demonstrate promise of seeking admission to a doctoral

15

program within two years following TM 10 2002.

Candace Wexler Aiani Taiwan	Nancy McGriff LaPorte, IN
Judah Hamer Teaneck, NJ	Erin Meyer-Blasing Madison, WI
Joquetta Lynn Johnson Baltimore, MD	Gabriella Miller Gibsonia, PA
Kymberly Ann Kramer Indianapolis, IN	Leslie B. Preddy Indianapolis, IN
Deborah D. Levitov Lincoln, NE	Christina E. Petrus New Haven, CT

Top

Dr. Daniel Callison Dr. Nancy P. Thomas

Last Updated: Friday, May 10, 2002

Treasure Mountain and Judy Pitts Scholars Biographical Profiles

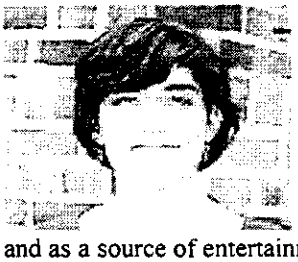
Candace Aiani

My work, my interests, my projects, and my hopes for the future are literally and figuratively "global."

My current position is with Taipei American School in Taiwan. This is my third year in an overseas school, a situation that presents some unique challenges in providing access to information. The effort to meet those challenges has required that I expand my own definition of a school library, and encouraged me to push for services that might be considered outside of what is traditionally necessary in an urban high school, services such as document delivery and participation in the host-country, information-sharing network.

Another challenge for overseas librarians that is not unique, but perhaps exaggerated by oversea work, is a sense of professional isolation and a lack of readily available professional development. To combat this problem, I am working on a project right now with a small group of international librarians to establish support for a new consortium called Schools International Library Consortium (SILC-Asia). This exciting grassroots effort is gaining momentum and the benefits to libraries across Asia and the Pacific Rim are tangible.

My hopes for the future include continuing the exciting work that I have found with the international library community as well as enjoying personal opportunities for travel and exposure to diverse cultures.



Joan Bessman

As a doctoral student in Library and Information Science, Assistant Program Coordinator of the School Library Media Program at the University of Illinois at Urbana-Champaign, and a former middle school language arts teacher, I am highly invested in examining and promoting reading in its varied though often elusive roles. I am interested in reading as a method of information seeking and as a source of entertainment, but view reading practices as much more dynamic than these categories connote.

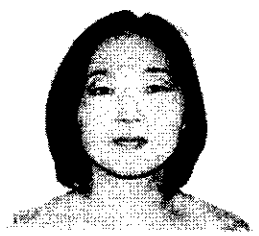
My research agenda is currently focused on an ethnographical investigation into the daily reading practices of actual rather than theorized persons, an investigation into the practices that should inform the creation of information systems, educational methods, and services for real readers of all ages. Using collective reading (i.e. book discussion groups or literature circles depending on the population) as my point of access, I intend to study how and why people read, why people make the reading selections they do, and how the spread and use of technology transform the act of reading.

As an educator in Library and Information Science, I hope to bring an awareness of reading practices to the education of our field's future leaders, particularly those striving to cultivate and assist lifelong readers.

Lourdes Cervantes

I have recently been named the librarian for a new elementary school in my district. Working directly with teachers and students in a library setting will provide me the opportunity to explore the integration of curriculum and information science. My previous experience as a classroom teacher has shown me the importance of information literacy and the need to instruct students in the skills needed for information seeking. My Masters in Education is in Instructional Technology and I am currently seeking a PhD in Information and Library Science with an emphasis in curriculum integration.

My research interests are the integration of information science, technology, and curriculum to insure that students are provided the opportunity to learn how to find information and use this information to solve problems. Developing projects that integrate technology and information seeking in a meaningful setting so that students can learn lifelong information literacy skills is one of my highest priorities. Training teachers to become knowledgeable in information seeking strategies that they can pass on to their students is also part of my objective. I feel that participation in Treasure Mountain expands my knowledge base and provides the opportunity to network with others taking part in similar research projects.



Jinsoo Chung

I am currently a Ph.D. candidate at College of Information Studies, University of Maryland. I am originally from Korea where there was no school library media program in its formal educational system when I left the country. As I have been studying for my advanced degree here in the States, I have found that the school library media program was one of the critical educational elements that was missing during my formal education in Korea.

My interest then shifted to the issues related to children's use of information for learning and I am passionately pursuing this interest now. My dissertation, "Information Use and Meaningful Learning," which is currently in progress under the guidance of Dr. Delia Neuman, deals with how high school students seek and use information to learn. I believe "how children learn by using information and how they learn differently using different information sources" are some of the crucial questions that we need to explore more, particularly since we are dealing with a great amount of information in a variety of formats everyday.

My MLS is form the School of Library and Information Management, Emporia State University, and my BA is from Sung Kyun Kwan University, Seoul, Korea.

Stephen DelVecchio

I have over twenty years of experience as children's librarian, school librarian, and teacher. After serving for several years as a children's librarian in the Bronx and East Harlem, I was selected to be the Pilot Project Director for the New York Public Library (NYPL) and DeWitt Wallace Reader's Digest Foundation's Connecting Librarians and Schools Project (CLASP). In that capacity, I helped develop a pioneering program that has since been publicly funding and expanded to all three of New York City's public library systems. At the Family Academy, an innovative public school in Harlem, I established the school's library and worked closely with the National Book Foundation and the Harlem Writer's Guild to design and run a model author residency program.

I have Master of Science degrees in both Library Service (Columbia University) and Telecommunications and Information Management (Polytechnic University). My articles and reviews have appeared in Wilson Library Bulletin, School Library Journal, and Teacher Magazine. For two years I was a contributing writer and children's book columnist for Teacher Magazine. Prior to entering librarianship, I served as a Peace Corps Volunteer, teaching junior high and high school mathematics and science in Fiji.

I am now a first year Ph.D. student at the Information School of the University of Washington in Seattle and a research assistant on the Keeping Found Things Found research project. My research interests include children's everyday life information behavior. I hope to pursue work as a research and teacher that will support and strengthen our ability to serve children's information needs as children's librarians, young adult librarians, school librarians, teachers and parents.

Judah Hamer

I've worked in libraries since high school. Student teaching taught me that I didn't want to teach English. Public and school librarianship would be far more diverse and challenging, I though, especially since funding can be so precarious. For four years I was a middle school media specialist. At the same time I earned my M.L.S. and managed to survive the $1.2 million construction project that became our new media center. As the Young Adult Services Coordinator for Bergen County Cooperative Library System, I often get to the committee member whose employer actually makes it easy to attend meetings. Recently I've helped rewrite the *Guidelines for Young Adult Services in Public Libraries in New Jersey* and implement our state library's *Symposium for Youth Services*. This spring I'll co-present a program on school-public library cooperation to the Long Island Library Association.

While I love serving patrons, I'm increasingly drawn to analyzing people's information seeking behavior. I believe that acquiring new information plays a key role in self-actualization. When I'm trying to avoid clichés, I just say *knowledge is power*. For instance, if I had known as a gay adolescent that there were lots of other guys like me, I surely would have had a much fuller social life. If someone understood the real or perceived barriers to filling relevant information needs that existed for me, I might have felt empowered. I'm still interested in looking at how gay adolescents find information. However, I'm more intrigued by the information seeking behavior of *all* males, because I suspect the social and psychological patterns influencing this area of male lives supersede the matrix of male sexuality. Learning more about the ways males interact with information providers and systems will provide valuable insight for research in other disciplines, and by agencies and individuals concerned with male behavior.

April Hatcher

I am a junior high school library media specialist in the Three Village Central School District in New York. Prior to becoming a school library media specialist, I was a children's librarian in the public library system. I am a history buff and an avid reader with a special interest in historical fiction and multicultural children's literature. An aspiring writer, I am currently working on a historical novel about African American pioneers.

I have a Bachelor of History degree from the State University of New York at Stony Brook, and a Master's degree in Library Science from St. John's University in New York. I am currently pursuing a doctorate in Information Studies at C.W. Post-Long Island University as well as post-graduate certification in Education Administration from the State University of New York at Stony Brook.

In the future, I hope to become a professor of Library and Information Science with a specialty in school library media. My interests in this area include collection development, information literacy, and the use of educational technology. I am also interested in the evaluation of library services. My doctoral research focus is on the role of educational administrators in school library evaluation. I hop that my work in this area can help improve overall school library services.

Joquetta Johnson

I am the Library Media specialist, Technology Liaison and Webmaster for Milbrook Elementary in Baltimore, MD. I am also an Adjunct Faculty Member at Baltimore City Community College and Master Teacher for the National Teacher Training Institute. Recently, I was selected to serve as a member of the Elementary Dance Curriculum Writing Team. In 1999, I was a Fellow in the 1999 Maryland Technology Academy and nominated for the Computer Educator of the Year Award. I have presented at local, regional, and national conferences and workshops.

I received a BS in Telecommunication from Morgan State University and completed graduate studies in Mass Communications at Towson State University. Afterwards I taught Developmental Reading and Speech 101 at the Community College of Baltimore. In 1994 I began my career as a Media Specialist in Baltimore City Schools, switching to Baltimore County in 1998. I will receive my MS in Library Media in May 2002 from Western Maryland College and plan to pursue a PhD next fall.

I recently completed "The 3 R's of Diversity: Race, Religion, and Region—Resources and Materials for Teaching an Education That's Multicultural." This project is an annotated bibliography intended for classroom teachers, library media specialists, reading specialists, and ESOL teachers.

Kym Kramer

I have been in public school education for 13 years. I taught second and third grade for six years before becoming a media specialist seven years ago. As a classroom teacher, I held the philosophy that students learn most effectively when subjects are integrated. Luckily early in my career I discovered there is a particular teaching philosophy called Integrated Thematic Instruction (ITI) that validates my beliefs. After just nine years of working in more traditional schools with fragmented curricula, I was hired as a media specialist at Fishback Creek Public Academy. I am currently part of a staff that shares the vision of integration, and my school is a recognized leader in ITI. It's a perfect fit for my views on effective education.

Changing to the field of media allowed me to further broaden my thoughts on what integration can encompass. During the past two years, I have developed and refined the *Dream Weavers* integration model that allows multiple curriculum areas to be integrated around a core project. Thus, specialty areas such as art, music, and physical education are intertwined with classroom curricula for up to twelve weeks at a time. This area of professional investigation continues to be refined project after project.

Denise Levitov

I am Coordinator for Library Media Services for Lincoln Public Schools in Lincoln, NE, a district of over 30,000 students with 51 schools. Before moving to the central office position ten years ago, I served as a school library media specialist at both the elementary and secondary levels. My main focus as Coordinator is making curriculum and instructional connections through the integration of information literacy skills and the use of resources, using a research process. I coordinate related staff development opportunities for teachers and library media specialists.

I served as the staff development coordinator for a Dewitt Wallace Reader's Digest Library Power Initiative from 1993-1997. I was also the co-chair for the Nebraska Information Power Committee. On that committee, I helped secure a $79,000 IMLS Grant entitled "Librarians Online to Information Literacy" and assisted in developing an online course for library professionals in Nebraska through that grant. I am active in her state professional associations. I also helped in the publication of two books, *The Lincoln Public Schools Guide to Integrated Information Literacy Skills*, Lincoln Public Schools, 1999-2002, and the *Guide for Developing and Evaluating School Library Media Programs*, Libraries Unlimited, 2000.

I have a B.A. in Social Work with an Elementary Teaching Endorsement and a M. Ed. in Educational Administration with a Supervisory Certificate, K-12 and a Library Media Endorsement, K-12 from the University of Nebraska. I am in the process of applying to doctoral programs.

Cory Little

I am a middle school social studies teacher who recognized the unrealized potential of most school library media centers, particularly at the elementary and middle school levels. Knowing that it is difficult to champion a cause that one is not part of, I returned to school for my K-12 School Library Media certification and capped that with a Masters degree in Instructional Technology. Still not ready to take on the forces against change, I took a one-year sabbatical and started a doctoral program in Instructional Technology through Utah State University. Rushing through my coursework, I plan to begin dissertation work this fall on the role of school library media specialists. My goal is document the value of a robust school library media program and lobby for increased support of both secondary and elementary programs at local, district, and state levels.

Mary Frances Long

I have been the teacher-librarian to a student body of over 1,000 students and 100 staff at Wilson Middle School in Plano, TX for the past nine years. I serve as chair for the campus' Technology Committee, chair the Technology Subcommittee for the campus' School-Based Improvement Committee (SBIC), and am the Webmaster for the school.

I created and sponsor three book discussion clubs for students and one for staff members who read and discuss two to three young adult books a month. I also encourage student writers through a creative writing club I sponsor and I involve students in planning library programs and activities through the Library Teen Advisory Board (TAB).

Currently, I chair the Margaret A. Edwards Award—2002 committee sponsored by YALSA/ALA and co-chair one of the component committees revising the school library standards for the State of Texas. I have also chaired YALSA's Quick Picks for Reluctant Young Adults Readers and on the state level chaired the

Texas Lone Star Reading List Selection Committee, creating annual recommended reading lists for middle schoolers. In 1999, I was honored as a TALL Texan and attended the leadership development program sponsored by the Texas Library Association.

I earned my MLS from Texas Woman's University. I am currently working on my doctorate in education at Nova Southeastern University.

Marcia Mardis

I am a former K-12 media specialist in Michigan and Texas. Currently I am an Internet and Information Media Specialist at the Center to Support Technology in Education at Merit Network, Inc. at the University of Michigan (Ann Arbor). I serve as the Project Director for Michigan Teacher Network, a clearinghouse for K-12 educators, and as the Co-Principal Investigator of a National Science Foundation digital libraries project.

I am also on the faculty of the Department of Teacher Education at Eastern Michigan University's College of Education. I teach graduate educational media and technology courses. In addition, I am pursuing doctoral studies in the Department of Educational Leadership. I have published and presented widely on my passionate interests of Web searching, information literacy, and school library media advocacy issues.

Janet Martin

I am a third-year doctoral student in the Instructional Technology Department at the University of Georgia (UGA). My activities as full-time doctoral student include serving as Secretary of the Instruction Technology Student Association, serving on the School Library Media Pre-Service Program Advisory Board, and teaching three undergraduate classes as instructor of record. My honors include induction into Kappa Delta Pi Honor Society, receipt of the State Normal College Scholarship, receipt of the Armed Forces Communications and Electronics Association Scholarship, and publication of feature articles in *School Library Media Activities Monthly* and *Teacher Librarian*. I believe my greatest honor was receiving outstanding course evaluations from undergraduates enrolled in my classes! I want to contribute in significant ways towards forwarding racial diversity in library schools through my academic work and research.

Before attending UGA, I worked as a 6th grade teacher and elementary school librarian while earning my MLIS degree from University of South Carolina. My creative and innovative energy as a librarian brought media coverage to my Title-I school on several occasions. My fondest memory as a school librarian was when author Dori Sanders celebrated Children's Book Week with my students.

Nancy McGriff

Currently I am the K-12 media specialist for South Central Community Schools in Union Mills, IN. I was President of the Association for Indiana Media Educators (AIME) and I currently am the chair of AIME's Information Literacy Skills Task Force. In 2001, I was awarded the Peggy Leach Pfeiffer Service Award by AIME. Additionally I am a member School Library Media Specialist Leadership Cadre of the Indiana Department of Education.

Claudette McLinn

As supervisor of Title VI Library Nonpublic School Services for the Los Angeles Unified School District, I believe that the purpose of the library program is to promote literacy serve the underrepresented populations. "Librarians are powerful change agents who must take into their heart to actively learn and embrace the needs of their customers and to satisfy their customers individually."

I participated on the California Department of Education's working committee to revise the state's *Recommended Literature: Kindergarten through Grade Twelve.* I served on the boards of the California School Library Association and the Los Angeles School Library Association. I was recently appointed to the ALA's Council Committee on Cultural Diversity and served as liaison member on the ALA Special Presidential Task Force on the Status of Librarians, which produced a final report addressing the status and salary issues related to librarians.

I am currently a doctoral candidate at Pepperdine University specializing in Organizational Leadership. I received a B.S. in Education and M.S. in Library Science from Wayne State University, and M.S. in Education Administration from Pepperdine University. I am an expert in the area of children's multicultural literature and plan to publish and lecture on this subject.

Sharon McQueen

I am a doctoral candidate at the University of Wisconsin - Madison, School of Library and Information Studies. I hold a doctoral minor in Early Childhood Education, with an emphasis on Emergent Literacy. My areas of interest include: Library Services for Youth, Emergent Literacy, Librarytime (Storytime), Children's Literature, Young Adult Picture Books, and Homeschoolers & the Library.

I have taught in the graduate programs of both the University of Wisconsin – Madison (Children's Literature) and the University of Wisconsin – Milwaukee (Public Libraries). I have also presented on Young Adult Picture Books for The University of Wisconsin – Madison's biennial children's literature conference. I have served as the Convener of the Doctoral Students SIG (Special Interest Group) for ALISE (Association for Library and Information Science Education) and currently serve on the ALISE Membership Committee. I am pleased to serve on the Planning Committee of LRSII (Library Research Seminar II), which will be held in Kansas City, MO, in October of 2004. My first book, *In-House Book Binding and Repair*, is due to be published by Scarecrow Press.

Prior to my decision to pursue a career in librarianship, I was a professional theatrical. I enjoyed a successful, fifteen-year career as a performer, director, artistic director, and producer. At twenty years of age I moved from Wisconsin to New York City, where I procured an agent within two weeks and produced my first off-Broadway show within five months. Upon returning to Milwaukee, I founded my first theater company. In 1984 I founded my second theater company (currently operating under the name Next Act Theatre) and served for seven years as both the company's Artistic Director and Producer. I believe that my former career will serve me well as I continue to grow in the library world.

Erin Meyer-Blasing

I expect my Master's degree from the University of Wisconsin-Madison School of Library and Information Science (SLIS) this August and will begin the doctoral program at SLIS in the fall of 2002. I currently hold a Project Assistantship as a solo librarian at the Woodman Astronomical Library and plan to continue the assistantship throughout my doctoral studies.

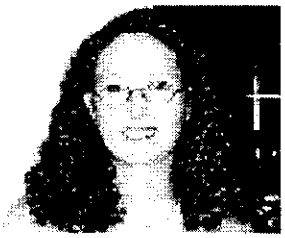
My areas of research interest include bibliographic instruction, reference service, information seeking behavior, and the history of library service as well as service to marginalized groups such as those with limited English and incarcerated populations. I have been a volunteer with the Jail Library Group since the fall of 2000 and enjoy providing library service and programming to the inmates of two Dane County jails. I held the position of group Coordinator from December 2000 to January 2001. I recently presented a workshop on Internet resources for librarians serving Spanish-speaking patrons to public and school librarians from throughout the Midwest.

In the realm of school media research, I have interests in children's and young adult literature (particularly multicultural literature) and intellectual freedom issues. Recently, I assisted Dr. Dianne Hopkins with a study of challenges to materials in Wisconsin school library media centers. This summer I will be taking a course on action research in school library media centers.

Gabriella Miller

I received my BS from Syracuse University in Communication Disorders and my MS from the University of Pittsburgh in Speech Pathology. I am currently employed as a speech/language pathologist in a school district located north of Pittsburgh, PA. I spent many hours in the library researching lessons for my students and developed a wonderful working relationship with the middle and high school librarians. This was the impetus to my taking a sabbatical leave so that I could pursue an MLIS degree from Clarion University.

As I progress in the library science program, I find that my mind still focuses on how this degree can assist me in helping students with learning needs find enjoyment in reading and improve their literacy skills. I am interested in utilizing current theory and technology to capture the interest of reluctant and struggling readers so that their learning experience is more successful. By developing lessons in which multiple formats are used and collaboration between teachers is emphasized, I believe that more children will become enthusiastic readers and library users.



Christina Petrus

The growing importance of information literacy in our society, as well as interest in computer and Internet technologies, love of literature, and pleasure working with children resulted in my decision to pursue the M.L.S. with school library media certification. Last year, I had the opportunity to work as a school library media specialist (SLMS) long-term substitute teacher for three elementary schools in a suburban town in Connecticut. The experience afforded me firsthand knowledge of some of the issues facing today's SLMS including the need to promote the value and technique of collaboration between the classroom teacher and SLMS.

After completing the school year at the suburban town, I pursued my degree full-time. This year of full-time study has allowed me to conduct research on school library media topics and co-organize a conference on collaboration. With Dr. Mary E. Brown, Principal Investigator, I am examining the perceptions of

teachers, administrators, and SLMSs on the role of the school library media program in the overall educational mission of the school and on standards that should be adopted in support of that role. The Conference on Collaboration was created, with fellow student, Ann Johnson, to promote the profession and increase communication and understanding between the education community and SLMSs. Specific objectives included describing and modeling teacher/librarian collaborations, discussing ways to market the SLM program and specialist, and examining how to create strong relationships with administrators (http://www.geocities.com/ct_school_media/index.html).

Leslie Preddy

I have spent ten years as a school library media specialist at Perry Meridian Middle School in Indianapolis, Indiana. I feel that the support I receive from my building administration has given me ideal working conditions. That support has given me the freedom to take on a leadership role and work tirelessly to help her school to incorporate information literacy, write and implement grants, develop high-level collaborations, and participate in professional growth opportunities.

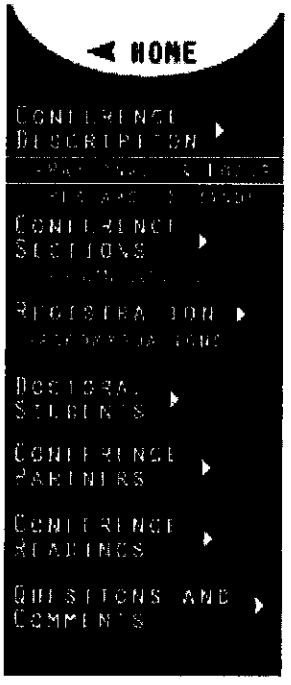
Since 1998 I have remained on the board of the Association for Indiana Media Educators (AIME) in a variety of roles. Among my volunteer commitments, I have served as the Young Hoosier Book Award Chair, regional Media Fair host, and organized the first annual AIME College Scholarship Fundraising Auction. Currently she is AIME Vice President and 2002 state conference chair.

I am a participant of the Indiana Department of Education-Office of Learning Resources SLMS (School Library Media Specialist) Leadership Cadre. Among the professional development opportunities this has afforded me was a chance to develop a program to facilitate schools, classroom teachers, and library media specialist's integration of student inquiry in the research process, which is currently being tested in five K-12 schools throughout Indiana.

Lorine Sweeney

I am from Vermilion, Alberta, Canada, and I am presently employed as School Improvement Coordinator for a rural school division near Edmonton, Alberta. I have been a teacher and teacher-librarian for many years in the division and continue to be interested in designing library programs and facilities suited to unique demands of students. As part of my present school improvement duties, I am working with a team responsible for assisting teachers in the integration of the information and technology curriculum with the core curriculum.

My MEd thesis involved a study of teachers and teacher-librarians working together and I continue to believe in the strong benefits of this collegiality. Presently I am enrolled in a doctoral program through the faculty of Elementary Education at the University of Alberta. I am interested in seeking insight into the experiences of teachers and students who have participated together in technology-related professional development activities. I believe in working together as a school community, and in the area of technology I think that students and teachers learning together has the potential to be both motivational and rewarding. Students are a huge untapped resource!



Conference Readings | Home

TM 10 Readings List

Conference participants are encouraged to read about conference - related themes. Here is a preliminary list of relevant titles. We invite you to suggest others! Send suggestions to Dr. Nancy Thomas.

Information Literacy and Instruction:

1. AASL/AECT (1999). Information Power: Building partnerships for learning.Chicago: ALA.
2. Callison, McGregor, Small (Eds.). (1998). Instructional intervention for information uses. Hi Willow Research and Publishing.
3. Donham, Jean (1998). Enhancing teaching and learning: A leadership guide for school library media specialists. New York: Neal Schuman
4. Hughes-Hassel, S. and Wheelock, A. Eds. (2001). The Information-Powered School. Chicago: ALA.
5. Kuhlthau, C. C. (1997). Learning in digital libraries: An information search process approach. Library Trends, 45 (4), 708-724.
6. Kuhlthau, C.C. et al (eds.) (1996). The virtual school library : Gateway to the Information Superhighway. Englewood, CO: Libraries Unlimited.
7. Kuhlthau, C. C. (Ed.). (1994). Assessment and the school library media center. Englewood, CO:Libraries Unlimited.
8. Loertscher, David V. and Woolls, Blanche. (2002) Information Literacy Review of the Research. 2nd edition. Hi Willow Research.
9. LIRT. (1995). Information for a New Age: Redefining the librarian. Englewood, CO: Libraries Unlimited.
10. Neuman, D. (1990). Beyond the chip: a model for fostering equity. School Library Media Quarterly, 18 (3), 158-164.
11. Pappas, M. L. (1998). Designing authentic learning. School Library Media Activities Monthly 14 (6), 29-31, 42.
12. Small, R. V., & Anrone, M. P. (2000). Turning Kids On to Research: The Power of Motivation. Englewood, CO: Libraries Unlimited.
13. Thomas, N. P. (1999). Information literacy and information skills instruction: Applying research to

practice in the school library media center. Englewood, CO: Libraries Unlimited/Teacher Ideas Press.
14. Zwiezig, D., Hopkins, D., & Webb, N. L. (1999).Lessons from Library Power: Enriching teaching and learning. Englewood, CO: Libraries Unlimited.

Top

Diversity and Gender Issues

1. Belenky, M. F., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1986). Women's ways of knowing: The development of self, voice, and mind. New York: Basic Books.
2. Delpit, L. (1995). Other People's Children: Cultural Conflict in the Classroom. New York. The New Press.
3. Ford, D. Y. (1996). Reversing Underachievement Among Gifted Black Students: Promising Practices and Programs. New York. Teachers College Press.
4. Fordham, S. and Ogbu, J. U. (1986). Black students school success: Coping with the "burden of acting 'White'." Urban review 18: 176-206.
5. Hale-Benson, J. E. (1986). Black children: Their roots, culture, and learning styles 2d ed. Baltimore, MD: Johns Hopkins University Press.
6. Irvine, J. J. (1990). Black students and school failure: Policies, practices, and prescriptions. Westport, Conn: Greenwood Press.
7. Ornstein, P. & A.A. U P. (1994).School girls: Young women, self-esteem, and the confidence gap. New York: Doubleday. School Librarianship: New Roles and Responsibilities
8. Powell, L. C. (1997). The achievement (k)not: Whiteness and 'black underachievement." In Fine, M. et al. Off white: Readings on race, power, and society.
9. Riggs, Donald and Tarin, Patricia A. Eds. (1994). Cultural Diversity in Libraries. New York: Neal Schuman.
10. Rothenberg, P. S. (1998). Race, class, and gender in the United States: An integrated study. New York: St. Martin's Press.
11. Sadker, M., & Sadker, D.(1994). Failing at fairness: How America's schools cheat girls. New York: Scribner's.
12. Tarin, Patricia A. (1996). Asian Language Collections in California Public Libraries: A Study with Recommendations. DIANE Publishing.
13. Tatum, B. D. & Brown, P. C. (1998). Breaking the silence: Talking about race in schools. Knowledge Quest, 27 (2), 12-16.
14. Vandergrift, K. (1996). Ways of knowing: literature and the intellectual life of children. Lanham, MD: Scarecrow.

Reasearch in School Media

1. Callison, Daniel. "The Twentieth-Century School Library Media Research Record." Encyclopedia of Library and

Information Science. Vol. 71. 2002. 339-369. A reprint available upon request: callison@iupui.edu

2. Treasure Mountain Online (managed by David V. Loertscher) http://tigris.sjsu.edu. Fifty full-text studies cited in Information Literacy: A Review of the Research by Loertscher and Woolls. Passwords available through davidl@wahoo.sjsu.edu

Top

Dr. Daniel Callison Dr. Nancy P. Thomas

Last Updated: Friday, May 10, 2002

HOME
CONFERENCE DESCRIPTION
CONFERENCE SESSIONS
REGISTRATION
DOCTORAL SESSIONS
CONFERENCE PARTNERS
CONFERENCE READINGS
QUESTIONS AND COMMENTS

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Organizers

Dr. Daniel Callison
School of Library and Information Science
Indiana University Indianapolis
755 W. Michigan Street, UL 1110A
Indianapolis, IN 46202-5195
callison@indiana.edu

Dr. Nancy P. Thomas
School of Library and Information Management
Box 25 William Allen White Library
Emporia State University
1200 Commercial Street
Emporia State University
thomasna@emporia.edu

Top

Last Updated: Thursday, May 16, 2002

AASL American Association of School Librarians
a division of the American Library Association

Improving Literacy Through School Libraries Grants
See the AASL "Funding Opportunities" Resource Guide to learn more about this new competitive grant program from the U.S. Department of Education.

AASL News

AASL presents 2002 National School Library Media Program of the Year Award
James River High School in Midlothian, Va., will receive the award at the 2002 ALA Annual Conference. The award is given for an exemplary school library media program that is fully integrated into the school's curriculum. [Full Story]

AASL presents 2002 awards recipients
AASL is pleased to announce the recipients of eight 2002 AASL awards. The awards will be presented to each winner at the 2002 ALA Annual Conference in Atlanta. [Full Story]

information MATTERS @AASL KC ■ MO **AASL 11th National Conference Call for Proposals**
The call for proposals and online program proposal submission forms for the AASL 11th National Conference are now "live" on the AASL Web site at www.ala.org/aasl/kc/proposals.html. The deadline for submitting preconference workshop proposals is

ALA 2002 Annual Conference

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ALA ANNUAL CONFERENCE
June 13-19, 2002
June 13-19, 2002

Pre-register for AASL preconferences, school tours and other ticketed events at the ALA 2002 Annual Conference!

View the complete schedule of AASL special events, educational programs and meetings.

The ALA 2002 Annual Conference Web site includes registration, travel and accommodations info, and an event planner.

AASL Web Sites

ICONnect

Knowledge Quest on the Web

July 1, 2002 and the deadline for submitting concurrent session proposals is September 15, 2002. [Full Story]

School Library Media Research

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Mission and Goals

Mission Statement:
The mission of the Association for Educational Communications and Technology is to provide leadership in educational communications and technology by linking professionals holding a common interest in the use of educational technology and its application to the learning process.

Goals:
Leadership will be demonstrated through a continuous effort to define those disciplines and professional activities that make up educational communications and technology. Leadership will be demonstrated through a continuous effort to accommodate, serve, and represent professionals and professional activities in educational communications and technology. Leadership will be demonstrated through a continuous effort to develop those elements and attributes that enhance the professional stature of educational communications and technology. Leadership will be demonstrated through a continuous effort to actively promote the improvement in learning environments through the use of educational communications and technology.

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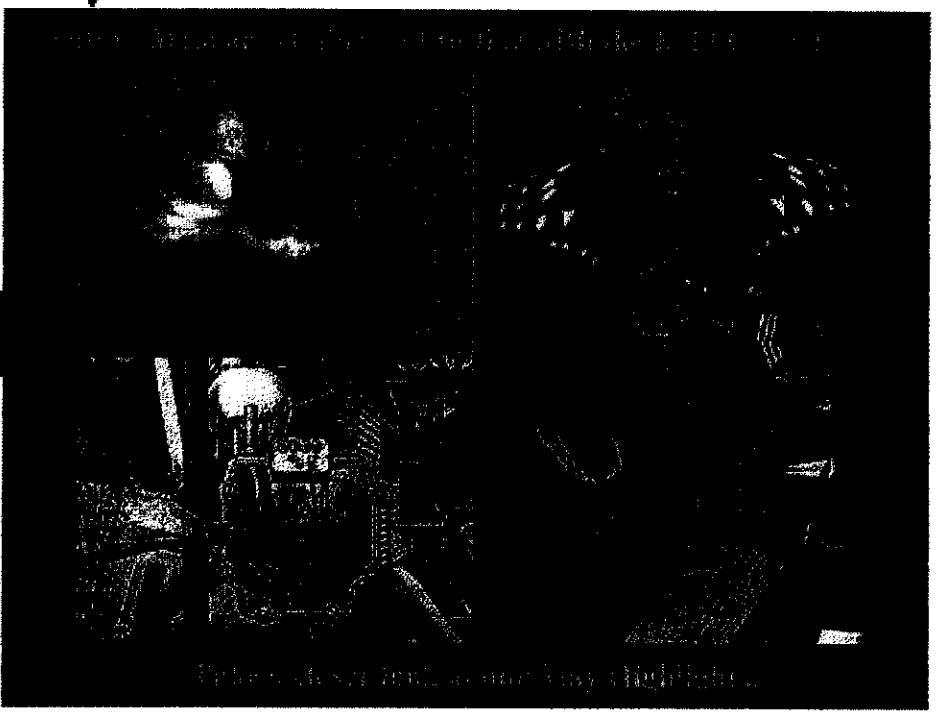

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Collaboration Highlight for 2002

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School Libraries Get Top Marks with Help from IMLS Grants

Students in schools with media centers that are well-staffed, have networked technology, and have strong collections perform better on standardized tests, according to a major study funded in part by IMLS. The Library Research Service of the Colorado State Library released a report in June 2000. It showed that state reading scores for students in schools that focused on improving their library programs were, on average, eight to 21 percent higher than similar schools without such development, even when other factors like community demographics are taken into account. Findings from this and other studies across the country prove what many in the library community already know: that school media centers can make a big difference in student achievement.

Through the administration of Library Services and Technology (LSTA) grants through state library agencies, IMLS has developed a track record of support for school libraries and librarians. Many of these libraries are earning extra credit with students, teachers, principals, and communities with projects that reach underserved audiences, promote literacy and reading, improve collections, and use technology creatively.

Lesson in partnership

The Federal Hocking School District is located in the rural foothills of the Appalachian Mountains in southeastern Ohio. District services are spread across 250 square miles, and the public library is as far as 20 miles away from the homes of some residents. District librarian Bonnie Lackey strives to provide library services to the district's 1,444-student population, which includes many from low-income families. A coalition between the school district and the Nelsonville public library was formed as a result of LSTA funds. The coalition established the Lancer Satellite Resource Center, a mini-library and homework center for residents and students in the small town of Stewart and surrounding district communities.

The school system provided the space for the center in an existing former school building. The building is near the new middle school and high school complex and is in walking distance for people living in Stewart. The LSTA grant helped outfit it with quick reference materials, computers, and technology accessibility. Center patrons have access to these resources, several online research databases, and more, after school and during evening hours. On-site volunteers who staff the center can help patrons obtain new library cards and reserve library resources on the public library's Web catalog. The public library delivers materials to patrons at the center through interlibrary loan.

The opening and planning of the center mobilized the community. Teachers, students, parents, residents, and 4H groups came together one night to help clean, paint, and prepare what was once an old classroom and was soon to be new resource center. Teachers, who once had taught in the room, reminisced as they rolled up their shirtsleeves to prepare the space for new students and adult patrons.

Future plans include additional partnerships, workshops, and community gatherings. The center has also sparked interest in town hall meetings for the revitalization of the old school building and an investigation into the historic value of the campus. Community activists are hoping to revive the ball fields and playgrounds that surround the center and improve the cohesiveness of a largely separated district.

Infusing schools with technology

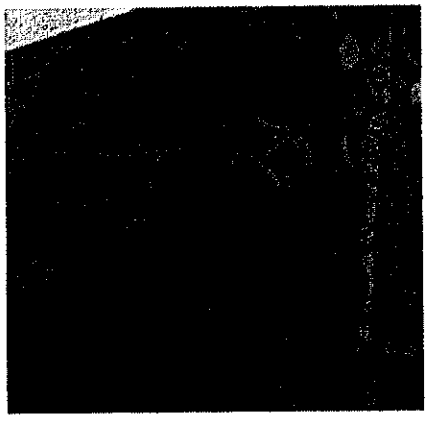
Rosemary Sharpe is the media specialist at South Jones Middle School in the small town of Ellisville, Mississippi. She applies regularly for grants to supplement funding for her library and school. In a school district where nearly 60 percent of the students come from low-income families, where computers in the home are rare, and home Internet connections are rarer still, she finds that school-based access to technology is critical. In 1999, she received funding through LSTA and the Mississippi State Library to integrate computer use in all of the school's classrooms. The school building was new and all of the classrooms were wired for computers and networking, but funding had run out before the school had reached that goal.

With LSTA and other grants, Sharpe was able to obtain classroom computers, enough for one computer for every five students, and the local area network to link them. The school library serves as the network hub. With new equipment in place, Sharpe said, it was far easier to make the case to the

school district for Internet hookup.

Now, the library is not only the computer network hub, it is also the center for digital information, computer training (for both students and teachers), and library resources. The library and the classrooms have free access to online reference databases for collections of resources in science, literature, history, current events, biographies, and much more through the statewide library consortium Web site.

"A benefit of the grant was the increased use of the technology by the teachers," said Sharpe. The teachers were enthusiastic about computer training and took advantage of state-offered classes that covered the most basic skills to more sophisticated office software, such as the popular PowerPoint program.



A student of South Jones Middle School in Ellisville, Mississippi, uses a Golden Mean gauge to measure proportions of an illustration of the Parthenon. Math, science, and art teachers at the school used computers funded through LSTA to enhance their lessons with units on the Fibonacci ratio.

According to Sharpe, teachers have embraced the technology and are infusing curriculum with online resources that cut across disciplines and address state standards. Teachers at the school are using the Copernicus Learning Network to see and share lesson plans online, and they have found Web sites resources to use with their Fibonacci-based lessons. The Fibonacci number sequencing principle has been used at the school to demonstrate proportions used in art, classical architecture, human anatomy, botany, and, of course, mathematics.

Students at South Jones Middle School in Ellisville, Mississippi, created a mural depicting famous buildings that conform to the Golden Ratio or Rectangle. They studied the Fibonacci ratio and its application to classical architecture with the Golden Ratio using computers and a Golden Mean gauge purchased with LSTA grants.

Media Specialist Linda Lovely of Bloomfield Elementary School in Trenton, Ohio, used LSTA-funded technology to address the problem of having too many classes to serve and not enough time in the day. "There were so many classes coming in for their scheduled 30 minutes that there wasn't enough time to help students with their individual research projects," she said.

Students at Bloomfield Elementary School, of Trenton, Ohio, enjoy using the LSTA-funded Mobile Reference Library for their research projects. Credit: Linda Lovely

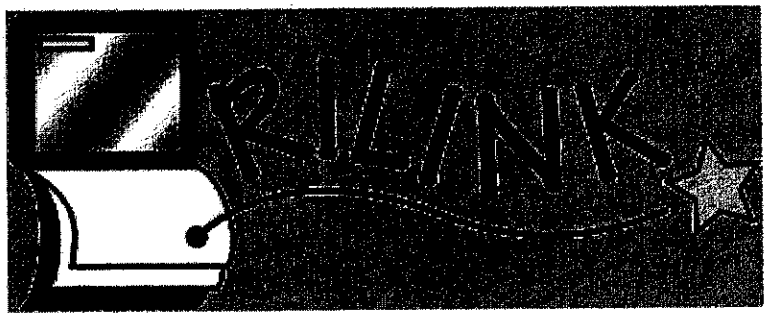
Her solution: to bring the library to the classrooms with a mobile reference library built upon three rolling book and computer carts. One has a complete encyclopedia set with a small-scale copier on top. The second has 10 laptops with electronic encyclopedias installed and wireless connections to a printer which sits on top, and the third has four extra laptops that can be plugged into the network from the classroom for access to the Internet, the library catalog, and public library resources.

Mrs. Kelly Philpot and her third grade students at Bloomfield Elementary in Trenton, Ohio, use the mobile reference unit to conduct research for their animal reports. They are excited to discover that they can hear animal sounds on the computer. Credit: Linda Lovely.

Librarian Linda Lovely and the school's teachers have been very pleased with the mobile reference library. She said, "We were in a real dilemma. I have no clue how we would have allowed kids to do research if it hadn't been for that grant being funded."

Linking libraries' resources

RILINK is a Web-based union catalog of Rhode Island school library materials. The catalog allows each of the 25 participating media centers access to any of the 300,000 cataloged items through interactive interlibrary loans. Students can search the catalog themselves, from home or school, and find out the shelf status of a book. The students' searches are linked to relevant Web sites that have been selected by the vendor and are maintained on the vendor's site.



The Rhode Island Library Information Network (RILINK) began four years ago as an LSTA project linking the resources of just two school libraries. Now, RILINK is a self-supporting service of the East Bay Educational Collaborative and includes more than 300,000 items in 25 media centers.

Linda Wood, school library media specialist from South Kingstown High School in Wakefield, Rhode Island and co-founder of RILINK, said, "Students at my school would often come up to me and say, 'I can't find anything that I'm looking for, and I've searched the catalog.' It would be frustrating to know that the information existed somewhere, in some other

library. I felt that if we only had some way of sharing resources between one school library and another school library and the public library, we'd be able to fill that void, and students would be able to find the information they needed."

Dorothy Frechette, executive director of RILINK, described typical scenarios in which RILINK proves its merit. For instance, when a new book is added to the collection and a teacher decides to do a new unit on it, a school librarian would need 10 or 12 copies all at once for the class. Or suppose an entire class is doing a project on whales, and the school library only has two items on whales. RILINK allows librarians to search libraries throughout the state for the materials they need. She said, "RILINK opens up a lot more resources for students and teachers. It is especially helpful for those who can't get to a public library."

By enabling materials to be shared among libraries, RILINK provides patrons access to collections worth far more than what an individual library could afford. Wood figures that at an average cost of $20 for each new item to put on a library shelf, RILINK makes more than $22,000-worth of additional books and other materials available to students and teachers.

Project staff and participants have made cost-saving changes and have implemented other improvements since the project was begun in 1998 with just two schools. The network, which was established and supported in part by LSTA grants until last year, has become self-sustaining with payments from member libraries. RILINK shifted its virtual library from a computer server at the vendor's site to one in the office of the public library consortium at the Warwick Public Library, for annual savings of more than $20,000. The project staff who now maintains the server can update the database frequently. Before, updates took place only once a year. The project also now uses a new, powerful program to standardize and reduce duplicate records in the catalog.

Beyond the service provided to students, RILINK has established new collaboration and communication between school librarians, said Frechette. "There has been a real opportunity beyond the statewide library media association for school librarians to work together," she said. "They sometimes feel isolated in individual schools. RILINK provides an opportunity for collegiality and for working with peers."

Books, books, everywhere

One of the key predictors of academic achievement identified by the Second Colorado study was the level of the library

media program development, which is determined in great part by the collection size and relevancy. Yet even as new schools are being built and new technology is secured, local funding often is in short supply for collection maintenance and improvement, resulting in book collections that are out-of-date, insufficient in numbers, and no longer aligned with the curriculum. Resourceful librarians and school administrators have sought new ways to support their library collection acquisitions and have sometimes turned to federal LSTA funding.

Teresa Thomas was hired as a new media specialist by Candor Elementary School in North Carolina around the time the new school building was completed. She said, "The collection was very outdated. When I started weeding through it, I got rid of almost half of the entire collection, everything prior to the 1970s and 80s. If I took away everything, I wouldn't have had anything left on the shelves." From the 4,200-piece collection, she removed more than 2,000 books, some of which had not been checked out in 20 years. In particular, the school needed new poetry and geography books. Even the media center's globe was outdated, showing the USSR.

Thomas knew from the beginning that she wanted to improve the collection. Fortunately she was able to take advantage of an LSTA grant program administered by the State Library of North Carolina aimed at improving school library collections. The program helps school librarians describe the connection between strong library collections and academic achievement and reveal the deficiencies of their collections to important groups both within and outside of the school system, including principals, teachers, school district administrators, and PTAs. In order to apply for a grant, applicants must first conduct a collection assessment, develop a multi-year collection development plan, and arrange for local dollar for dollar matching funds. In the program's three years, between 150 and 175 grants have been awarded annually in amounts from $500 to $10,000 for purchasing library materials.

According to Penelope Hornsby, the state library's federal grants program consultant, the grant program was set up to be a one-time "shot in the arm" for school library media centers. The requirements for planning, matching funding, and local involvement are designed to help libraries make a case to local stakeholders for improved annual collection development budgets. "We don't see these grants as an on-going way to address a problem of this magnitude. They can help librarians spotlight their need so they can tackle it locally," she said.

Thomas obtained a commitment from the Parent-Teacher Organization (PTO) to match the $10,000 grant received

through the state library. With additional PTO support for bilingual publications, she is right on track with her three-year collection development plan.

Ptarmigan Elementary School Principal Jimmie Daniels, in Anchorage, Alaska, had an opportunity for LSTA funding that produced a similar boost in materials for his school library collection. He obtained a $12,000 LSTA grant from the Alaska State Library to establish an Accelerated Reader family literacy program.

The Accelerated Reader software program is a system based on current research trends that allows children to test their reading proficiency by computer, select books based on their difficulty, keep track of books read, and measure reading improvement.

Daniels applied for the grant at a time when many of the library books were outdated, there was little participation in recreational reading, and reading test scores were low. He was able to purchase 1,000 new books for the library, in addition to buying the $4,000 computerized system. The Accelerated Reader program is on the school server and can be accessed from anywhere in the building.

The school set up Accelerated Reader as a recreational program, so that students are encouraged to read more books between classes and in their spare time. Students in each grade level strive to reach the goals for their grade, gaining points for each book read. Students in grade levels that reach their goals are treated to a monthly ice cream social. Family reading nights bring parents into the school to participate in the reading and to test the software.

"The main thing," said Daniels, "is to stretch the abilities of the kids with books that are not too difficult and not too easy, to get them to practice." Is the program working? Tests show that the program has produced a five percent increase in reading schoolwide.

Power Libraries: institutionalizing change

Since 1998, selected exemplary Colorado school library media programs have been paired with "developing library programs" to encourage a schoolwide focus on library development and improved student achievement. Reading assessment scores in the schools increased, on average, by more than seven percent over previous years. In the Power Libraries Project, "high performance" school library media specialists and their principals meet with and mentor library

staff, principals, and classroom teachers at "developing" schools. Teams from both commit to improve their programs through staff training and long-range planning. Ninety-one schools have participated, reaching more than 60,000 students and hundreds of school teams. From 1998 to 2001, the project was funded by LSTA. It is continuing under the guidance of the Central Colorado Library System, one of the seven regional library consortia in the state.

Tammy Copper's fourth grade class gets fired up about poetry. Librarian Mary Perine and Copper collaboratively planned and are teaching the unit about recognizing and constructing a simile. The lesson is one of many that are taught in the school media center with the librarian, thanks to the LSTA-funded Power Libraries Project.

Mary Perine, library media specialist at Cherry Drive Elementary School in the Denver suburbs, runs a very busy library. She provides flexible scheduling so students can complete projects and do long-term research in the library. She collaborates with teachers on curriculum so the library is an extension of the classroom. She teaches alongside the classroom teacher in the library. And she oversees student projects that provide hands-on learning and fun.

It has not always been so. Before she arrived at the school during the 1995-1996 school year, the school was running a traditional library program, with each teacher bringing classes of students into the library for weekly half-hour sessions.

Participating in the Power Libraries program required a change in the way of thinking at her school. She said, "When I first arrived, some people kind of liked the idea of flexible scheduling and teacher-librarian collaboration, but most were used to the old way. Some said, 'all I want is for you to teach the students some library skills for a half-hour. That's all I want from you. Nothing else.' It was difficult the first couple of years."

After forming the required library advisory team, composed of

an administrator and teachers from all grades, Perine began working with a mentor school. Two events helped the school see the benefits of the new library program model. First, the school received $6,500 as part of the LSTA grant, which Perine told teachers was theirs to spend on materials for lessons and units planned collaboratively with the librarian.

Then, a group of teachers were provided with substitutes so they could visit the mentor school. The group heard from the principal, who was very enthusiastic about the library program, and they observed in the library a couple of lessons that had been collaboratively planned. Perine said, "Just talking about it doesn't convey the idea, but when you are there, you can see how it works. You see the teacher doing one thing, the librarian doing something else, the kids are spilt up or working together. It's well-planned and running smoothly. And everyone is having fun."

Fourth graders, Max and Nicholas, of Cherry Drive Elementary School in Thronton, Colorado, hunt for words to write a simile. They know that learning is fun in their school library, which has recently been designated by the Colorado Power Libraries Project a "high performance" library.

At the next staff meeting, teachers were ready to participate. For two years, the school grew in the developing category. This year, it was designated a high performance school, an indication that the program is embraced by the entire school.

Cherry Drive Elementary School librarian Mary Perine and fourth grade teacher Tammy Copper co-teach poetry in the library. The school, in Thronton, is one of 33 schools in Colorado designated "high performance" in the Power Library Project.

Most days, Perine is booked solid. She may have fourth graders coming in to work on a poetry lesson that includes exercises in dance, music, theater, and art. Or she may be with first graders who are reading and studying author Eric Carle. Their lesson may involve seeing a video on him, writing about his themes, and painting Carle-inspired paper for making paper collages.

"Everybody wins," Perine says of the arrangement. "I win because I work in my standards that I have to present. The teachers have a second person to help with their lessons." A recent survey of Power Libraries participants backs up the recommendations from the second Colorado Study for strong library programs, combined with librarian-teacher collaboration and technology support. Perine said, "What a difference a good library program can make. It's just phenomenal. The whole focus is student achievement. That is what we care about."

Vital Statistics:	
Grant:	National total for LSTA State-Administered Programs for 2002 is $149,014,000. Awards made to fifty states, the District of Columbia, and the U.S. Territories according to a population-based formula. LSTA Overview Museum and Library Services Act
Highlighted Projects:	The following Web sites provide more information about the highlighted initiatives. Lancer Satellite Resource Center-- http://www.seovec.org/libraries/fhhs.htm RILINK-- http://www.ri.net/RILINK/about.html Power Libraries Program-- http://cemacolorado.org/plp.htm

Questions, comments, or problems? Contact IMLS via email imlsinfo@imls.gov or by phone (202) 606-8536.

Analyzing Relationships Between School Libraries and Academic Achievement

Keith Curry Lance
Director
Library Research Service
Colorado State Library &
University of Denver

Outline

- Background
- Research questions
- Data types & sources
- Statistical concepts & techniques
- "Success stories"

Background

- A half century of previous school library research
- The political climate of education & libraries in the late '80's
- The School Match Incident
- The first Colorado study
- The political climate of education & libraries in the late '90's
- The second Colorado study & successor studies by Lance, Rodney & Hamilton-Pennell
- Successor studies by others

Research Questions

- Are students more likely to "pass" tests if they have a school library than if they don't?
- Are students likely to score higher on tests if they have a school library than if they don't?
- As the school library improves, do test scores rise?
- How are different qualities of school libraries, schools, and communities related to each other?
- Do school libraries & test scores improve together, even when other school & community conditions are taken into account?

Types of Data

- Nominal
  - Categories
  - No necessary quantitative dimension
  - ***Pass/fail, library/no library***
- Ordinal
  - Degrees of difference
  - No equal intervals
  - Zero is just a code
  - Usually limited number of values
- Interval/Ratio
  - Equal intervals
  - True zero (have none of something)
  - Usually large number of values
  - ***Weekly hours of librarian staffing, test scores***

Types of Variables

- Dependent variable
  - "The effect" in a cause-and-effect relationship
  - **Reading test scores** used to "operationalize" concept of <u>academic achievement</u>
- Independent variables
  - "The causes" in a cause-and-effect relationship
  - Characteristics of **school libraries**, schools & communities
    - "Treatment" or predictor variables
    - "Control" variables

State Test Scores

- Standards-based tests v. "standardized" tests
- Test scores, % proficient & above v. % "passed" v. percentile rankings
- Reading scores are key
- Difference between existing & available data (actually acquiring data file in a usable format & on a timely schedule)

Other Data Sources

Library — **Survey**

- School library hours
- Staffing & staff activities
- Collections, technology & usage
- Expenditures

Community — **State ED dept., census**

- Students by NSLP status (poverty), race/ethnicity
- Adult educational attainment

The Data Model

Community

School library

School

Test scores

Experiment v. Statistical Analysis

- Experiment
  - Older studies
  - Smaller samples
  - More precise units of analysis (student)
  - More control over independent variables
  - Matching issues
  - Easier to explain, communicate
- Statistical analysis
  - Newer studies
  - Larger samples
  - Less precise units of analysis (school)
  - Less control over independent variables
  - Data availability issues
  - More precise measurement of effects

Statistical Significance

- Likelihood the sample results are representative of the universe under study
- Most common notation:
  - $p < .05, < .01, < .001$
- Difference between statistical significance & confidence interval (i.e., margin of error)
- No statistical test of SUBSTANTIVE significance (i.e., how important is this?)

Statistical Analysis Software

- **Market leaders:**
  - SPSS: Statistical Package for the Social Sciences
  - SAS: Statistical Analysis Software
- **Software Issues:**
  - Available statistical techniques: correlation, comparison of means, factor analysis, regression
  - Data management features: sort, sample, compute, recode, if
  - Case limits (maximum number of cases allowed)
  - Cost (education discount)

Cross-tabulation

- ***Are students more likely to pass tests if they have a school library than if they don't?***
- Two nominal variables or one nominal and one ordinal (small range)
- Pass/fail on tests, librarian/no librarian
- Turning interval or ratio variables into nominal or ordinal ones
- Chi-square (X^2) indicates statistical significance

Test Scores by Time Spent Teaching Information Literacy: Alaska, 1998

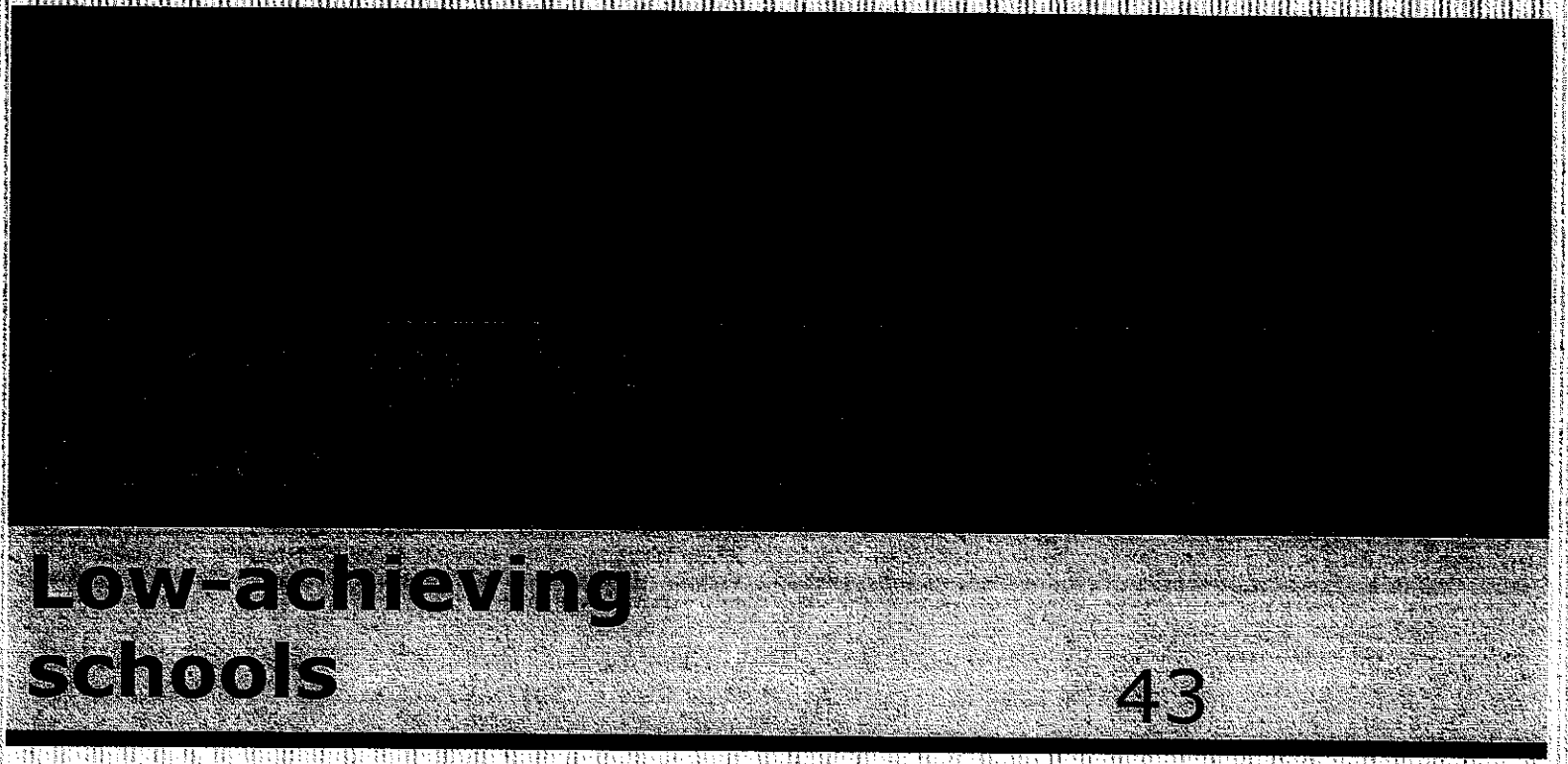
Median & above	56 82%	12 18%
Below median	33 53%	29 47%

Chi-square = 12.743, $p < .001$

Comparison of Means

- ***Are students likely to score higher on tests if they have a school library than if they don't?***
- One nominal (2 dimensions), one interval or ratio variable
- Pass/fail on test, hours of librarian staffing
- Generates means (averages) for 2 groups
- Levene's test indicates equality (or inequality) of variances between groups
- t test indicates statistical significance of difference between groups

Student Visits for Information Literacy Instruction for Higher & Lower Scoring Elementary Schools: Alaska, 1998



t = 3.963, p < .001

Correlation (r)

- ***As the school library improves, do test scores rise?***
- Two interval or ratio variables
- LM expenditures per student, volumes per student
- Pearson's product-moment correlation (r)
- Expressed in decimal form
  - Perfect correlation = 1.00
  - + & - indicate positive & negative relationships (+ = both rise or fall, - = one rises, other falls)
  - r = .60-.80 v. .80+ & factor analysis
  - r square = percent of variation explained

Bivariate Correlation Coefficients for LM Program Development Variables: Colorado Middle Schools, 1999

LM Development variables	1	2	3	4	5	6
1. LMS hours/100						
2. Total hours/100	.696					
3. Volumes/student	.695	.703				
4. E-reference/100	.668	.779	.668			
5. Subscriptions/100	.701	.646	.680	.640		
6. LM exp. per student	.788	.790	.837	.755	.802	

$p < .001$

Factor Analysis

- ***How are different qualities of school libraries (schools, communities) related to each other?***
- Analyzes relationships between and among variables
- Key statistics:
  - Percent of variance explained
  - Factor loadings
  - Factor scores
    - Allow mixing items on different scales
    - Data reduction technique

Factor Analysis of LM Program Development Variables: Colorado Middle Schools, 1999

LM Program Development Variable	Factor Loading
Volumes per student	.874
LM exp. per student	.949

Initial eigenvalue = 4.638, 77% variance explained

Regression (R, R^2)

- ***Do school libraries & test scores improve together, even when other conditions are taken into account?***
- Need to conduct correlation—and often factor—analyses first
- Linear regression
- Stepwise regression
- Multiple R, R square & R square change
- Standardized beta coefficients (indicate positive or negative direction)
- Included v. excluded variables

Regression Analysis of 4th Grade Scores with LM, School, & Community Predictors: Colorado, 1999

Predictor added	R Square	R Square Change	Beta
% Minority	.709	.502	.021	-.225

$p < .01$

Excluded variables: teacher-pupil ratio, per pupil expenditures, teacher characteristics

"Success Stories"

- Even the strongest statistical evidence can be made more persuasive by compelling "success stories"

Characteristics of Good "Success Stories"

- One clear point: value of librarian as teacher (technology coordinator, in-service provider)
- Variety of voices: librarians, students, teachers, principals, parents
- "Short & sweet"
- A quotable quote

SYRACUSE UNIVERSITY

SCHOOL OF INFORMATION STUDIES

January 20, 2001

Daniel Callison
Associate Professor
School of Library & Information Science
Indiana University
1320 E. 10th Street
Bloomington, IN 47405-3907

Dear Danny,
I have developed a brief summary of my presentation for the 2002 Treasure Mountain Research Retreat. The topic is: "Experimental Methods to Test Instructional Design."

Participants will be introduced to experimental research, using a simple example to illustrate the various parts of the research process. A variety of experimental research methods used to assess the effectiveness of instructional designs for different (but relevant) educational contexts, subject areas, and learning audiences will be described, in order to illustrate the range of methods, from simple to complex, that could be employed. Examples of real and/or hypothetical research studies that focus on questions related to information literacy instruction will be included, where possible.

Participants will then be divided into small groups providing each group with a question or problem in which experimental research must be used to address that question or problem and asking them to brainstorm how they might investigate that problem. Groups will be asked to think about the different research methods presented and how the method chosen might influence the kinds of data the researcher would likely gather about the problem and the way those data would be reported.

The presentation will conclude with an information literacy skills instructional design case study for which participants will design a hypothetical research study, describing as much about the process as possible and an analysis and discussion of how different methods, including qualitative methods (e.g. case studies, survey research, participant observation) might yield different findings. Ideas for future studies will be brainstormed.

This presentation will be developed using MS PowerPoint. Participants will receive handouts of the presentation slides and annotated bibliography.

Sincerely,

Ruth

Ruth V. Small
Professor

4-206 Center for Science and Technology / Syracuse, New York 13244-4100
315-443-2911 / Fax: 315-443-5806 / E-mail: ist@syr.edu / URL: http://istweb.syr.edu

A Comparison Study of Library Media Students' Perceptions of Their Learning Experiences in Online and Face-to-Face Classrooms

Julie I. Tallman, Ph.D.
Sandy Geisler, M.Ed.
Mary Ann Fitzgerald, Ph.D.
Department of Instructional Technology
University of Georgia
April 2002

A Comparison Study of Library Media Students' Perceptions of Their Learning Experiences in Online and Face-to-Face Classrooms

Introduction

Humans are unique individuals, each with differing personality traits and learning styles. In education, what works for one student may not work for another. While acknowledging these differences, our educational system continues to produce course offerings from K-12 through higher education that do not fully support these differences. Movement for change has been underway for years. However, too many educators "think of students as a featureless mass; too many rarely vary their teaching methods, thinking that the method by which they were taught is best for everyone" (McKeachie, 1995, p.1). When teachers do not acknowledge the effect of their teaching methodologies on students with different learning styles, students will have more difficulty becoming independent learners.

Today's society and businesses require an educated workforce, motivated to continue learning as job demands change. The educational system, set up to meet the requirements of workers in the Industrial Age, must now expand and refine its offerings to meet the individual needs of its students who are increasingly involved with technological demands of the Information Age. One response has been for many universities and colleges to utilize the Internet to offer courses and degree programs to any one, anywhere and at any time. These Internet offerings are pushing the educational system to study the way that students respond to these courses.

For a number of years now, universities have been evaluating teaching through student surveys at the end of each term. Although these surveys have been criticized as ineffective measurement tools, universities continue to use them as a measure of student

satisfaction with instructors' courses. Considering the importance placed on these evaluations for promotion and raises, are these ratings an indication that courses are or are not meeting student learning preferences and student learning styles? Are these ratings indicative of student learning growth? What happens to course satisfaction levels when courses are delivered online? How do student learning preferences and learning styles affect their perceptions of course delivery methods and their learning growth? What happens to student perceptions of their satisfaction with courses when a face-to-face course is directly paired with an online course for the purposes of community building in a graduate degree program leading to school media certification?

These are the questions that evolved when this team of researchers initially chose to consider what was happening with student satisfaction with The University of Georgia's Department of Instructional Technology's newly established flexible delivery program for educating pre-service media specialists. Because the design of the program paired two courses very different in delivery and content with different instructors, this research study attempted to look at the ways that an individual's learning style might influence their perception of their learning outcome in an online versus a traditional face-to-face course.

In fall of 2001, twenty students took two courses, EDIT 6300 Administration of Media Programs (face-to-face delivery) and EDIT 6320 Information Technology (online delivery) as part of the flexible delivery cohort program. The instructors' intent was that students would have more active peer support for their online class if they were also seeing each other every other week in the face-to-face class. Students would have opportunities in the face-to-face class to discuss problems and issues from the online course. This was part of the instructors' attempt to build a community of learners regardless of course format.

Students consistently awarded the instructor of the face-to-face class superior teaching evaluations. Students consistently awarded the instructor of the online courses excellent to superior ratings for her online courses. For most terms, the online instructor averaged approximately ½ point lower in her ratings compared to the face-to-face instructor. At the end of the fall term 2001 when the ratings came back with a slightly larger difference in the ratings, the instructors decided to see if students with specific learning styles and learning preferences had significantly different reactions to either course.

Considering the difference in delivery format, they also decided to examine if students with specific learning styles had significantly different opinions about the organization of the courses, assignments, technology needs, and time requirements. Other factors existed that could affect the results, such as difference in course content and non-media students as part of the peer group in the online course. However, the online instructor felt that the study would allow the opportunity to examine the organization of her course according to how students with various learning styles reacted to it. Her hypothesis was that learning styles would make a significant difference on the satisfaction of online learning.

During spring of 2002, all twenty media specialist students who had taken both classes in the fall term of 2001 volunteered to complete confidential surveys to determine their learning styles and their perceptions and satisfaction levels with these two courses. The results of the surveys were compared to determine if there were significant differences in perceived learning outcomes and course satisfaction based on an individual's learning style.

Learning styles can be defined as "characteristic strengths and preferences in the ways they take in and process information." (Felder, 1996, p.18.) The traditional face-to-face course (EDIT 6300) in this study was teacher-led and met every other Saturday for six hours at an off-campus location during the fall term. The course included some technology-based projects as well as an online syllabus and email communication. The online course (EDIT 6320) met only once at the beginning of the semester. The course was conducted asynchronously and students completed the course according to set timelines with constant instructor facilitation and resource support. The course syllabus, content, activities and projects were posted using WebCT, a web-based management system used by the University of Georgia. Within WebCT the discussion list, tools pages, course content (including syllabus), and presentations pages provided the platform for the course.

Literature Review

Because online learning is growing at a rapid rate in the academic as well as business environment, research on this topic is also growing. Studies in various settings have been undertaken to determine the impact of learning styles on course development in general and we are beginning to see similar studies involving online courses.

Historical Foundations of Learning Styles.

Individual differences and personality traits have been studied and documented for a number of years. In the late 1920's, the French developmental psychologist, Jean Piaget, presented ground-breaking work on child development and the nature of intelligence and how it develops. Piaget's theory "describes how intelligence is shaped by experience.

Intelligence is not an innate internal characteristic of the individual but arises as a product of the interaction between the person and his or her environment" (Kolb, 1984).

Jerome Bruner was responsible for bringing Piaget's work to the forefront in America. He recognized from the work of Piaget and others in cognitive developmental processing that the basis for an instructional theory was present. Understanding cognitive developmental stages made it possible for the creation of an educational curriculum that would better fit individual learners. This led to the creation of experiential learning theories currently in use today. Different from behavioral theories that focus on observable outcomes, experiential learning emphasizes the process of learning. Experience-based education works well for many nontraditional students and has become widely accepted in colleges as well as businesses. "Internships, field placements, work/study assignments, structured exercises and role plays, gaming simulations..." (Kolb, 1984, p.3) are examples of the experiential learning process.

Further, working closely with the theory of experiential learning is the study of individuality. Beginning with Carl Jung's and others' work, the study and measurement of individual differences, such as learning styles, continues today. A number of different measurement tools have been developed and used to determine the extent to which a person exhibits each of the different modes of learning. These modes vary by developer, but many refer back to the work done by David Kolb who has researched and written extensively on experiential learning theory and learning styles. He divided the learning process into four areas: "concrete experience, reflective observation, abstract conceptualization, and active experimentation" (Kolb, 1984, p. 64). Kolb developed and validated his Learning Styles Index that has been used extensively by the research community.

Traditional Versus Web-Based Instruction.

In the last five to ten years, research into the effectiveness of traditional, face-to-face classrooms versus web-based instruction has grown. A review of earlier studies was conducted by Jung and Rha (2000) indicating, "in many instances, distance education is as effective as conventional classroom teaching and shows no differences in learning outcomes" (p.57). However, where differences in learning outcomes did occur, much could be traced back to instructor or student factors. It is not the technology that makes a course effective; it is how effectively the technology is used (Jung and Rha, 2000).

In another study, the researchers "systematically compared the student learning outcomes and perceived effectiveness of several for-credit courses offered via the World Wide Web with traditional on-campus sections of the same courses..."(Buchanan et al, 2001, p.275). The purpose of the study was to determine what approaches and technologies worked best for the student as well as the teacher. The study concluded that the instructor is the key to the course success, even more so than the topic itself. They found that there were no significant differences in student performance in the two learning environments, however differences in the perceptions of the importance of instructor and student qualities needed to succeed in an online course did arise" (Buchanan et al, 2001).

Yet another study was undertaken "to examine the change, if any, in personal learning mental models of students enrolled in graduate-level library media courses conducted with Web-based course software" (Tallman & Benson, 2000). They used Johnson-Laird's ideas to explain mental models:

> "Mental model theory is an attempt to explain human understandings of objects and phenomena, such as understanding the process of how one learns most effectively when taking a course of study, the process of how one solves problems created by working with

> computer technologies, or the process of accessing and using online course software" (Tallman & Benson, 2000, p. 208).

This qualitative study used written statements, course evaluations and focus interviews to determine what changes took place. What the researchers learned was that the student's mental models of the course environment did not change as much as their mental models of themselves as learners changed. With little prior experience with technology, the group entered the online learning environment still needing the traditional classroom security and safety. In the beginning they were afraid to take risks with their reading of the assignment expectations, they looked for approval from the instructor before they took ownership of their efforts. By the end of the course, most of the students realized they had gained more independent learning skills. However, "they had difficulties recognizing their transformation and diminishing need for safety supports in the online class" (Tallman & Benson, 2000). This study was conducted on a small group (seven students), indicating the need for further research to continue to identify ways to improve online offerings by designing courses to better meet the needs of the individual students.

Learning Styles Research Today.

Research into individual learning styles is considerable, all bringing attention to the need for teachers to consider the students' learning styles in their course design. We know that students with certain learning styles find online learning more difficult than other designs. "Because they lack lectures, online courses may be hardest on auditory and visual learners, who will have to adjust to learning without listening to a professor's voice, hearing themselves speak in class discussion, watching a professor's gestures, or seeing material written on a chalkboard" (Weiss, Knowlton, & Speck, 2000, p. 37). While there are studies

which seek to link learning styles to course design recommendations, this is still a relatively new area as it relates to online learning.

A recent study was conducted through the University of Western Ontario to determine if there were gender differences in learning preferences of engineering students. The study used the Index of Learning Styles (ILS), created by Richard Felder and Barbara Soloman, to assess the students' positions on the four learning style dimensions. The results of this study indicated gender differences in learning preferences, however, it further reinforced other studies showing the need for teachers to address a variety of learning styles in order to provide effective learning outcomes.

E-School! International of Iowa City, Iowa, conducted a study involving 158 students in the 9^{th} - 12^{th} grade using an online curriculum. The purpose of the study was to determine if online course curricula could be adapted to individual learning styles. The results of the three-year study indicated that online courses are adaptable, "without applying learning styles to the methods in which these technology functions are carried out, technology is not being used to it fullest extent and learners are not receiving the full benefit of online education" (Muir, 2001, p.7). This study presented a number of suggestions for inclusion in an online course, relating them to different learning styles. When designing a course, whether online or traditional classroom, it is as important to know how a student learns as it is to know how a teacher teaches (Muir, 2001).

Why is it as important to know how a student learns? Teachers tend to teach in the ways in which they themselves learn most comfortably. This may or may not match a student's learning style. "In fact, it could be argued that teaching cannot be successful

without a knowledge of learning styles and a commitment to matching them with teaching styles and strategies" (Sarasin, 1998, p. 7).

Further, an ongoing action research project being conducted at Ryerson University looks to increase student learning and satisfaction. An electrical engineering course was redesigned, introducing the many opportunities that technology brings to the educational system. The evidence gathered shows a positive effect of hypermedia on student achievement. It also "indicated that specific learning preferences are better accommodated through hypermedia-assisted instruction than through conventional instruction (Zywno & Waalen, 2001, p.1). In fact, the researchers observed that academic performance improvement was greater for the lower achieving students than it was for the higher achieving students. The overall satisfaction for the group studied was very positive on the use of hypermedia in their coursework, but it was clear that this group preferred that technology be used to supplement the course. It should not replace student-teacher interactions (Zywno & Waalen, 2001).

The issue of adapting online learning to various learning styles is getting attention in the educational community. However, these studies indicate that more work is needed to continue to develop further recommendations to improve online coursework. This research project will attempt to add to the current body of knowledge.

Research Questions

This research investigates the following questions:

1. How do student-reported learning preferences compare with their learning styles?

2. Are there significant differences for students in specific learning style categories with their satisfaction and perceptions of their face-to-face course versus their online course?
3. How does student satisfaction with the face-to-face learning experience in EDIT 6300 compare to satisfaction with the online learning experience in EDIT 6320?
4. How do student perceptions of the qualities that students need to bring to the face-to-face experience differ from the qualities needed for the online experience?

Methodology

Participants

The twenty participants for this study are all volunteers enrolled at the University of Georgia in the Media Specialist Flexible Delivery Program in the Department of Instructional Technology. As part of a cohort, these students progress through their program of study as a group, taking online as well as face-to-face courses required for their graduate degree. The group is representative of the larger group of teachers and media specialists in the educational arena. All are working on their masters degree or their specialist degree (already having a Masters Degree in some field). Of the participants, only two are not currently teachers, media specialists or paraprofessionals in the media center.

The demographics of the group are fairly homogenous. Eighteen of 20 are female and all are Caucasian. Ages of the participants range from 21 to over 50. Because this group is still enrolled in the cohort with the same professors from their previous courses, the study was designed to assure anonymity of the participants with their answers.

Instruments

Of the two instruments used in this research study, the first instrument was created specifically for this study. This paper-based survey consisted of 43 Likert-formatted items designed to measure the students' satisfaction with different aspects of instructor teaching styles, different aspects of each course, their course experience and technology in general, as well as the new knowledge and skills gained in these two courses. The survey asked participants to classify their perceptions of their own personal learning preferences along a continuum from very teacher-structured to self-directed. And finally, they were asked to rate the importance of personal characteristics students bring with them to online and traditional face-to-face courses. The survey was reviewed and tested for clarity by other students in the Department of Instructional Technology as well as being approved by the Institutional Review Board (IRB) at the University of Georgia for use with human subjects.

The Index of Learning Styles (ILS), developed by Richard M. Felder and Barbara A. Soloman was used to assess the participant's learning styles (Felder & Soloman, 2002). The tool was reviewed for face validity by MERLOT (Multimedia Educational Resource for Learning and Online Teaching). The ILS was peer reviewed by the Merlot Business Review Panel on August 30, 2001, and was rated five on a scale of five for quality of content, potential effectiveness and ease of use (MERLOT, 2002). The ILS is in the process of being validated and has been used in a number of other studies due to its simplicity in application (Muir, 2001).

The ILS was developed "based on Jung's theory of psychological types (Sensing/Intuition) present in the Myers-Briggs model, with Kolb's information processing dimension (Active/Reflective)" (Zywno & Waalen, 2002, p.1). The survey consists of 44

questions which classify the student's response according to the four learning styles dimensions:

- active/reflective (the way students process information),
- sensing/intuition (what type of information students perceive),
- visual/verbal (how sensory information is most effectively perceived), and
- sequential/global (how the student progresses toward understanding) (Felder, 1993).

The students took a paper-based version of this tool. The data collected was loaded into the Solomon and Felder web-based scoring mechanism producing learning styles results for each participant.

Design and Procedure

Both surveys were administered at the beginning of one of the face-to-face class meetings during the next semester. Those individuals who were not part of the cohort were eliminated from the pool of participants. Consent forms and surveys were given to all volunteers. They were arranged by pseudonyms from a variety of color names. These pseudonyms were used to match the two surveys but not to provide information as to the identity of the participant. The completed surveys were placed in an envelope and delivered to the graduate assistant for analysis. The graduate assistant prepared the result forms and explanations of meanings of the learning styles for each pseudonym. These were made available during the next face-to-face class meeting by leaving them in a box for students to collect on their own.

Limitations of the Study

There are several limitations to the study which need to be noted.

- For fourteen of 20 students, this was their first online course experience. Only one student out of the participant pool had taken more than one online course.
- The course content in the two courses was very different. The online course focused on technology planning and its uses in schools. Over half the student population enrolled in the online course were students studying to be technology coordinators in K-12 education. The face-to-face course was specifically designed to address administration of school media centers and programs.
- The two instructors for these courses were very different in their own learning and teaching styles. The face-to-face instructor was more actively oriented, moderately verbal and somewhat sequential. The online instructor was strongly reflective, moderately visual and moderately global.
- Because the surveys seek to determine an individual's perception of their learning through self-analysis and reporting, the study is dependent on their perceptions versus observable results. Differences could be present.
- The courses in question were taken during the Fall 2001 semester. This research was completed during the Spring 2002 semester. This cohort is already participating in two other courses, so their recollection of information specific to their fall experiences might not be exact.
- Participants in this study are all volunteers from the cohort. These are graduate students who may have different motivations than other student groups. However, this group is representative of the media specialist and teaching field.
- The sample size for this study is small (20) for quantitative analysis.

- This study is not generalizable because of its size and, thus, is relevant only for the participants of this cohort.

Method of Analysis

The data collected from the two surveys were compared using a mixed model repeated measures analysis of variance. This tool was used to determine if there were interactions between the different learning styles levels (4) and student responses to the online and face-to-face courses. T-tests (2-tailed paired samples) were run to determine if there was a difference in student answers to individual online and face-to-face questions. Finally, univariate analysis of variance (ANOVA) tests were run to compare the student learning styles to the six learning preferences questions on the course survey and student qualities.

Results

Research question one asked how student-reported learning preferences compared with their learning styles. The ANOVA test showed there were no significant differences between the student learning styles as determined by the Solomon and Felder ILS and their learning preferences as indicated on the course survey continuum. Although the ILS has yet to be validated, this test indicates there is some validity between the ILS data and what the students perceived to be their preferred learning styles.

Research question two asked if there were significant differences for students in specific learning style categories with their satisfaction and perceptions of their face-to-face course versus their online course. The Mixed Model tests indicated overall there were no significant differences in the student responses to the online versus face-to-face course

questions based on their learning styles. There were only two groups of questions that showed a significant variance and both were in the Active/Reflective learning style group. These differences involved the organization of the course (syllabus and task directions) and the student level of learning outcome regarding course assignments, personal growth in technology and personal growth in the profession. Students categorized in the active learning style category rated their face-to-face course higher for personal learning outcomes and organization of the course.

Table 1: Significant Differences in Satisfaction with Learning Outcomes and Course Organization

Active / Reflective	Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Learning Outcomes: Face-to-Face versus Online	Sphericity Assumed	4.045	4	1.011	12.762	.000
	Greenhouse-Geisser	4.045	4.000	1.011	12.762	.000
	Huynh-Feldt	4.045	4.000	1.011	12.762	.000
	Lower-bound	4.045	4.000	1.011	12.762	.000
Course Organization: Face-to-Face versus Online	Sphericity Assumed	5.426	4	1.356	3.508	.033
	Greenhouse-Geisser	5.426	4.000	1.356	3.508	.033
	Huynh-Feldt	5.426	4.000	1.356	3.508	.033
	Lower-bound	5.426	4.000	1.356	3.508	.033

Mixed Model test indicating significant difference in student answers in comparison of online to face-to-face courses for "learning outcome" and "course organization."

Research question three asked how student satisfaction with the face-to-face learning experience in EDIT 6300 compared to satisfaction with the online learning experience in EDIT 6320. The T-tests indicated that there were significant differences in student responses to the online versus the face-to-face course questions for the following categories. Only one group of questions had no significant difference, those that compared student level of learning course subject through the assignments, personal growth in technology skills, and personal growth in understanding the library media profession. The other results rated the face-to-face course experience significantly higher for the following

categories of questions except for the last category where the online course fared significantly better in helping students develop these traits.

Table 2: Significant Differences in Satisfaction with Instructor Attributes and Student Results

Groups of course questions comparing online to face-to-face responses.	Df	Sig. (2-tailed)
TRCOMF – TRCOMO—instructor communication, dynamic presence, feedback	19	.000
TRDELF – TRDELO—instructor delivery, patience, facilitation, flexibility	19	.007
TRCNTF – TRCNTO—instructor subject knowledge, student assessment	19	.014
TRORGF – TRORGO—instructor organization skills and ability with written directions	19	.000
CORGF – CORGO—course organization (syllabus & directions for tasks)	19	.000
CDELF – CDELO—schedule flexibility, student time required, pace of course	19	.003
CCNTF – CCNTO—task relevance, course relevance to professional goals	19	.001
LOINDF – LOINDO—confidence in transferring knowledge and skills from course to job, growth in independent learning, growth in organizational skills, and growth in time management skills	19	.003

Research question four asked how student perceptions of the qualities that students needed to bring to the face-to-face experience differed from the qualities needed for the online experience. The researchers found no significant differences in the personal qualities students thought they would need for success with the online class in comparison to success with the face-to-face class.

Discussion

In this study we asked four critical questions in an attempt to find out if learning styles affected student satisfaction with their learning environment particularly with the online course. Except for several issues, the result was negative. Surprised by these findings because of the research that indicated learning styles made a difference, we analyzed the data that indicated problems with online course organization and structure. Perhaps these factors hid the effect of learning styles.

When the students took a learning style inventory, so did the course instructors. The online instructor was globally oriented as a learner and a reflective thinker. The face-to-face instructor was a sequential learner. Most of the students in the class were sequential learners and active thinkers. Upon analysis, when we knew more about what we should be looking for, we could see that the online course organization and structure was obviously oriented toward global and reflective learners. We identified logic leaps in the design that led to student confusion with directions on assignments and tasks. These logic leaps proved more important than dealing with online technology formats and overshadowed learning growth that the instructor saw as evident but remained unrecognized by the students themselves.

In face-to-face classes, confusion of this type can most times be smoothed over by the instructor's verbal explanations. However, in an online course, the instructor is less immediately available when a student attempts an assignment. The clarification and explanation to questions that might need further explanation appeared through delayed types of communication and not at the point of need. One method the instructor used to solve the problem of confusion was through online office hours, but they seemed effective only for the students who attended those optional office hours, even though the log of the chat was posted immediately.

In this online course delivered in a project-based format, the rôle of the instructor changed to that of facilitator and guide. When students found that the facilitator provided confusing directions, the students tried to gain help from their peers through the discussion board. However, knowing that their peers were in the same predicament created feelings of frustration, isolation and confusion.

The need for solid instructional design was even more evident after this study was completed. The globally oriented instructor was too close to the material to identify where logic leaps occurred. Thus, these researchers argue for the provision of an instructional design consultant who could look at the organization and directions contained in an online syllabus as would students with various learning styles. Only when the course is tightly designed can students' learning styles be tested for how they affect satisfaction with learning growth and other factors. In other words, the interference "noise" from improper course design should first be eliminated as an influential factor.

Jung and Rha (2000) reported that where differences in learning outcomes did occur, much could be traced back to instructor or student factors. This study provided evidence that instructor factors such as clarity in course design and articulation of process steps for assignments need attention initially, even before student learning styles are considered. The responsibility lies with the instructor to organize the online course so that students have clear directions in a well-organized structure allowing them to proceed in their assignments without confusion as to what they are to do. Only then can the integrity of the assignments be assured and examined for compatibility with a variety of learning styles.

It seems clear that students had expectations for a high level of supportive structure for both courses, and did not make allowances for the difference in delivery format. For students, the difference in delivery was a matter of using different tools for learning. For the instructor, it meant an entirely different way of thinking about the contents of a course and how it would be presented. Thus, it was up to the instructor to find a way of generating

comfort with the course, security in knowing what was expected even when learning independently, and feedback and communication to forestall isolation.

Ways to assure greater design clarity center on reorganizing the syllabus and piloting it with course designers instructed to look for logic leaps and process steps. In addition, the instructor will focus on the first session of the online class that meets face-to-face together with the cohort class. The instructor is preparing an advance organizer describing what will happen during the course, what the students can expect from the technology, where to find support, and what the instructor will expect from student work. The role of the instructor as facilitator and delegator of student learning responsibilities and the student as independent, active learner will be emphasized. The instructor will suggest strategies to deal with the discomfiture of online learning and the loss of the lecture, oral discussion, and body language signals. Use of the discussion board for posting article abstracts with reflective thinking, ideas, questions about assignments, requests for peer support, and general thoughts is one popular strategy for building community and applying what they are learning to the media center. Explaining why the quality and quantity of their discussion activity helps build community, generate ideas and decrease isolation should help students participate frequently. Prior to the first class, the instructor will send letters to students asking them to visit the online website to study the syllabus and bring questions about it to class. Thus, the instructor can address these questions verbally and be prepared to strengthen these sections in the syllabus.

Future Research

The instructors intend to continue this study with each cohort class admitted to the program. Twenty students are a minimal number for a quantitative study. This study had

the surprise result of identifying the type of problems with the online course that caused student discomfort and seemed to overshadow recognition of learning growth. These problems caused frustration for students, especially when the course was compared to a well-taught and designed face-to-face course that had the comfort factors built-in through socialization, body language, and non-threatening community environment. These factors carried over somewhat to the online course but did not supercede the problems in the course design. Because of the cohort and the two courses planned together, students had more avenues for expressing their frustration with the online course, thus raising the awareness of the instructors for the need of such a study.

The instructors intend to maintain a longitudinal study of cohorts to analyze the results of the redesign in the online course. We also want to continue our investigation into whether a higher sample number is more apt to support the hypothesis that learning styles influence how students react to the online course versus the face-to-face course. Follow-up studies should indicate if the changes taken to improve the online course design have been effective in lessening student confusion resulting from the design problems. Only then can we further explore issues with learning styles, teaching styles, and adult learning theory, as is our intent.

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1650 Research Blvd. • Rockville, MD 20850-3195 • 301 251-1500 • FAX 301 294-2040

January 16, 2001

Daniel Callison, Director and Associate Professor
Library Science and School Media Education
Indiana University
1320 E 10th Street
Bloomington, IN 47405

Dear Dr. Callison

I would be pleased to make a 90-minute presentation at the next Treasure Mountain Research retreat. My talk, Development and Implementation of a National Survey: Methods and Limitations, will cover the following information:

> The methodologies involved in each step of the survey process will be highlighted in the presentation, which will contain illustrations from a large survey conducted for the U.S. Department of Education. Steps that are required in conducting a federally funded survey will be incorporated into the talk. The importance of obtaining support and input from the library and school communities from the beginning of the study will be emphasized. Specific topics that will be addressed include developing the survey instrument, the importance of sampling, procedures for obtaining a high response rate, and preparing different reports for different audiences.

Best wishes in your proposal for external funding for your research retreat.

Sincerely,

Joan S. Michie

Joan S. Michie, Ph.D.
Westat Study Director

LEARNING IN AN INFORMATION-RICH ENVIRONMENT

Delia Neuman
College of Information Studies
University of Maryland

This study addresses the central question of what teachers and students need to know to use sophisticated information resources for meaningful learning. A qualitative study, it involves approximately 140 seventh-graders, their seven-member teaching team, and the school's library media specialist. It is q guided by the following foreshadowing questions:

*What learning tasks yield the most significant opportunities for meaningful learning in a school that is rich in information technology and information resources?

*What instructional strategies and techniques must library media specialists and other teachers develop in order to design, deliver, and evaluate these tasks?

*What learning strategies and techniques must students develop in order to learn deeply and meaningfully from these tasks?

Preliminary observations began in Spring 2000, and the full study proceeded during the 2000-2001 academic year. A follow-up study is planned for Spring 2002. Methods have included observation, interviews, analysis of teaching materials, and analysis of student projects. Several frameworks for data analysis (currently underway) are under development, and the one for this presentation will be based upon the AASL/AECT "Information Literacy Standards for Student Learning."

Outcomes will include an annotated and detailed collection of strategies that contribute to meaningful learning in an information-rich environment. The collection can serve as a research base for the design of instruction, evaluation, and staff-development activities within and beyond the case-study site.

Ester Smith, Ph.D.

Ester Smith has over 25 years of U.S. and international experience as manager of state, national, and international research projects and as an evaluation specialist. She is a recognized expert in the areas of Evaluation, Survey Research and Statistical Methodology. Dr. Smith received a doctorate in Mass Communications Research with specialization in Quantitative Methods/Applied Statistics and an MBA with specialization in Management Information Systems. She is the president of EGS Research & Consulting, a firm she founded in 1991.

Dr. Smith conducted several large-scale studies involving public school libraries and public libraries for the Texas Education Agency (TEA) and for the Texas State Library and Archives Commission (STLAC). The library studies involved multiple research methodologies and compilation and collection of primary and secondary data from multiple sources. In addition to the study she will present at the conference, Dr. Smith recently completed a comprehensive evaluation of STLAC's Five-year Plan involving eight programs funded by LSTA. She also evaluated the effectiveness of the Texas Library Connection (TLC) and the Full-Text Pilot Project for the Department of Library Services, Educational Technology Division of TEA; a pioneer effort by the TEA to introduce online resources into Texas school libraries. In addition, Dr. Smith conducted a study in 1998-99 for the Texas Legislature on the use of technology and technology resources in libraries (and schools) to improve accessibility and delivery of information. Dr. Smith also conducted multiple performance reviews of school districts for the Texas Comptroller of Public Accounts which include the performance and management of libraries/media centers.

TEXAS SCHOOL LIBRARIES: STANDARDS, RESOURCES, SERVICES, AND STUDENTS' PERFORMANCE

Texas School Libraries: Standards Resources, Services and Students' Performance had three objectives. (1) Examine school library resources, services, and use, on the basis of the School Library Programs: Standards and Guidelines for Texas and determine the need for updating these standards and guidelines so that they better serve communities across the State. (2) Determine the impact that school libraries have on student performance as measured by the percent of students who met minimum expectations on the reading portion of the statewide standardized test, the Texas Assessment of Academic Skills (TAAS). (3) Highlight library practices in the best performing schools.

The questionnaire designed for this study inquired into library staffing, activities performed and time devoted to each activity, hours of operation, type and size of collection, library usage, library technology resources, school technology with access to library resources, and library funding. Data was collected from a random sample of 600 school libraries, which according to the 1999-00 Texas Education Agency's Public Education Information Management System (PEIMS), reported a school librarian on staff. The sample, proportional to the universe of school libraries in Texas, consisted of 327 elementary schools, 120 middle/junior high schools, 139 high schools, and 14 elementary/secondary schools. Data were collected through a self-administered mail survey during September-November 2000. Responses were obtained from 503 libraries, yielding an 84 percent response rate. Data from 500 responding libraries were used in the analyses. These consisted of 267 elementary school libraries, 104 middle/junior high school libraries, and 129 high school libraries.

Survey data were supplemented with secondary data available from the 1999-00 Texas Education Agency's Public Education Information Management System (PEIMS) on school characteristics and student TAAS performance. Survey data were also supplemented with community economic data extracted from the Federal Reserve Boards' Federal Financial Institutions Examination Council (FFIEC) web site. TAAS and student demographic data were also provided by PEIMS on all schools without a librarian. The study employed more than 200 school, library, and community variables in examining the relationship between libraries and TAAS performance.

1. Libraries and School Library Programs: Standards and Guidelines for Texas

The Texas State Library and Archives Commission (TSLAC), in consultation with the State Board of Education, adopted standards for school library services. The Texas Education Code 33.021 sets forth that "A school district shall consider the standards in developing, implementing, or expanding library services." The School Library Programs: Standards and Guidelines for Texas address five components:

- Library program management
- Library learning environment
- Curriculum integration
- Resources
- Facilities

The standards and guidelines are applied at four levels: exemplary, recognized, acceptable, and below standard.

School Library Programs: Standards and Guidelines for Texas are available in electronic format at http://www.tsl.state.tx.us/ld/school/libs/standards.html

1.1 Library Funding

Texas school libraries are underfunded based on the Public School Library Programs: Standards and Guidelines for Texas.

The standards and guidelines recommend that schools allocate annually no less than one to three percent of their instructional budget "to acquire library materials, equipment and supplies in support of school library program." The standards and guidelines recommend that "acceptable" libraries have no less than one percent of the instructional budget and that "exemplary" libraries have no less than three percent of the school's instructional budget. On average, libraries' budget for 1999-00 ranged between 0.5 percent (elementary and middle/junior high school libraries) and 0.8 percent (high school libraries) of the school's instructional budget.

The average elementary school library's operating budget in 1999-00 was $12,529; 75 percent of it was funded from local tax dollars. Middle/Junior high school libraries operating budget was $16,144.67; 69 percent of it was funded from school resources. High school libraries' operating budget was $27,174.66; 83 percent of it was funded from school sources. On a per student basis, library's operating budget funded from school sources ranged from $16.45 to $26.69. Taking into account all funding sources, libraries' mean operating budget per student ranged from $22.14 to $31.45.

Table I.1 – School Library 1999-00 Operating Budget

[illegible]	Elementary School Libraries		Middle/Junior High School Libraries		High School Libraries	
Funded by school	$ 9,371.06	74.8%	$11,095.13	68.7%	$22,625.68	83.3%
Funded from other sources	$ 3,159.16	25.2%	$ 5,050.54	31.3%	$ 4,557.78	16.7%
Total budget	$12,529.47	100.0%	$16,144.67	100.0%	$27,174.66	100.0%
Library operating budget per student (school funded)	$16.45		$16.64		$26.69	
Library operating budget per student (all funding sources)	$22.14		$24.26		$31.45	

Libraries' operating budget is strongly associated with libraries' collection size, the current status of the collection, and libraries' staffing resources. Libraries with larger operating budgets have larger and more current collections and more staffing resources to support student needs.

1.2 Library Staffing

Public School Library Programs: Standards and Guidelines for Texas recommend a graduated staffing structure for school libraries based on the size of the student population which includes certified librarians and paraprofessionals. Based on the standards and guidelines, Texas school libraries with more than 350 students are generally understaffed. Elementary and middle/junior high school libraries of all sizes typically have one librarian and a part-time aide. Between 36 and 38 percent of the elementary and middle/junior high school libraries have only one staff member. High school libraries typically have one full-time librarian, one part-time librarian and about one full-time aide. However, nearly one-quarter of high school libraries have only one staff member.

Table I.2 – School Library Staffing

Staffing	Elementary School Libraries	Middle/Junior High School Libraries	High School Libraries
Number of librarians (mean)	1.01	1.05	1.40
Number of library aides (mean)	0.67	0.71	0.98
Number of library staff (mean)	1.68	1.76	2.36
Percent of libraries with one staff	38.5%	35.9%	22.5%
Percent of libraries with two staff	55.8%	52.4%	39.5%
Percent of libraries with three or more staff	5.7%	11.6%	38.0%
Librarian person hours per week (mean)	38.8	40.2	53.9
Library aide(s) person hours per week (mean)	22.7	25.0	35.5
Library staff person hours per week (mean)	61.5	65.2	89.5

Lower than recommended staffing levels and especially the absence of library aides significantly curtail the range and type of services that librarians can provide. In libraries staffed by both a librarian and an aide, librarians are more likely to offer services identified in the standards and guidelines as high priority. These high priority services consist of collaboratively planning and teaching with teachers, providing staff development to teachers, facilitating information skills instruction, managing technology, communicating with school administrators, and providing reading incentive activities. Furthermore, the number of librarians and librarian hours of service (per 100 students) significantly impact library use. Libraries with higher librarian staffing levels and hours accommodate greater use of the library and its resources and allow more students to visit the library and enable more materials to be checked out. Library staffing levels represent the value that schools attach to libraries. Libraries that are more adequately staffed also have larger and more current collections and larger technology and financial resources.

1.3 Library Services

Library staff are expected to provide a wide range of services. Library staff spend the following average percentages of their time performing the named activities during a typical week.

- Basic Library Activities, such as checking materials, shelving, processing and retrieving: 43 percent in elementary school libraries to 46 percent in high school libraries.

- Administration: 21 percent to 24 percent.

- Information Access and Delivery: 17 percent in high school and middle/junior high school libraries to 24 percent in elementary school libraries.

- Teaching and Staff Training: 12 to 16 percent.

The School Library Programs: Standards and Guidelines for Texas recommend that librarians engage in collaborative curriculum related integration. The following percentage of librarians report engaging in these activities.

- Staff Development to Teachers and Other School Staff: 60 percent.
- Teach Cooperatively with Teachers: 67 to 75 percent.
- Participate on Curriculum Committees: 75 to 83 percent.
- Plan Instructional Units with Teachers: 80 percent.

Librarians who do engage in collaborative activities spend on average between 9.9 and 14.9 percent of their time in collaborative activities per week. Library staff spend the following percentages of their time in collaborative activities, on average.

- Staff Development to Teachers and Other School Staff: 1.1 to 1.5 percent.
- Participate on curriculum and Other Committees: 1.4 to 2.3 percent.
- Planning Instructional Units with Teachers: 2.3 to 3.1 percent.
- Teaching Cooperatively with Teachers: 5.1 to 8.0 percent of time.

The following table shows selected library staff services, the percent of libraries providing these services; average number of hours per week each service is provided, and the average percent of time per week library staff engage in each service.

Table I.3 – School Library Services

	Elementary School Libraries			Middle/Junior High School Libraries			High School Libraries		
	% Libraries	Hours per Week	% Hours per Week	% Libraries	Hours per Week	% Hours per Week	% Libraries	Hours per Week	% Hours per Week
Plan instructional units with teachers	78.6%	1.45	2.5%	81.7%	1.86	3.1%	81.4%	1.87	2.3%
Teach cooperatively with teachers	67.4%	2.94	5.1%	74.0%	4.73	8.0%	75.2%	5.96	7.2%
Provide staff development to teachers or other school staff	60.3%	0.63	1.1%	61.5%	0.92	1.5%	59.7%	0.94	1.1%
Meet with building or district curriculum committees	83.1%	1.12	1.9%	77.9%	1.37	2.3%	75.2%	1.13	1.4%
Assist teachers to access or utilize state initiative information	47.6%	0.94	1.6%	41.3%	0.87	1.5%	36.4%	0.99	1.2%
Identify materials for instructional units developed by teachers	92.1%	2.79	4.8%	88.5%	3.26	5.5%	93.0%	4.83	5.9%
Provide information skills instruction	83.5%	4.21	7.2%	81.7%	4.25	7.2%	87.6%	7.23	8.8%
Provide reading incentive activities	97.4%	7.17	12.3%	76.0%	2.91	4.9%	64.3%	1.82	2.2%
Manage library technology	88.4%	5.16	8.9%	88.5%	6.76	11.4%	93.0%	13.46	16.4%
Administer electronic reading programs	62.9%	3.48	6.0%	62.5%	3.91	6.6%	30.2%	2.08	2.5%
Manage inter-library loans	50.6%	0.55	0.9%	44.2%	0.41	0.7%	51.2%	0.76	0.9%
Meet with building and district library staff	75.6%	0.82	1.4%	72.1%	0.82	1.4%	72.1%	1.20	1.5%
Meet with library staff outside the district	26.6%	0.32	0.5%	28.8%	0.31	0.5%	42.6%	0.44	0.5%
Meet with principal or other building or district administrators	80.9%	0.77	1.3%	70.2%	0.68	1.1%	81.4%	0.89	1.1%
Attend faculty or staff meetings	91.4%	1.00	1.7%	88.5%	0.84	1.4%	89.1%	0.91	1.1%

1.4 Library Resources

As recommended by the School Library Programs: Standards and Guidelines for Texas, libraries have diversified collections of print and non-print materials. Libraries are expanding their non-print collection from video to CD ROM and to Internet-based sources.

Seventy-seven percent of elementary school libraries, 93 percent of middle/junior high school libraries and 74 percent of high school libraries have collection development policies. Between 50 and 55 percent of the libraries participate in a program to evaluate print and non-print resources. Such a program is typically staffed by librarians and teachers who meet periodically and evaluate new materials.

Libraries' collections most typically (90 percent or more of libraries) consist of print volumes, newspapers and magazines, and video materials. The following percentage of libraries include these technology-based collections.

- Encyclopedias and Reference Titles on CD ROM or Laser Discs: 80 to 86 percent.
- Computer Software Packages: 56 to 64 percent.
- Electronic, Internet-based, Subscriptions: 43 to 53 percent.

Approximately 75 percent of libraries in Texas belong to the Texas Library Connection, a statewide technology resource sharing initiative. Participating libraries have access to the Gale Group databases and Encyclopedia Britannica. The percent of libraries subscribing to additional online licensed services is currently still small, especially at the elementary and middle/junior high school levels.

A wide-range of technology resources are available to Texas school libraries. Most libraries (97 to 99 percent) have computers. On average, elementary school libraries have 10 computers; middle/junior high school libraries have 16 computers; high school libraries have 20 computers. Most libraries have computers that are connected to the Internet (92 to 95 percent). Most libraries have computers with CD ROM drives (94 to 95 percent). Additionally, the following percentages of Texas school libraries offer technologies which extend electronic resources beyond their physical facilities.

- Remote Access to the Library Catalog: 87 to 88.5 percent.
- Remote Access to the Libraries' Subscription Databases: 81 to 84.5 percent.
- Computers with Modems that Enable Staff and Students to Access Web-based Resources and Use Electronic Mail: 68 to 73 percent.

Library resources in 65 to 70 percent of the schools can also be accessed from computers in classrooms, offices, and other school locations, thereby expanding the reach of the

library beyond its physical location. On average, networked library resources may be accessed in elementary schools through 62 computers; 97 computers can do so in middle/junior high schools; and 159 computers in high schools.

Libraries are also able to expand their collections by accessing Internet resources as well as engaging in inter-library loans. Between 42 and 60 percent of the libraries loan to and borrow materials from other libraries in the district. Fewer than 10 percent of the libraries loan or borrow materials from libraries outside the district. Typically, inter-library borrowing or loans involve five or fewer items per week.

1.5 Facilities: Hours of Operation

Seventy to 83 percent of the libraries offer access to their resources beyond the instructional day, as recommended by the School Library Programs: Standards and Guidelines. These libraries are open, on average, between two and three hours a week before school and between 2.7 and 3.9 hours a week after school hours. Libraries with larger operating budgets and more diverse collections are likely to be open longer hours. Longer hours of operation are associated with greater library use, as reflected by the number of visits to the library and the volume of materials checked out.

1.6 Conclusions

A review of library resources, operations, and services relative to the School Library Programs: Standards and Guidelines for Texas reveals:

(1) Significant gaps between recommended library funding levels and actual funding levels.

(2) Significant gaps between recommended staffing levels and actual staffing levels.

(3) The great extent to which library staff currently engage in delivering basic library services, and the minor extent to which they currently engage in collaborative (curriculum integration) activities recommended by the school library standards and outlined in the State Board of Educator Certification Standards for School Librarians Certificate and Certificate Renewal Requirements.

(4) The growing presence of technology resources in the library and in the school with access to networked library resources.

(5) The increase in electronic, Internet-based, materials that can both replace and supplement print materials; thereby altering the definitions of "current" information and collection size.

(6) The expansion of access to library (electronic) resources from the physical library, to the school and to the home of students and teachers.

2. Indicators of Library Performance

The study employed more than 200 variables in examining the relationship between libraries and TAAS performance. Among the large number of variables examined, 34 were identified through statistical techniques as significant indicators of library performance. Statistical techniques were also used to group these variables. Variables were grouped into five areas, representing library performance factors.

- Program development:

  Number of staff per 100 students
  Staff hours per 100 students
  Library's hours of operation per 100 students
  Print volumes per student
  Current newspaper and magazine subscriptions per 100 students
  Video materials per 100 students
  Software packages for in-library use per 100 students
  Volumes purchased in 1999-00
  Library's operational expenditures per student

- Leadership: staff involvement with administrators, teachers, and colleagues (hours per week):

  Meeting with principal and administrators
  Serving on curriculum committees
  Meeting with library staff in district
  Meeting with library staff outside the district
  Attending faculty meetings

- Collaboration through teaching (hours per week):

  Planning instructional units with teachers
  Teaching cooperatively with teachers
  Providing training (staff development) to teachers
  Assisting teachers in accessing and using information about state funded reading programs
  Identifying materials for instructional units developed by teachers
  Teaching information literacy to students

- Library technology - computers in or under library supervision (per 100 students):

  Total number of computers
  Computers with Internet connection
  Computers with access to library catalog
  Computers with access to library databases
  Computers with CD ROM drives

Computers with networked access to CD ROM resources
Computers connected to a modem

- School technology – school computers with access to networked library resources (per 100 students):

  Total number of computers
  Computers with Internet connection
  Computers with access to library catalog
  Computers with access to library databases
  Computers with CD ROM drives
  Computers with networked access to CD ROM resources
  Computers connected to a modem

3. Libraries' Effect on Students' TAAS Performance

Nearly one-quarter of all schools in Texas do not have librarians. At all educational levels over 10 percent more students in schools with librarians than in schools without librarians met minimum TAAS expectations in reading. On average, 89.3 percent of students in schools with librarians compared with 78.4 percent of students without librarians met minimum TAAS expectations. In 2.5 times more schools with librarians (52 percent) than schools without librarians (21 percent), over 90 percent of the students met minimum TAAS expectations. In over one-quarter of the schools without librarians compared with five percent of schools with librarians, 70 percent of less students met minimum TAAS expectations.

Student performance in Texas, similar to findings of studies in other states, is affected, in large part, by socio-economic conditions. Library variables contribute a smaller but not insignificant portion to students' TAAS performance. The effect of socio-economic conditions on student performance is evident both in schools with and without librarians. Schools without librarians had a large percent of economically disadvantaged students (55 percent) than schools with librarians (49 percent); the former also exhibited lower TAAS performance. In a recent study in Massachusetts, elementary school library books per pupil, presence of a full-time librarian, and automation "explained" 7.5 percent of student performance. At the middle/junior high school level, library variables explained 4.5 percent of performance; and at the high school level, library variables explained 1.5 percent of student performance. Student performance was mostly explained by the percent of students entitled to free lunch. Similarly, in a recent study in Colorado, library staff, collection size, and budget explained 7.5 percent of student performance at the elementary level and 1.6 percent at the secondary level.

In the Texas study, library variables explained four percent of student performance on TAAS reading at the elementary school level, 3.9 percent at the middle/junior high school level, and 8.2 percent at the high school level. Also, library variables were generally more important to explaining the variance in TAAS than school variables such as the number of school computers per student, teacher experience, and teacher turnover ratio. In Texas, as in these other states, student performance was largely explained by

socio-economic factors associated with the students and their communities. Among the socio-economic variables, the percent of economically disadvantaged students was the strongest predictor of TAAS performance.

The powerful and highly significant effect of socio-economic factors on students' performance is further magnified when schools with the highest TAAS performance were compared to schools with the lowest TAAS performance. Elementary schools with the lowest TAAS performance have three times as many economically disadvantaged students; three times as many minority students; more than three times as many students with limited English proficiency; and one-half of the median family income. The lowest performing middle/junior high schools have nearly three times as many economically disadvantaged students; five times as many students with limited English proficiency; four times as many people in poverty in the community; and one-half of the median family income. The lowest performing high schools have nearly three times as many economically disadvantaged students and more than six times as many students with limited English proficiency. These high schools also have four times as many people in poverty in the community; more than three times as many minorities in the community; and two-thirds of the median family income. The libraries in both groups of schools also differ at all levels. The libraries in schools with the highest TAAS performance have more resources than the libraries in the low performing schools and spend more time on collaborative teaching-related (curriculum integration) activities.

Table I.4 – 25 Highest and 25 Lowest TAAS Performing Schools (Selected Variables)

Comparison	Elementary Schools		Middle/Junior High Schools		High Schools	
	Highest TAAS	Lowest TAAS	Highest TAAS	Lowest TAAS	Highest TAAS	Lowest TAAS
TAAS (percent of students who met minimum expectations in reading)	99.64	64.53	97.58	77.09	98.72	76.05
Library staff per 100 students	.482	.403	.325	.266	.606	.346
Library staff hours per 100 students	11.94	13.92	11.61	9.48	21.26	12.63
Library hours of operation per 100 students	12.21	9.75	8.46	6.97	12.70	8.52
Print volumes per student	20.35	16.47	17.03	12.77	23.99	15.00
Library operating expenditures per student	$36.02	$16.52	$30.30	$20.60	$57.47	$23.92
Meet with district library staff	.863	.794	0.95	0.68	0.67	1.59
Plan instructional units with teachers	1.29	1.25	2.31	1.76	2.18	1.46
Teach cooperatively with teachers	2.40	1.76	4.34	4.48	4.18	6.54
Computers in library per 100 students	3.91	2.88	2.32	1.80	3.14	2.69
Library computers with access to catalog	2.95	1.40	1.63	1.07	2.16	1.88
Library computers with CD ROM drives per 100 students	3.47	2.59	2.14	1.42	2.77	2.47
School computers per 100 students	16.77	10.26	10.56	9.55	28.98	13.21
School computers with Internet connection per 100 students	12.12	8.83	8.84	8.89	23.73	12.06
School computers with access to library catalog	9.09	4.22	6.54	7.44	21.03	8.23
School computers with access to library databases per 100 students	9.12	5.95	7.91	7.90	22.54	12.05
Percent of economically disadvantaged students	29.10	84.59	21.81	68.30	21.05	59.10
Percent of white students	65.64	11.72	73.92	20.88	75.14	20.10
Percent of Hispanic students	25.48	56.47	16.57	63.84	16.22	57.85
Percent of students with limited English proficiency	11.83	38.40	3.19	19.58	2.24	16.26
Percent minority staff	18.75	56.84	8.63	40.70	10.73	44.49
Percent minority population	25.29	67.19	15.86	60.36	13.76	60.18
Percent of community in poverty	10.73	29.00	6.86	28.40	6.70	26.58
Median family income	$74422	$37894	$67026	$36903	$63842	$38220

TAAS performance was associated with different library factors at each educational level. For example, at the elementary school level, TAAS performance was explained by two library factors depicting program development and library technology. The two factors were composed of the following variables:

- Library volumes purchased in 1999-00 per 100 students
- Library operational expenditures per student
- Library computers connected to a modem per 100 students
- Library software packages per 100 students

At the middle/junior high school level, TAAS performance was explained by an instructionally related factor composed of:

- Identifying materials for instructional units developed by teachers
- Providing information skills instruction to individuals or groups

At the high school level, TAAS performance was explained by two library factors depicting program development and collaborative activities. These factors were composed of the following variables:

- Library staff per 100 students
- Library staff hours per 100 students
- Library hours of operation per 100 students
- Volumes per students
- Current subscriptions to magazines and newspapers per 100 students
- Planning instructional units with teachers
- Providing staff development to teachers

While these library variables, in addition to the socio-economic variables, play a primary role in explaining the variance in TAAS performance, the association between TAAS performance and library resources and activities can not be inferred as a causal relationship solely on the basis of statistical analysis, although a causal relationship is highly plausible. Moreover, the statistical relationship between library resources and activities and students' TAAS performance may even be underestimated due to the nature of TAAS as a measure of performance. TAAS basically groups all students who meet minimum requirements into a single cluster regardless of the degree to which they meet these requirements. Each student who meets the minimum requirements is given equal weight. In this sense, TAAS offers a "unrefined" measure of performance. In addition, the Texas School Accountability System and the emphasis in the past few years in Texas on reading and TAAS resulted in increased TAAS performance. Consequently, the variance in the percent of students who meet minimum expectations has greatly decreased. For example, only 13 to 16 percent of the schools in our sample had fewer than 80 percent of students meeting minimum expectations on TAAS reading. In 46 to 54 percent of the schools 91 to 100 percent of the students met minimum expectation on TAAS reading. This lack of variance further limits the detection of effects.

The relationship between the library resources and activities identified through the multiple regression analyses as being associated with student performance on TAAS is not a linear relationship, as assumed in previous studies. Treating the relationship between TAAS performance and library resources and activities as linear may be misleading because it may not detect significant changes in variance. The examination of

the nonlinear relationship between these library variables and TAAS performance at all educational levels indicates that the variation in TAAS performance is high when these library variables have low values. The variation in TAAS performance decreases as the value of these library variables increases. That is, in low performing schools, libraries have fewer of these resources and devote less time to these activities. High performing schools have more library resources and devote more time to collaborative activities. Furthermore, TAAS results tend to increase and become more consistent, for example, as library staff spend more time in collaborative activities.

Minimally, schools at all levels should strive to increase their library resources and activities to levels maintained by the high performing schools. Optimally, expenditures and activities should be increased to meet the "Exemplary" level of the School Library Programs: Standards and Guidelines for Texas."

As immediate objectives, elementary schools should:

- Increase the library budget to the recommended level,
- Increase the number of volumes purchased annually,
- Increase the number of software packages for use in the school library by students,
- Explore the feasibility of expanding the use of adult volunteers,

Middle/Junior high schools should:

- Increase to the appropriate level the number of hours librarians spend identifying materials for instructional units developed by teachers, and
- Increase to the appropriate level the number of hours librarians spent providing information skills to individuals and groups.

High schools should:

- Increase to the appropriate level the number of library staff,
- Increase to the appropriate level the number of library staff hours,
- Increase to the appropriate level the number of hours of library operations,
- Increase to the appropriate level the number of hours librarians spend planning instructional units with teachers,
- Increase to the appropriate level the number of hours librarians spend providing staff development to teachers,
- Increase to the appropriate level the size of the library's print volume collection,
- Increase to the appropriate level the number of current subscriptions to newspapers and magazines.

GirlsTech

Getting girls and young women involved in the sciences and technology

GirlsTech explains and demonstrates a framework for use by teachers, parents, and youth group leaders to evaluate electronic resources (web sites, CD-ROMs, software, and games) that will encourage and increase young women's interest and participation in the sciences and technology.

GirlsTech.douglass.rutgers.edu

An integral part of the Douglass Project for Rutgers Women in Math, Science, and Engineering

A program of Douglass College, the undergraduate women's college of Rutgers, The State University of New Jersey

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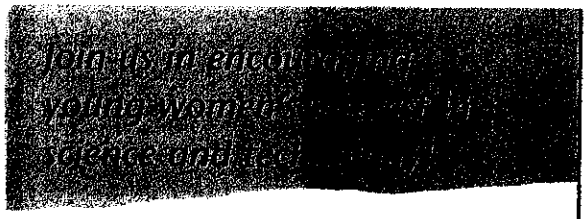

The GirlsTech web site carefully describes eight evaluation criteria with which to assess electronic resources, provides examples that illustrate them, and rates those examples. A summary of the research, an explanation of theory behind it, a bibliography, and a downloadable version of the complete research report are also contained on the site.

Visit

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Douglass Project for Rutgers Women
in Math, Science, and Engineering
Douglass College
50 Bishop Street
New Brunswick, NJ 08901-8530

DOUGLASS COLLEGE

PROPELLING YOUNG WOMEN INTO THE CYBER AGE: GENDER CONSIDERATIONS IN THE EVALUATION OF WEB-BASED INFORMATION

Denise E. Agosto

Rutgers, The State University of New Jersey

Abstract

Women hold a minority of the high-status, high-salary jobs in computer- and technology-related fields. As a method of encouraging young women to enter these professions, this paper presents a Gender-Based Website Evaluation Framework for selecting websites and other electronic information resources of high interest to young women. The framework includes eight evaluation criteria related to gender: collaboration, social connectivity, flexibility/motility, contextuality, personal identification, graphic/multimedia concentration, inclusion, and confidence. The identification of resources strong in these areas can encourage young women to use websites and related technology more frequently than they currently use them, thereby increasing their computer experience and confidence and making computer and technology professions more appealing career options. Funded by a Rutgers University Douglass Project for Rutgers Women in Math, Science, and Engineering grant entitled "Leading Young Women to the Sciences and Technology," the research results reported in this paper were derived from analysis of related library and information science and gender studies research, from original theoretical work, and from analysis of data collected from group interviews with adolescent female participants.

Propelling Young Women into the Cyber Age:
Gender Considerations in the Evaluation of Web-Based Information

Introduction and Background

For many years now, women have held a minority of the high-status, high-salary jobs in computer- and technology-related fields (Comber et al., 1997; DeRemer, M., 1989; Dorman, S. M., 1998, Gorriz & Medina, 2000). Various factors account for women's under-representation in these professions, including adolescent girls' generally less frequent use of computers for leisure pursuits, especially computer games, which are primarily targeted at male audiences; adolescent girls' consequently reduced levels of computer confidence; and young girls' gradual loss of interest in computers as they mature (Comber et al., 1997). As a result, the number of women who complete computer science bachelor degrees is not only alarmingly low, it is decreasing (Gorriz & Medina, 2000).

Another major cause of young women's reduced levels of interest in computer and related technology fields is that interface designers generally do not understand young people's experiences and perspectives, due to a lack of strong user-centered computer use studies. As Laurel (1990) explained, more user-centered research is crucial to understanding "which features of an interface are most valued by users with distinct characteristics and

specialized tasks" (p. 93). User-centered youth computer use studies are especially sparse, according to Laurel (p. 93). The result is computer software, websites, and other electronic information resources of limited interest to young people.

In response to women's under-representation in technology professions, The Rutgers University Douglass Project for Rutgers Women in Math, Science, and Engineering and the Girl Scouts of America secured a grant from Toyota USA. Part I of "Leading Young Women to the Sciences and Technology" sought to develop institutes, materials, and other methods for encouraging adolescent women to enter computer, science, and technology fields.

Part II of this project sought to work toward redressing the above-mentioned lack of user-centered youth computer use studies. Based on analysis of library and information science and gender studies research literature and on original theoretical work, the project investigator created a framework for evaluating the appeal of websites and other electronic information resources to young women. The project investigator then used group interviews with 14- and 15- year old young women and young women's questionnaire responses to test and revise the theoretically-derived framework, making the study user-centered. Each interview involved between five and eleven participants and lasted between forty-five and sixty minutes. The interviews were loosely structured and inductive in nature. The project investigator asked the young women three questions about each of the five test websites the young women had previously explored: "What did you like about the site? What didn't you like? What would you change if you could make changes?" The project investigator also used probe questions to test any proposed evaluation criteria that did not arise in the young women's discussion of the three main interview questions. The project investigator then

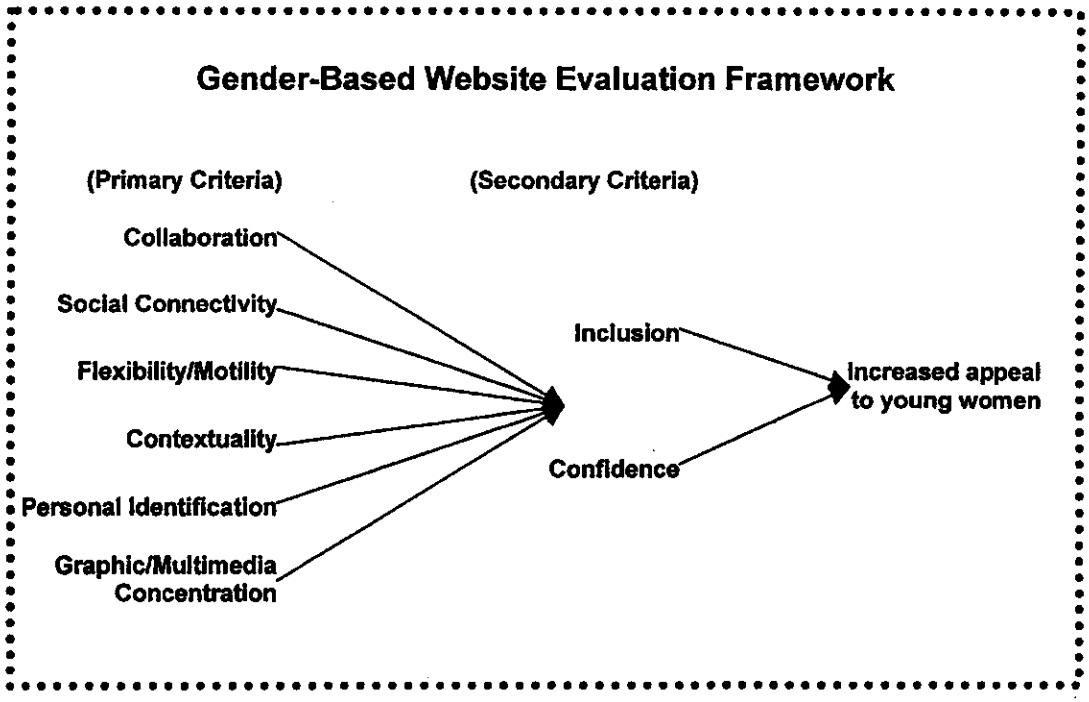
used iterative pattern coding (Miles, 1994) to analyze the data, modifying the proposed theoretical model in accordance with the resulting data patterns. The questionnaires were also loosely structured, asking the young women simply to record their impressions and opinions of the five test websites as they explored them.

Thus, this research is based on the belief that the only way to know what aspects of electronic information resources appeal to young women is to ask them. Many organizations have created and continue to create lists of recommended electronic information resources for youth, but exceedingly few of these organizations base their selections on input from actual young people. By incorporating data from the four group interviews and from the questionnaires into the resulting Gender-Based Website Evaluation Framework, this research hinges on the idea that young women know best what types of resources will encourage other young women to enter computer and technology fields.

The resulting Gender-Based Website Evaluation Framework includes eight evaluation criteria related to gender: collaboration, social connectivity, flexibility/motility, contextuality, personal identification, graphic/multimedia concentration, inclusion, and confidence. Resources that are strong in many or all of these areas are more likely to appeal to young women than are resources weak in many or all of these areas. Consequently, the identification of resources strong in these areas can encourage young women to use websites and related technology more frequently than they currently use them, thereby increasing their computer experience and confidence and making computer and technology professions more appealing career options.

Visual Model

The following visual model depicts the relationships among the eight evaluation criteria in the Gender-Based Website Evaluation Framework. Six of the evaluation criteria are primary criteria, indicating that they are of maximum importance to young women in their evaluation of websites and other electronic information resources. The remaining two criteria are secondary criteria, indicating that they are of less importance to young women, yet they still merit inclusion in the model. The greater the extent to which the website supports each of these criteria, the greater the resulting general appeal to young women.



Gender Schema Theory

Although the Gender-Based Website Evaluation Framework was designed specifically to target resources of high interest and high appeal to young women, it is important to understand that its use will identify resources likely to appeal to *most*, not *all*,

young women, because not all young women exhibit gender-specific electronic information preferences. Gender schema theory explains that sex is biologically determined and dichotomous, whereas gender is socially constructed and continuous. That is, genetic makeup determines whether a person is a woman or a man, but societal conditions result in a person's viewing the world in gender-schematic or gender-aschematic terms. As Bem explained,

> Gender schema theory proposes that sex-typing derives in large measure from gender-schematic processing, from a generalized readiness on the part of the child to encode and to organize information--including information about the self--according to the culture's definitions of maleness and femaleness. (1987, p. 231)

Gender-schematic, or sex-typed, individuals are those who view the world largely from a gendered point of view, bifurcating society into female and male components. Gender-aschematic, or non-sex-typed, individuals do not view the world in this generally bifurcated manner. Thus, a young woman who is strongly gender-schematic is likely to identify herself as a stereotypical young woman according to society's general stereotype of the ideal female (i.e. nurturing, acquiescent, non-confrontational, untalented in working with computers and technology, etc.) and to consequently have an attitudinal barrier against pursing a computer-related career. "High-tech careers," she would think, "are appropriate for young men, but not for me." There is nothing biological that prevents the gender-schematic young woman from entering a high-tech career; the societally-nurtured attitude that she has adopted prevents her from doing so. Consequently, resources selected according to the following evaluation criteria can be used to attract gender-schematic young women to the computer and technology fields, thereby serving to counteract this attitudinal barrier.

Although the concepts of "sex" and "gender" should not be conflated, and it must be understood that electronic information preferences vary among young women, the goal of

this research is to discover what aspects of electronic information resources are most likely to attract and to repel the greatest numbers of young women. As Cassell and Jenkins (1998) explained, to assert that all young women share the same preferences and wants is artificial, but necessary: "Despite the clear dangers of such 'sweeping generalizations,' the ability to determine what girls want may seem necessary at a time when we are trying to open up a space for girls to participate within this medium at all" (p. 25). For this reason (and for greater parsimony), the terms "women" and "young women" are used in place of the more exact terms "gender-schematic women" and "gender-schematic young women" throughout the following presentation and explanation of the gender-specific criteria.

Gender-Specific Evaluation Criteria

Explanations of each of the eight criteria in the Gender-Based Website Evaluation Framework follow, with references to related library and information science and gender studies research. Short excerpts from group interviews conducted to test these criteria are also included as evidence that these aspects of website evaluation are indeed important to young women. (These excerpts appear in **Arial font bold** to make them easier to identify.)

Collaboration

In general, women tend to prefer learning through collaboration; men generally prefer learning through competition (Brunner, Bennett, & Honey, 1998; Burdick, 1996; Martin, 1998; Mayberry, 1999; Miller, Chaika, & Groppe, 1996; Seymour & Hewitt, 1997). As Seymour and Hewitt found in their interviews with undergraduate science majors, many young women find competition-based learning repellent: "As [the students'] comments

indicate, most women prefer not to see learning turned into a competitive activity--indeed, they tend to view competition as getting in the way, both of good learning and of good collegial relationships" (1997, p. 264). As a result, when selecting websites and other electronic information resources for young women, resources not based on competition are preferable to those that present information through competitive formats, such as scored quiz games.

The young women in the Douglass project group interviews agreed that they generally preferred to work collaboratively. For example, one group discussed the merits of working together versus working alone when using computers:

> **Young woman #1: "I think that anything that deals with school and learning is easier to do with another person--"**
>
> **Young woman #2: "Yeah, because you have the same objective."**
>
> **Young woman #3: "Right. You're looking for the same thing."**
>
> **Young woman #4: "And it's fun. You feel like part of the same thing and can make jokes and stuff."**

However, these young women stressed that they preferred working collaboratively in educational settings and for school-related work, but that they generally preferred working alone in relation to leisure pursuits, such as reading email and playing computer games. Thus, it is important that websites and other electronic resources selected for school and educational use support collaboration, but resources selected for leisure purposes need not support collaborative work to hold young women's attention.

Social Connectivity

Women tend to value computers for their ability to connect them with other human beings and as tools that facilitate communication with other humans (Brunner, Bennett, & Honey, 1998; Honey, et al., 1991; Schofield, 1995; Subrahmanyam, & Greenfield, 1998; Turkle, 1988). Conversely, men tend to view computers as tools, valuable and impressive as examples of technological power. Most importantly, women are more apt to respond positively to information presented in terms of human relationships than to information presented for information's sake alone.

The young women who participated in the Douglass project group interviews supported this theoretical concept of social connectivity. Overwhelmingly, their preferred use of the Web and of the Internet was for sending and receiving email, with chat room use being the second most popular pursuit. Even in the case of playing computer games, the young women expressed a desire to establish contact with other human beings:

> **Young woman #1: "It would be good if you could play against other people, that are online."**
>
> **Young woman #2: "Yeah."**
>
> **Young woman #3: "Yeah, like if you go to the Jeopardy website and if you register you can play against other people."**

All of the young women in the particular interview excerpted above became extremely excited at the prospect of playing a Web-based game against actual people, instead of having a computerized opponent.

Flexibility/Motility

Some women dislike computers based on a belief that there is just one "right way" of doing things in the digital world (Brunner, Bennett, & Honey, 1998; Miller, Chaika, & Groppe, 1996; Roychoudhury, Tippins, & Nichols, 1995; Turkle, 1988). This gender-based attitude surfaces in women's and men's evaluation of computer software. In general, women "are drawn towards a style of programming...best characterized as...a relational encounter.... It is marked by an artistic, almost tactile style of identification with computational objects, a desire to 'play with them' as though they were physical objects in a collage" (Turkle, 1988, p. 50). Many men, on the other hand, tend to prefer a risk-taking style, "characterized by testing the limits of both machine and self through mastery and manipulation of the computer environment" (Turkle, 1988, p. 47).

Miller, Chaika, and Groppe (1996) found that the young women they interviewed did not desire closure of a section of a computer game "before moving onto another game or segment of a game. They seemed to prefer moving freely among environments without 'completing' or winning one. The contrasting paradigm -- that players will continue until they win or move to the next level -- which usually appears in popular gaming software, was not observed at any of the sessions" (p. 31). Consequently, young women are likely to prefer electronic resources that have multiple possible paths and many correct answers to questions and problems posed.

The young women in the Douglass project interviews also expressed preferences toward flexibly structured information resources. Of the five websites that they evaluated, the study participants' favorite site was a fully flexible, non-competitive coloring book site

that allowed them to select their own paths to travel through the site and did not require completion of any one section before moving to another.

The study participants also supported the concept of motility. When discussing a website that takes the user along on a flight into the center of a hurricane through a series of pages with text, photographs, and video clips, the young women expressed shared discontent that the site did not enable them to direct the path of the airplane:

> **Young woman #1: "When they said you'd go on a ride, I thought you'd actually be like, moving, but it was actually just clicking."**
>
> **Young woman #2: [Indicating distaste.] "Ew."**
>
> **Young woman #3: "It would have been better if you were like flying the plane."**
>
> **Young woman #4: "Yeah!"**
>
> **Young woman #5: "When it said 'cyberflight,' I thought you were actually going to go on a flight, where you could kind of control it--"**
>
> **Young woman #6: "That's what I was thinking!"**
>
> **Young woman #4: "Oh! That would have been REALLY cool!"**
>
> **Various young women: "I know! Yeah!" [Many other indications of agreement.]**

As these young women discussed their desire to be able to control the plane's path, many of them gesticulated as if they were flying an airplane, indicating their desire to have tactile contact with the imaginary plane's controls.

Contextuality

Next, research has indicated that young women tend to perform better in science and technology coursework when lessons and problems are introduced in context (Honey, et al.,

1991; Lage & Treglia, 1998; Scaife, 1998). That is, young women are likely to understand better the process through which a refrigerator chills foods from a narrative describing a restaurant refrigerator and its role in preserving foods for customers than from a diagram that depicts the inner workings of that same refrigerator. Moreover, women of all ages tend to prefer information presented within a narrative, a format that supports contemplation and interpretation. Men of all ages tend to prefer information presented in a more rigidly structured framework, or a format ideal for ready analysis.

Again, data from group interviews strongly supported this evaluation criterion. For example:

> **Interviewer: "The hurricane site had a story when you're following in the airplane and the NASA site was straight information, biographies. Do you have a preference?"**
>
> **Young woman #1: "I like the hurricane one better. I don't like straight information and stuff, it's not good--"**
>
> **Young woman #2: "It's really boring--"**
>
> **Young woman #3: "It's just going on and on about stuff and having a picture--"**
>
> **Various young women: "I know! Yeah!" [Many other indications of agreement.]**
>
> **Young woman #4: "[The story] made information and stuff not boring."**

Thus, websites that provide information within story contexts are more likely to appeal to young women than are un-contextualized information resources.

Personal Identification

A considerable amount of research indicates that young women learn more when they can relate lessons and problems to their personal lives (Miller, Chaika, & Groppe,

1996; Roychoudhury, Tippins, & Nichols, 1995; Subrahmanyam & Greenfield, 1998). A derivative concept is that many young women learn best through role-playing, which allows them to use their imaginations to personally experience an unfamiliar lifestyle.

For example, the young research participants in the current study visited a website that provided photographs and short biographies of female scientists at NASA. These young women generally agreed that the Women of NASA site was dull because they had no personal connection to the subjects of the biographies:

> **Young woman #1: "The women [of NASA website] was always boring. It gets tiring; it gets old and boring, repetitive.**
>
> **Young woman #2: "You don't really know the people, and it's just going on about them and having their picture and it just like has all this stuff about them and--"**
>
> **Young woman #3: "If one of the NASA women was my mom or something like that, I'd be, like, 'Oh, my God!'"**
>
> **Young woman #1: "It'd be more interesting."**
>
> **Young woman #3: "Yeah."**

After this last comment, the other young women in the group interview became very excited at the prospect of reading an online biography of someone they actually knew, serving as strong proof of their preference toward resources with personal connectivity.

Graphic/Multimedia Concentration

Research shows that young people, regardless of gender, prefer electronic information resources with considerable amounts of high quality graphic and multimedia content to plain-text resources (Fidel et al., 1999; Kafai & Bates, 1997; Wolcott, 1998). For

most young women, quality and amount of multimedia content are exceptionally important in maintaining their attention and interest (Miller, Chaika, & Groppe, 1996).

In fact, data from group interviews indicate that to many young women, this evaluation criteria is the most important of all eight proposed in the evaluation framework. In all four interview groups, the young women spent more time discussing their opinions of the graphics, videos, audio clips, colors, fonts, etc., than in discussing any other aspect of the websites they evaluated. For example, in discussing her first impressions of a site, one young woman said,

> **Young woman #1: I have a thing about colors, and I liked the green background.**

This comment initiated a long and intense discussion of whether or not the particular shade of green of the background was attractive, with almost all of the young women in the group passionately arguing for or against the color. Another young woman in another group interview summed up her group's overall consensus:

> **Young woman #1: "The page has to be inviting--for you to be able to look at it again and again."**

Although personal design preferences varied from young woman to young woman, the importance of website multimedia quality and quantity to young women cannot be overstated, based on the data collected for this study.

Inclusion

The illustrations and photographs in most science and technology texts show many more male scientists than female scientists (Schofield, 1995; Walford, 1981). Similarly, the contributions of female scientists have largely been excluded from written histories

(Harding, 1991). To express the idea that all young women, and all young people, can become scientists, resources should depict roughly equal numbers of women and men, as well as people from many racial and ethnic groups, in positions of status and leadership in science and technology.

Although some of the study participants did claim that inclusion was important in their evaluation of websites, as a whole, they felt that this criterion was of generally secondary importance. A few young women claimed that the one redeeming aspect of the Women of NASA website was its feminist aspect. As two of the members of one group interview said:

> **Young woman #1: "I like that it showed that women can get this high and stuff. It sets a good example."**
>
> **Interviewer: "The inspiration?"**
>
> **Young woman #2: "Right. I was just going to say that."**

Other study participants expressed little or no preference for inclusion, however, making this a gender-based evaluation criterion of secondary importance to young women.

Confidence

Finally, one of the main reasons that gender-schematic young women rarely consider computer-related careers is that they lack self-confidence in their computer abilities, whether or not they lack related competence. From her interviews with highly educated, intelligent women who are nonetheless reluctant to use computers, Turkle (1988) has concluded that "The central issue for these competent and talented women is not phobia or lack of ability, but a reticence to become more deeply involved with an object experienced as threatening" (p. 366). Similarly, Opie (1998) traced girls' reduced levels of confidence with computers to

their lesser developed technological skills. Comber et. al. (1997) traced these reduced levels of computer confidence to adolescent women's less frequent use of computer games, the majority of which are designed for and marketed to males (1997). Resources that offer strong encouragement and support can help to counteract this gender-related self-doubt.

As with inclusion, confidence was an evaluation criterion of secondary importance to the study participants. Participants in only one of the four group interviews discussed any related ideas:

Young woman #1: Um, [I liked] the teen-friendly vocabulary [in the website].

Young woman #2: Oh, that's right.

Young woman #3: They had good language.

Young woman #2: That's right.

Young woman #3: Understanding of us.

Young woman #4: Yeah.

More research is needed to investigate this criterion further, but as it stands, confidence is a secondary level evaluation criterion.

Evaluation Questions

To facilitate the selection of websites and other electronic information resources according to these eight gender-based evaluation criteria, this section presents a list of evaluation questions to consider when evaluating websites and other electronic information resources for young women. Teachers, librarians, parents, and other adult intermediaries will be able to apply this evaluation framework to new electronic information resources for

many years to come, selecting materials that will help to encourage young women to enter computer and technology fields in greater numbers than they are currently doing today.

Collaboration

1. Does the resource encourage exploration and inductive learning, or does it only emphasize competition and winning?
2. Does the resource lend itself easily to small-group use?
3. Is the main point of the website to win a competition of some sort, or are other site attributes (such as information presentation and explanation, storytelling, or character development) also emphasized?

Social Connectivity

1. Does the resource emphasize the importance of its topic matter to human relationships?
2. Is there a method for contacting other people, such as a chat room for speaking to experts, or an email address for obtaining further information?

Flexibility/Motility

1. Do questions and problems embedded within the resource have just one correct answer?
2. Does the website allow the user to select from numerous navigational paths?
3. Does the resource allow the user to rearrange the physical placement of objects on the screen?

4. Does use of the resource involve cognitive risk-taking and penalties for selecting incorrect choices or paths, or are multiple use styles encouraged and rewarded?
5. Does the resource require closure, or does it support fluidity and exploration?

Contextuality

1. Are information contexts (histories, stories, explanations, backgrounds, etc.) emphasized?
2. Is information presented in story format, or as isolated facts, figures, charts, and graphs?
3. Does the resource encourage contemplation and interpretation or immediate analysis?

Personal Identification

1. Is it likely that most young women will find a connection between their personal lives and the context of the website?
2. Does the resource encourage role-playing?

Graphic/Multimedia Concentration

1. Is there a relatively high percentage of graphic and multimedia content?
2. Are the graphics clear and easy to understand?
3. Are the audio and video components high quality?

Inclusion

1. Are women and men represented in roughly equal numbers in narrative, graphic, audio, and video content?

2. Are people of diverse racial and ethnic backgrounds depicted?
3. When women and members of marginalized groups are represented, are they presented in positions of respect and influence, or are they shown performing auxiliary roles?

Confidence

1. Does the resource use a tone of respect in regard to users' abilities, or does it seem to present itself as exclusively authoritative?
2. Does the resource encourage exploration and inductive learning, or does it imply that the user should already be proficient in the subject matter?
3. Above all, does the resource support and nurture young women's confidence in themselves and in their abilities?

Conclusion

Not only do women continue to represent a minority of high-salary, high-status jobs in computer-related fields, research indicates that fewer and fewer young women are completing bachelor's degrees in computer science (Gorriz, & Medina, 2000). One method of combating this trend is for librarians, teachers, and other adult intermediaries to select electronic information resources using the gender-based website evaluation criteria proposed in this paper. As young women investigate these high-interest resources, they will gain valuable computer skills as well as increased self-confidence in their computer abilities, helping them to view themselves as potential future computer scientists and technology engineers in our ever-more technology-driven world.

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f i r s t m o n d a y

PEER-REVIEWED JOURNAL ON THE INTERNET

Teacher's Palette

by Diana Helton Rennels
and Jill Fairhurst Taylor

"The arts have been an inseparable part of the human journey. They provide us with pleasure, spark our creativity, and frame reality in fresh perspectives. We value them for themselves, and because we do, we believe knowing and practicing, them is fundamental to the healthy development of our children's minds and spirits."
- Madeleine Kunan

In 1998, the Indiana University-Purdue University Indianapolis (IUPUI) University Library received a grant from the Institute of Museums and Libraries (IMLS). Sub-grants were awarded to six educator teams in central Indiana during the summer of 1999. The purpose of this mini-grant was two-fold. Twelve teachers became part of a national pilot program to integrate art into a regular classroom using a digital database as one resource. The second goal of this grant was to develop lesson plans to integrate art into each school corporation's existing curriculum. What follows are just a few examples of units of study and lessons that were implemented in a third grade classroom at Brown Elementary School in Brownsburg, Indiana. The true success of this project lies in our collaboration, a library media specialist and third grade teacher working together to make sure we "leave no child behind."

Art is the great equalizer. There is no right or wrong answer; it speaks to a child's emotions, which have been described as the gateway to brain compatible learning, and it sparks the creative spirit in all curricular areas. The at-risk student label given many children can be discarded and replaced with an artist's palette, symbolizing a color wheel of possibilities. As the school year begins, each child's canvas is blank, the slate has been wiped clean, and the chance for new beginnings is just a brush stroke away. The classroom studio has specifically been created as a safe place where creative expression, tolerance, and the celebration of the individual spirit are recognized and encouraged.

To begin, we introduce the artists Rembrandt and Rockwell in the media center, focusing on their self-portraits. After watching "Rembrandt's Beret," the children are given their own purple felt berets, their "painters' crowns." The artistic transformation has begun. With berets tilted jauntily on their heads, the children draw their own self-portraits. Then we look inward and using excerpts from Walt Whitman's "Song of Myself" the children write poems celebrating their inner selves as shown in James's poem below.

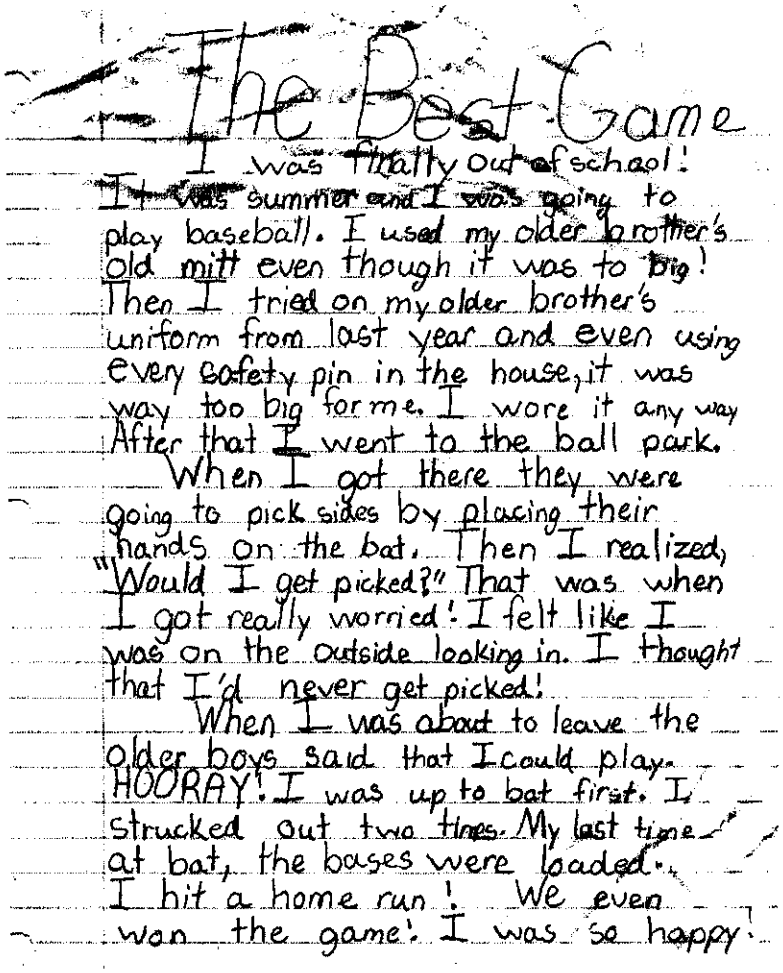
135

"I celebrate myself.
People say I'm as slow
as turtle,
but I'm not.
I am as fast
as an alligator.
When people hurt my feelings,
I'm an orphan
and no one cares about me.
Then I feel like a very lonely lizard
in a boiling hot desert.
To me, every day used to be a rainy day -
water for tears.
Now I know that some people
feel the same way.
And, today ...
I celebrate myself.
I'm excellent at running
like the wind in a tornado.
I can tackle a bull
when it's trapped in a pen.
I kick like a radiant horse
when it is whipped.
I celebrate these things in me."

From this writing experience, we begin to know our students, and more significantly know our students' perceptions of themselves. The first stroke of color has been added to the canvas.

In Indiana, state achievement testing occurs in early September. As part of this third grade ISTEP test, the students are asked to write a story and given fifty-five minutes to do so. Often, a picture is used as a writing prompt. This testing experience is simulated using a Norman Rockwell print prior to testing as shown by Kristen's writing sample below.

136



The Best Game

I was finally out of school! It was summer and I was going to play baseball. I used my older brother's old mitt even though it was to big! Then I tried on my older brother's uniform from last year and even using every safety pin in the house, it was way too big for me. I wore it any way After that I went to the ball park.

When I got there they were going to pick sides by placing their hands on the bat. Then I realized, "Would I get picked?" That was when I got really worried! I felt like I was on the outside looking in. I thought that I'd never get picked!

When I was about to leave the older boys said that I could play. HOORAY! I was up to bat first. I strucked out two times. My last time at bat, the bases were loaded. I hit a home run! We even won the game! I was so happy!

Figure 1: Kristen's writing sample for ISTEP.

This writing sample is used as an assessment tool and is later compared to a writing sample completed at the end of the school year. This is a powerful means of demonstrating growth and speaks to the issue of teacher accountability.

Our next unit of study focuses on our community. Hoosier artists are featured; see our online lessons plans. In celebration of the bicentennial of the Library of Congress in May 2000, our class project, selected by Representative Edward Pease, became part of the Local Legacies national database as a permanent record in the Library of Congress. The legacy of farming was the focus of our project. A quilt was hand-stitched by our eight and nine year old students, including Indiana rural landscapes painted on their own quilt blocks. As we explored the legacies left by the farmers in Brownsburg, our "Unsung Heroes," we began to see that weaving the study of artists and their works into our curricular tapestry brought a richness and depth to the legacy we hope to leave with each of our students.

137

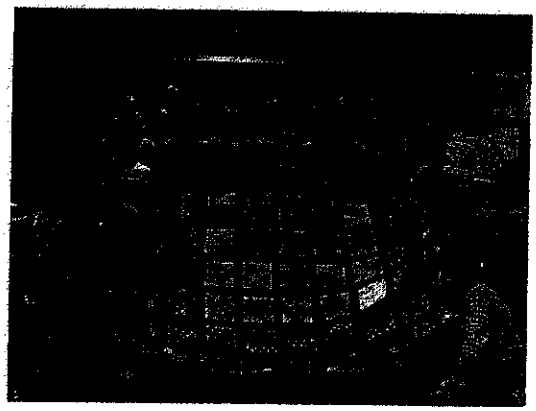


Figure 2: From the Emerald Isle to Little Ireland: The Legacy of Farming in Brownsburg, Indiana.

Throughout our Native American unit, we shared the artwork of many artists including Frederic Remington, Charles Russell, and Georgia O'Keeffe. A field trip to the Eiteljorg Museum of American Indians and Western Art was an integral part of our tribal research project and provided an opportunity to make real-world connections. Back in our school media center, the children worked in small groups to complete the research of various tribes throughout North America, research begun during our museum visit. Using a wide variety of resources including the Internet, CDs, books, videos, and video conferencing we were literally able to bring the world to rural Indiana.

With the wealth of research data on the brain and its implications for student learning we now have available, we know that integrating curriculum in meaningful ways positively impacts student achievement. After the Native American research was completed, the children applied that factual information in an illustrated math story problem of their own design. Jesse's story problem below was based on the Sioux ceremony, which Remington brought to life in his own painting entitled "The Sun Dance."

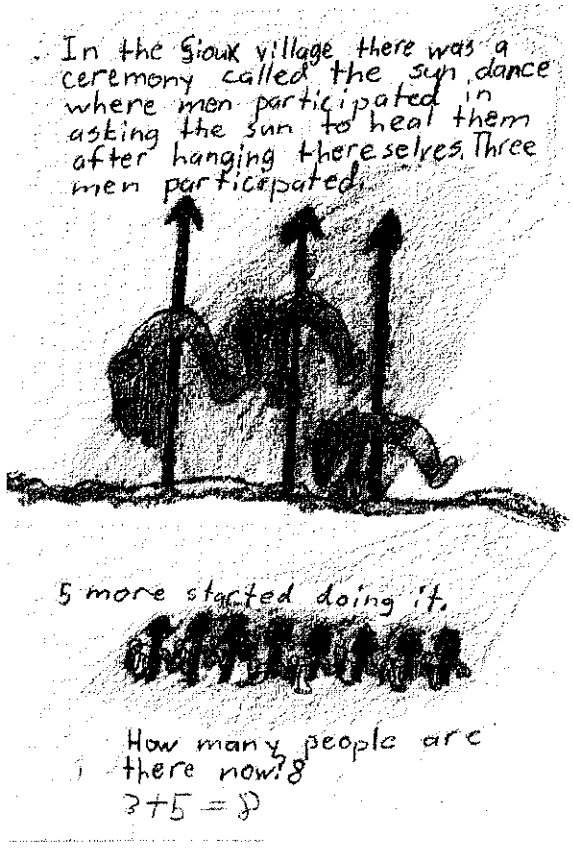


Figure 3: Jesse's Interpretation of Remington's "The Sun Dance."

Using Russell's painting, "The Wolfer's Camp," as a springboard for discussion, we introduced the concept of barter and trade, two components of our economics curriculum. This led to the children's interest in establishing a trading post (with a little guidance from us) in our elementary school. The children decided to produce Native American beaded jewelry, dream catcher kits, and popcorn after learning that maize was an important crop in many native cultures. These items would then be made available to all the students at Brown Elementary School.

To purchase the resources necessary to make our wares, we asked a local bank to loan us $40. Jay Puckett, loan officer for the State Bank of Lizton, came to our classroom and explained the loan process, including the reason we had to pay $.43 interest and why the contents of the children's desks and cubby holes needed to be held as collateral. It was a sobering moment for our students when they internalized the concept that if we did not pay back our loan, their art supplies and "smelly" markers could be confiscated. With great ceremony the children voluntarily signed the loan agreement in cursive to make our loan legally binding.

Throughout the next couple of weeks the children went into full production, learning first-hand core economic principles. The help of parents was essential in bringing this project to fruition. We are pleased to announce that the entrepreneurial spirit is alive and well. The trading post was a huge success! Our record of sales was reproduced in the media center using Microsoft Excel, and we were thrilled to learn that our profits exceeded $500! Mr. Puckett returned to our classroom and the children proudly handed him the $40.43

necessary to satisfy our loan agreement and shared with him the genuine sense of achievement they felt in this business venture. The profits of our trading post went toward purchasing a wood burning stove and Christmas food basket for a Navajo family living on a reservation in New Mexico, and we also were able to sponsor and purchase Christmas gifts for a single parent family in our own community.

You see, this project encompassed so much more than just the integration of art and technology into our third grade curriculum. It added a color and texture to the children's canvases and allowed the innate goodness in all children, irrespective of academic levels or backgrounds, to shine forth. The sense of fulfillment and joy in our students' faces shone brightly, a beacon in the fog of negativity regarding education in this country. Through this article and our presentation at the Web-Wise conference in February, we hope our voices and the voices of our students will be heard, for they are voices of hope and great promise.

One final unit we'd like to share involves the study of Leonardo da Vinci whose scientific genius related to our science unit on simple machines. The Wyeths (N.C., Andrew, and Jamie) illustrated the strong bonds of family that was evident in our study of the Wright brothers. Picasso's work tied seamlessly into our math curriculum as the children made kites like Orville and Wilbur Wright using geometric principles.

To introduce simple machines we journeyed to the Indianapolis Children's Museum. There the children had hands-on experiences using simple machines in the Science Works area of the museum. Upon our return to the classroom, the children were able to literally experience all the simple machines on the seven-foot wooden simple machine model in our classroom. This connected beautifully with our study of the Wright brothers' odyssey to produce a flying machine. What a surprise it was for the students to discover, utilizing a CD in the media center, that Leonardo da Vinci had made drawings of what today would be a helicopter! The media center was also the site for a Science Court experiment with simple machines.

The real world applications of our study of simple machines, geometry, and the invincible spirit of the Wright brothers were culminated in an Invention Convention. Prior to this, the children received patents for their own inventions, which had to include at least two simple machines. Often with the help of family members the children then constructed models of their inventions and showcased them in a Microsoft Power Point presentation produced in the media center's production room and in our school computer lab. These presentations were shown before our students demonstrated their models at our annual Invention Convention. Parents, grandparents, neighbors, and friends were amazed at the innovative inventions created by our third graders.

Below is Nowell's technical drawing, the first slide in his Microsoft Power Point presentation, illustrating his invention entitled the "Litter Sifter." His invention included all the simple machines we studied and allowed him to empty his cat's litter box in a very creative way!

140

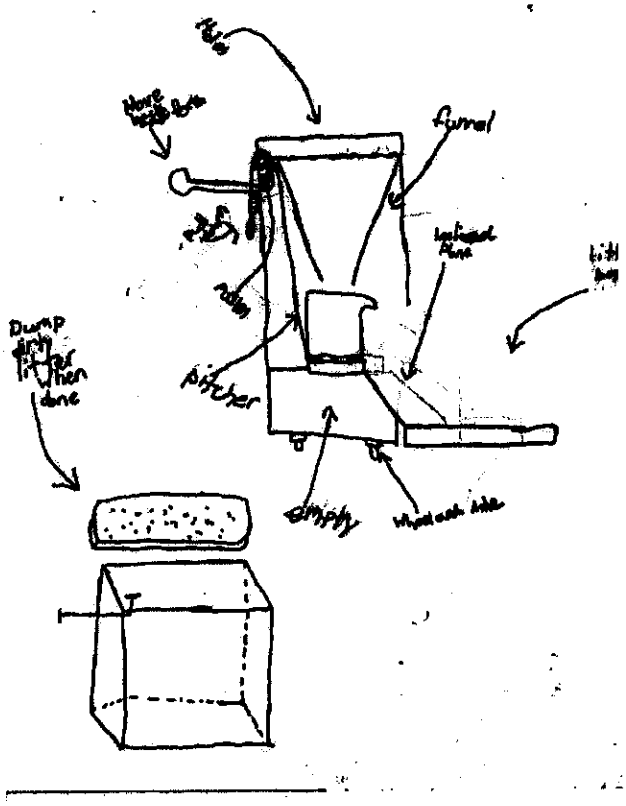


Figure 4: Nowell's technical drawing of his invention, the "Litter Sifter."

Every child had his/her own moment in the spotlight during this unit. This experience allowed those kinesthetic learners who are often tethered by traditional paper and pencil tasks to soar unencumbered in their flights to reach new heights of achievement and recognition.

Picasso said, "Every child is an artist. The problem is how to remain an artist once he grows up."

Perhaps a visit to the Indianapolis Museum of Art by our third grade students to see an original Picasso painting will be the impetus for a lifetime love of art. Thanks to our grant from IMLS, we believe that the potential for *all* of our students to remain artists throughout their lifetimes is possible. Our students' canvases are works in progress, and with the many hues of color available through technology; their palettes are ever changing and growing in complexity. Our children are our country's masterpieces and our most precious national treasures. And with the collaboration between the "old masters" in our schools, museums, and libraries, we can indeed ensure that "no child is left behind."

About the Authors

Diana Helton Rennels, BS, MLS, is Library Media Specialist at the Brown Elementary School in Brownsburg, Indiana.
E-mail: drennels@brownsburg.k12.in.us

Jill Fairhurst Taylor, BA, MA, is a Third Grade Teacher at the Brown Elementary School in Brownsburg, Indiana.
E-mail: jtaylor@brownsburg.k12.in.us

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Contents Index

Teacher's Palette by Diana Helton Rennels and Jill Fairhurst Taylor
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The University of Georgia

College of Education
Department of Instructional Technology

Presenters: Julie Tallman, Mary Ann Fitzgerald

Title: Collaborative Research Methods in Information Literacy

Collaboration is an essential working strategy in both developing and investigating information literacies. Primarily, this is true because the development of information literacy requires unified efforts on the part of teachers, media specialists, academic librarians, and other educational professionals. We will explore examples of methods that lend themselves particularly well to collaborative research, including discourse analysis, action research approaches, and online data collection. Along with the methods we describe, we will provide examples of projects from our own experience that include local, national, and international investigations involving collaborative efforts targeted at enhancing information literacies.

604 Aderhold Hall • Athens, Georgia 30602-7144 • Telephone (706) 542-3810 • Fax (706) 542-4032

Think About It:
Using the Think Aloud Method to gather information-seeking process data

Jennifer L. Branch, PhD
University at Albany
State University of New York

This presentation will explore the results of a study using Think Alouds to gather data about the information-seeking processes of twelve junior high students as they accessed information using CD-ROM encyclopedias. The study took place in Inuvik, Northwest Territories, an isolated community in the Canadian Arctic, and most of the participants were of Aboriginal descent.

The Think Aloud Method (TAM) dates back to Plato and Aristotle.[1] For qualitative researchers interested in getting a rich source of data, Think Alouds provide a participant's verbal stream of consciousness while carrying out a task or solving a problem.[2] The method is especially useful when the researcher has no predetermined ideas about the nature of the task.[3] Yet, this method has experienced criticism from the quantitative community such as the data being irrelevant[4], incomplete, subjective, idiosyncratic, and distorted[5]. Those of us doing qualitative research will recognize that these criticisms have been leveled at almost all naturalistic inquiry.

This presentation will explore the challenges and successes encountered when using the TAM in a qualitative case study.

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[1] Ericsson, K. A., & Simon, H. A. (1993). Verbal reports as data (2nd ed.). Cambridge, MA: MIT Press.

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[3] Cacioppo, J. T., von Hippel, W., & Ernst, J. M. (1997). Mapping cognitive structures and processes through verbal content: The thought-listing technique. Journal of Consulting and Clinical Psychology, 65(6), 928-940.

[4] Ericsson, K. A., & Simon, H. A. (1993). Verbal reports as data (2nd ed.). Cambridge, MA: MIT Press.

[5] Hayes, J. R., & Flower, L. S. (1983). Uncovering cognitive processes in writing: An introduction to protocol analysis. In P. Mosenthal, L. Tamor & S. A. Walmsley (Eds.), Research on writing: Principles and methods (pp. 207-220). New York, NY: Longman.

Think About It:
Using Think Alouds, Think Afters, and Think Togethers
to gather information-seeking process data

Jennifer L. Branch

There are many methods that qualitative researchers can use to gather data about specific situations. Interviews, observations, surveys, and focus groups are just some of the methods that provide researchers with data. A less common but equally useful method is verbal protocol analysis.

For qualitative researchers interested in getting a rich source of data, the verbal protocol analysis method is an excellent choice. Wilson (1994) emphasized that inspiration can be gained from people's conscious thoughts. Pressley and Afflerbach (1995) expanded the idea by noting that "spoken language is the data used in protocol analysis and the richness and variability of language are the greatest assets and liabilities of the verbal reporting methodology" (p. 2). Verbal protocol analysis is a way to gain information about a participant's cognitive thought processes using verbal reports. Verbal reporting is bringing thoughts into consciousness, making the ideas verbal if needed and then verbalizing them (Ericsson & Simon, 1984).

This paper will explore the use of verbal protocol analysis to gather information-seeking process data in three different studies. It begins with definitions used in this paper and an overview of verbal protocol analysis. Next, there is a literature review of recent studies in the fields of

education and library and information studies that have used verbal protocol analysis methods. Finally, results and insights from three studies as well as successes and challenges of using the method will be presented.

Definitions

Verbal protocol analysis is used in this paper to refer to verbal reports of thought processes that are obtained from participants who are asked to describe what it is they are/were doing and thinking as they complete/completed a task. For this paper, there are three types of these verbal reports of thought processes that will be explored: Think Alouds, Think Afters, and Think Togethers. The first, concurrent verbal protocols, is referred to as Think Alouds in this study. Think Alouds are verbal reports that are gathered while a participant is completing a task, e.g., searching for information on the Internet. The second type, retrospective verbal protocols, is referred to as Think Afters in this paper. Think Afters are verbal reports gathered after a participant has completed a task, e.g., watching a videotape of their CD-ROM encyclopedia search and then being asked to recall their actions and thoughts while they were completing the task. Think Togethers is used to describe a group of participants doing Think Alouds together, i.e., discussing their information-seeking processes as they complete a group or individual research project.

Verbal Protocol Analysis

Ericsson and Simon (1984) based their work on verbal protocol analysis on the constructs of short-term and long-term memory from information-processing theory. They hypothesized that all human cognition is information processing and stated, "that a cognitive process can be seen as a sequence of internal states successively transformed by a series of information processes"

(p. 11). The way that this information is organized is highly individual. Long-term memory contains a vast amount of knowledge, both procedural and factual, that can be accessed. Short-term memory, on the other hand, is extremely limited, especially if the information is not acted upon. External stimulation and associations from long-term memory are the basis of short-term memory. According to Pressley and Afflerbach (1995), short-term memory can be quickly accessed and the contents reported. It is this short-term memory that verbal reports tap. Ericsson and Simon (1984) used this conclusion to validate think aloud data that was gathered earlier in the century and to promote its continued use today.

Protocols done properly, according to Russo, Johnson and Stephens (1989), "ask subjects to report their thoughts, not to explain them" (p. 759). Ericsson and Simon (1984) discuss the history of verbal reports and introspection in the first chapter of Protocol Analysis: Verbal Reports As Data. They suggest that the method is a very old one. Philosophers such as Aristotle and Plato used introspection to inquire about the nature of man by examining their own cognitive processes. Van Someren, Barnard & Sandberg (1994) explained that the main advancement with the method over the years was that verbal reports began to be treated as data instead of conscious processes. It was near the end of the 1960s that the method was revived again. As interest in cognitive processes grew, the interest in methods that could provide information about these processes grew as well.

Newell and Simon (1972) used this methodology to build very detailed models of problem-solving processes. According to van Someren, Barnard and Sandberg (1994), "this work had a major influence, because it showed that very detailed explanations of verbal data can be obtained" (p. 31). The method was used when design of expert computer systems began to

grow. The need to find out about a human expert's knowledge to create these computer systems made the method more popular. According to Ericsson and Simon (1984), "the real breakthrough came when the Think Aloud method could be given explicit meaning in terms of a formal model of the thought processes that could be simulated on a computer" (p. 61). Ransdell (1995) pointed out that protocol analysis "is one of the few methods available in cognitive psychology that gathers data with sufficient temporal density to test models of online, second-by-second behaviour" (p. 89).

The greatest strength of the method is the ability to use it to generate hypotheses. According to Cacioppo, von Hippel, and Ernst (1997), the method is "particularly useful when one either has no predetermined ideas about the cognitive dimensions that are relevant or has only a few untested hunches" (p. 929). Pressley and Afflerbach (1995) note that verbal protocol analysis provides a way of gathering data on cognitive processes that, otherwise, could only be studied second hand. The method also allows an insight into affective processes as well as cognitive processes. Wilson (1994) made a point of mentioning the method's versatility and this can be seen in the variety of research areas in which the method has been used. The method can be used successfully with naïve users as well as experts.

Studies Using Verbal Protocol Analysis

The Think Aloud method is now accepted by a large part of the research community and is being used in a variety of different research areas. Hayes and Flower (1983) and Ransdell (1995) have done extensive research in the area of writing. Whitney and Budd (1996) used the method to study text comprehension and other researchers have used the method to study reading comprehension strategies (Davey, 1983; Garner, 1982; Kavale & Schreiner, 1979).

Cacioppo, von Hippel and Ernst (1997) cite the many uses of verbal protocol research in clinical and counseling psychology. Murtaugh (1984) used verbal protocol analysis to study the grocery shopping decision-making process. Sullivan and Seiden (1995) assessed the online catalogue user's education needs using the method.

More recently, it has been used as a method in research projects more similar to this researcher's interests. McGregor (1994) used the Think Aloud method to analyze the thinking in the research process of high school students. Nahl and Tenopir (1996) used the Think Aloud method as faculty and graduate students searched a full-text online database of magazines. The researchers were interested in the search strategies and the affective, cognitive and sensorimotor behaviours of the participants. Yang (1997) used verbal protocol analysis and observation to study six cases of information-seeking behaviour in university students as they accessed information in the Perseus Hypertext System. Yang had each participant practice the Think Aloud method before asking them to think aloud while working on the problem. Hughes, Packard and Pearson (1997) also used the Think Aloud method in looking at reading in a hypertext environment. They introduced the method to the participants using a video of other computer tasks so that the method was demonstrated without "suggesting strategies for using the intended target of research" (p. 5).

Xie and Cool (1998) used the Think Aloud method to study end-user online searching. They found through the use of this method that "much insight is gained into the problems encountered by searchers and the adaptive strategies they employ in such situations" (p. 329). Tallman and Henderson (1999) used the Think Aloud method to look at the mental models of teacher-librarians as they taught students about electronic resources. Hirsh (1999) used the

think aloud method to study elementary students' relevance criteria and search strategies during a school project. Her results have implications for how we teach students about information literacy and for the design of systems.

Agosto (2001) used group interviews as a research method to gather data about how 14-15 year old girls evaluate Internet sites. The method is used so that multiple perspectives and opinions can emerge. For Agosto, "group interviews differ from focus-group interviews in that the major goal of focus group interviews is to achieve group consensus, whereas this is not a goal of group interview research" (par. Group Interviews). Think Togethers is another way of referring to this type of group interviews.

Challenges to Verbal Protocol Analysis

The Think Aloud method has been better received than the Think After method. Many of the concerns about retrospective protocols focus around the problem of forgetting and fabrication. Retrospective protocols may be influenced by a "motivational shift [that] can occur whenever subjects are informed that they will have to generate a subsequent verbal report" (Russo, Johnson, & Stephens, 1989, p. 765).

Both methods have long histories and have experienced much criticism. The first and most often cited criticism states that verbal data is incomplete and that behavioural and performance changes cannot be gathered by the method. Hayes and Flower (1983)pointed out that because the method is so idiosyncratic, a participant "may fail to verbalize a considerable part of the information that passes through the short term memory" (p. 61). They added that this type of reporting would cause the distortion of cognitive processes even if a person were to be aware

of the processes. Ericsson and Simon (1984) suggested another criticism that they call the epiphenomenality or irrelevance argument. This argument "is that the verbalizations may report an activity that occurs in parallel with, but independent of, the actual thought process, hence provides no reliable information about the latter" (p. 61).

Researchers have suggested that the production of verbal reports may change the cognitive processes being studied. Fawcett (1993) suggested that in certain situations the participants will be so focused on the task that they will be either unable to think aloud or the thinking aloud will interfere with the process. Verbal reports have also been criticized as not being generalizable because they are so idiosyncratic. Hayes and Flower (1983) suggested that verbal reports are not objective and are not scientific. Steinberg (1986) also suggested that "the presence of the person arranging for the protocol and of the tape recorder and the very nature of the protocol session distort the cognitive processes of the [subject] giving the protocol" (p. 699).

These criticisms have been leveled at almost all research involving fieldwork such as observation and interviews. Although the work of Ericsson and Simon is recognized as seminal in the field of verbal protocol analysis, these three research studies followed a modified approach to verbal protocol analysis. It did not feel comfortable sitting behind the participants while they searched. There was not the concern of "intruding" into the search as the researcher. As a matter of fact, I was very important to the research. The terms used by I was interested in spending time with junior high students while they searched. I wanted to be open to what would happen in the research setting.

Ericsson and Simon's verbal protocol analysis is firmly set within the positivist paradigm as they are concerned with reliability, validity and generalizability. In the naturalistic paradigm, "realities are multiple, constructed, and holistic" (Lincoln & Guba, 1985, p. 37). Qualitative research is, therefore, concerned with credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). The researcher and the object of the research, in this case the participants, interact to influence one another and the inquiry is value-bound. For Lincoln and Guba, "the aim of the inquiry is to develop an idiographic body of knowledge in the form of "working hypotheses" that describe the individual case" (p. 38). These research studies were influenced by my values as expressed in my choice of these particular cases and problems and how they were framed, bounded, and focused.

THREE STUDIES OF INFORMATION-SEEKING

Study 1

The first study (Branch, 2000) explored the use of both concurrent and retrospective verbal protocols, Think Alouds and Think Afters, in a study of early adolescents who were accessing information from CD-ROM encyclopedias. The objective of this research was to analyze the effectiveness of the two methods, concurrent and retrospective verbal protocols, in obtaining information about the processes that 12-15 year olds use in searching for information on Microsoft Encarta Encyclopedia 98.

The five participants from Edmonton, Alberta were read a script describing the searching activities and were given the opportunity to practice the Think Alouds. After completing the practice session, participants were introduced to Microsoft Encarta 98 and given an introduction

to the searching capabilities of the electronic encyclopedia. The participants then began the four search activities. The search activities were:

- Describe the male cardinal bird.
- In what year was Queen Elizabeth II born?
- What year was speed skating first in the Winter Olympics?
- Who was the first woman in space?

The first woman in space and speed skating questions were derived from the work of Gary Marchionini (1989). For more information on the methodology, see Branch, 2000.

Study 2

The second study (Branch, 2001) was a research project that looked at the information-seeking processes of junior high students as they accessed information using CD-ROM encyclopedias. The study took place in Inuvik, Northwest Territories, Canada in the autumn of 1999. Twelve participants, recommended by their teachers, participated in the study. Each participant completed 12 searches so that at the end of the study there were 144 Think Aloud protocols. The participants searched the encyclopedia for answers to four researcher-generated questions, four teacher-generated questions, and four self-generated questions. Search session 1 required all of the participants to search for the answers to four researcher-generated questions. The questions were:

- Who was the first woman in space?
- Describe the cardinal, a bird.
- Who was the first man in space?
- Describe the boxer, a dog.

Search session 2 had four teacher-generated questions based on the social studies curriculum for each grade, i.e., Alaska for Grade 7, Egypt for Grade 8, and Inland Canadian Waterways, Latitude and Longitude for Grade 9. The final search session required participants to search for the answers to four self-generated questions. These questions included topics on sports (hockey, soccer and rugby), Halloween (scary stories, trick or treat, black cats and witches), Northern topics (Fort McPherson, Inuvik, snowmobiles, and the Northwest Territories), popular culture (Pokemon, Blair Witch Project, and horror movies), Anne of Green Gables, and countries and major cities of the world.

Study 3

This study followed a small group of students in a grade 9 class as they worked together over two months to complete a research project on a topic of their own choice. During this time, the students shared their information-seeking strategies and their reflections on the research process. Participants were selected from a grade nine class of students and were followed as they completed a research project over the course of 13 80-minute classes (approximately 6 weeks). The participants selected a topic of their own choice, received instruction from the teacher-librarian, and worked on the research project. Throughout the research project, participants were asked to do Think Togethers by sharing their ideas, processes, resources, and plans. They were asked questions not only about their research process but also about how they were feeling about the research project. The group consisted of four students selected by the teacher-librarian. Participants also completed Think Afters; students responded to questions posed by the researcher and responded using a personal tape recorder.

Findings

Study 1

Similarities emerged in the detail of data generated by the two types of verbal protocols. The Think Alouds and the Think Afters provided information about the participant's cognitive and behavioral processes in finding the answers to the questions. Similar accounts about search strategy and decision-making can be gathered from Think Alouds and Think Afters. However, in the Think Alouds, much more detail about the affective nature of the information-seeking processes was also given. The Think Alouds more clearly provided the data about frustration during searches. The Think Alouds also provided data about success and excitement in searches.

The Think Afters provided a "path of least resistance" approach to describing in an electronic encyclopedia. Some of the participants did not discuss the dead ends and incorrect search terms in retrospectively describing the search process. With particularly difficult searches, the participants apparently found it difficult to remember their complete search processes.

The Think Alouds provided the most complete and detailed description of the information-seeking processes. Not only did Think Alouds provide the specific search terms and decision-making steps but they allowed a glimpse into the affective nature of the information-seeking process as well. The points where decisions were made were also clear in the Think Alouds. However, the reasons behind the decisions that were made were often explained in the Think Afters. The Think Alouds provided the richness of data associated with verbal protocol analysis. However, valuable data also came from Think Afters. For this type of research, where

an understanding of adolescent's information-seeking processes using CD-ROM encyclopedias is desired, both methods are valuable and necessary.

When asked which method they preferred, Think Alouds or Think Afters, participants were mixed in their opinions. Several felt that it was easier to do Think Alouds because it was difficult to remember all the steps at the end of the search. Alice preferred the Think Alouds because in "the Think After you really had to go back and remember all the steps that you did". Carl also preferred Think Alouds because it was easier "telling you (the researcher) what I did while I was doing it. It was easier to remember". However, two of the participants preferred the Think Afters. Brandon described the reason this way:

> *Cuz then I can focus on going through and finding something and then once I found it let you know afterwards. Cuz if I go through and I get to a point where I know it is not going to be there then I have to go back and start again. It is easier to tell you at the end.*

Eliza preferred Think Afters as well and explained the reason:

> *After I think because when I was doing it I got kind of absorbed in it and I was almost forgetting to tell you things.*

Despite the differences in preferences, the researcher saw no differences in the extent to which participants spoke freely and openly in the study.

Study 2

Study 2 found that Think Alouds and Think Afters provided rich data about the information-seeking processes of junior high students accessing information from CD-ROM encyclopedias. The addition of videotaping of the search screen allowed participants to follow their search and

respond to their Think Alouds provided more information about specific decision-making situations. However, while transcribing the 144 Think Aloud protocols, it was noticed that some participants had what could be called incomplete Think Alouds, that is, very brief Think Alouds or very procedural Think Alouds.

Some of the participants were not able to generate complete Think Alouds while performing the searching tasks. There has been much written about why this can happen. Stratman and Hamp-Lyons' (1994) list of factors is a good one. These include poor Think Aloud directions, limited capacity in short-term memory to do task and Think Aloud, hearing the sound of one's own voice, increase in learning due to Think Alouds, and influence of researcher's verbal and non-verbal cues (Stratman & Hamp-Lyons, 1994). It was the notion that some participant's may be unable to do a task and Think Aloud at the same time that was most interesting to this researcher. Study 2 explored the 48 Think Aloud protocols from Search Session 1 using the theory of Biemiller and Meichenbaum (Biemiller & Meichenbaum, 1992; Meichenbaum & Biemiller, 1998; 1992).

During Search Session 1, participants had many more Think Aloud statements because they had a more difficult time finding the answers to the questions and spent more time searching. With practice students became more efficient searchers and the mean number of Think Aloud statements decreased from 86.4 in Search Session 1 to 58.6 in Search Session 2 to 50.1 in Search Session 3.

The average number of statements for all sessions was 181. Chris, Paul and Fran generated a lot of Think Aloud data. Other participants such as Sue, Mary, Ken, and Eric generated much

fewer statements than the average. Biemiller and Meichenbaum (1992) noted in their research that highly self-directed learners generated more than twice as many statements as less self-directed learners.

Participants had two very different types of questions. The answers to the first question, "Who was the first woman in space?" and the third question, "Who was the first man in space?" were quite difficult to find. These questions were chosen because they were quite complex. Several of the participants did not have any planning statements while searching. Explanations for the few planning and monitoring statements can be explained by the work of Biemiller and Meichenbaum (1992). When learners in the acquisition role are faced with a new task it "creates "overload", or at least occupies the student's full attention" (p. 76). Mary and Carol were unable to do the task and also think about it at the same time. Lynn and Sue, on the other hand, were very familiar with the task and searching for an answer was an automatic process, one that needed little self-talk or thought.

Several of the participants had a high number of planning and monitoring statements. These participants, Chris, Bob and Eric, were likely in the consolidation or consultation role (see discussion). They felt comfortable doing the Think Alouds and generated more planning statements than the group as a whole. They were all familiar with computers, had one at home and spent time searching on the Internet. It may not be surprising to note that the boys tended to be more familiar with computers and to do some planning and/or monitoring in each search.

Two of the participants had no planning or monitoring statements in either search. Mary and Carol are both novice users and were very quiet during their searches. Although Mary continued to be very quiet during her searches, Carol actually began to use more planning and monitoring statements as she progressed through the searches. This may indicate a movement from the acquisition role to the consolidation role.

The second and fourth questions were much easier for most participants. Most of the participants typed in the word "cardinal" or "boxer" and immediately found the answer. It is interesting to note how much Think Aloud data Fran generated even in these very simple searches. She was very talkative throughout the study and had more evaluating statements than any other participant.

Even though finding the answer to these two questions was easy, Bob, Paul and Chris still did some of planning and/or monitoring in each search. Bob was a very interesting participant. He had just moved to Inuvik from California about a month before the study began. He spontaneously used language to solve the task and also to relate this search to his own background knowledge and experiences. Meichenbaum and Biemiller (1998) propose that students like Bob are in the *consultation* role and "they come to understand the task, and to be able to call upon the associated skills (in a literal, verbal sense) when new situations occur in which the skills are relevant" (p. 77).

Study 3

Participants in study 3 are currently working on their PowerPoint presentations of their research project. The participants have completed 3 Think Togethers and have done two Think Afters

on tape recorders. Preliminary data analysis indicates that students are much more open to sharing information and ideas in the Think Together situation. They feel comfortable with their fellow participants and use ideas and conversations as a springboard for their own ideas and concerns. The Think Afters have yet to be analyzed as students still have their tape recorders at home. Some spontaneous Think Alouds have also occurred during the study. These are simply conversations where I ask the student to talk about what they are currently doing, i.e., making notes from a book on witches and organizing information into a web; creating a PowerPoint slide about the perfect golf swing; doing an Internet search for "Friends" hairstyle trends.

DISCUSSION

Think Aloud, Think After and Think Together methods provide ways to gain a greater understanding of many aspects of the work of teachers, librarians and students. But, just like other methods, there are important considerations to keep in mind when using the methods to gather data. Study 1 found that Think Alouds provided important and interesting information about the information-seeking process. Think Alouds provided great insight into the cognitive and affective behaviours of a search. However, Study 2 found some things to be cautious about when using Think Alouds with students.

The work of Meichenbaum and Biemiller (Biemiller & Meichenbaum, 1992; Meichenbaum & Biemiller, 1998; 1992) provided one way of looking at the participants in this study and their ability to generate Think Alouds. Their work with self-directed learner seemed, at first, totally incongruous with this work on information-seeking processes and verbal protocol analysis. Yet, on closer study, the researchers are interested in the very same thing – the nature of thinking

out loud as one does a task. Meichenbaum and Biemiller's research, conducted over the past 15 years, involves studying the most and least self-directed students in elementary schools as identified by their teachers and peers. In a study involving 70 high and 70 low self-directed learners, the researchers recorded what the students did and what the students said. This involved recording the students' self-talk, their talk to peers, and their talk to teachers. As a result of this work, Biemiller and Meichenbaum (1992) developed a coding system to analyze the "children's discourse about tasks" (p. 76).

This coding system enabled the researchers to compare high and low self-directed learners and to "infer the nature of their cognitive and metacognitive self-regulatory activities" (p. 76). This task-related speech, or Think Alouds, provided a way of accessing the cognitive processes of a learner. Biemiller and Meichenbaum (1992) determined that "children whose level of cognitive development exceeds the complexity of tasks they are being taught have "surplus mental capacity" permitting them to "think" (self-dialogue) about what they are doing" (p. 76). On the other hand, children who are less cognitively advanced approached a task with fewer skills. As a result, they encountered an overload or, at the very least, needed their full attention to complete the task. These low self-directed learners had "little or no capacity left for verbal thought processes while conducting the task" (p. 76).

Specifically, Biemiller and Meichenbaum (1992) found that highly self-directed learners generated more than twice as many statements as less self-directed learners. The statements were coded as defining, planning, conditional planning, monitoring, or evaluating. These coding categories were used in Study 2 to analyze the Think Alouds of Search Session 1. The following is an explanation of the coding categories:

Defining: Statement or question labels and notes features of tasks, procedures, and objects ("It's John's game." "That's red paint.").

Planning: Statement or question about what will or should happen next ("Can I do X?" "Mix some soap in the paint." " Where are the sparkles?" "I need...").

Conditional Planning: Statement or question relates a plan to a condition or specifies the basis for choosing between alternative plans ("If we make noise, then we won't have recess.").

Monitoring (ongoing task): Statement or question notes progress, or lack thereof, on the task (You're going too fast." "Slow down.").

Evaluating (completed or aborted task): Statement or question concerns conclusions on ending the task – regarding the product, the child's ability, or the experience of doing the task ("This is my best one so far!" "I can't do it!" "The math squares are fun!") (Biemiller & Meichenbaum, 1992, p. 78).

Biemiller and Meichenbaum (1992) found that both groups had similar rates of defining and evaluating statements but highly self-directed learners had more planning and monitoring statements. The authors suggest, "spontaneous planning and monitoring statements are crucial indicators of the degree to which a child is functioning with expertise in a specific situation" (Biemiller & Meichenbaum, 1992, p. 76). Seventeen task-directive statements per hour were received by less self-directed learners from their teachers. Highly self-directed students received only two statements per hour from their teachers. Teachers were "thinking

for" the less self-directed learners by giving them planning and monitoring statements (Biemiller & Meichenbaum, 1992).

Meichenbaum and Biemiller (1998) identified "three phases of self-direction: *acquisition, consolidation*, and *consultation*" (p. 75). In the *acquisition* role, the learner "observes, imitates and acts under the guidance of the instructor" (p. 75). In this role, learners are less likely to be able to do the task and to also be able to talk about it at the same time. In the *consolidation* role, the task begins to become more automatic. This automaticity "reduces the attentional and memory load associated with the skill, freeing up cognitive capacity to attend to other features of the task or to talk or think about the task while doing it" (p. 76). In the *consolidation* role, the learner becomes more able to plan and ask questions, and, as a result, becomes more efficient. Learners who have reached the *consultation* role "can perform requisite skills and plan specified applications, provide assistance to others as needed, collaborate effectively with others in planning large tasks, and consult with themselves when they encounter difficulties or problems in accomplishing tasks" (p. 77)

Biemiller and Meichenbaum's work is very interesting, especially when considering the problems that some of the participants in Study 2 encountered when doing Think Alouds while searching CD-ROM encyclopedias. Stratman and Hamp-Lyons' (1992) list of reactivity factors includes "limited short-term memory capacity for talking and attending at the same time" (p. 95). To determine if the *acquisition, consolidation and consultation* roles could be applied to junior high information-seeking processes, the coding scheme developed by Biemiller and Meichenbaum (1992) was used. See Branch (2001) for the complete study.

All learners are unique and bring to a task their own skills, experience and vocabulary. The researcher has to keep this in mind when using Think Alouds as a way of gathering data. The work of Biemiller and Meichenbaum helps to explain why some searchers experienced difficulty generating complete Think Alouds. Those students who are not in the *consolidation* or *consultation* role in the given task may have difficulty generated Think Alouds. To get the best and most complete data then, researchers must ensure that learners are given time to become familiar enough with the task so that they can speak about what they are doing. However, learners must not be so familiar with the task that it becomes so automatic that they are unable to think out loud about the task.

There is a delicate balance that must be reached by the researcher and, obviously, one that is difficult to do with a group of junior high students. Biemiller and Meichenbaum (1992) suggest that others in the classroom including teachers, teacher's assistants and more able students sometimes do the thinking and planning for less self-directed children. It may be unreasonable to expect those students to generate complete Think Alouds without preparation and time to move away from the acquisition role. These learners have come to depend on others to do their defining, planning and monitoring activities. As a result, this becomes a "self-maintaining cycle" (Biemiller & Meichenbaum, 1992, p. 77).

Biemiller and Meichenbaum (1992) suggest that those interested in working with children "should strive to systematically monitor their students' social and self-discourse in order to infer the children's level of knowledge, strategies, and motivation" (p. 77). These are important clues to each student's level of competence and expertise. A researcher should do the same

thing. Time should be spent before the study observing and listening to the self-talk of each student as they search so as to infer what role they were in. Those students who were in the *consolidation* or *consultation* role would then be ready to generate Think Alouds. However, those students in the *acquisition* role should be allowed more time to become familiar with the task before being asked to do Think Alouds.

There are concerns too about getting the best possible data from Think Afters. Three participants from Study 1 told the researcher that they experienced some difficulty in doing Think Afters because of forgetting. The idea of forgetting is consistent with the work of Ericsson & Simon (1984) who found participants may forget information in retrospective verbal protocols. In doing the Think Afters, participants tended to describe the shortest route to finding the correct answer. This usually included the first search term and the final search term used but eliminated some of the dead ends that occurred in the middle of the search. To allow students to better describe their information-seeking processes, however, it seemed that some other method of recording data was needed. Study 2 included videotaping the computer screen so that after each search activity the videotape could be played back to help participants to remember their information-seeking processes better. Videotaping allowed participants to hear their Think Alouds when replaying the search. The researcher and the participant were able to interact with the video and discuss the cognitive, affective and behavioral processes involved. There are other ways available to record the information-search process on a computer including keystroke capture and screen capture software.

Think Togethers provide another way to gather information about information-seeking processes. The participants in Study 3 seem to like to share experiences, ideas and concerns as

they complete their research project. The participants need to feel comfortable with each other and with the researcher. Some preparation time is definitely needed to develop the sense of trust necessary for students to speak openly and honestly about their research process. Data gathered from time spent with each participant individually and from the questions posed as Think Afters are providing additional information about the research process.

CONCLUSION

Gathering information about the information-seeking processes of people is a tricky business. Using Think Alouds, Think Afters, and Think Togethers, along with observation and videotaping of teaching and searching, can help gather a rich collection of data. Because forgetting and fabrication may influence Think Afters, researchers should attempt to use a combination of verbal protocol analysis and other methods such as observation, screen captures, transaction log analysis or videotaping the search to gather the most complete data. In order to gain a deep understanding of the information-seeking processes rich data needs to be generated.

Study 1 found that it depends on the nature of the search question as to whether Think Alouds or Think Afters provide the greater amount of data. The data generated from Think Alouds and Think Afters is quite different. For researchers interested in looking at a phenomenon as it happens, Think Alouds provide rich data. However, some participants may find it difficult to generate Think Alouds while carrying out a new task or a task that involves a lot of cognitive processing.

Biemiller and Meichenbaum (1992) suggest that "students who are more expert have the ability to nurture their own self-regulatory skills" (p. 77). Because teachers often provide planning and

monitoring information, they may not "provide the less competent child with the same opportunities or tasks to practice to develop his or her self-regulatory competence" (p. 77). As a teacher and a researcher, it is disheartening to hear my own talk during the search sessions. At the time, I was just "trying to help" but now realize that I was influencing the kind of Think Alouds that some of the student's generated. The work of Biemiller and Meichenbaum will be very important when designing future research.

There is no way to know whether the ability to generate Think Alouds in Study 2 can be attributed only to the role the learner was in, i.e., *acquisition*, *consolidation*, or *consultation*. As Stratman and Hamp-Lyons (1994) suggest there are several other factors that may have influenced the Think Alouds. There could have been confusion as to what the researcher wanted when asking for the participant to Think Aloud. There was a cultural difference between the researcher and some of the participants that may have influenced the Think Alouds. There may have been gender issues or learning style issues that influenced the Think Alouds. Any or all of these may have contributed to incomplete Think Alouds.

However, Biemiller and Meichenbaum present a very interesting theory that appears to hold true in this situation. Their suggestions for helping all learners become more self-directed are good ones. Teachers and researchers will have difficulties because students "vary in the areas in which they have expertise" (Biemiller & Meichenbaum, 1992, p. 77). Researchers need to be aware that differences exist and help learners move from the *acquisition* role before trying to gather Think Aloud data. Not only will this be of benefit to the learner; it may also help to generate the best Think Alouds possible.

Using Think Alouds, Think Afters, and Think Togethers along with observations and videotaping means a lot of data to work with as a researcher. Bringing together the data will require the use of a software program such as Ethnograph or NUD*IST. Assistance with transcription will also be required.

Think Alouds, Think Afters and Think Togethers pay attention to information-seeking processes and provide rich data. As with any method, there are some challenges to overcome but the method is easy to use. More and more researchers are using the method for research into Internet use. But, there is still a need to know much more about how people search for, use, and evaluate information found on the Internet. This researcher plans to continue to use verbal protocol analysis to gather that kind of data.

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Frances Jacobson Harris
Treasure Mountain 10
May 2002

Teaching Students the Ethical Use of Information and Communication Technologies: A New Role for School Librarians

Abstract

With the publication of the 1998 *Information Literacy Standards for Student Learning*, the profession officially blessed the inclusion of social responsibility as a core component of information literacy. Standard 8 describes the information literate student as one who "practices ethical behavior in regard to information and information technology." But in a world where information technologies and communication technologies are no longer distinct, this mission is not as straightforward as it seems. We cannot continue to confine our professional role to the transmission of narrowly-defined intellectual property morés. This paper examines prevailing perspectives on moral development and ethics education in terms of the evolving role of the school library media specialist. An in-progress analysis of approximately five years worth of student responses to information and communication technology-based ethical scenarios will be presented. Student responses are being coded according to the knowledge domains of moral knowledge, social-conventional knowledge, and a domain that constitutes a mixture of the two. Discussion will focus on evaluation of the data and possible implications for the role of school library media specialists in ethics education.

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Children's choice of information sources and their perception on information : An explorative case study

Jinsoo Chung[1], Diane Barlow[2], and Anne S. MacLeod[3]
College of Information Studies
University of Maryland

[1] jchung@glue.umd.edu
[2] dbarlow@deans.umd.edu
[3] am2@umail.umd.edu

Abstract

When children need to solve information problems, they interact with information sources in libraries as well as adults who can help. Using Taylor's Information Use Environment as a conceptual framework, this study attempts to draw a picture of how elementary school children use information to do their school assignments in a public library setting in a city that no longer has school library media programs in the schools. The study identified six sets of characteristics that affect children's information behavior in the public library setting. Personal characteristics include children's age levels, parents' information skills, family culture, and teachers' preferences. Perceptual characteristics include children's ownership of their school assignments and their problems of interpreting these assignments. Problem characteristics include children's tendency to lose or misinterpret information on their assignments and teachers' tendency to give assignments without researching the available sources. Environmental characteristics include children's work styles. Information characteristics include children's preference to be less cognitively challenged, their anticipation of information with certain physical attributes, and their perceptions of information and information sources. Lastly, information source characteristics include the suitability of electronic sources for children's use, the reading levels of encyclopedias, and the use of the Internet for information.

1. Problem

Children come to the library for a variety of different purposes, some to read books, some to do school assignments, and some to use the computers. When children come to library to use different kinds of information sources they try to draw meanings by interacting with information to solve their problems. But, how do they perceive and use information in the library?

Many of the information tasks children bring to libraries are assigned by schools (Gross, 1997). Many children and parents visit the library to do their school assignments. If there is a school library media program with a library media specialist who regularly communicates with teachers and children, children might be able to get much help from

the library media specialist. However, what if there is no library media program and a library media specialist in a school, how do children solve their information problems?

This study was conducted with the Enoch Pratt Free Libraries in Baltimore, Maryland, where there are no school libraries. The study attempts to draw a picture of children's information behavior in solving their school based information problems using the resources of the public library. It is assumed that children solve their school based problems by using information and goes beyond the simple relationships of the surface features of the information sources and the responses of children by considering the whole context where children interact with sources and with librarians for their problem solving.

2. Literature Review

Studies on how children access information have identified some critical issues that we should address in order for them to use information more effectively. Summarizing all the studies on information seeking is certainly difficult, due to their variety of foci: differences in users, in information resources used, and in other environmental factors involved in the studies. The studies can be categorized into the groups according to the findings related to children's information use. The most dominant group of studies focus on children's use of a specific information system – such as OPACs (Solomon, 1993; Borgman et al., 1995), CD-ROMs (Large et al, 1994; Large et al., 1998; Marchionini, 1989; Liebscher and Marchionini, 1988; Pezylo and Oliver, 1992; Small and Ferriera, 1994), online bibliographic databases including Dialog (Neuman, 1993), and the Internet (Bilal, 2000; 2001; Fidel et al, 1999; Kafai and Bates, 1997; Large and Beheshti, 2000; Schacter, Chung, and Dorr, 1998; Wallace and Kupperman, 1998). These studies identified both the major difficulties that children have in using these information systems, and the kinds of search strategies that children use to access information. The implications of these studies include how systems can be improved to address the problems, and what needs to be taught. Another group of the studies focus on the information seeking and use by considering the processes that children go through (Kuhlthau, 1991; McGregor, 1994; Pitts, 1994). These studies examined how high school students approach their learning tasks and how they move along. The implication for the library media specialist is to help high school students learn by understanding the information behavior of high school students.

Elementary school children who use OPACs are found to have difficulties in generating search terms according to their needs. Their searches often fail when they use abstract terms, whereas they succeed when children express their needs with simple and concrete terms (Solomon, 1993). Children were successful if search terms were provided in a question to input or if search topics were easy to locate in the subject hierarchy by browsing (Borgman et al, 1995).

If the system takes into account the specific needs of children, for example, spelling, typing skills, vocabulary, Boolean logic, in using a system such as the Science Library Catalog, or a simple CD ROM encyclopedia targeting novice users, children are generally

successful in finding relevant matches. However, a critical problem in children's use of Online Catalog is the mismatch between children's subject knowledge structure and vocabulary and knowledge represented in that of OPAC and LCSH (Solomon, 1993). The Science Library Catalog used the modified version of Dewey decimal system for children's use in a four-level hierarchy. However, children still had difficulties finding certain information since the information was put under the different place in the hierarchy from the locations that children initially thought it would be (Borgman et al. 1993). For example, the term "fire fighting" was located under "engineering" category whereas children thought the term was placed under "building for city services" category. In using three kinds of CD ROM encyclopedias (Encarta, Castle Explore, and Exploring Castle), sixth grade children were found to lack search strategy formulation and sophistication in language use. As novice users in using full text encyclopedia, third, fourth, and six grade children often expressed search queries in phrases or sentences, which led to failures, because they did not have the appropriate mental model of the search system. Their searches tended to be "interactive" with the system as they search rather than "planned" before their searches (Marchionini, 1989). In her study of high school students' use of online bibliographic databases, Neuman found that there are conceptual as well as linguistic gaps between students' knowledge structures and those of systems' and in result students had difficulties to access the information (1993).

This fundamental problem, which has been identified in many different studies in late 80's and 90's, is still a crucial matter. There has been an effort to provide systems with interface features that address the needs of elementary school children (Borgman, et al., 1995). There are suggestions to create information systems with instructional design principles that could guide students as they come across the problems during search (Neuman, 1993: 1995). Another possibility is to add such functions as thesaurus and usage sensitive search aid since children don't have the appropriate mental model to search an information system (Marchionini, 1989).

Differences in children's use of print sources and multimedia sources were identified by Small and Ferriera (1994) and Large et al.(1994). Middle school children - grade level six, seven, and eight - using multimedia source were are found to be more motivated and to use more "finding" and "engaging" activities, while children using books used more "extracting" activities. Children's learning patterns were found to be different in their "pattern noting" behavior. Children using multimedia sources demonstrated more single words than children using books, and children using books used more phrases and sentences, after using these information sources. Small and Ferriera interpreted with this finding that "multimedia treatment" children may have been more fragmented in engaging information since those children used more browsing, reading, and viewing, when they use the multimedia sources. Large et al. (1994) found that type of tasks is the factor affecting six grade children's success in retrieving information. If the search task requires children to use more than one concept, children are not successful in finding relevant information regardless of the format of the encyclopedia. Liebscher and Marchionini (1988) noted that high school students used browsing strategy more than analytic strategy and did not distinguish relevant information from non relevant information because they lacked the internal organization of information at the query

representation stage. However, they found that both analytic and browsing strategies were successful in finding relevant information.

Twelve year-old children's use of multimedia information needed appropriate instructions (Perzylo and Oliver, 1992). Without instruction children were only able to extract textual information from the multimedia source, CD ROM encyclopedia. But after giving instruction, children were able to extract sound, graphical images, video from the source.

The most currently available information source, the Internet, is often used by children for many different purposes. The studies on children's information seeking on the Internet so far have identified children's difficulties and typical behavior in using the Internet. The most typical behavior of middle and high school students is to use only basic functions of the Internet browser (Bilal, 2000; Fidel et al., 1999; Large and Beheshiti, 2000; Wallace and Kupperman, 1997). The back button, which takes the user back to the previous page, was the most used function. Also children repetitively use the same keywords and repetitively visit the previously visited sites (Bilal, 2000; Wallace and Kupperman, 1997). Elementary and middle school children do not examine and evaluate the hits returned (Kafai and Bates, 1997) and take the information at *face value* (Wallace and Kupperman, 1997). Browsing is significantly more used than keyword search by middle school children (Large et al., 1999; Schacter et al., 1998).

Fifth grade children's relevance criteria are different from adults because children have limited knowledge of subjects and of the information systems in general (Hirsh, 1999). Children tried to seek "topical relevance" in examining the information. However, they look for exact matches between their terms and the terms used in the sources. Wallace and Kupperman (1997) also found that six grade children evaluated the Internet sources as valuable if they found terms that they expected to find. "Novelty" was another criterion for children (Hirsh, 1999). As children look for information during the search process, they tried to find new information that they have not already collected. When they seek graphical information, "interesting" was the criterion for selecting it. Most children did not use authority as a criterion for their relevance judgment (Hirsh, 1999; Wallace and Kupperman, 1997; Schacter et al. 1998). These findings indicate that children tend to believe information on electronic sources is reliable.

When high school students use the electronic sources, they are more concerned with authority of the sources, particularly with the Internet sources (Chung, forthcoming). This is a result of teacher's and library media specialist's instruction to emphasize how to distinguish reliable and unreliable sources on the Internet. Also, it might be due to the fact that adults as users are acquiring appropriate knowledge to teach children on how to evaluate reliable and not reliable sources.

Another group of studies identified and examined the stages of information seeking processes of high school students (Kuhlthau, 1993; Pitts, 1995). Kuhlthau delineated six stages in the information search process - task initiation, topic selection, exploration, formulation, collection, and presentation - and addressed each from cognitive, affective,

and physical perspectives. She found that students' thoughts, feelings, and physical actions are different from stage to stage, and reported that students' information seeking behaviors are largely dependent on the stage at which they are working.

While Kuhlthau focused on the information search process from the cognitive, affective, and physical perspectives, Pitts (1994) examine the cognitive aspects of why high school students make different decisions as the process moves along. Using the concepts of "personal understanding" and "mental model" theory as her conceptual framework, Pitts found that students make decisions based on their prior learning experiences, which are reflected on a variety of intertwined "learning strands." The study indicates that students switched from one strand to another as they experienced difficulties. Another important finding is that students used surprisingly little information from libraries and other information systems because they did not know how to access information that could meet their information needs.

McGregor (1994) focused on how high school students use thinking skills by using information. She found that students' thinking was observed to progress quite naturally through the levels of Bloom's taxonomy - knowledge, comprehension, application, analysis, synthesis, and evaluation. She also reported that types of students' question affect their level of thinking and skills used. However she found that most students were more "product oriented" than "process oriented" in their thinking and learning. That is, the students were more interested in finishing their learning tasks rather than in learning through the process of doing their tasks.

3. Conceptual Framework

Taylor's Information Use Environments (IUEs) is chosen as a framework to study information behavior of a user group, because it allows us to see the whole picture of a user group's information behavior. Information Use Environment is defined as the "contexts within which users make choices about what information is useful for them as particular times (Taylor, 1991)." In IUEs, Taylor identified four key elements affecting information use of different user groups: people, problems, settings, and resolution of problems.

The "people" element in IUEs is to understand a set of users. It identifies the nature of their work and the demographic and non demographic characteristics of the users. The "problems" element describes not only the kinds of typical problems of users but kinds of information sought by users and uses made of that information. The "setting" element is to study how the setting works in terms of affecting user's information behavior. "Resolution of problem" element describes how users resolve their problems in terms of what information and how much information to be used.

Children as a set of users are different from adults, because the context where children use information is unique. Children have typical information problems in using information, mostly school related and/or animals related, as research indicates (Gross,

1997; Solomon 1993). Children have their own information problems and these problems can be predicted if we know the kinds of information problems and the patterns of information use. The typical settings for children can be anticipated as well, since children's world is relatively limited. How children resolve their problems can be answered in various contexts and from many different perspectives.

These four elements can be used as identifiers in examining the issues in children's information behavior. Six sets of themes have been identified under each of four elements for analysis as follows.

Taylor's Information Use Environment (1991)	Sought in the context of children solving their school based problems
People	- Personal characteristics - Perceptual characteristics
Problem	- Problem characteristics
Setting	- Environmental characteristics
Resolution of Problem	- Information characteristics - Information sources characteristics

4. Research Questions

How do children's choice and use of different types of information sources (CD ROMs, Internet, Print Sources) affect their use of information for school assignments?

Foreshadowing questions

1. What factors affect children's use of information sources?

2. What is children's perception of the information and how is information retrieved for use?

3. How do children evaluate their success?

5. Research Setting

Enoch Pratt Free Libraries are the public library systems in the city of Baltimore, Maryland. The public libraries have currently 24 branches providing children and youth services. One particularly noticeable feature of the Enoch Pratt Free Libraries related to

the school systems is that the libraries also serve for children with school related works because there are no school libraries in schools in Baltimore.

Reisterstown branch was chosen by the Enoch Pratt Free Libraries for a site to conduct a focus group with children as well as the individual interviews with children. It was located in the suburb of Baltimore City where there are dominantly Jewish and African American communities.

6. Methodology

This research is essentially qualitative. The specific methods used for data collection were the *multimethod uses* of focus groups and individual interviews (Morgan, 1997). The researchers conducted two focus groups with children's librarians, one focus group with children, the grade level ranging from 2 to 5, and seven individual interviews with children (from 2nd grader to 6th graders).

Each of two focus groups was conducted by researchers with a group of children's librarians working in different branches of the Enoch Pratt Free libraries. One was conducted in a face to face format in the central Enoch Pratt Free Library in November, 1999, and the other was conducted on-line using the chat function provided by WebCT, in April, 2000. For the first focus group session, four children's librarians were gathered to discuss the prepared questions with three researchers. For the second focus group session, seven children's librarians met on-line to discuss the same questions.

Another focus group was conducted with a group of four children, who regularly visited the library at the branch library in April, 2001. Parental permissions were obtained by the children's librarian. The children's librarian at the branch asked individual parents whose children were regular users if they were willing to give their permissions to researchers. All the children in this focus group were African American children.

For individual interviews, seven children were selected by the children's librarian and the parental permissions for the interviews were obtained and collected by the children's librarian. All the children participated in these interviews were African American children.

All of the participants of the study were ensured of their privacy and were informed of their rights to withdraw during their participation of the study.

QSR Nudist classic 4 was used for analysis of the transcribed data from focus groups and interviews.

8. Findings

Personal Characteristics

The younger children are, the more they prefer books to other sources, such as an encyclopedia in both print and electronic formats and other online sources. Children

below age 9, who participated in this study, particularly have difficulties of accessing and evaluating information from the computer. Many of them do not have experience in using computers and online sources. Even if they have experience, it is hard for them to understand and follow the necessary steps of retrieving relevant information. Many young children below fifth grade indicate books as their favorite sources for information because books for their age level are easy to understand. On the other hand, older elementary school children were more enthusiastic about using electronic sources, the Internet and the CD ROM products for children. They use the electronic sources because they know how to enter keywords or topics and because the results are brought up quickly. Teachers often assign research projects that require older elementary school children to look at different kinds of information sources including the Internet in the library. In addition, older elementary school children play online games and use the chat function online, which add to their enthusiasm for electronic sources.

Children's librarians pointed out that not only children's age level affects children's choice of information sources, but so do the teachers' preferences. It is the observation of children's librarians from the school assignments children bring to the library that the young teachers tended to know and to assign children to use electronic sources, and the older teachers tended to assign the traditional print sources which they have been using for a long time, such as Readers' Guide for Periodical Literature, known as "Green set." The children's librarians raised the issue that the teacher preparation should cover what is available and what is out there.

Family background was found to be a factor affecting children's use of information. Parents' skills in finding information in particular affect children's use of information in the library. If parents try to help their children's assignments but are not very knowledgeable, the parents get frustrated and their frustration gets delivered to children. As children become more independent in using information sources in the library, their parents' educational level does not affect them as much as when they are younger and have to rely on their parents.

The culture of children's family was identified to be a factor also, as illustrated by the examples of a branch where two different children librarians have experiences in working. Two distinct cultures in the community the branch library serves are the Jewish community and the African American community, where parents in each community respond differently toward children's responsibility for school assignment. According to the librarians, Jewish parents push their children to work hard and usually let them work by themselves to finish their project, whereas African American parents themselves try to help their children finish assignments. Many of the African American parents seek help from the children's librarians if they do not understand their children's assignments, whereas Jewish parents let their children take the responsibility of their work and let children ask for help to the librarian if they need to.

As the current librarian describes the difference of the two cultures, it became obvious that how parents respond to their children's assignments makes a difference in children's information behavior in the library.

"I have about an even split in the community of African Americans and Jewish...I have particular situations where the parents are ...completely frazzled by the assignment. They're trying to help .... trying to participate in their child's education and take them to the library, but the assignment is really...so befuddling to the parents that they become frazzled and that in turn frazzles the child and then you just sort of have this really tense situation....I mean I have one mother that does this every time. She ..... goes completely to pieces over assignments that there's nothing to come unglued about. .... But she unravels her child every time and we just have this...complete break down... "

".....Of that Jewish population, the majority of them are Orthodox Jews, completely separate, private Orthodox schools where there is a huge push on education.....In these cases, the parents are not doing assignments. The parents are not coming in saying, giving me this book... I can take it home for my kid to do. The kids ...[have the] responsibility. They [use] their sources and you know whether frustrated or not, or whether they need a lot of help from me, but the parents are not doing those assignments in that particular group...."

The information skills of individual children are a factor as well. Children have varying skills in accessing, evaluating, and using information. A fourth grade child knew that if she wants some specific information she has to find the category that the information might fall into to look up the information as well as to look in the index of the book. Another fourth grade child was able to say that "good information is one that is relevant to your topic and bad information is one that is not relevant." A third grade child who does not seem to be very academically capable did not know how to use the Internet or encyclopedia to find information for his assignment and often went to adults or older siblings for help.

Perceptual characteristics

Children's librarians observe that children often do not seem to have ownership of their school assignments. Both parents and children focus more on finishing the assignments rather than learning by doing the assignments. In addition to the librarian's comment mentioned in the above paragraph, other librarians agreed that they see more parents than children do their children's assignments in the library. Many parents know it is harder to teach children how to do it than to do it themselves. One fourth grader child during a focus group mentioned "I save the assignment until I get home and ask my mom if she can help me," Another fifth grader said as "...my mom tells me to do this math assignment, I get confused ...because I don't like studying." Children do not understand completely that learning is their responsibility.

Children's librarians pointed out that many children who come to library are not clear about and sometimes misunderstand the assignments. Younger children in lower grades get the print copy of the assignment descriptions from teachers but older children often get the description off from the chalkboard and often some of the information was copied wrong and missed during copying.

Attractive and colorful pictures are important for children's satisfaction. Children's librarians observed that it is important for children to have a hard copy of the information. They like having books in their hands, particularly younger children in

lower grade level, who are satisfied with having books being an "attractive package" with pictures. Children look for books with colorful and attractive pictures, even if the book contains less information than other books in the shelf. This explains one phenomenon in the library: even children up to fifth graders read and play with picture books for their pleasure because the books are easy to absorb and have attractive graphics.

Children's satisfaction in doing an assignment/ or solving an information problem comes from finding out the answers. They often try to find an answer without going through the necessary process of looking for that answer. One child mentioned that she had a question about how fast an eel can go and tried to get her answer from the librarian online.

Problem Characteristics

Problems that children bring to the library were found to be mostly about their assignments from school. Many children we found at the library came to do their assignments until their parents pick them up. Children often do not understand what they have to do for their assignments, and they rely on their parents and/ or children's librarians. It can be easier for the librarian to help younger children if they have the printed description of their assignments. However, children often lose the printed description or do not bring it to the library when they come to do their assignments. Older elementary school children take the description off from the board, and often lots of it are lost during copying and translating. Often times, parents who come to check out the needed books for their children's assignment ask librarians to help with them without knowing what exactly the assignments are.

"....that becomes very frustrating on our end and then the parent gets frustrated with us because we haven't produced a book, but we don't know what exactly we're looking for....[For] example, a parent came in for a fourth grader assignment where the child had to list all the cities in Asia. ...and I thought this has to be a mistake. ....I said, countries or is it list...ten cities, 20 cities? No, as far as I know, it's just list every city in Asia. And I thought well, you better just go home because...you don't have enough paper...."

Another problem children's librarians noted was that teachers sometimes give assignments apparently without knowing about the appropriate resources or without knowing children's ability. Some of the librarians have the experience of doing an assignment for a child. One librarian's experience is described as follows.

"I had another teacher who assigned her gifted and talented to make a book report, but her gifted and talented class to read Tony Morrison. And those children were in fourth grade. And I happened to know this mother and k now that she didn't want this child to read Tony Morrison, no way, now how. And I said well do you know what is the point of the assignment -- it was right after she won the Nobel. And she said well she is an excellent writer, I said yes she certainly is -- for adults. My child is a very good reader and she can understand anything. I said trust me you don't want your child to understand Tony Morrison. You may be unhappy if she understood Tony Morrison. "

Another librarian's said:

"Teachers aren't really researching their assignments very well. They're assigning books that Pratt only owns two copies of in the whole system and one is missing and the other is checked out. Or they're -- in February for black history month, [students are told to] bring in an individual biography on an obscure figure in history who is going to [have]--- maybe have a paragraph in specialized encyclopedias....but the teachers are saying, you need to bring in a biography --- with a picture, yes, definitely....."

Children's librarians also found that it is difficult sometimes to help with children's assignments, because teachers require children to use or not use a specific source, for example, an encyclopedia, in a situation where the librarians think children might miss very good information because the sources were limited.

Environmental Characteristics

All branches of the Enoch Pratt Free Libraries have a section for children, called *Kids' Corner*. It is a section of the library where there are books as well as little tables and chairs for children. *Kids' corner* is designed to be "cyber free" for children and have a heavy concentration on print sources for children's use. It has one computer terminal with audio equipment where children can use educational games and CD-ROM encyclopedia. The programs installed in the computer are preloaded and managed by the central library.

Children's librarians observed that children who use the computer often use the educational games preloaded on the computer but seldom use the computer for their research. When the children want to use the Internet, they go to the adults' section of the library to use it.

Children's work style is observed to be different from adults' in using the Internet. When they do their group work, children are found to split their work. One fourth grader said "we both do our assignment or whatever and I do one piece and she does another piece." Children's librarians also observe that children's concept of working together is taking a role in using the sources, the Internet in particular. One librarian describes this as follows.

"The computers are never used in isolation.....Even for research... but I think the part of it is coaching each other. One is doing the reading, while the other is clicking or...we have reader and non-reader. You may have a non-reader on the computer, [who] needs the reader to get them through the instructions. And I think some of it starts out with team work. But it's something that you observe as you're going by, you see someone reading and the other person responding."

Children's librarians pointed out that children move around and cluster for their recreational use of the Internet.

"One the adult side we have three computers and there will be times when there will be pre-adolescents on those three computers. And it's a dance they do. They're clustering computer to computer. You start out with three children, one on each computer, then they're over on this computer, and one breaks away and goes back, then they're there. And then they're around the other side. They're constantly moving...Because somebody's pulled up something much more interesting than what the other person has...I think we had 20 computer banks we would have a moving cluster"

Information Characteristics

Children do not seem to understand how to do research, and they do not want to be cognitively challenged in doing their assignments. When children ask the librarian for help in finding information for them, they want easiest and shortest way to find information presented using the biggest fonts and pictures. Often children ask the librarian to find detailed information for them. Children like to be handed the information in a simple form, for example in a page with an answer. For school assignments, they want their answers in easiest and quickest way without going through the whole chapter, or whole book.

"...the shortest route...when you pull that hefty tome off the shelf...you can see the panic in their eyes. They do not realize it's alphabetical and you're going to go to [one] page for them. All they see is that massive book"

Children's anticipation and perception of information are found to be come from the teachers' assignment requirements regardless of their age level. Since often times teachers specify the physical assignment requirement of the number of pages or kinds of sources, children tend to measure their anticipation of information by the number of pages and the sources.

Children often try to please their teachers by making their assignment physically attractive, such as printing out colorful photographs from the Internet and by typing their assignment on computer. One children's librarian quoted a child's saying as she printed out a photograph, "it's pretty and my teacher likes it."

Adults' guidance is critical for children doing assignments. A fourth grade child mentioned that doing a school assignment is easier than solving personal information problems because she can ask the librarian and her teacher about it. Children indicate that they ask their parents, librarian, and teacher to help them do their assignment. As described in the section of *Problem Characteristics*, it was found that children and their parents often bring mis-translated assignment to the library and expect to get some solutions.

Physical features of the sources are very important for children. All of the children's librarians agreed that children do not want to use anything that look old, thick, heavy, and that does not contain pictures. Children do not want to read many pages to find information. Pictures attract children to an information source.

"....when you were talking about shiny books...this happens a lot....that really that's probably not the best books for them because it's going to have less information than they will probably really use in their report. [But] They're very happy with the shiny book and willing to leave more needy books – that may not have pretty pictures –on the shelves."

When they access books and/or other electronic sources, children expect to see colorful pictures. Reading a short caption sentence with a picture in a book was found out to be a

very common behavior among younger children. As one children's librarian describes it, children like pictures with short sentences which they can easily understand.

".....And I've seen more and more and I've started many a kindergartner with reptiles. Oh and I read what page that has fascinated them. I will just read under the picture to them and that's their whole world at that moment is right there. And they keep pulling the same book out and over time, over the time of a year, a year and a half, they would be reading sidebars. And with books they have their favorites. They will constantly go back to the same book. The same subject area and [they] almost memorize what is in that area."

While younger children select books according to its physical attributes- "attractive package," older elementary school children are found to have better perception of information than younger elementary school children. A fourth grade child pointed out the importance of organizing the information found. She mentioned that to get a good grade, "if you can have it organized so it won't be a piece." Another fourth grade child indicates that he knows there is relevant and non-relevant information and the information that he doesn't need for his school project is non-relevant information. Children above fourth grade level also understand having good information depends on the sources from which they get the information. However, they perceive a good source to be one from which they can get a lot of information from a source. Thus, they believe an encyclopedia and the Internet are good sources because both give much more information which they can select from.

Children's librarians also pointed out that children in general do not distinguish the most relevant and least relevant information. Children are observed to take the first book listed or given to them without reading or examining which is most relevant. It was pointed out that the librarian shows the page with an answer on it, children try to look their answers in the first paragraph, if they do not find it, they think the answer is not there.

Information Source Characteristics

Certainly, electronic sources, particularly the Internet are attractive to children, because the electronic sources respond faster than books and they have attractive multimedia information such as pictures. However, children's librarians pointed out that young children do not have cognitive ability to understand electronic information from the Internet.

"..In lower grades ... I think it's still true that the electronic resources require a certain facility of language that younger children don't have. ...even if you pull it up on the screen for them, they can't read it. And there's something more... there's something slower, I guess, for lack of a better word, about having it in front of you as a book, and you can sound out the words, or ask someone, instead of just looking at computer screen or printing it off and then trying to do it later. "

The Internet sources generally are not easy for children to read. Children's librarians indicated that younger children below fifth graders do not respond well to online sources, particularly to the Internet sources, because the physical features of the Internet sources are not suitable for children's use. The qualities of children's books, such as large font

sizes, appropriate language, and appropriate caption text with the pictures, are not present in the Internet sources. While the content is for children, the sources do not have appropriate features for children's use. One librarian describes the problem as follows.

"I haven't seen internet sources specifically for younger children in terms of font size...[or other] things that we [expect] about books for young children - a certain number of pictures, a certain font size, a certain page limitation, a certain way the index is set up. The publishing industry has really come up with a formula that I think works most of the time ....if it's for younger elementary grades, its type size is going to be bigger and darker, the index will be simpler, there will be more pictures, there will be captions that related to the text on the page. There's relational connection between text and the pictures that isn't true on on-line sources at this stage. There are on-line sources for young children, but they tend to be... just content."

Encyclopedias in both electronic and print formats are also difficult for young children to understand in terms of vocabulary. Children report that it is hard to understand the information because of the difficulties in understanding some of the words in the encyclopedia and they also like to use a dictionary to find out the definitions of those words. If a child's academic ability is below average, it is particularly difficult for him to use an encyclopedia. However, librarians said that the structure of encyclopedia makes more sense to children compared with the Internet sources, since the encyclopedia is organized alphabetically and then under topics with different headings, in straightforward ways.

As mentioned earlier, pictures are favorite information sources for children, and the Internet seems the most popular source of the pictures for children. Children's librarians report that they use the Internet most to print out the colorful pictures for children.

"I'm having at least – at least one request a day from a child from a child who needs a picture. Doing a report on Maryland and need pictures of the State bird, or the State flag. And really... to photocopy black and white [at], 20 cents per page doesn't make sense when I can print off the Internet and get a huge picture for them, beautiful and in color and the children are just beside themselves when they realize that this is going to embellish their report. And that I've been using a lot."

Another use of the Internet was to get the most current information. Children's librarians indicated that children like to use the Internet not only because they can find anything from it but it has current information. Children also know that the Internet is the source if they need the current information. Even a fourth grade child mentioned that if she doesn't think she will find some words in books and encyclopedias because these sources have old information, she will use the Internet.

9. Conclusion and Implications

This study explores how children use information for their learning tasks, that is, school assignments. The study reports what was perceived important and interesting by children's librarians from two focus groups, and data from a focus group with children and the individual interviews supported the findings from children's librarians. Therefore,

the limitation of the study comes from the sources of data. Data for this study has been collected from children's librarians and children through focus groups and interviews. School teachers were not chosen as a data source, and thus, the study only speaks from the perspective of children's librarians and children.

The child's information use environment is different from that of adults, because children's information behavior is largely influenced by the environment and adults who guide them. The study identified six sets of characteristics that affect children's information behavior in the public library setting. Personal characteristics include children's age levels, parents' information skills, family culture, and teachers' preferences. Perceptual characteristics include children's ownership of their school assignments and their problems of interpreting these assignments. Problem characteristics include children's tendency to lose or misinterpret information on their assignments and teachers' tendency to give assignments without researching the available sources. Environmental characteristics include children's work styles. Information characteristics include children's preference to be less cognitively challenged, their anticipation of information with certain physical attributes, and their perceptions of information and information sources. Lastly, information source characteristics include the suitability of electronic sources for children's use, the reading levels of encyclopedias, and the use of the Internet for information.

The study has implications for both schools and public libraries. The findings demonstrate that there is a great need for communication between school teachers and children's librarians. Children's librarians who participated in this study are aware of the importance, and some had tried to initiate the effort. However, those who tried to work with teachers found it difficult to make an effort individually. Children try to get help from adults - parents, teachers, and children's librarians. Sometimes, parents need help from children's librarians in helping their children's school assignments. If children's librarians and teachers cooperate for children to access, evaluate, use information, it will definitely benefit children's learning more. For example, teachers can consult with children's librarians about available sources and give the assignment descriptions in advance to children's librarians.

School library media specialists can use the results of this study as well. Findings suggest that children have perceptions that a good information source should contain much information, and the Internet and encyclopedia are the good sources because they both contain a lot of information. Library media specialists can address this perception and teach children what sources are considered good according to their cognitive and age level.

Another implication is for systems designers. The study found that younger children have difficulties in accessing, evaluating, and using the electronic sources, because of the sources design. As the findings suggested, the electronic sources do not have appropriate physical design attributes for children which create difficulties for young children in accessing the information.

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Methods for Measuring the Influence of Concept Mapping on Student Information Literacy Achievement

Treasure Mountain 10
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Dr. Carol Gordon
Associate Professor, Boston University
Head, Educational Resources Library
cgordon@bu.edu

Introduction

Research traditions in Education and Information Retrieval have grown up in parallel worlds, although they share a theoretical foundation that profoundly influences research methodology and best practice in their respective domains. They also share a common problem: the need for a method for analyzing sparse, quantifiable data collected in qualitative studies with small sample sizes. This paper explores the theory of expected information that uses formulas derived from the Fano measure (1961) and Bayesian statistics (1764), and demonstrates its application in a study on the effects of concept mapping on the searching behavior of 10th grade Biology students.

Common Ground: Research in Education and Information Retrieval Studies

Behaviorism was defined by Skinner's (1965) theory of operant conditioning which claimed that behavior could be shaped by reinforcing, or rewarding, the desired responses to the environment. Educators became concerned with learning outcomes and devised steps to help learners achieve desired behaviors. Behaviorism also became a theoretical basis for systems approaches in information retrieval for research that was system, rather than user, centric. Behaviorists did not make inferences about how learners process information, or what goes on internally when learning takes place. In education, behaviorist theory informed practice by providing a rationale for programmed instruction, teaching machines, and computer-assisted instruction. In library instruction it encouraged the a tool-specific approach to teaching information skills in isolated lessons taught out of the context of their utility.

Cognitive psychologists investigated learning and created models of how information was received, processed and assimilated into the learner's knowledge system. Piaget's (1928) theory of cognitive development traced the development of the child from the sensori-motor stage of infancy, through the intuitive or pre-operational stage of early childhood and the stage of concrete operations in the elementary school years, and finally to the stage of formal operations in adolescence (Inhelder & Piaget, 1958). He described schemata, or mental structures by which individuals organized their perceptions into categories to classify specific information. These schemata adapt during the learning process through assimilation, by which the learner integrates new information into existing schemata, or by accommodation, whereby existing schemata are modified to create new mental structures. Learners were viewed as actively assimilating and accommodating information in terms of what they already knew (Bartlett, 1932; Inhelder & Piaget, 1958). Constructivist theory has grown to provide a rationale for hands-on, active learning, inquiry learning, "learning to learn," and performance-based assessment in the classroom. With a paradigm shift from bibliographic instruction to information literacy, this theory supported the process approach to teaching information skills in the academic context of curriculum. The information user is seen as learner through the lenses of information literacy, cognitive and meta-cognitive processes.

The behavioral and constructivist schools of thought emerged from educational research that built its knowledge on a philosophical foundation, an ethnographic tradition of

observation, and the practical study of human beings. Piaget (1928) and Dewey (1943) observed the child as the object of study as they studied the phenomenon of learning. When the ideas of Thorndike (1903) supplanted this ethnographic approach, psychology as an empirical science became the new foundation for building theory. His dictim, "Whatever exists at all exists in some amount. To know it thoroughly involves knowing its quantity as well as its quality"(Lagemann, 2000, p. 57) prodded educational research to mature into an empirical science. The subsequent contributions of Benet, Simon, Galton, Pearson, Spearman, and Fisher established quantitative measures as the dominant, and most credible, kind of data. Lagemann (2000, p. 94) criticizes educational psychologists who embraced mental testing: "But having found a technology that could be applied and tinkered with endlessly, they generally avoided questions concerning the value and necessity of sorting students in the first place." The "Eight-year Study," conducted by the Progressive Education Association, moved Tyler (1950) to use learning objectives to guide test construction. Fueled by the large number of college applicants and rooted in Education's march to empiricism, the Educational Testing Service was born, creating a culture of standardized testing. With the writings of Lincoln and Guba (1985) qualitative methods began to find a place in educational research. The re-birth of qualitative research and philosophical traditions in educational research, along with the adoption of principles of contructivism from cognitive psychology, provide the common ground where educational research and information retrieval studies can find their roots. This is significant for their respective research agendas since learning theory adopted as a theoretical framework in a research study has a particularly strong effect on that study's methodology.

The behavioral, system-centric tradition in information retrieval studies grew from a bibliographic paradigm: "Information retrieval has concentrated on what matches the system's representation of texts rather than responding to the users' problems and process of information gathering." (Kuhlthau, 1993, p. 1) These studies, conducted largely by engineers and scientists who were pioneers of IR development, relied heavily on probabilistic theory and algorithmic approaches. User-centric studies, on the other hand, were based on constructivist theory and collected data through ongoing interaction with the user. The system-centric school considered relevance too elusive and subjective and rejected it as a criterion for performance testing. On the other hand, user-centric studies explored relevance in the context of the sense-making approach and experimented with relevance judgments prior to accepting or rejecting relevance as a criterion for performance. The dominant research model of the 1960's and 70's emphasized input processes and components, such as document representation and retrieval effectiveness. Learning theories derived from cognitive psychology, which grew from concepts such as knowledge states, conceptual framework, and internal representation, constituted a trend away from system-centric views and shifted the focus from relevance to the information needs of the user. The theory of an anomalous state of knowledge (ASK) described by Belkin, Oddy, and Brooks (1982) counteracted the best match principle. Dervin's (1983) sense-making approach and Taylor's (1968) user-value approach emphasized the user's perceptions of the information problem and of utility and value of the system. The march

toward a theoretical framework based in cognitive psychology culminated in Kuhlthau's (1986) model for the Information Search Process, which used Kelly's (1963) theory of constructs and included thoughts, actions, and feelings of the information seeker. Information retrieval studies used interviews, think-alouds, observation, journaling, concept mapping, and other methodologies that yielded qualitative data.

Constructivist learning theory and qualitative investigative methods have emerged as powerful research tools that have transformed practice in educational and information skills programs, shortening the distance between the classroom and the library.

The Quantitative-Qualitative Divide

The debate between quantitative and qualitative research is bogus in that the value of their respective methodologies lies not in their relative merits, but in their appropriateness to the research question at hand. There is a tension, however, that arises from practical, rather than theoretical considerations. At the root of this tension is an over-confidence in what can be quantified and lack of confidence, or interest, in more cumbersome verbal data.

A practical consequence of qualitative research's lack of credibility is the inappropriate use of quantitative research findings as they are applied to all points of analysis in Education, i.e., learner, classroom and school, to produce results that raise concerns about validity. On a political level, the bias for the quantifiable, which offers a succinct interpretation of data, puts this kind of data in headlines. Although there are appropriate uses for norm-referenced tests, results are often interpreted in terms of individual student achievement. Funding, and even the very existence of marginal schools, may be determined, not on how well students are progressing with respect to their own learning history as a baseline, but how well they are progressing compared with everyone else.

The emergence of qualitative assessment measures in Education and the teaching of information literacy, namely performance-based (authentic) assessments, are endangered by the absence of a method for handling verbal data quantitatively. These methods use rubrics to determine the attainment of standards as measured by performance ratings that are described at each level of attainment, journals that document process, and portfolios that supply longitudinal evidence of growth. Mounds of qualitative evidence are accumulating devoid of any quantifiable analysis.

Performance-based assessments are intended to be formative, i.e., they yield continuous feedback to the learner for the purposes of providing opportunities for revision in order to improve the performance of both the learner and the teacher. Traditional testing and assessment are intended to be summative: they use grades or percentile ranks. While both formative and summative assessment are useful and necessary for the full cycle of the instructional process, the data collected by performance-based instruments can not easily be pronounced publicly or used politically to garner support and funding. This is a problem for educators, who know that a percentile ranking is a slick and clean way to

pigeonhole student performance, but offers little substantive information with regard to diagnosis and remediation. Even item analyses of tests, while identifying weaknesses in students performances, are applicable to group performance in terms of a class, a grade level, or a school, but do not adequately address deficiencies or remedial needs of the individual student. Although performance-based assessment and its attendant constructivist methods are supported by the research, rote learning and behavioral teaching styles that are not information literacy friendly thrive in a climate of test-driven curricula and the demand of state departments of Education for measurable results.

Qualitative research seems to defy definition. Lincoln and Guba (1985, p. 8) wrote, "it is not possible to provide a simple definition...Instead a proper impression...can be gleaned only as an overall perspective." A common criticism of qualitative research is that "soft" data do not escape the subjectivity of the researcher, raising doubts about reliability. In fact, the analysis of soft data explores the significance, or possible meaning, in the incidence of an event. Qualitiative research has an effective tool, the method of constant comparison (Glaser& Strauss, 1967), that is based on the premise that repetitions and patterns in data are meaningful. The signficance of this is under-appreciated as the bias against lengthy, verbose analyses that defy clear and efficient encapsulation renders vast bodies of meaningful qualitative research inert. When there is a need to process numerical data researchers often create hybrid studies that marry verbal and numerical data with corresponding qualitiative and quantitative methods. If measures were available for sparse quantifiable data, that data could analyzed and triangulated with qualitative evidence in a way that would preserve the integrity of the ethnographic research. Even sparse data carries some information, and it could be argued that a single occurrence of an event provides important information that the event is possible at all.

Classical statistics requires a large sample, using the philosophy of a 'bias', 'probability generator' or 'urn of black and white balls' out there in nature, without agreement as to the "magic point" at which the amount of sampled data crosses from sufficient to insufficient. Not surprisingly, some researchers feel uncomfortable with its methodologies. This may be attributed to a lack of experience with numeric and, in particular, probabilistic concepts. It might also be due to a genuine intellectual concern for matters in relation to notions of sampling and standardized testing, excessive classical emphasis on the refutation of the negative hypothesis, and a feeling that many observations which cannot be quantified in probabilistic terms, or for which there is in classical terms insufficient data, nonetheless do seem to provide evidence which seem intuitively reasonably and cannot in good faith be disregarded. Some of these issues could be better addressed in terms of Bayesian statistics.

The Fano Measure and Bayesian Statistics

The treatment described below derives from The Theory of Expected information presented by Robson (1974) who combined a derivative of the Fano measure with Bayesian probability theory to treat sparse events. This was probably the first attempt to introduce Bayesian methodology into the bio-molecular life sciences and particularly the

area now known as 'bio-informatics.' Here there was and is a pressing need for analysis, prediction, and decision making governing future action, even in cases of sparse data.

Information theory has developed in directions which are of interest as statistical measures, or as quantifiable concepts in information science. Generally, information theory is not concerned with confidence levels: you merely have a lot of information or very little. To some interpretations, the amount of information is a kind of degree of confidence. This is analogous to saying that the hypothesis would become acceptable at the 43.0 or 88.5 or 99.75 confidence level, whatever the data gives, rather than say, "reject it because it did not reach the magic number of 95.0." Such a number is a human artifact. However, a certain threshold of value of information can be used to make a decision.

The kind of information which most closely relates to perceived meaning or new knowledge is of the general kind:

Information learned about A =
What you now note about A - What you knew or expected about A.

The expected probability of A happening anyway can be related to that which is due to pure chance, or the probability of a happening in the general case rather than the circumstance of interest, or simply the probability of what you expected on the basis of well-founded subjective knowledge.

The notion of expected probability being the probability of A occurring by chance is the least controversial, not least because the same principle is used in standard statistics. However, it is quite common that your prior knowledge is not simply that something happens by chance. The chance situation is not always the most useful or meaningful basis: there is more hope of finding *Oliver Twist* in a library than in the average room in the average house, for example. It is also possible to introduce a kind of probability which actually relates to utility such that one will tend to make a decision in a direction which is more profitable or less risky. For example, the decision to look for a book in a library rather than the average room might be reassessed if it cost an enormous amount of money to enter the library or execute a library search.

The information measure can be positive (A has more chance than you would expect), zero (the occurrence of A is just what you would expect, and there is no information), or negative (A has less chance than you would expect). The units depend on the base of logarithms used:

base 2 - binary units or BITS

base 10 - decimal units or HARTLEYS

natural logs (base e) - natural units or NATS

For formal reasons the use of NATS is recommended for statistics: The natural logarithm is usually the automatic setting on a calculator. Metric units of these, e.g., centinats or decinats, are also used. The latter is common with 1 nat = 10.

Fano's measure is a particular well-defined case of the above information. It is one of mutual information:

$$I(A;X) = \log \left[\frac{\text{(number of times A and X are observed together)}}{\text{(number of times any A is observed, i.e., with or without X)}} \right]$$

This reads as the information relating A to X is equal to the number of times A and X are observed together divided by the number of times A is observed (with or without X).

Probability P(A) is the "simple probability" or "self probability" of event A. In the limit of large numbers this is given by n(A)/N, the number of times event A is counted divided by N the total sample size. Note that N will be:

$$N = n(A)+n(B)+n(C)+...$$

summed over all events A,B,C...etc. For example, P(blue eyes) = probability of occurrence of a person with blue eyes.

Probability P(A,X) is the "joint probability" or A and X, i.e., the probability that they will be counted together. For example P(blue eyes, boy) is the probability of counting a blue-eyed boy.

A joint probability could be represented as:

$$P(A, X) = P(A) * P(X)$$

Probability P(X|A) is the "conditional probability" of X on A. For example, P(blue eyes|boy) is the probability of finding blue eyes, given that the person is a boy. It may be calculated from P(A) and P (A,X) by

$$P(X|A) = P(A,X)/P(A)$$

P(A|X) could be obtained by only counting eye color in the set X, i.e., in boys. Then P(A|X) = n(A,X)/n(X), i.e., the number of blue-eyed boys is divided by the total size of the sample, here the number of boys. Some condition X is in a sense always present behind the scenes: It is the set in which you perform your counting. In other words, in statistical sampling you are concerned about the representativeness of your X.

Mathematical probability is based on a model that assesses the frequencies of sequences of events. Conditional probabilities provide a refinement of the concept so that particular features of a situation are taken into account when probability is assessed (Parsaye & Chignell, 1988). If we rely on a frequency view of probability, however, the more features of a situation we consider, the more unique it is and thus there are fewer previous cases to draw on in estimating the probability. This, in turn, reduces our confidence in the accuracy of the probability assessment.

"The Bayesian approach to probability relies on the concept that one should incorporate the prior possibility of an event into the interpretation of a situation" (Parsaye & Chignall, 1988). Bayes' (Parsaye & Chignell, 1988) equation is a special application of conditional probability as described above:

$$P(H|D) = P(D|H) \times P(H)/P(D)$$

P(D|H) is the probability of obtaining data D given (conditional on) hypothesis H, and is the quantity normally measured by statistics. Since it is not a probability of obtaining the hypothesis, but rather of getting that data given the hypothesis to be true, it is properly called the likelihood. However, it is P(H|D), the probability of the hypothesis being true given the data, which is of interest. To get the latter, we have to know P(H) and P(D). The latter is no problem, it can be chosen so that all the P(H|D) add up to one, the formal requirement for a probability. P(H) however, is the probability of a hypothesis before, or without taking account of, the data D. In classical statistics it is impossible to count, or even give meaning to, such a probability. Hence classical statistics cannot obtain the desirable quantity P(H|D) and rather tortuous reasoning must be used, notably, "I assume H if I can show that the P(H|D) I appear to get is not consistent with H happening by chance." Bayes got around the problem: probabilities cannot represent biases or trends put there out in nature, they can only represent degrees of belief. Incidentally, since we can hold degrees of belief about anything, it is perfectly good statistics to hold degree of belief about a probability or range of probabilities, e.g. Belief(P(H)|D)), which is a kind of probability about a probability, or in classical statistical terms, a "probability density."

Bayes' theorem relates the conditional probabilities of events, i.e., it allows us to express the probability P(A|X) in terms of probability of P(X|A), P(A) and P(X). This is important because the probabilities which are available are often P(X|A), P(A), and P(X), but the desired probability is P(A|X).

Information between alternatives is simply one Fano measure subtracted from another, the first being about the probability for some fact or event A, and the second about some fact or event not-A, i.e., the information that A will not occur. This takes in the full weight of available evidence, the information for A and the information against it. Note that the information which data carries about a hypothesis being true is

$$I(H;D) = \log [P(H|D)/P(H)] = \log [P(D|H)/P(D)]$$

The information about the hypothesis being true is what is implied by the above: we should write H = true every time we write H. This is not the same as the information about the hypothesis being false, where we would write H = false every time we wrote H above. Fortunately, information against something is negative information for it, so we can subtract the two:

$$I(H = \text{true:false}; D)$$

$$= I(H = \text{true}|D) - I(H = \text{false}|D)$$

$$= \log [P(H = \text{true}|D)/P(H = \text{false}|D)] - \log [P(H = \text{true})/P(H = \text{false})]$$

Applying the Theory of Expected Information

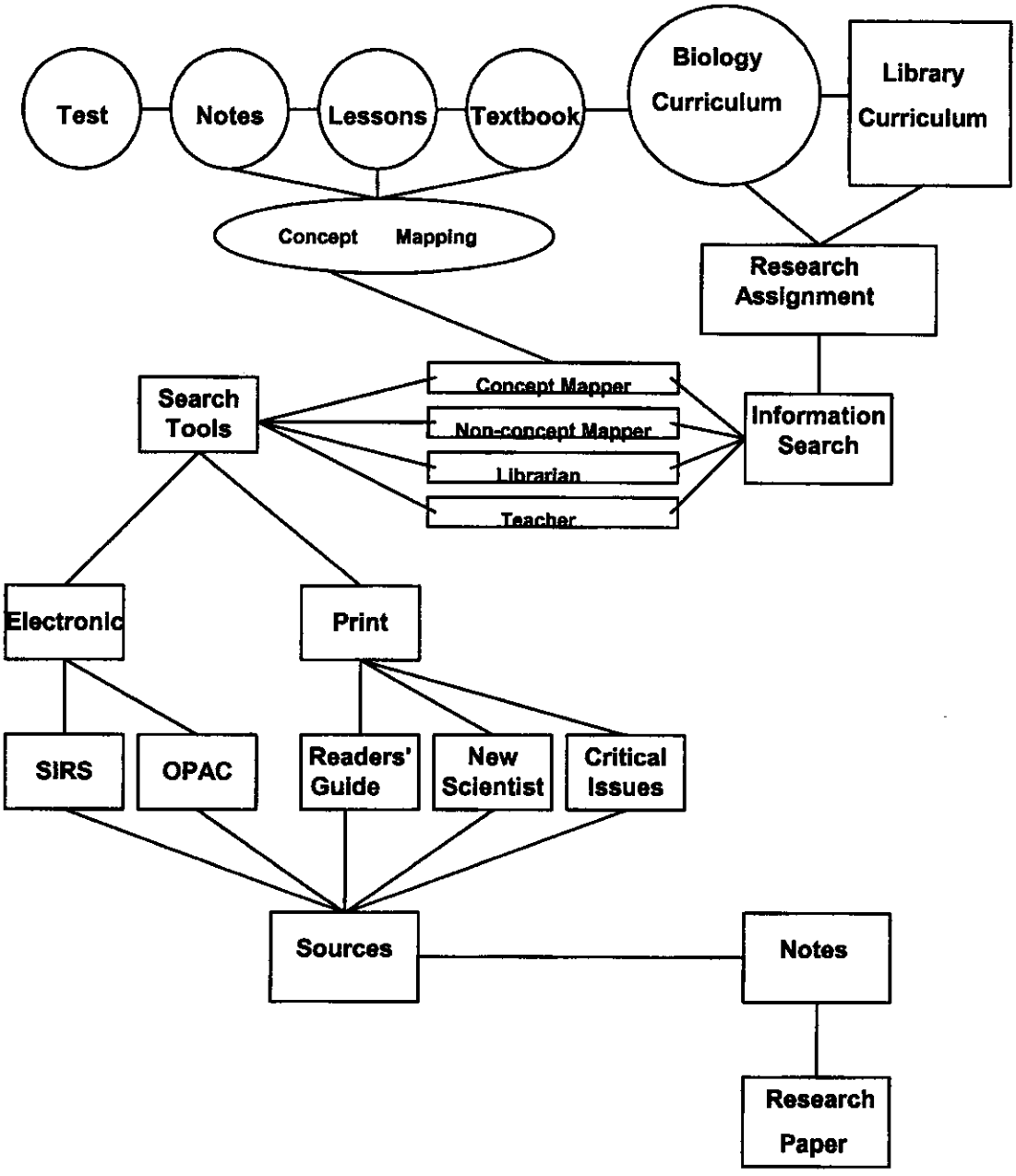
The research design. A qualitative study addressed the effect of concept mapping on the searching behavior of tenth-grade students engaged in research projects based on their instruction in a classroom-based genetics unit (Gordon, 1995). The setting was an automated library of a private American school in Europe. Ten students were chosen by purposive sampling. Selection criteria, monitored by user profiles, included student age, computer experience, native language, grades, and test scores. How did 10^{th} grade Biology students who learned and used concept mapping in the classroom for seven months search for information in the context of a library research assignment? Research questions included:

1. How did students concept-mappers and non-concept-mappers search for information in the context of the same library research assignment?
2. How did concept formation influence search strategies and relate to developing search strategies?
3. How did expert searches of the librarian and teacher compare with each other and with the searching of concept-mappers and non-concept-mappers?
4. How did student searching relate to stages of the Information Search Process? (Kuhlthau, 1993).

The conceptual framework for the study is shown in Figure 1 illustrates the key constructs of the study. One group used concept mapping over a period of seven months, while the other, taught by the same teacher, received the same class-room instruction without mapping. Data on searching behavior of students, the Biology teacher, and the librarian were collected during audio-taped think-aloud search sessions followed by structured interviews. Participants wrote transaction logs from memory immediately following each search. Stimulated recall was used as an interview method; key informants were provided with written transcriptions of their think-aloud sessions. Participants maintained journals from the beginning of the genetics unit to the end of the research project. De-briefing took place immediately following each session of data

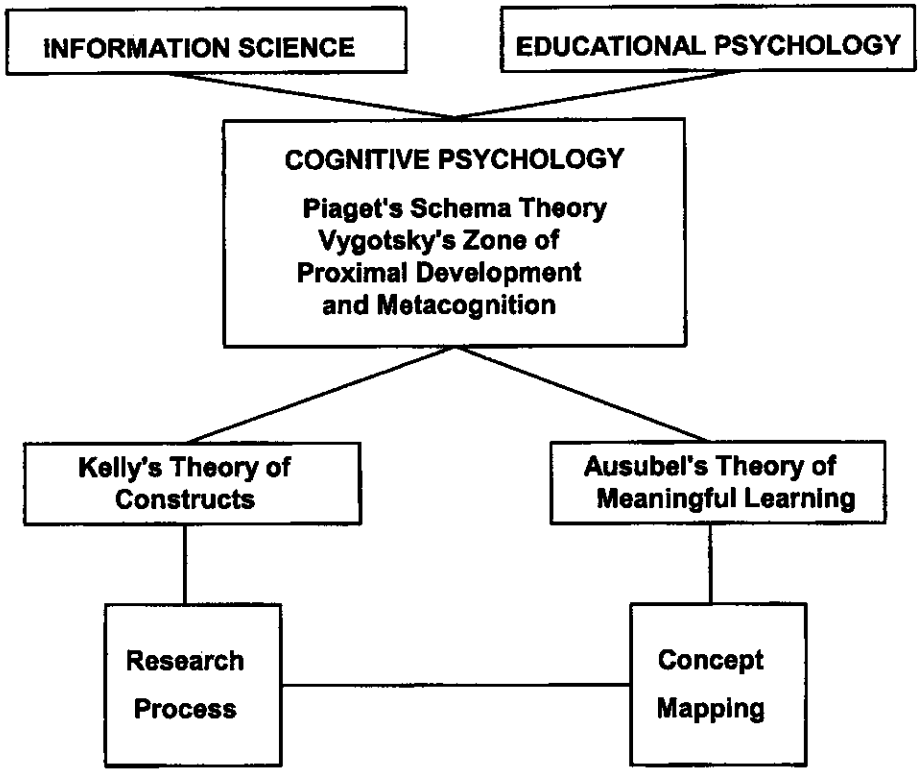
collection. The constant comparative method of analysis was applied to these data. Calculations based on Bayesian statistics and the Fano measure from information theory were triangulated with qualitative analysis of data. Information searching, as defined by Kuhlthau's ISP model, was examined to include stages from pre-focus formulation to writing the research paper.

Figure 1: A Conceptual Model of the Study



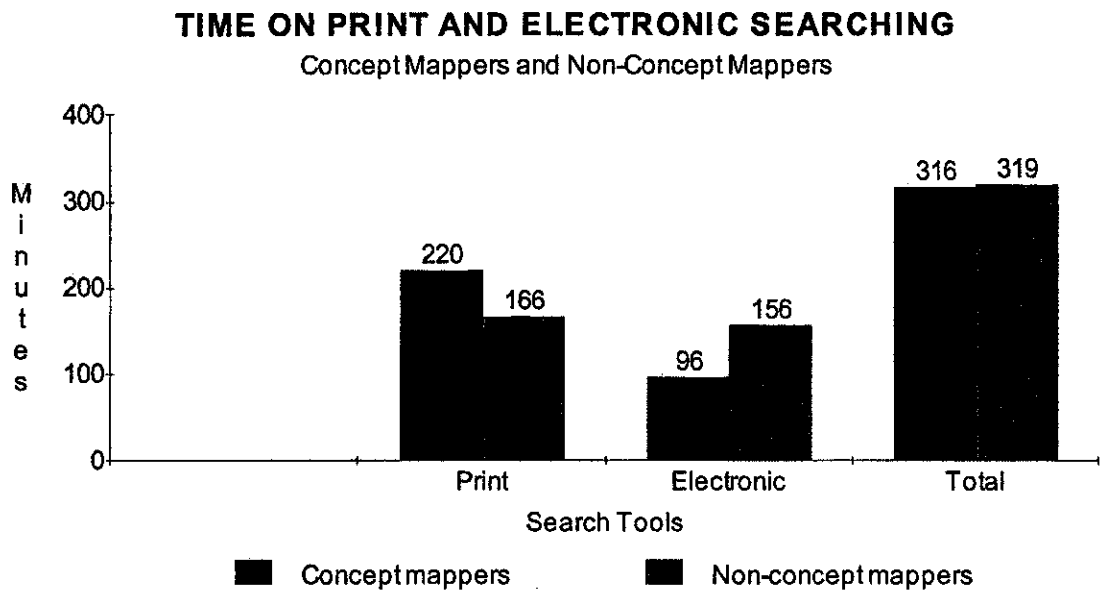
The theoretical framework drew from the research traditions in Education and Information Science studies based on cognitive psychology. Figure 2 illustrates the components of this framework.

Figure 2: Theoretical Framework for the Study



Analysis of the Data. The raw data for time spent searching on electronic and print search tools is shown in Figure 3. The total time spent searching by the two groups differed by only three minutes, with the concept-mappers searching a total of 316 minutes and the non-concept-mappers searching for a total of 319 minutes. There was some difference between the total time spent by the two groups researching print indexes: mappers searched for 220 minutes while non-mappers searched 166 minutes.

Figure 3: Total Time Spent Searching on Print and Electronic Search Tools



When the time allotted to print indexes was compared with computerized search tools, it was observed that concept-mappers spent 96 minutes of their total time searching electronically while non-concept-mappers spent 156 minutes on computers. As noted, there was virtually no difference in the total searching time of both groups. Another way of highlighting the differences in apportionment of time is shown in Figure 4 for concept-mappers and Figure 5 for non-concept-mappers. Concept-mappers spent 6.6% of their search time on the OPAC while non-concept-mappers spent twice as much time at the OPAC. The total time on computer search tools, i.e., OPAC and SIRS, was 30.3% of total time spent searching by concept-mappers and 48% for non-concept-mappers. The allotment of time to print indexes was 69.7% for concept-mappers and 52% for non-concept-mappers.

Figure 4: Search Time Allotment--Concept-mappers

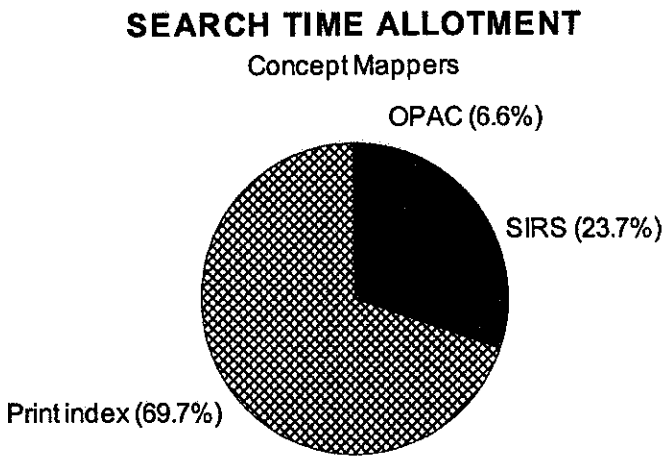
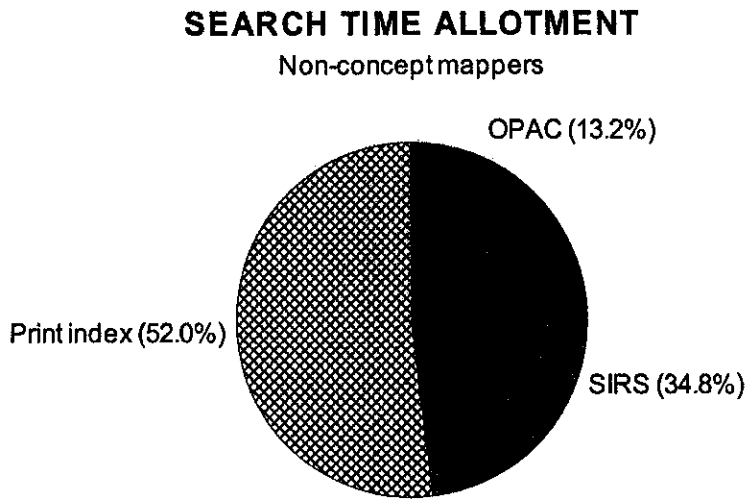


Figure 5: Search Time Allotment--Non-concept-mappers



A useful way of encapsulating the essence of diagrams such as that of Figure 4 , and avoiding the subjectivity inherent in visual judgment of graphs, is to process the quantities represented to information measures. Even more importantly, the approach allows account to be taken of the fact that a particular type of education or training might have a beneficial effect in favor of some activity A even if the student still spends less time in that activity A than in other activities. To allow this analysis, the amount of time spent in each kind of pursuit (use of print, use of electronic) is interpreted as proportional

to a probability, i.e., the probability that the student will be found in the specified pursuit, such as use of print, at any time. The ratio of time in one activity as opposed to another is, in effect, compared with (expressed, relative to) the ratio that we "expect" if we pool (and thus choose not to distinguish) concept map from non-concept map students. Logarithms are taken consistent with the theory of information posed by Fano, and in this case natural (base e) logarithms resulting in natural units or 'nats' of information. The formula used is as follows:

I(use=print : electronic ; concept-mappers) =

log[P(concept-mappers, print) / P(concept-mappers, electronic)]

- log[P(print) / P(electronic)]

This could be read as "the amount of information provided by concept map training that the student will use print at any time as opposed to electronic means." The semi-colon means "information provided by" and the colon means "as opposed to." Substituting the times, we obtain log[220/96] - log[386/252] = +0.40 nats as the measure of that information. Because we are estimating probabilities from data in regard to time spent, it is customary to express results as being conditional on that assumption about data. To do this, a vertical bar is used to express the notion of "conditional on." That is, we may write

I(use=print : electronic ; concept-mappers | time spent) = + 0.40 nats

which means the information being positive indicates that the information is information in favor of the student using print means at any time. Repeating this but now replacing the values for concept-mappers by those for non-concept-mappers, we obtain the information measure

I(use=print : electronic ; non-concept-mappers | time spent)

which could be read as "the amount of information provided by non-concept map training that the student will use print at any time as opposed to electronic means." This yields

log[166/156] - log [386/252] = - 0.36 nats.

That is, we may write

I(use=print : electronic ; non-concept-mappers | time spent) = - 0.36 nats

This measure, being negative, indicates that the information is information against the non-concept-mappers using print at any time. As it happens, the effect is quite strong, such that this can be taken as equivalent to the fact that the concept-mappers will more

probably be using print. However the subtlety of the measure is that it could be that the concept map training was shown to have a positive effect even if it was still less probable that print would be used. For example, your vote is a step in the right direction for your party even if it doesn't get elected! Note also that basic information theory does not make statements about significance, but only about the amount of information available and representing a "weight of evidence," loosely analagous to stating the level of confidence limit at which a given hypothesis would become acceptable in classical statistics. The above measures correspond to the kind of value one would obtain IF there was expected to be no bias and the results showed concept-mappers to spend 50% more time in print than in electronic, which in this example is consistent with the impression easily gained from the diagram. In contrast to classical statistics the information theory approach likes to consider both Type I and Type II errors as of relevance, and this is implied in the above approach.

Although not used by Fano in that it loses comparative detail in relation to what is "expected", subtracting the second (non-concept mapper) measure from the first (concept-mapper) measure is some measure of the total information available in distinguishing concept-mappers and non-concept-mappers, and is

I(use=print : electronic ; concept-mappers : non-concept-mappers | time spent) =

+ 0.767 nats

The difference between measures for mappers and non-mappers is +.767, or about three-fourths the value of 1 nat (1 = natural log 2.718) or 2.04. This means that if there was the expectation that no bias existed between the use of print as opposed to electronic by mappers and non-mappers regarding time spent, the difference between the time spent by mappers and non-mappers in print is more than 2 nats. A measure of 1 nat or more is generally regarded as particularly "meaningful."

An alternative measure is

I(user=concept mapper : non-concept mapper ; print | time spent) = + 0.29 nats

and

I(user=concept-mapper : non-concept mapper ; print | time spent) = - 0.48 nat

This measure has some conceptual advantages, reading as the "information that the time spent in the technique used tells about whether the user is a concept mapper or non-concept mapper." In the first case, the log of concept-mappers' time in print (220 minutes) divided by non-concept-mappers' time in print (166 minutes) minus the log of total time spent searching by concept-mappers (316 minutes) minus total time spent searching by non-concept-mappers (319 minutes) yields an information measure of +0.29

which measures the amount of information in favor of the user being a concept mapper. Similarly, the second measure of -.48, obtained by subtracting +.29 from +.767, or the difference between the two information measures for mappers and non-mappers of time spent in print as opposed to electronic (+.40 and -.36) yields a measure of the amount of information in favor of the user being a non-concept mapper, (i.e., -.48.) The measure of +.29 is a useful, single measure, indicating by the positive sign of the measure of concept-mappers that the mappers are doing better. Not least, the non-concept-mappers are the whole complementary set to the concept-mappers (they are "mutually exclusive") which covers all possible outcomes and so facilitates interpretation. However it leads to generally similar conclusions but seems less natural with regard to sequence of events in time, i.e., than considering the information provided for the posteriori process of searching by the prior process of the choice of the method of teaching (concept map or non-concept map). Further, for related reasons we are interested in predicting the search performance of a searcher given whether he is a concept mapper or not, which is another way of saying whether we consider the concept map training useful.

The methodology used here differs from the Fano measure in that it involves the difference between two such measures, in which the researcher considers the information for a hypothesis or an event, and then subtracts the information against the hypothesis or event, this latter information being regarded as relevant, but contradicting, information,. This then resembles other measures such as the 'K-statistc'. It was then regarded that many such measures could be held for a given set of sparse date, including cases like zero or one observations. A Bayesian expectation of the method was then evaluated over all the different measures that might exist in the mind of the researcher using Bayesian theory. As it happens, this approach and the mathematical integration implied in it led to a quite simple approach with a flavor of its own, which allowed a pencil and paper evaluation of the information content of sparse events.

Triangulation with Qualitative Data. Qualitative data provided evidence for formulating hypotheses that could explain the effects indicated by application of the measures of expected information. When asked whether they preferred print or computer searching, concept-mappers did not share a consensus as a group. It was not yet obvious why concept-mappers allocated more time to print.

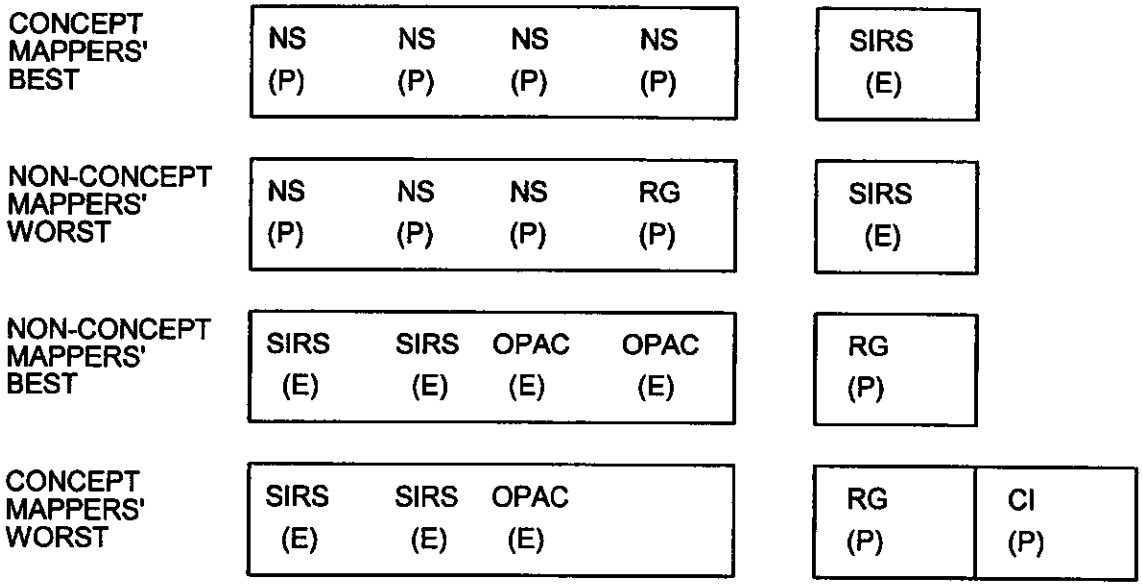
Non-concept-mappers unanimously expressed a preference for electronic rather than print because computers seemed to make searching easier. Their reasons for the preference indicated that either the computer helped them to cut through the large quantities of information or it provided them with a lot of information, which made them feel confident about searching even if that information was irrelevant.

Data in Figure 6 shows stated preferences of searchers made about their best and worst searches. While a stated preference for a search tool is not synonymous with judging that a search was a successful, one would expect to find some correlation between the two. Four concept-mappers chose print indexes as their best searches, while only one chose a

computer index, agreeing with their stated preferences for print indexes. On the other hand, four non-concept-mappers chose computer indexes as their best searches while only one chose mappers thought their worst searches were electronic while two chose the print indexes for this category. Four of the non-concept-mappers thought their worst searches were a print index. This evidence supports the non-mappers' stated preferences for electronic searching. When choices for the worst searches were compared, three of the concept-mappers chose print indexes while only one chose a computer index as his worst. There was more correlation between the non-mappers stated preference for electronic and their choices of their best searches than for the mappers, who said they liked electronic searching but chose print indexes as their best searches. The choices of the two groups for best and worst searches are almost mirror images of each other: print searches were chosen for the concept-mappers best searches and for the non-concept-mappers worst four out of five times. Similarly, computer search tools were chosen as non-concept-mappers' best and computer tools were chosen as concept-mappers' worst in almost the same ratio.

When non-concept-mappers best searches were compared with concept-mappers' worst searches, the same pattern was observed: non-concept-mappers' best corresponded almost exactly to concept-mappers' worst. Scrutiny of the search tools offered some clues for preferences. From the four concept-mappers who preferred print indexes, three stated the *New Scientist* as their preference, which was the most difficult search tool to use because of its complicated coding system. It also indexed the most difficult, yet scientific and technical, reading material. The fourth concept mapper who preferred the print index stated a preference for *Critical Issues*, which indexes articles from the *New York Times*. This index was also difficult to use because it was coded to microfiche that was retrieved from a binder separate from the index. Searchers also had to learn how to use the microfiche reader printer. Concept-mappers did not perceive any of these difficulties as obstacles. Some even saw the print indexes as an aid in focusing: "*The Readers' Guide* has helped me focus by showing me what articles are available on different subjects and to break down the subject." On the other hand, non-concept-mappers chose the same types of indexes as their worst search tools, with the exception of Christian. He noted in his journal that the *Readers' Guide* "...has been my longest search so far. What I achieved through the search...is that out of the huge number of sources the search provided, it helped me to realize that a lot of the information that I had been considering was irrelevant given the time and length limits placed on this paper. I think this was the first search which has made me realize that I must maintain my focus if I am ever going to get this done!" Mappers tendency to spend more time in print indexes was directly related to: 1) the high quality of scientific, technical information retrieved through print indexes; 2) the large number of sources the indexes yielded; 3) the rich supply of search terms the indexes offered by cross-references and titles.

Figure 6: Searchers' Best and Worst Searches



P = PRINT INDEXES
NS = NEW SCIENTIST INDEX
RG = READERS' GUIDE INDEX
CI = CRITICAL ISSUES INDEX
E = ELECTRONIC INDEXES
OPAC = ONLINE PUBLIC ACCESS CATALOG
SIRS = FULL-TEXT DATABASE

A closer look at what the searchers were doing with their time revealed more information about the reasons for their preferences and time allotments. The number of sessions that the two groups searched differed, as shown in Table 1. Concept-mappers searched a total of 24 sessions, 7 of which were electronic searches, which represents 29% of their total number of search sessions compared with the non-concept-mappers, who had 9 electronic search sessions, which represents 53% of their total number of search sessions. For print sessions, the reverse was true with concept-mappers spending 17 sessions, or 71% of their total number of sessions, in print; non-concept-mappers spent 8 sessions in print, or 47% of the total number of sessions. These comparisons support earlier findings that concept-mappers showed a preference for print index searching, allocating more sessions and longer periods of time to them.

When the number and length of search sessions is examined (Table 1), it can be seen that concept-mappers spent more time and more sessions in print, but their sessions were shorter than non-mappers, indicating that they were either searching faster and possibly doing more, or searching shorter periods of time during which they were doing less.

Table 1: Number and Length of Search Sessions

	Total time	Mean length of session	No. of sessions	Mean time per searcher
Electronic				
CM	96	19.2	7	2.7
NCM	156	30.6	9	3.7
Print				
CM	220	12.9	17	1.8
NCM	166	20.8	8	2.6
Total				
CM	316	13.2	24	12.9
NCM	319	18.8	17	20.8

Why did concept-mappers search about one-third of their time on electronic tools while non-concept-mappers searched almost half their time on computers? Why did concept-mappers prefer print indexes while non-concept-mappers spent considerably more time on electronic searches? Did electronic methods compensate for non-concept-mappers lack of a conceptual map? Do electronic methods benefit concept-mappers or non-concept-mappers?

Critical to answering these questions was the data that would indicate whether concept-mappers were searching more efficiently in electronic tools and more thoroughly in print indexes as compared to their non-mapper counterparts. Examination of the remaining search characteristics was intended to explore how searchers used their time and the rates at which they performed search functions in order to make judgments about efficiency and thoroughness of their searches.

These questions led to applying the Expected Information measure to the search characteristics listed in

Findings. Table 2 summarizes the information measures for ten search characteristics. In each instance, supporting qualitative data supplied explanations and insights about these measures.

Table 2: Summary of Measures of Search Characteristics

Search Characteristic	Concept-mappers	Non-Concept-mappers
Print vs. electronic	0.40	-0.36
SIRS vs. OPAC	0.96	-1.65
Subject vs. key word	0.74	-0.41
Total search word repertoire	0.91	-0.74
Unique search word repertoire	0.61	-0.41
Opening moves	0.72	-0.52
Reformulations	0.78	-0.57
Search operations	0.79	-0.64
Breadth searching	0.60	-0.47
Depth searching	0.22	-0.21

The differences between the two measures for each search characteristic is the measure of the probability that concept-mappers searched more thoroughly and more efficiently. In all cases that probability measured at least half a nat (one nat being equal to 2.718), indicating that the chances were approaching twice as likely that searchers engaged in these functions in print indexes were concept-mappers. The sign plus or minus is an indication: conclusive statements cannot be made on the strength of the effect. Since the study defined successful searching in terms of these indicators, findings strongly indicated that the amount of information available was in favor of mappers doing more in their searching, i.e., being more thorough searchers who showed a preference for print search tools.

There was a greater probability that concept-mappers will use print rather than electronic means, that they will search in SIRS rather than the OPAC, and that in electronic searching they will conduct subject heading rather than keyword searches. In print, as opposed to electronic searching, measures showed mappers applied a larger number of search terms, employed opening moves, re-formulations, search operations, and relevancy judgments more often and executed more depth than breadth searching. In all cases probability measured at least half a nat (one nat equals 2.718), indicating chances were approaching twice as likely that searchers exhibiting these characteristics in print indexes will be mappers. Larger differences between the groups emerged in electronic searching, where mappers spent less time. Quantitative data verified mappers were more thorough and efficient, reformulating by shifting synonyms and moving from general to specific search terms and terminating searches to read rather than when they depleted their search terms. Stronger focus formulation emerged as the most important determinant of searching behavior. Further research is recommended to replicate the study with a larger sample, using information theory as an alternative to classical statistics in hybrid qualitative-quantitative studies.

A summary of information measures on the number of times per minute opening moves, re-formulations and search operations were performed is reported in Table 2.

Table 3: Summary of Measures of Rates of Search Operations

Search Operations	Concept-mappers	Non-Concept-mappers
Opening moves	-0.25	0.3
Re-formulations	-0.26	0.34
Search operations	-0.33	0.38

Data indicated a trend: concept-mappers will perform these operations about the same number of times per minute and make more relevancy judgments while searching in print as opposed to electronic search tools, which is appropriate given the nature of manual as opposed to electronic searching. With attention to sign, since the negative values were computed for print as opposed to electronic for reasons of consistency and comparison, the measures indicated that the signs of the computations were consistently in favor of the probability that concept-mappers would use these operations in electronic searching as opposed to print, the sign being inverted for the calculation of electronic as opposed to print. These characteristics were calculated per minute, indicating rate: mappers were performing the functions faster if they were able to do more per minute. Since the study defined the search in terms of these indicators, the findings strongly indicated that from these measures that the amount of information available was in favor of the mappers doing less per minute in their print searching, i.e., being more thorough given the nature of print searching.

The probability of assessing whether these results could arise by chance was actually quite difficult for a calculation of this nature. The nature of the indication of an information measure reflects the probability that a concept mapper will get one kind of result as opposed to another. However, the proper procedure would be to progressively increase the number of individuals in the sample until the results converge and become approximately independent of the sample size. This could be accomplished by replicating the study and accumulating data in order to keep the sample small.

The relationship between the quantification of data and the texture and depth of understanding provided by qualitative data was synergistic in the analytical process that sought to explain as well as describe what was going on in the search process. Emerging patterns of searching behavior in print and electronic environments were outlined by numerical summaries; texture and color of related qualitative description served to provide a measure of understanding. For example, while characteristics of searching behavior, i.e., search word repertoire, opening moves, and reformulations, could be quantified to point out differences in print and electronic environments, qualitative data provided explanation for relevancy judgments and connections. The interplay of numerical and verbal descriptions served to push the analysis toward understanding the

searching phenomenon in depth, e.g., the interdependence of focus formulation and information overload. Qualitative data, through triangulation of students' testimony about their own thought processes with observations of their performance, shed light on the meta-cognitive aspects of searching. Quantification of the data provided direction and structure, as illustrated by the examination of key word and subject searching and search word repertoire, which highlighted characteristics of the concept-driven search. In every instance qualitative evidence supported the findings described through the information measures: concept-mappers were more thorough and efficient in their searching, more inclined to concept-driven searching as evidenced by their ability to focus and make connections, and more inclined to make meta-cognitive judgments that led to successful searching.

The searching behavior of concept-mappers was more thorough and more efficient if they:

1. Reformulated by shifting synonyms and moving from general to specific search terms rather than by changing concepts, so their reformulations were within the focus of the search.
2. Avoided information overload.
3. Made more connections in a balanced and eclectic pattern from print and electronic search tools.
4. Terminated searches, because they wanted to read and not because they exhausted their repertoire of search terms.

Analysis of the data has shown that the most dramatic differences between mappers and non-mappers emerged in electronic searching where the concept-mappers:

1. Spent less time searching.
2. Searched for fewer and shorter sessions.
3. Preferred subject heading to key word searching.
4. Spent less time in the OPAC than in the electronic index..
5. Had fewer search words in repertoire of non-repeated words and in total number of search words.
6. Generated fewer opening moves and generated them at a faster rate.
7. Generated fewer search strings and generated them at a faster rate.
8. Generated fewer reformulations and generated them at a faster rate.
9. Generated fewer search operations and generated them at a faster rate.
10. Generated fewer relevancy judgments.
11. Performed a larger percentage of depth rather than breadth searches.

Based on these observations the researcher concluded that concept-mappers were more sensitive to the electronic environment: they were more efficient in the way they used their time to perform more search operations per minute and more thorough in consistently applying a more concise repertoire of search terms and in engaging in more depth searching.

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Methods for Measuring the Influence of Concept Mapping on Student Information Literacy Achievement
Treasure Mountain 10
June 1, 2002

Dr. Carol Gordon
Associate Professor, Boston University
Head, Educational Resources Library
cgordon@bu.edu

An illustration of the application of an information measure from the Theory of Expected Information to determine if concept mapping had an effect on the searching behavior of 10th grade Biology students. This excerpt uses the data on print vs. electronic searching.

Figure 3: Total Time Spent Searching on Print and Electronic Search Tools

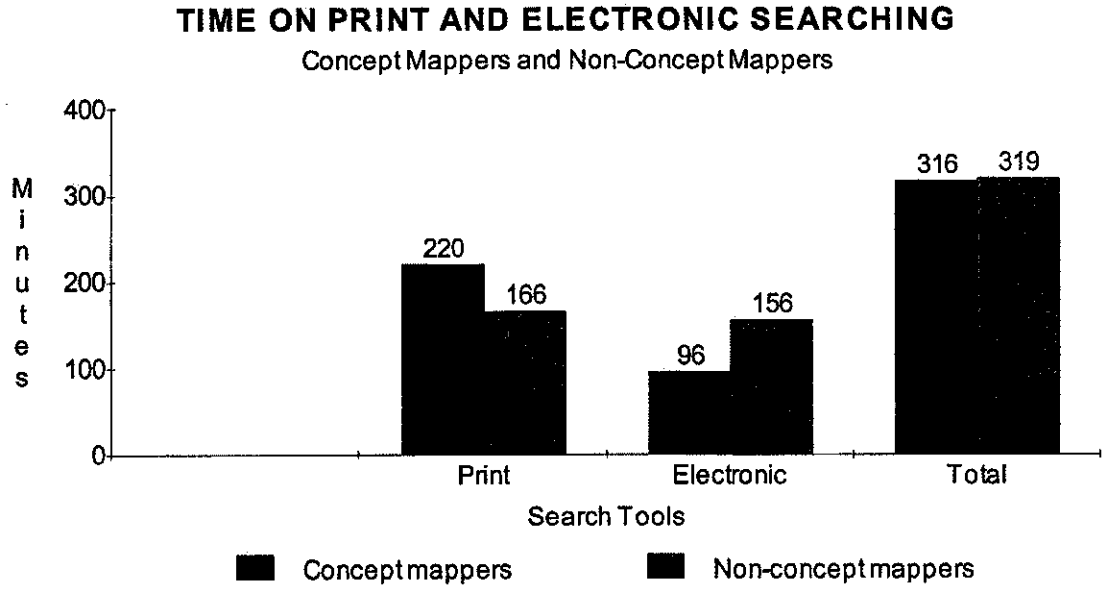


Figure 4: Search Time Allotment--Concept-mappers

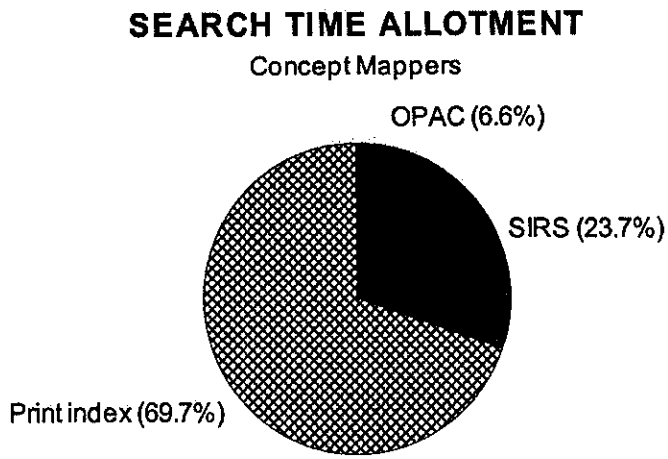
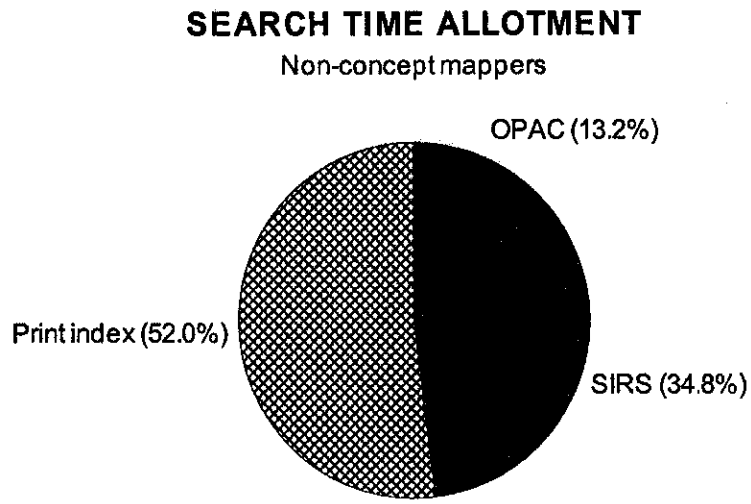


Figure 5: Search Time Allotment--Non-concept-mappers



I(use=print : electronic ; concept-mappers) =

log[P(concept-mappers, print) / P(concept-mappers, electronic)]

- log[P(print) / P(electronic)]

This could be read as "the amount of information provided by concept map training that the student will use print at any time as opposed to electronic means." The semi-colon means

"information provided by" and the colon means "as opposed to." Substituting the times, we obtain log[220/96] - log[386/252] = +0.40 nats as the measure of that information. Because we are estimating probabilities from data in regard to time spent, it is customary to express results as being conditional on that assumption about data. To do this, a vertical bar is used to express the notion of "conditional on." That is, we may write

I(use=print : electronic ; concept-mappers | time spent) = + 0.40 nats

which means the information being positive indicates that the information is information in favor of the student using print means at any time. Repeating this but now replacing the values for concept-mappers by those for non-concept-mappers, we obtain the information measure

I(use=print : electronic ; non-concept-mappers | time spent)

which could be read as "the amount of information provided by non-concept map training that the student will use print at any time as opposed to electronic means." This yields

log[166/156] - log [386/252] = - 0.36 nats.

That is, we may write

I(use=print : electronic ; non-concept-mappers | time spent) = - 0.36 nats

Although not used by Fano in that it loses comparative detail in relation to what is "expected", subtracting the second (non-concept mapper) measure from the first (concept-mapper) measure is some measure of the total information available in distinguishing concept-mappers and non-concept-mappers, and is

I(use=print : electronic ; concept-mappers : non-concept-mappers | time spent) =

+ 0.767 nats

The difference between measures for mappers and non-mappers is +.767, or about three-fourths the value of 1 nat (1 = natural log 2.718) or 2.04. This means that if there was the expectation that no bias existed between the use of print as opposed to electronic by mappers and non-mappers regarding time spent, the difference between the time spent by mappers and non-mappers in print is more than 2 nats. A measure of 1 nat or more is generally regarded as particularly "meaningful."

An alternative measure is

I(user=concept mapper : non-concept mapper ; print | time spent) = + 0.29 nats

and

I(user=concept-mapper : non-concept mapper ; print | time spent) = - 0.48 nat

This measure has some conceptual advantages, reading as the "information that the time spent in the technique used tells about whether the user is a concept mapper or non-concept mapper." In the first case, the log of concept-mappers' time in print (220 minutes) divided by non-concept-

mappers' time in print (166 minutes) minus the log of total time spent searching by concept-mappers (316 minutes) minus total time spent searching by non-concept-mappers (319 minutes) yields an information measure of +0.29 which measures the amount of information in favor of the user being a concept mapper. Similarly, the second measure of -.48, obtained by subtracting +.29 from +.767, or the difference between the two information measures for mappers and non-mappers of time spent in print as opposed to electronic (+.40 and -.36) yields a measure of the amount of information in favor of the user being a non-concept mapper, (i.e., -.48.) The measure of +.29 is a useful, single measure, indicating by the positive sign of the measure of concept-mappers that the mappers are doing better. Not least, the non-concept-mappers are the whole complementary set to the concept-mappers (they are "mutually exclusive") which covers all possible outcomes and so facilitates interpretation. However it leads to generally similar conclusions but seems less natural with regard to sequence of events in time, i.e., than considering the information provided for the posteriori process of searching by the prior process of the choice of the method of teaching (concept map or non-concept map). Further, for related reasons we are interested in predicting the search performance of a searcher given whether he is a concept mapper or not, which is another way of saying whether we consider the concept map training useful.

S.O.S. for Information Literacy

Abstract submitted to
Treasure Mountain Research Institute
Research Strand: Instructional Design and Technology

Submitted by
Ruth V. Small, Associate Professor
School of Information Studies, Syracuse University

Marilyn P. Arnone, President
Creative Media Solutions, Philadelphia, PA

Today's educators are challenged to find effective, innovative techniques for teaching research and information skills, especially to young children. With the creative use of current and emerging digital video, database, and information technologies, ***S.O.S. for Information Literacy****, is intended to support information literacy instruction. Educators identify relevant Situation-specific variables and desired instructional Outcomes. Suggested instructional Strategies (linked to a database of exemplary real-world video demonstrations, lesson plans, etc.) are subsequently generated.

A matrix was created to map state information literacy standards to a synthesis of existing information skills models in order to confirm the scope of content to be included in ***S.O.S.***. A front end analysis, conducted to gather input data from educators to guide the design of ***S.O.S.***, included:

- a 40-item electronic survey for practitioners to garner information about type of equipment available to practitioners, type/amount of Internet use, essential content/system features, and perceptions of future technology implementation within their schools.
- a brief electronic survey of 12 selected college educators/leaders in the field to gather consensus on the appropriate scope of ***S.O.S.*** content, proposed features, and effective dissemination efforts.
- an ongoing asynchronous electronic focus group and progressive feedback panel of practitioners (using WebCT, a classroom management software application) to guide the development of the ***S.O.S.*** prototype.

This paper describes research results and their subsequent impact on the development of the ***S.O.S.*** prototype.

* ***S.O. S.*** *for Information Literacy* is a project funded by the U.S. Department of Education.

Information Literacy Skills of College-level Virtual Library Users: An Exploratory Study

Mary Ann Fitzgerald
Chad Galloway
University of Georgia

Virtual libraries have proliferated in the past decade. Through the Web, these systems provide full-text and abstracted documents to K-12 and college library patrons. Currently, there is very little empirical research exploring how the existence of digital libraries affects the acquisition and practice of information literacy skills.

In this qualitative study, we observed student interactions with a virtual library in the search phase of a resource-based project, gathering data about students' information usage patterns and strategies for handling information tasks. Results from the study illustrate eight of the *Standards,* and provide an opportunity to explore the cognitive processes involved within information usage tasks.

Background

Around the United States, many colleges and universities have mounted virtual libraries. Virtual libraries are online systems through which patrons can access scholarly information. Large database vendors have provided increasing amounts of their holdings in full-text digital form, and databases indexing citations and abstracts are available in most subject areas. Georgia's virtual library, GALILEO (GeorgiA LIbrary LEarning Online), was launched in 1995, making it one of the oldest of these systems.

GALILEO provides services to academic, public, and K-12 school library patrons. Access is controlled through password entry, and the menu of databases varies according to the patron type. For example, K-12 users can access *EBSCO* products for primary and middle school children, while university users may access scholarly databases such as *Current Contents, GEOBASE,* and *PsycINFO.* GALILEO works via a web browser. Users may login from any terminal at home or on campus, although certain databases may be limited to certain campuses depending on licensing arrangements. Once logged onto GALILEO, patrons may search secondary indices of periodicals, multimedia encyclopedias, or primary databases containing full-text articles from journals and newspapers.

Now that the system has been in place for several years, questions have arisen. Media specialists and librarians observe patrons using the system as a shortcut by performing research based solely on online abstracts and by limiting research to articles that can be found as full text, leaving expensive print journals languishing unused on shelves. Teachers and professors, with a lingering suspicion of web-based resources, wonder how they can design pedagogically sound projects that incorporate virtual libraries. Educators also wonder if students have the information literacy skills necessary to use the system effectively. They would like to take advantage of

provided resources and to prepare students to use the kinds of information systems they will encounter after graduation.

These practical concerns reveal a gap in our understanding of user behavior. In this relatively new information environment, how are the skills denoted by information literacy standards coming into play? Specifically, are undergraduate students able to find information, evaluate it, and apply it in the specific ways suggested by the standards? Under authentic circumstances, how often are these skills needed and how well are students able to apply them?

This paper maps the data gathered through an intensive study of ten undergraduates using a virtual library onto the information literacy standards. We explore both K-12 and college standards (ACRL, 2000; AASL/AECT, 1998) in order to consider whether or not the K-12 standards provide a smooth passage to the information skills required of college students. To facilitate this process, we incorporate similar data gathered from ten high school students where appropriate. The purpose of this study was to explore how the use of digital libraries might affect the acquisition and practice of information literacy skills.

Research questions for this exploration included:

- How does the behavior of undergraduate students pursuing authentic information-based inquiry projects in virtual libraries align with the K-12 and collegiate information literacy standards?
- From the aspect of instructional design, how might a media specialist or librarian diagnose the current information literacy skills of a student, specifically in the early phases of information use?

Methodology

This qualitative study involved two participant groups: 10 undergraduate students and 10 high school students. All participants conducted searches of an extensive virtual library as part of research projects for their classes. In sessions lasting from one hour to ninety minutes, qualitative data about participants' information use were gathered through four techniques: 1) interview questions, 2) retrospective accounts of previous GALILEO sessions, 3) think-aloud protocols and observation concurrent with an online GALILEO session (Ericsson & Simon, 1993), and 4) stimulated recall (Marland, 1984). In addition to audiotaped interviews and observation notes, electronic activities were captured through the recording application *ScreenCam* (1997). Through these techniques, we observed students' interactions with the virtual library in the search phase of a resource-based project, gathering data about students' information usage patterns and strategies for handling information tasks. Undergraduate sessions were held in a faculty office located in a building approximately a mile from the main campus library. High school sessions were conducted in the school media center.

Because we were interested in studying information use in authentic situations, efforts were made to observe users under conditions that were as authentic as possible. For this reason, we asked participants to bring one or more current research projects to the session. Data were collected in spring of 1999. Participants were paid a small honorarium for their participation.

Each session followed a general pattern of pre-interview, think-aloud/observation, stimulated recall, and post-interview. The pre-interview included questions about the participant's past GALILEO use, demographic factors, opinions about GALILEO, the topic for the day's search, and any prior knowledge about that topic. Next, a think-aloud procedure was conducted in which participants sought information, describing their thoughts as they did so. Detailed instructions for performing think-alouds were given, in addition to modeling by the interviewer. Because we avoided interrupting the participant during the think-aloud process, this activity was followed by stimulated recall in which we asked the participant to explain actions taken during the think-aloud or statements made that needed clarification.

We analyzed the data using a multi-step process. Interviews, observation notes, and *ScreenCam* files were transcribed first. Next, we began the long process of open coding, which involved reading through each piece of data, seeking unique meanings within them, and tagging individual text units with labels identifying their content.

The entire analysis process was facilitated by *QSR NUD*IST*, a software package that creates a database of text units with their assigned codes and allows sorting and multi-layer categorization, as well as complex search functions. After open codes were assigned to text units in each piece of data, they were sorted into a hierarchy of categories. Next, we sought gaps in the open-code analysis. Finally, emerging patterns generated new questions that were pursued.

Several conditions limit the trustworthiness or value of this study. The study relied heavily on verbal reports of several kinds, which have been criticized as being filtered through participants' biases in several ways (Bernard, 1988; Brown, Bransford, Ferrara, & Campione, 1983; Ericsson & Simon, 1993; Kelly, 1995; LeCompte & Priessle, 1993; Moll, 1987; Murtaugh, 1985; Smith & Wedman, 1988). The technique of observation brought to the study the possibility of several unique sources of error (Bernard, 1988; Evertson & Green, 1986). Also, the methods used to recruit participants may have created a bias toward users with positive feelings about GALILEO, as is often the case with volunteers. Seventeen of the twenty respondents were seniors (either high school or undergraduate), creating an upperclassman bias. The high school students, by virtue of their enrollment in an Advanced Placement calculus class, were probably among the highest achieving and most motivated students in their school. These factors combine to form a possible elite bias as well.

Ericsson and Simon (1993) and Whitney and Budd (1996) assert that the listed limitations and biases are problems of validation and propose the use of multiple data sources to mediate them. Particularly, combining concurrent reports with retrospective accounts and electronic logs provided three windows that helped reveal the cognitive processes of the participants. Electronic logs provided a specific view of the objects of thinking and helped to capture the specific parts of documents participants studied. Smith and Wedman (1988) suggest that limiting verbalization to thoughts, rather than explanations of thoughts, helps to avoid the problems of invalid reports and cognitive overload. In addition, LeCompte and Preissle (1993) and Bernard (1988) recommend using observation to triangulate verbal reports of all kinds. Thus, we used participants' thought verbalizations, two modes of observation of behavior matching those thoughts, and stimulated recall to provide four data sources describing the same period of behavior.

Qualitative research results are often criticized for lack of generalizability (Yin, 1994). Stake (1995) asserts that if the parameters of a problem are adequately described, readers can decide for themselves whether findings apply to other situations. In short, the research context included students pursuing typical research assignments within the virtual library. We intend to describe procedures and the analytic path from data to conclusions thoroughly enough to provide readers with the necessary information to evaluate the efficacy of the process. Readers are free to apply methods and findings to personal situations and to construct their own conclusions.

Results

Because relevance and motivation are linked by many educational theorists (Dewey, 1902; Frick, 1991; Tyler, 1949; Vygotsky, 1934/1962), a qualifying condition for participating in the study was that participants bring to the interview an active project for which they expected to use GALILEO. Also, unmotivated people are less likely to exercise their full range of judgmental ability (Flavell, 1981; Simonson & Nye, 1992). Interview questions verified that each participant's project had at least one motivating element beyond the honorarium paid as an incentive to participate in the study.

Students in this study were involved in the initial stages of information use. Hence, the data are rich regarding online library usage patterns, searching, interface problems, and initial judgments of information quality and relevance. Also, at the time of data collection, we were most interested in Standard 2 (evaluating information critically and competently). Because of this interest, we concentrated our interview questions and observation tactics upon constructs related to this standard. As the study progressed, we realized that we were incidentally collecting information about the broad spectrum of information use, despite our fairly narrow focus. Two articles have been published regarding these targeted results: Fitzgerald and Galloway (2001a) explores relevance-judging, evaluation, and decision-making in depth; Fitzgerald and Galloway (2001b) explores practical aspects for application. In this paper, we broaden our focus to consider the data in light of the information literacy standards. Table 1 provides a representation of the relative distribution of data resulting from this study.

Table 1. Data depth in relation to the Information Literacy Standards

Standard No.	Data depth
1. Access	Deep
2. Evaluation	Deep
3. Usage	Moderate
4. Personal interest	Moderate
5. Literature	Shallow
6. Excellence	Shallow
7. Democracy	Moderate
8. Ethics	Nonexistent
9. Groups	Moderate

This paper focuses on information use in the undergraduate volunteers who participated in the study. However, we collected similar data from high school students. At times, the data regarding an information literacy standard are thin amongst the college students. At other times, examining the high school data contributed greatly to an understanding of the transition that occurs between high school and college. Therefore, we will delve into the high school data at times during this paper to add additional insight, clearly labeling these instances.

Participants

The ten undergraduate participants were volunteers responding to an advertisement in the college newspaper or flyers soliciting students using GALILEO for a research project. The ten high school students were all part of an intact Advanced Placement calculus class. We collaboratively planned a project with the teacher of the class, who gave the students a list of mathematical topics to research. Each participant was paid $20.

Participants consisted of 8 males and 12 females. High schoolers averaged 17 years, and undergraduates 21.5. The high school group (HS) consisted of 9 seniors and 1 junior, while the undergraduate group (UG) contained 8 seniors, 1 junior, and 1 sophomore. Table 2 summarizes data about the participants.

Table 2. General information about participants.

Partici-pant	Gender	Group	Age	Edu-cation	Content area or major	Topic/project
Al	M	HS	18	12th gr.	NA	History of computers: group research paper
Ann	F	UG	21	Senior	Psychology	Paraphilia; self-disclosure in romantic relationships: lit reviews
Apple	F	UG	22	Senior	International business and MIS	Production company or film festival: database creation
Ben	M	UG	22	Senior	Economics	Centralization vs. decentralization in organizational management: term paper
Chris	F	UG	19	Soph-omore	Cellular biology	Any psychology article: 2-page report on article
Cleopatra	F	UG	22	Senior	Psychology	Prejudice against light skin color in black communities: literature-based research project
Crusty	F	UG	21	Junior	Psychology	Validity of polygraph testing: group term project, presentation w/ bibliography
Edward	M	HS	17	12th gr.	NA	Benjamen Banneker: report
Erin	F	UG	22	Senior	Real estate	Employee compensation, tied to DialAmerica interview: presentation
Gidgit	F	HS	17	12th gr.	NA	Women mathematicians: group report
Julie	F	HS	16	11th gr.	NA	Women in mathematics: group report
Katie	F	HS	17	12th gr.	NA	Women in mathematics: group report
Michelle	F	UG	21	Senior	Psychology	Philosopher: 7-page critique of article
Mike	M	HS	17	12th gr.	NA	History of computers: group report
Mond	M	HS	17	12th gr.	NA	Women mathematicians: group report
Pat Sullivan	M	HS	17	12th gr.	NA	History of computers: group report
Robert	M	UG	23	Senior	Economics	Vending machine management: research paper
Savannah	F	HS	17	12th gr.	NA	Women in mathematics: group report
Sharon	F	HS	17	12th gr.	NA	Women mathematicians: group report
Teddy	M	UG	22	Senior	History, political science	Permian-Triassic extinction: 15-page paper

We now present findings regarding each information literacy standard, using the K-12 Standards as an organizational scheme. Corresponding or related ACRL Standards are given as well.

Standard 1: Accesses information efficiently and effectively

Related ACRL standards: 1. Determines the nature and extent of the information needed; 2. Accesses needed information effectively and efficiently

Two themes emerged regarding this Standard: searching and convenience. Due to its importance in the modern information climate, we will spend considerable space presenting data related to searching. The theme of convenience – where students made decisions based upon the quick availability of resources – is a much smaller finding in this study, but a prominent one nonetheless. Therefore, we will present the evidence related to it as well.

Searching: General information. Due to the capture of electronic files during the think-aloud portions of the interviews, a substantial amount of information involving searching was available. Specifically, present data allow a description of participants' initial plans of attack, the mechanics of their search processes, search strategies, and how participants sometimes learned from searching itself. Misconceptions and gaps in participants' knowledge also emerged in our examination of their searching procedures.

Searching: Plan of attack. We found that participants varied in their initial plans to attack their searching problem. We asked participants what they planned to do first in GALILEO and then how they would proceed to find information about their topics. This question revealed information about how much participants knew about GALILEO in general, and also how they organized their searches. Table 3 presents a typology of participant plans of attack.

Table 3. Participant plans of attack.

Category	Explanation	Participants	Example
Specific resource	Named specific resource as a target	Ann, Chris, Al, Crusty	Without any deliberation, Ann planned to use *PsycInfo*.
Search term	Listed search terms as focus of plan	Apple, Ben, Crusty, Katie, Mike, Mond, Edward	Crusty planned to look up "polygraph" and "lie detector."
Trial and error	Planned to try several different procedures, not sure which would work best	Apple, Ben	"I would probably have to experiment" (Ann).
Category	Named specific category as focus of plan	Chris, Michelle, Teddy, Erin	Chris named the Health and Medicine category as her destination.
Specific feature	Named a specific feature as focus of plan	Cleopatra, Katie, Michelle	Michelle named "abstracts" as her target.
Browse through databases	Planned to browse through database titles	Julie	"Mmm, I think I'm gonna look down a little bit. …It didn't go down any further. <Pause> Um, would it...have anything under education?"
Look for something "interesting"	Mentioned "interesting" as a target characteristic	Chris, Mike	"I'm gonna try to find something that seems like it would have something interesting pertaining to the history of computers." (Mike)
Multiple choice	Intervention: due to lack of system knowledge, we provided several alternatives from which participants chose	Savannah, Mike	Mike admitted he was choosing at random.
Where partner left off	High schoolers worked in groups; partners planned to start where their predecessor had stopped	Pat Sullivan, Gidgit	Al and Pat Sullivan were partners. Al found more resources than he could browse in the Internet Resources, and bookmarked them. Pat Sullivan expected to use these bookmarks.

Also, Teddy described plans of attack for both of his current projects, and the one he pursued is included in the above categorization. The other project, however, required a different plan of attack. For that one, an exploration of Christian Samurai warriors, he expected to begin with books:

> Because with a topic like that I'd go try to find books to get some general, um, at the same time I'd also just run in here [to GALILEO] and ... Christianity and Samurai, something like that, searches. And go for that. Skim through some of those, some of the journal articles and such. And just see kind of basically what they're saying, and then go

> for the details. Because details don't do you any good until you're like, okay, so this is what they're talking about.

Searching: Narrowing, limiting, and broadening. Focusing searches presented a considerable challenge for participants. Participants did not always change the scope of their searches in accordance with standard principles of searching (e.g., Katz, 1997). In studying the use of this concept, examination of how participants used the Limit feature is useful. Also, participants sometimes sought to limit their searches in other ways. In this discussion, "narrowing" refers to setting up a precise search initially, and "limiting" refers to reducing a large list of returns when the searcher judges it to be too large.

Some participants used no limiting at all: Al, Ann, Michelle, and Pat Sullivan. They did not mention the concept of narrowing or limiting in any way. For example, Ann scrolled through 70 of 5,747 returned citations in one search, despite having a firm topic focus. She explained that she deliberately used a broader term to give her "a wide variety of things to look at." Ben likewise spent a good deal of time looking through *Encyclopedia Britannica Online*'s outlined list of 1,722 returned items. In the other cases, however, the need for limiting may simply have not been present. Al, for example, found only fourteen items in his search, and the other participants produced similarly low numbers. Pat Sullivan had difficulty finding any information at all. Michelle's assigned topic was extremely broad, and within the loose confines of her assignment her list of 131 returns did not seem too long.

Several participants voiced a wish or need to limit their searches, but did not seem to know how to do so. Mond, Savannah, and Sharon, all high school students, fell into this group. Mond asked for help in limiting a list of 42 returned items. Sharon, who experienced difficulty in finding relevant information, wanted to make her searches narrower. Thus, she understood the concept of limiting, but did not understand how to apply it appropriately.

Five participants used a type of limiting we label "manual." In these cases, participants used a broad search initially, and then started over with a narrower set of terms. For example, Edward began with the search term "Banneker" and later narrowed it by starting a new search using "Benjamin Banneker." This procedure seemed to work well for each of these participants when they could identify the appropriate terms with which to limit their search..

Three participants used the Limit feature provided by GALILEO, but experienced difficulties with it: Apple, Cleopatra, and Robert. Robert misunderstood that he was specifying that the words "cash cards" appear in the title of citations by typing them into the "other terms" box, and gave up when the search was completely unsuccessful. Apple and Cleopatra experienced similar problems when they failed to notice that the search engine was limiting in ways they did not intend. Distracted by adding a succession of limiting terms, one after the other, they overlooked that GALILEO was reproducing a previous search for each new limit. They both did not realize that they were beginning with lists of zero returns, and that they were continuing to try to limit that empty list further. This oversight happened despite the fact that the problematic words automatically appeared in the "Your Search" box each time on the Limit screen.

Finally, two participants showed a sophisticated understanding of the Limit feature, and applied it to great advantage. Crusty used a combination of simple limits like dates of publication and broad limiting subject terms in an overall strategy of synonym substitution, methodically switching databases until she felt she had found enough information. Teddy began with an overly narrow search, broadened it through deletion of terms, and then subsequently added in one limiter at a time until he produced a list of 39 satisfactory results. He made one major error by trying to limit results to English, using "English" as a descriptive keyword instead of a language. When no citations were found, he backed up one step, discovered his error, and corrected the problem.

One final observation is that participants varied widely in how many results they thought required limiting. Crusty applied a limit to a list of 37 results, although most participants seemed satisfied with lists this small. At the other extreme, Ann looked through the first 70 of 5,747 citations before launching another search. Often, participants looked through the first set of these large lists to determine if their search was on target before limiting it further. Apple expressed another dilemma: "I'm sure there's a simpler way to make this more focused, but I don't know right now, I don't want to lose what I have."

Searching: Boolean and Precision Searching. Participants knew very little about the more powerful types of searching. Although we did not pursue Boolean logic as a standard interview question, occasionally the concept emerged in the dialogue. In situations where combination searches were needed, it occasionally occurred to us to ask participants if they knew about it. Julie, Sharon, and Gidgit answered "no" to this question. In Gidgit's case, someone had exposed her to the idea of Boolean searching in the past, as evidenced in this question: "You think it should be women AND algebra or women?" She did not know the concept by name, however. More important, in the entire study, no participant used Precision Search, a form of "advanced" search that allows the user to fill in multiple boxes.

Searching: Strategies. Participants demonstrated a number of searching strategies in their attempts to find relevant information. For example:

- Cleopatra examined descriptors and subject headings of likely citations to help her find additional citations. She jotted these terms down in a notebook for current and future reference.
- Gidgit found names within an abstract of two female mathematicians (her topic), on which she then performed searches.
- Crusty listed synonyms to help her construct search terms.
- Erin and Crusty both used an overall plan of using a series of search term combinations sequentially in a number of different databases, demonstrating their understanding that databases cover different but sometimes overlapping territory.

Searching: Learning content through the process of searching. Three participants made comments about learning content knowledge through the searching process. Apple's goal for her session was to establish effective search terms and the location of likely information resources. Her earnest gathering was to take place at a later date. To accomplish this goal, she felt she would remember the types of information she found in her fast and broad-ranging searches. Thus, she expected to learn her objective information, at least temporarily. Erin, seeking

information about a local telemarketing company as background for an upcoming site visit, expressed surprise at the "good bit" she learned through her searches. She said that her abstract printouts would help her study further and remind her of what she had seen. She did not intend to track down the articles themselves. Robert spoke of absorbing "bits and pieces" of information from his searching, contributing to one of his goals of staying current with developments in the topic area. Teddy summarized:

> I don't know how much, you know, mainly today's stuff has been based on what the title was. I don't know how much learning you can really get done from that. Although, I definitely have learned some things about some crinoids. Um, no, I'd say most of, a vast majority of the learning takes place when you're actually sitting there reading it. Although, yes, you do learn some from the abstracts, if it, the abstract is very important.

Searching: Participant knowledge. Shortcomings in searching concepts appear above in presentations of data about limiting, Boolean, and Precision searching. Numerous shortcomings in participants' knowledge about the mechanics of searching were evident as well. Apple spoke of the frustration caused by searching difficulty:

> At times it can seem frustrating, because you're looking for something and it seems difficult to find, or if you find something with the information you want, it doesn't give you enough information and you can't get further, so at times it's frustrating.

Later, during her think-aloud, she struggled with finding a specific person and said, "It *should* be easy."

Many shortcomings in participant knowledge about searching demonstrated themselves as questions or problems concerning syntax. Apple puzzled over names: "I'm not sure how to look up names....complete name, I wonder if that includes the middle name...." Gidgit wondered if she should use punctuation between multiple terms. Katie asked if a term (SAT testing) should be capitalized, and Sharon had a similar question.

Spelling also caused questions. Apple jokingly said "I'm very dependent on spell-check" after mis-typing a search word. When a search was unsuccessful, she double-checked her spelling and wondered if capitalization was the cause. Chris and Cleopatra had similar problems. Edward's search for "Benjamen Bannakar" was completely unsuccessful and his search floundered until we intervened and suggested that he check spelling. Gidgit likewise had trouble figuring out the problem when her search for "mathamatics" returned nothing. On the other hand, Ben, who had serious spelling problems and was aware of this difficulty, typed "industrail management" into *Encyclopaedia Britannica Online*. The database compensated for his error and produced a satisfactory list of items. Ben never noticed this particular spelling error.

Searching: Problems. A couple of participants juxtaposed GL with Internet search engines. Mond wanted to know if GALILEO had a relevancy ranking feature, like Internet search engines typically do. At least one person – Robert – felt that *Yahoo* was easier to use that GALILEO:

> MAF: You said that GALILEO was much different from *Yahoo*. How is it different?

> Robert: Okay, well, if I could, you know, because I'm not used to trying to find out when to use search limit and so forth on the GALILEO. I've never done that, but on *Yahoo* you can just type in "vending machines" and it will find everything in vending machines.

This passage illustrates two important points. First, Robert may have assumed that *Yahoo* performs a thorough and exhaustive search of the Internet, a common misconception about Internet search engines. Second, Robert felt that *Yahoo* was easier to use than GALILEO.

Convenience. We examined the reasoning participants used to accept and reject information, a decision that was directly observable as participants chose whether or not to print or save items. Most often, these reasons revolved around relevance and information quality, to be discussed below. In a significant number of instances, however, the reasons revolved around convenience. Table 4 presents these episodes, taken from both undergraduate and high school data:

Table 4. Data related to convenience.

Reason	Explanation	Decision	Example
Full text	Because it's there	Accept	"That sounds pretty good, since we've got the whole article." (Katie)
Available	Easy availability increases attractiveness	Accept	"That looks interesting and it's in BF, and I'm always in the Main Library, so..." (Ann)
Vocabulary	Difficult to understand or inconvenient	Reject	"... but it looks like there's a lot of long words and I'm typing this, so I probably wouldn't choose this one." (Chris)
Difficult	Difficult to comprehend; confusing	Reject	"I was just thinking it sounds confusing when you read it." (Julie)
Not available	Print version difficult to access	Reject	"This one also doesn't have display location, so I just wasted that time." (Crusty)
Full text	Lacking	Reject	MAF: "The ones with the dots are the ones that do have [full text]."... Mike: <laugh> "So, I mean the ones with the dot are the ones I'm looking for." (Mike)

Standard 2: Evaluates information critically and competently

Related ACRL Standard: Evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system

For data related to this standard, we sought episodes where participants displayed some kind of critical thinking regarding information, whether subtle or explicit. For example, Crusty, seeking information about polygraphy, expressed direct evaluative thinking in the following episode:

> Mmm, [pause] this is something about, from the American Bar Association. That should be good. This looks like some kind of compromise for everybody. It talks about

reliability, and it's around 90%. I tend to doubt that, but it's good to have other people's opinions. Otherwise I look like I'm presenting one side. This also has to do with some stuff we talked about earlier in the semester. So I'll print this, and hopefully it will be good. And I'll go back. I'm gonna try a different database now.

In this episode, Crusty noticed that a citation, from *Lexis Nexis' Academic Universe,* was in the *American Bar Association Journal,* a factor she interpreted as lending the article credibility through authority. She disagreed with the thrust of the article, but recognized the value of acknowledging opinions from an opposing perspective. She also recognized material in the article that agreed with her prior knowledge, another factor that leant credibility.

Table 5 presents evaluation-related reasons expressed by other participants:

Table 5. Evaluation-related reasoning.

Reason	Explanation	Partici-pants	Example
Good	Verbatim; no specific reason given	8	"Okay, it's about drug abuse. And medicine and tolerance. That looks good. Okay. Basically, what I do now is print it out." (Chris)
Context	Item appears in questionable context	4	"A lot of these are book reviews, so that's not gonna work." (Michelle)
Methodology	Scientific method seems sound	4	"I can use all these statistics and we can compare them later." (Andrea)
Perspective	Presents an alternate view	4	"This one would be good because it's a contrast between what I just printed..." (Ben)
Insufficient	Not enough information presented to be of use	3	"I'm not sure if it's gonna be enough." (Ben)
Author	Well-known, familiar, or important author	3	Teddy noticed the multiple occurrence of a single author within the same hit list.
Currency	Item is too old	2	"This is also a 1994." (Robert)
Wrong methodology	Avoid specific methodological types	2	"Oh, wait a minute. This is a study. I'm not really interested in studies." (Patricia)
Obvious	Item seems silly, unimportant	2	"...expecting...sell...should be paid for it. Ah. Obviously." (Erin)
Strange	Item contains feature that seems "strange," "weird," "crazy"	2	"But, um ... um, this is very strange." (Ann)
Disagree	Participant disagrees with the item	1	"I see something that says polygraph testing has overall accuracy rates of 98%, and I'm automatically skeptical of that....*General Child Sexual Abuse*...I don't think I'll use this one..." (Crusty)
Authority	Recognized professional association or business	1	"...from the American Bar Association..." (Crusty)

Other evaluation-related reasons included triviality, comparison to some other piece of information or idea, consideration of study results, comparison to similar situations, finding that it is interesting, comparison to prior knowledge, comparison to personal experience, thinking about what would happen if a recommended course of action were followed, level of specificity, and others.

Evaluative strategies. "Evaluative strategies" were procedures used by participants to assess information. In analysis, we coded sections of think-alouds and interviews in which the participant seemed to be making judgments about information. These incidents were examined closely for expressed strategies. For the purposes of this study, these strategies are broken down into the smallest discrete unit, as expressed by the participant. For example, Ben discussed the difficulty of choosing between four or five prescriptive theories of business. He said, "...sort of looking for a more persuasive argument, or, but not so much that 'cause, you know, a great speaker can talk about whatever he wants to." In this excerpt, he alluded to evaluating the worth of arguments, while warning against being persuaded by superfluous rhetorical elements. Thus, assessing the quality of arguments, a cornerstone of logical analysis, was a strategy clearly used by Ben. However, logic is an extremely complex system of heuristics, and Ben did not describe his analysis further. Therefore, the smallest unit we could break this strategy down into, in this case, was "Choose the most persuasive argument."

On the other hand, Michelle spoke of using logic in a slightly more specific sense:

> Well, just looking at the argument that the philosophers and, actually I took a logic class and...I mean, at the conclusion and seeing actually how they, first of all, came up with the premises. And, that leads to a good conclusion.

In this example Michelle indicated some prior knowledge about logical analysis and condensed the procedure into the examination of premises and conclusions. Her strategy was probably similar to Ben's, but she explained it in more detail. Therefore, we were able to summarize her strategies as "Examine assumptions (premises)" and "Examine the sequence of arguments leading to conclusion." Neither of these is sufficiently detailed to teach a novice how to perform them, but they communicate the process well to someone who already understands the procedures involved.

Often, strategies were simply the questions participants asked themselves about information as a way of determining its quality. They used the answers to these quality questions to clarify their thoughts about the information. In many cases, no evaluative strategies were explicit. Thus, the total set of strategies used by these participants in these information interactions is likely to be larger, possibly much larger, than those found in this study.

After extracting strategies and sorting them by type, we then examined numbers of strategies demonstrated by types of participants. Counting separate strategies only once per participant, the following statistics were obtained:

Table 6. Strategies demonstrated by participant type.

Type	Number of different strategies demonstrated[1]	Avg.	Total strategies executed[2]	Avg.
High school	19	1.9	20	2.0
Undergraduate	70	7.0	89	8.9

Thus, high school students demonstrated a total of 19 different strategies, or an average of 1.9 each, and 20 total, or 2 each. In contrast, undergradaute participants demonstrated 70 different strategies (7 each), and 89 total (8.9 each).

Relevance. Often, as participants considered citations, they verbalized reasoning that related to relevance. For example, Michelle considered an article in this think-aloud portion:

> Um, now let me see what this writer is. Is he for it or, if he argues for it or against it ... The writer questions one of the motivating assumptions of this disagreement. Okay, 'cause he's looking at – no, um, space. Compared with Leibniz. And that would be a, ok, I mean, I, I said I would like to just concentrate on one that seems like it would be in line to kind of see two different point of views. Not really sure exactly what side he's on, but it's, that seems like an interesting article, seems like something that I would want to do ... I would print this out. Well, I would go to "display location" and I would print it out....

This excerpt displays all of Michelle's verbalized reasoning concerning this specific item while viewing the abstract of a piece obtained in a search for "Leibniz," 69th in a list of 144 from *Humanities Abstracts*. She reviewed the content of the piece and interpreted part of it in her own words. She considered how she might put this piece to work (by using it to show another perspective of her topic) and mentioned that the article seemed "interesting." Thus, there are at least three relevance constructs in this episode: content review, usefulness, and interest.

We analyzed all undergraduate episodes in this way for relevance reasoning. Table 7 displays some of these reasons and examples.

[1] Not counting duplications in individuals

[2] Counting all strategies demonstrated including duplications in individuals on different items

Table 7. Relevance-related reasoning.

Reason	Explanation	Partici-pants[3]	Example
Interesting	Verbatim	10	"Yeah, this one actually looks interesting, so I'll probably print this one out. Yeah, I will take it." (Chris)
Specific idea	Names specific relevant idea sought	9	"Ah! I hit the jackpot. Dark skin males, fair skin males. Ah, lovely. All right, let me mark that." (Patricia)
Useful or helpful	Verbatim	7	"...maybe I can use that somehow..." (Andrea)
Specific use	States purpose this information will serve	6	"'Fetish in a Man With Learning Disabilities.' [Reading.] Um, I might look at the development of paraphilia as like an introduction to my paper." (Ann)
Banned idea	Item contains a specific idea participant does *not* want	5	"*Armageddon*, I don't want *Armageddon*." (Andrea; she sought another movie instead.)
Divergent	Encounters idea not considered before	3	"I didn't think of coming up on something about the company." (Erin)
Specificity	Judges whether the information is too specific or too general	3	"It might just be too specific for me to use. Um, totally concentrated on New York..." (Ben)
Back-ground	Piece provides background or general information about the topic	2	Erin found information about what telemarketers do, which gave her background information for an upcoming site visit.
More is better	Not sure about relevance, but keep it anyway just in case	2	"I do have doubts about it, but I'm going to copy it anyway because more is always better than less." (Patricia)
Essential	Important part of the issue; would be negligent to leave it out	1	"It's slightly off the subject, but it's something I have to address." (Ben)
Serendipity	Relevant to some other project	1	"This actually would be pretty good for, um, my other one." (Ann)
Prior knowledge	Covers familiar territory	1	"This also has to do with some stuff we talked about earlier in the semester." (Carolyn)

Other reasons related to relevance included geographical relevance, relation to personal information problem, personal benefit, theme reoccurrence, year of publication, and others.

Much as participants executed strategies to evaluate the quality of the articles they accessed, the reasons related to relevance stated above can be interpreted as strategies. At times, this strategic reasoning is explicit, while more often, only a descriptive reason was given.

[3] Undergraduates only

Standard 3: Uses information accurately and creatively

Related ACRL Standard: ...uses information effectively to accomplish a specific purpose.

To explore the standards related to information usage, we examined the types of projects participants were doing. We also examined accounts they gave of previous information projects. These data are summarized in the sections below.

Table 2 (General information about participants) provides a listing of each participant's current project. In the pre-interview, we asked participants how they had used the GALILEO system in the past. This question produced a range of information regarding past information usage projects and needs. Several categories of past information usage are apparent.

Table 8. Examples of past information usage.

Usage category	Description	Participants	Example
Professional	Direct support of job responsibilities	Robert	Robert needed to keep abreast of current industry information regarding his vending machine business.
Leisure	Pursue topics of personal interest or curiosity	Erin	Erin reported that she used GALILEO "for fun."
School research	Assignments for courses	Ann, Apple, Ben, Chris, Cleopatra, Crusty, Michelle, Mond, Robert, Teddy, all 10 high school students	The most common assignment was to write a "term paper" or "report" on a self-chosen but course-related topic.

Of the school research topics, by far the largest past usage category, projects fell into several categories:

Table 9. Breakdown of GALILEO usage in educational settings.

School research category	Description	Participants	Example
Papers	Find and synthesize literature on a course-related topic	Ann, Ben, Chris, Cleopatra, Crusty, Michelle, Teddy, all high school students (10)	Ann had written a paper on body image for a psychology class; Teddy was writing his senior thesis.
Information gathering	Collect facts on a given topic	Apple, Crusty, Mond	Crusty was gathering information to form a bibliography for a professor's research project.
Practice	Use some element within GALILEO as a study tool	Chris, Erin	Chris found that the *Psych Web* resource within GALILEO's Internet Resources provided practice quizzes that closely correlated with her coursework.

Standard 4: Pursues information related to personal interests

Related ACRL Standards: none

We asked questions about participants' projects and their motivations for completing them. Interview questions were designed to verify that each participant's project had at least one motivating element beyond the money paid as an incentive to participate in the study. Factors motivating participants to perform their information searches were extracted from statements describing their projects, plus spontaneous comments made as they answered other interview questions or commented during the think-aloud portion of the session.

Four motivating factors were found:

- academic (based upon the need or desire to graduate from high school or college)
- interest
- professional
- personal relevance

We assumed that all students (high school and undergraduate) were concerned with the need to graduate, especially since a high proportion (85%) were seniors about to graduate. Their projects, as part of course requirements, were steps on the path leading to graduation. No data suggesting low motivation appeared in these two groups of students. Statements indicating an interest in the subject of scrutiny beyond academic aspiration added an additional motivating factor. Robert's project revolved around his business. Cleopatra pursued an academic topic about skin color prejudice in part because she felt that she had been a victim of such prejudice in the past. One student indicated that she chose a topic because she was interested in it and already had a considerable amount of prior knowledge about it.

For the most part, students had some degree of latitude in choosing their projects, where their project was an assigned academic project. In most cases, professors and teachers had asked the students to choose a project topic that fell within the general topic area of the course. Cleopatra

and Robert stood out as individuals who were seeking information directly related to personal interests or needs. Ben and Teddy also were remarkable because they contributed data related to their senior theses, topics they had studied deeply and were motivated to work on beyond the normal motivation to achieve a good course grade.

Standard 5: Appreciates literature and other creative expressions of information
Related ACRL Standards: none

There is little data in this study to support the hope that students are building an appreciation for literature. Ben mentioned, in passing, that professors assigned book reports that he felt consumed valuable time he would rather spend researching his semester-end project. Chris was enrolled in a multicultural literature class, but made no statements to indicate that her interest in literature was anything beyond course credit. The high school students contributed several interesting data snippets in regard to literature. Edward admitted that he did not like reading books very much. Three girls spontaneously described using the Internet to help them find information about books they were reading in their literature classes, implying that they had read the texts, but used online resources to broaden and deepen their understanding. However, Al baldly stated that the Internet helped students he knew find information about books they were assigned to read but had not. On the other hand, Al was the only study participant who mentioned reading as an enjoyable activity: he liked reading Tom Clancy novels "more than anything."

Standard 6: Strives for excellence in information seeking and knowledge generation
Related ACRL Standards: none

Evidence regarding the excellence standard is scarce in this study due to less vigorous pursuit of this construct. Most often, the desire to do well in seeking information and generating knowledge occurs as a part of desiring good grades. Among the undergraduates, Ben talked about getting "lousy grades" and spent a substantial amount of time analyzing why this was so. Teddy was very cautious about using the Internet as a resource because he was afraid professors would criticize his information-finding process and give him a lower grade. Ben made an interesting comment about correcting misconceptions. He said that he welcomed the chance to do so, because he felt learning something wrong and correcting it made a greater impact, and that if he could retake tests he would make "great grades." Among the high school students, Mond (like Ben) refers to getting bad grades. However, both Mond and Edward made direct comments related to the desire to do a good job on their projects and get good grades. Gidgit talked about how using the Internet had helped her expand her information resources in a project and directly resulted in receiving a good grade on a previous report. Al mentioned that his teachers thought he was a good writer, but that writing was not easy for him.

Standard 7: Recognizes importance of information to a democratic society
Related ACRL Standard: none

Several undergraduates made side comments that directly or tangentially revealed knowledge of the importance of information in a democratic society. Ben and Teddy had conducted extensive research (their senior theses) on topics with themes related to this standard. Ben's topic had to

do with centralization of knowledge, exploring the issue of when it is important for everyone in an organization to *not* know pieces of information because it would confound the mission of the organization. For example, soldiers are sometimes better able to accomplish military tasks if they do not know all of the intelligence relating to a tactical situation. He contrasted this scenario with political situations in which it was important to "get at the other side we never hear about" in order to inform individual political decisions. Teddy's thesis had similar overtones: he was researching public perceptions of presidents, whether correct or incorrect, and how these perceptions affected elections and other political outcomes. These two individuals expressed a deep understanding of this information literacy principle.

Two other students offered opinions that showed awareness, although not in depth. Chris discussed the Clinton/Lewinsky scandal and its relationship to political reality, deeming it not important. Crusty had researched elections during a political science course, and discussed the presence of liberal biases in two local newspapers, recognizing her own moderate stance. Both of these students, simply by discussing these issues, indicated a subtle awareness of this standard.

Standard 8: Practices ethical behavior in regard to information and information technology

Related ACRL Standard: Understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally

Despite extensive searches of the data, we found no references to wrongful information use, cheating, plagiarism, or lying. On the other hand, we found no overt references to honesty in regards to information use. We concluded that the data gathering techniques of this study were not sensitive to this issue.

Standard 9: Participates effectively in groups to pursue and generate information

Related ACRL Standard: ...individually or as a member of a group...

As evidence related to this standard, we sought references to group participation. We also searched for negative information concerning group participation. On the positive side, Ann referred to working in a group for her current project and reported that her group had been formed by the professor according to topical interest. As the group refined its psychology topic, she said they "came to a consensus." Cleopatra reported working with a partner on her project. Crusty was also working with a group on her topic, and the end product was to be a presentation. All but one of the high school students were working in pairs or threesomes. The lone worker had chosen a topic that no one else was interested in. Despite extensive searches through the data, we found no complaints or problems related to working in groups. Further, we found no references to preferences for working alone.

Discussion

In this discussion, we discuss three significant themes arising from the data in this study: searching, differences between high school and college students' strategy use, and convenience.

Searching

In our opinion, participants lacked knowledge about searching to a critical degree. Most did not understand Boolean searching. Our observations of problems with the Limit feature, browsing through huge lists of returned citations, and the failure of anyone to initiate a Precision Search support the finding that participants understand searching to only a rudimentary degree. It seems clear that searching technique is a new literacy skill that needs to be integrated into curricula beginning in the early grades. For the current generation of students and graduates that have never had the opportunity to learn about searching, we suggest the creation of an online information skills course. We further suggest that undergraduates should experience such a course as a part of their core curriculum, or alternatively demonstrate competency.

Spelling presents a substantial obstacle to GALILEO users, according to data from this study. While improving spelling skills in users would be the best course of action, this goal becomes less likely as automatic spell-checkers become available in many computerized contexts. As we observed with Ben's spelling error and the "intelligent" response of *Encyclopaedia Britannica Online,* some databases already have this capability. Perhaps the possibility of adding an optional spell-checking capability could be explored. We do not recommend that search interfaces incorporate automatic spell-checking, however. Sophisticated users need the power provided by literal operation.

A final complicating factor is illustrated by Robert's stated preference for *Yahoo* as a user-friendly, exhaustive Internet search engine. This minor incident shows the influence of Internet search engines or possibly other databases on the searching process. Virtual libraries typically contain several different search interfaces, which themselves change with rapid upgrades over time. Add to those interfaces the many different Internet search engines, all operating according to their own set of rules, and this variety of differently-behaving search engines inevitably causes memory errors due to cognitive dissonance. Users can cope by limiting search engines to a few familiar ones, reading the help files to discover this information, and learning in-depth how to use those. Search engine developers could do much to alleviate this difficulty as well, but their behavior is beyond the scope of this report. Perhaps this complex problem will eventually disappear, but it seems reasonable that developers may have to agree upon a standard at some point.

Differences in evaluation between groups

From Table 6, it is clear that high school students performed far fewer evaluative operations than the college students. These data are insufficient for a detailed statistical analysis, but the findings are suggestive. Epistemologists (e.g., King & Kitchener, 1994) predicted and observed that older, more educated people engage in deeper reflective and critical thinking than younger people. Although their findings apply to critical thinking ("reflective judgment") rather than evaluation itself, the constructs are closely related. Thus, the findings of this study harmonize

well with theirs. It would be interesting to investigate whether evaluative behavior truly increases with age and level of education in terms of information evaluation.

Recall that undergraduate sessions were conducted in a faculty office in quiet surroundings, using a relatively new computer with a fast network connection. High school students were operating in a busy media center on a similarly new computer, but with a dial-up modem line that disconnected frequently. Conditions during the high school sessions were less than ideal, due to students' unfamiliarity with GALILEO and serious telecommunication problems. Perhaps these conditions created such a high cognitive load that their higher-order thinking was constrained. We would like to conduct further studies with high school students to explore this issue.

Despite the differences in conditions, the realities involved in these two contrasting data collection situations point to a deeper issue. Data concerning number of strategies executed reveals a dramatic difference between the two participant groups. If the study conditions contributed heavily to this difference, then we must consider how these conditions translate into real life situations. Distracted students using unreliable technology may not be able to think as well as students in a quiet environment using reliable technology. Yet, crowded facilities and unreliable technology are pervasive conditions in K-12 education.

Convenience

Table 4 reveals some disturbing patterns in these data, and we suspect that the availability of a virtual library has enabled users to cut some corners in scholarship. By providing a rich array of resources, more than students can possibly use, they are able to be more selective. However, this selectivity is artificially enhanced by eliminating all items not located in the library. Even though Crusty had used the OPAC to find periodical locations before, she now considered this step an extra cumbersome one, further limiting her list of possible citations. Ann preferred items which were located in a branch of the library that she could easily visit. At the undergraduate level, in the context of a minor course project, this tendency toward efficiency may be appropriate. However, it is not a practice that can be considered rigorous in a scholarly sense. In another study, doctoral students were observed on occasion limiting their searches by availability as well (Fitzgerald, 1998). This problem is one that can be addressed in an information use course, but will need to be systemically considered by college faculty of all subjects requiring library research.

Limiting searches to full text is another potential source of problems in scholarship. In full-scale literature reviews, using limits based upon full text availability would be unconscionable. The participants observed using full text limits (Crusty and Edward) were not performing full-scale literature reviews, however. Within the context of their information tasks, their choices seem reasonable. In the universe of information available, which was far greater than they could apply to their needs, they opted to examine the items that could be obtained in three mouse clicks. It is encouraging that this behavior was not observed in students performing more intensive projects. However, the question of compromising scholarship through artificial and convenience-based limits remains open for exploration.

Another concern is raised by abstract-only research. In addition to the one overt case observed, we were surprised to hear four participants comment about how learning can take place through searching, presumably primarily the browsing of abstracts. These observations alone are not problematic, because they all seem reasonable in context. However, their occurrence raises the question of whether students use similar shortcuts on a routine basis. If students depend upon abstracts for all of their research, their learning will be shallow at best. Also, no author of a research study can possibly communicate the full context of findings in a one-paragraph abstract. We feel this question needs exploration, if only to lay the concern aside.

Implications and Conclusion

The data in this study provide several baseline patterns of problematic and sophisticated information use. Results provide specific information regarding all but one of the information literacy standards, in the form of concrete characteristics and observable behaviors. *Information Power* provides indicators and levels of accomplishment related to each of the standards, and these naturalistic results provide enrichment and illustrations for some of them. We hope that data such as these may contribute information towards the goal of constructing a reliable and reasonable assessment of information literacy.

Our final observation is that the gap between the information literacy skills of high school and college students in the settings we observed seems large. Although the high school students were in their final semesters of high school, they did not seem ready to approach the information tasks required in college. The college students, for the most part, were also nearing graduation. The stories they contributed relating to their information literacy backgrounds indicate that our observations of high school students were not far off the mark. We can only surmise that the college students had bridged the gap while in college, and often as a result of their own trial-and-error efforts.

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QUALITATIVE RESEARCH: AN OPPORTUNITY FOR SCHOOL LIBRARY MEDIA RESEARCHERS

Delia Neuman, Ph.D.
Associate Professor and
Coordinator, School Library Media Program
College of Information Studies
University of Maryland
June 1, 2002

This interactive session will acquaint participants with the major theoretical assumptions and primary methodological approaches of qualitative research. It will explain the key concepts that differentiate qualitative from quantitative research and suggest criteria for choosing a qualitative approach. It will outline the processes of question generation, data collection, data analysis, data reporting, and the verification of findings and conclusions. It will draw upon the presenter's experience as a qualitative researcher to highlight selected findings and to suggest applications of the qualitative paradigm to school library media research. Finally, it will suggest sources participants can use to design and conduct their own qualitative studies.

I. Introduction
   a. Definition of qualitative research
   b. How qualitative and quantitative research differ
   c. Underlying theoretical assumptions
   d. When to choose a qualitative approach

II. Designing a qualitative study
   a. Research question and foreshadowing questions
   b. Data collection
      –Prolonged and persistent observation
      –Fieldnotes and expanded fieldnotes
      –Informal interviewing and interview protocols
      –Document analysis
   c. Data analysis
      –Coding–kinds and techniques
      –Electronic supports
      –Data reduction and theme generation
   d. Data reporting
      –"Thick description"
   e. Verification of findings and conclusions
      –Member checks
      –Peer reviews
      –Audit trail

III. Applications to school library media research
   a. Examples of studies
   b. "Action research"
   c. Using qualitative techniques for student assessment

IV. Conclusion
   a. Summary
   b. Questions

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LEARNING IN AN INFORMATION-RICH ENVIRONMENT: PRELIMINARY RESULTS

Delia Neuman, Ph.D.
Associate Professor and
Coordinator, School Library Media Program
College of Information Studies
University of Maryland

Cindy Krimmelbein, M.L.S.
Library Media Specialist and Technology Coordinator
Meade Middle School
Anne Arundel County, Maryland

May 31, 2002

This research addressed the central question of what teachers and students need to know to use sophisticated informational/instructional resources for meaningful learning. A qualitative study, it involved approximately 140 seventh graders, their seven-member teaching team, and the school's library media specialist. It was guided by the following foreshadowing questions:

*What learning tasks yield the most significant opportunities for meaningful learning in a school that is rich in information technology and information resources?

*What instructional strategies and techniques must library media specialists and other teachers develop in order to design, deliver, and evaluate these tasks?

*What learning strategies and techniques must students develop in order to learn deeply and meaningfully from these tasks?

Preliminary observations began in Spring 2000, and the full study proceeded during the 2001-2002 academic year. Methods included observation, interviewing, analysis of student projects, and analysis of teacher-prepared materials. Preliminary analysis has uncovered several major themes related to teachers' and students' interactions with a variety of technological resources. Final data analysis should provide a research base for the design of instruction, evaluation, and staff-development activities related to using electronic informational/instructional resources for teaching and learning.

I. Introduction
   a. General context
   b. Research need

II. Literature review
   a. Information seeking in electronic environments
   b. Learning with information
   c. Learning and electronic resources

III. Research questions (see above)

IV. Overview
  a. Setting: Meade Middle School, Anne Arundel County, Maryland
  b. Study design and research methods

V. Preliminary findings
  a. Difficulty of isolating specific technology-related practices
  b. Major theme for teachers: orchestration
    –advance planning
    –planning in the moment
  c. Major theme for students: structure
    –teacher-provided
    –student-generated

VI. Conclusion
  a. Implications for curriculum and instruction
  b. Implications for LMS and teacher preparation

VII. Questions

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Keith Curry Lance has been the Director of the Library Research Service since 1987. The LRS is a unit of the Colorado State Library and the Colorado Department of Education at the University of Denver. A 1984 Ph.D. in Sociology and History from the University of North Texas, he is the lead author of *The Impact of School Library Media Centers on Academic Achievement* (1993) – a.k.a. "the Colorado study" and *How School Librarians Help Kids Achieve Standards: The Second Colorado Study* (2000), as well as a co-author of similar studies for Alaska, Pennsylvania, Oregon, Iowa, and New Mexico.

Ruth Villency Small, Ph.D. Dr. Small is Professor and Director of the School Media Program in the School of Information Studies at Syracuse University. Her research focuses on the motivational aspects of information use and has published widely. She received the 1997 Highsmith Research Award from the American Association of School Librarians and the 2001 Carroll Preston Baber Research Award from the American Library Association. See also "Selections from SLMR", page 13, in this guide.

Lisa Janicke Hinchliffe is Library Instruction Coordinator for the Milner Library at Illinois State University, Normal, IL. *Illiterate or Aliterate? Information Literacy Challenges.* Academic librarians struggle daily with the challenge of assisting first-year college students in developing information literacy skills. Often, students seem to lack basic skills and be unaware of foundational concepts related to library research. More than one college librarian has yelped in exasperation "don't they learn anything in high school?" The answer, of course, is that "yes, they do." Indeed, many juniors and seniors in high school compose lengthy research papers with equally lengthy bibliographies, perhaps greater than any paper that they will be required to write in their first year of college.

This paper proposes that the behavior that academic librarians perceive as a lack of information literacy – information illiteracy – is really a lack of motivation or desire to utilize information literacy skills – information *aliteracy.* The paper will juxtapose the concepts of illiteracy and aliteracy, drawing on experiences with first-year students, examine the psychosocial

development of first-year students who are transitioning from high school to college, and discuss instructional strategies for addressing college student information aliteracy.

Ross J. Todd, Ph.D. Associate Professor, Rutgers, The State University of New Jersey. Ross Todd's primary teaching and research interests focus on adolescent information seeking and use. This multi-faceted research includes: information and critical literacies, technology and learning, cognitive information utilization and knowledge construction, how school librarians may more effectively empower student learning; and building schools as effective information-knowledge sharing communities. He has published over 100 papers and book chapters on these areas, and has been an invited speaker at many international forums.

School Librarians and Evidence-Based Practice: Concepts, Conundrums and Challenges. This paper explores the emerging concept of evidence based practice, and its implications for the teaching-learning role of school librarians. For school librarians, evidence based practice revolves around the key question: What differences do my library and its learning and information initiatives make to student learning outcomes in my school? The paper will first outline the two dimensions of evidence based practice: first, the conscientious, explicit and carefully chosen use of current best research evidence in making decisions about the performance of the day by day role. Second, the day by day practice that is directed towards demonstrating the tangible power of the school library's contributions to the schools' learning goals, where explicit attention is given to gathering meaningful and systematic evidence that show that local school library initiatives make a difference to student learning outcomes. This paper in particular focuses on the latter dimension of evidence based practice, and will discuss underpinning that identify concerns and challenges. It will also elaborate a methodology based on a critical incident approach for charting and documenting the techniques / measures / strategies / checklists / assessments that are used by school librarians to systematically and formally identify learning outcomes, and to articulate what the learning outcomes actually are.

Kathy Latrobe (Ph.D.) is a Professor at the University of Oklahoma where she has taught in the area of library materials and services for young people since 1986. Anne Masters (MLS) was the Norman Public School's District Coordinator for library media from 1973-01. Since retiring from that position, she has been the associate director of the Pioneer Library System. Anne Masters and Kathy Latrobe wrote "A Case Study of One District's Implementation of Information Power," (School Library Media Research Online 4:2001): ala.org/aasl/SLMR/vol4/content.html. Through this article, they reported on action research that served as a component in the Norman Public School's implementation of the 1998 AASL guidelines. See "Selections from SLMR", page 10, in this guide.

Action Research: Evaluation of School Library Media Programs is a methods presentation based on a continuation of action research related to planning and evaluation activities of school library media programs in one school district. With data gathered from teachers, principals, and school library media specialists, 1998-1999 research described participants' perceptions to two aspects of their building level programs: (1) the success of the program and (2) the level of their participation in the program. During the 2000-2001 academic year, school library media specialists have been encouraged by the district coordinator to integrate the school library media program explicitly into annual school site plans and to develop from one to three library media program goals for 2000-2001. Research questions to be pursued and reported at TM10 are: (1) What factors (e.g., informational, economic, political) influenced the determination of individual school library media programs and the inclusion of library media programming into site plans? (Data to be gathered from structured interviews of school library media specialists and principals.) (2) Have perceptions of LM program success and LM program participation changed from 1999 perceptions? (Data to be gathered from teachers", library media specialists", and principals" responses to a Likert-scaled assessment based on the national guidelines.)

Julie I. Tallman, Ph.D., Associate Professor, Department of Instructional Technology, The University of Georgia. Julie has taught at the university level for 12 years and, before that, has served as a secondary school media specialist for 11 years. She has been instrumental in redesigning the curriculum for school media specialists at Georgia to reflect the emphasis on

the teaching role of the media specialist. Teaching online for 7 years now, her research in teaching focuses on the effect of learning and teaching styles in online courses. She is currently working on a book with an Australian colleague; writing up the results of a Spencer founded study investigating the effect of mental models on school library media specialists as teachers using electronic technologies. A Fulbright Senior Scholar in 1999-2000 to the University of Botswana in Africa, Julie values her continuing connection with her African students and colleagues.

A Comparison Study of Library Media Students' Perceptions of Their Learning Experiences in Online and Face-To-Face Classrooms." Tallman, Geisler, and Fitzgerald. The purpose of the study was to investigate how student learning preferences and student preferred learning environments influenced their perceptions of their experiences and learning growth comparing an online course, Information Technology, to a face-to-face course, Administration of School Media Programs, during the fall of 2001. Specifically, the researchers looked for significant differences among students' learning preferences compared to:

1) their satisfaction with course design of both courses;
2) their satisfaction with instructor teaching preferences in both courses
3) their need for support in assignments and technology use; and
4) their perceived learning growth with content and technology use?

The results will influence future online course design and preparation of students for online course learning responsibilities and their own future teaching responsibilities as media specialists.

Sandra Geisler, M.Ed., The University of Georgia (2002), has been Julie Tallman's Graduate Assistant for the spring semester 2002. Sandra has 20 years of experience as a senior insurance company executive and has retired to work in her children's schools as a volunteer multi-media curriculum designer. She took the M.Ed. degree to expand her abilities to create curriculum projects for K-12 education use. Her achievements include web learning activities applicable for content units in elementary school.

Mary Ann Fitzgerald, Ph.D., Assistant Professor, Department of Instructional Technology, University of Georgia, taught in public schools for eleven years, both as a classroom teacher and as a media specialist. Her research involves the cognitive processes individuals use to evaluate information, usability of web-based educational resources, and inquiry as a pedagogical model.

Joan Michie, Ph.D., is a Senior Study Director at Westat, an employee-owned research corporation located in Rockville, Maryland. She has 20 years of experience conducting national studies on a wide range of topics. She directed the "Assessment of the Role of School and Public Libraries in Support of Education Reform," which included surveys of 1,000 public school, 1,000 private school, and 1,000 public libraries, as well as 10 case studies of innovative practices. Currently, she is directing the project "Characteristics of Public School Libraries: A Historical Comparison."

Delia Neuman, Ph.D., Associate Professor, is the Coordinator of the School Library Media Program at the University of Maryland. Her primary research interests involve learning in information-rich environments, particularly for K-12 students. She teaches a doctoral seminar in qualitative research methods and several school library media courses related to evaluating and designing resources for learners. She is the recipient of ALA's 1991 Carroll Preston Baber Research Award and the writer for *Information Power: Building Partnerships for Learning.* She currently serves on the Board of Directors of AECT.

Cindy Krimmelbein, MLS. A former Young Adult Public Librarian and English Teacher, Cindy currently is a Library Media Specialist and Technology Coordinator at Meade Middle School in Maryland's Anne Arundel County Public Schools. She is the author of *The Choice to Change: Establishing an Integrated Library Media Program.*

Denise E. Agosto, Ph.D., is an Assistant Professor in the College of Information Science & Technology at Drexel University. Her major research interests include young people's information seeking in digital environments, and Hispanic and multicultural issues in children's and young adult literature and library services.

Patricia A. Tarin, MLS, doctoral candidate, Rutgers, the State University of New Jersey. Ms. Tarin is Director of the Knowledge River, The Center for the Study of Hispanic and Native American Information Issues, University of Arizona School of Information Resources and Library Science. She is Principal Consultant to the Tall Tree Initiative for Libraries, sponsored by the Reader's Digest Foundation. She has served as consultant to the American Library Association and to numerous libraries on diversity issues, minority services, program planning and evaluation.

Diversity in Children's Services: From a Child's Perspective. This presentation will discuss developing a research agenda for children's services that takes into account the multicultural, multilingual settings most children's and school librarians now work in. Demographics show that in the preponderance of large cities, minority school age children are the numerical majority, and their numbers are growing rapidly in suburban and rural areas as well. The library field has been slow to incorporate substantive research about these changes into its planning, services or collection development. Research from inside and outside the library field will be discussed and participants will be asked to share in the drafting of a research agenda for library services to minority children.

Cecilia L. Salvatore, Ph.D., Assistant Professor, School of Library and Information Management, Emporia State University. Dr. Salvatore teaches courses on the theoretical foundations of service, community analysis and information system analysis, information retrieval, and library administration. She is doing research on the place of culture in information seeking discourse, culture in the interaction with information technology, and on the social legitimacy of libraries in society.

Recent manuscripts by Dr. Salvatore include "Community, Identity, and Institution: A Model for Understanding Information-Seeking Behavior," and "Ethnography of Communication and a Discourse-Centered Approach: A Necessary Framework for LIS."

James Carey, Ph.D., is Assistant Professor in the School of Library and Information Science at the University of South Florida. His teaching and research interests are in the areas of school media management, acquisition of higher-order information skills, instructional systems and technology, strategic planning and program evaluation, as well as distance learning.

Time to Learn: Optimizing Students' Learning Time on Information Literacy Tasks. It is difficult to engage in a work-related conversation of any length with a media specialist without hearing about the lack of time to do all that the job requires. Media specialists have always worked against the clock to optimize their productivity, but now the time pressures have increased with added responsibilities for new technologies and modes of information access, and with a move away from old support roles for the instructional mission of the school toward new role as collaborative partners on the school's instructional team. To succeed, media specialists must focus on managing "my time," but this focus easily generalizes during information literacy instruction into an emphasis on "my lesson" and "my teaching," and covering "my content. It is easy to forget that the true constraint in information literacy instruction is not on *time to teach*, but rather on *time to learn.* Learning comes from the active participation of students – their involvement in their own learning! The focus must be on the efficient utilization of the precious bit of student learning time that is available to the media specialist.

This paper explores the implications for information literacy instruction of the student learning time variable. Analyses are included of Morrison's (1926) observations of instructional time, Carroll's (1963) model of learning, Bloom's (1968) synthesis of Morrison's and Carroll's views into his mastery model of learning, Harnischfeger and Wiley's (1985) learner-centered perspective on student learning time, and Jonassen's (1993, 1998) contemporary thinking on constructivist models of learning. The paper then discusses a rationale and methodology for tempering ideal learning time

needs with typical learning time constraints, and concludes with a model and examples for optimizing students' learning time on information literacy tasks.

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Jonassen, D. H., Peck, K. H., Wilson, B. G. & Pfeiffer, W. S. (1998). *Learning with technology: A constructivist perspective.* New York: Prentice Hall.

Jonassen, D. H. (1993). Evaluating constructivist learning. In T. M. Duffy and D. H. Jonassen (Eds.), *Constructivism and the technology of instruction.* Hilsdale, NJ: Lawrence Erlbaum Associates.

Norman L. Webb, Ph.D., is a Senior Research Scientist for the Wisconsin Center for Education Research of the University of Wisconsin-Madison. His current primary area of research is the evaluation of systemic reform and he directs a number of projects in this area. He served as a consultant on the National Evaluation of the Library Power project.

Methods in Case Study Research for School Library Media Evaluation. Case study research methodology provides one means for studying school libraries and their connections with curriculum, policy, and other system components. Basic techniques will be described including identifying informants, structuring questions, conducting interviews, analyzing data, and aggregating data from multiple sites. Examples will be drawn from the

evaluation of the Library Power Program. Those who attend will be encouraged to actively participate in discussion.

Jennifer Branch, Ph.D., is the Coordinator of the Teacher-Librarianship by Distance Learning Program and an Assistant Professor in the faculty of Education at the University of Alberta. She was a teacher and teacher-librarian in remote Northern Canadian communities working with Aboriginal students of Inuit and First Nations backgrounds.

Frances Jacobson Harris, M.L.S., is Librarian and Associate Professor at University Laboratory High School, University of Illinois at Urbana-Champaign. She team teaches a required computer literacy course for eighth grade students, which includes information literacy and Internet ethics components. http://www.uni.uinc.edu/library/computerlit Her current research is in the area of young adults and Internet ethics.

Nancy Everhart, Ph.D., is an Associate Professor and director of the school media program at St. John's University in New York City. Her research focuses on evaluation of school library media programs. She is the author of *Evaluating the School Library Media Center: Analysis Techniques and Research Practices* and numerous professional journal articles. She serves on the Editorial Board of *School Library Media Research* as Associate Editor for Award Winning Dissertations Review and as the column editor for "Research Into Practice" for *Knowledge Quest.*

Dr. Carol Gordon is Head of the Educational Resources Library and Associate Professor at Boston University. After receiving her BA from Notre Dame College of St. John's University, she taught English on the secondary level in New York City where she also earned a Master of Arts degree from Richmond College, City University of New York. Carol worked as a school library media specialist in K-12 schools in Michigan and Massachusetts after receiving her Masters in Library Science from Western Michigan University. She worked in Germany as Director of Library and Information Services for Frankfurt International School. While writing her

dissertation for a doctoral degree in Curriculum and Teaching from the School of Education at Boston University she was school library media specialist at the American School in London. Carol currently serves on the Executive Board of the American Association of School Librarians as Member-at-Large and on the Executive Board of the New England Educational Media Association. She is the author of *Information Literacy in Action* and has published articles in *School Library Media Research, Knowledge Quest, SCAN, ECIS Magazine, A Bridge to the Middle, Open Road,* and *The Georgia Library Media Educator.*

James C. Baughman, Ph.D., is full Professor of library and information science at Simmons in Boston. Before joining Simmons, he was Supervisor of school libraries for the state of Massachusetts. He has served on the Committee on Accreditation and as its chair. He is listed in *Who's Who in America.*

Research Methods to Measure Student Achievement and School Media Programs. An exploration of the techniques (methods) common to the several studies (Colorado I and II, Alaska, Pennsylvania, Massachusetts, and Texas) drawing a relationship between academic achievement (as measured by test scores) and the provision of school library resources will be made. The philosophical principles that distinguish these research studies from glad tidings and testimonies will also be examined. Looking at the veritable results of these studies in an ambitious way might lead to insights into procedures in formulating concepts and hypotheses, making observations and measurements, building models and theories, and providing explanations and predictions.

Chad Galloway, M. Ed. Chad received his B. A. and M. Ed. In Mathematics Education from Clemson University, and is currently pursuing a Ph.D. in Instructional Technology from the University of Georgia. His primary research interest is the evaluation of technology-based grant programs.

Anna M. Martinson, M. L. S., is a doctoral student in Information Science at the School of Library and Information Science at Indiana University. She is specializing in computer-mediated communication and has taught courses on "Gender and Technology" and "User Needs and Behavior in Theory and Practice."

Rebecca K. Scheckler, Ph.D., is a post-doctoral fellow in the Center for Research on Learning and Technology at Indiana University. There she does discourse analysis and ethnography of the Inquiry Learning Forum, an online professional development environment for math and science teachers.

Gender Issues in the Design and Analysis of an Instructional Web Site.
Instructional design for the World Wide Web must meet at least two requirements in order to succeed: the content must be useful to the learners, and the design of the site must facilitate its use. A question too seldom asked, however, is "useful to, and use by, which learners?" This presentation reports on the analysis of the effects of gender in a multimedia web site designed to foster professional development among pre-service and in-service secondary math and science teachers. The site casts secondary teachers and teacher-in-training in the role of learners vis-à-vis the site developers, researchers at the School of Education of a major U. S. public university.

The site, the Inquiry Learning Forum (ILF), contains resources about curricula and instructional technology, discussion forums, and videotaped clips of selected teachers in their classrooms. Our analysis – part of a larger ongoing project investigating participation and community in the ILF – focuses on gender at multiple levels of representation on the site: the membership of the ILF, which is predominantly female, the video clips (both the gender of the videotaped teachers, and the gender of the students); and the e-mail forums where members discuss the video clips. This approach enables us to identify a number of ways in which the design and content of the site, including the content of the video clips, construct an environment that is subtly but pervasively biased towards male learners.

In this presentation we propose first to introduce the site, identify our research questions, and give an overview of the principal findings of the study, pointing out their implications for the design of female-friendly

instructional web sites. The second part of the presentation focuses on the methodological issues raised by the analysis of gender on a multimedia instructional web site. The study makes use of both qualitative and quantitative methods of content analysis, including methods designed specifically for analyzing video clips and e-mail exchanges. We will discuss how we selected methods for analysis, and in some cases, how we designed them when no pre-existing methods were available. We bring a variety of disciplinary perspectives to bear in this task, ranging from computer-mediated discourse analysis to human-computer interface design to feminist pedagogy. By explicating the methodological issues underpinning our collaborative research process, we aim to provide a useful model for beginning researchers interested in instructional design involving the World Wide Web.

Nancy P. Thomas, Associate Professor at Emporia State University, earned her Ph.D. in Communication, Information and Library Studies at Rutgers, The State University of New Jersey. She holds a masters degree in History from Northwest Missouri State University, as well as bachelors degrees in Library Studies and Education (Secondary Social Studies) from Northwest Missouri State, and Political Science from the University of Nebraska at Lincoln. Her dissertation was an interpretive study, which applied communication theory to the design of library facilities. Before attending Rutgers, Nancy served as a library media specialist in a pre-K-6 school in Missouri. From 1993 to 1996 she served as the Director/Consultant for the Library Power Project in Paterson, New Jersey, funded by the De-Witt Wallace Reader's Digest Fund. Her teaching and research center on information psychology, school library media program management, and information transfer among children and special populations. Her publications include a book for Libraries Unlimited/Teachers Ideas Press: *Information Literacy and Information Skills Instruction: Applying Research to Practice in the School Library Media Center.*

Daniel Callison, Ed.D., completed his doctoral studies in Instructional Systems Technology at the School of Education, Indiana University, in 1982. After 20 years of teaching and research at Indiana University Bloomington, Danny has assumed the roles of Professor and Executive

Associate Dean for SLIS at Indiana University Indianapolis. Since July 1, 2001, the Indianapolis program, accredited by ALA with Bloomington, has grown from 160 to over 300 students seeking graduate degrees in management of library information technology and instructional media. Danny has served on dozens of Ph.D. committees and has directed dissertations for former students who now serve on the faculty at the University of Hawaii and Oklahoma State University. He is founding editor of *School Library Media Research*, the online, referred research journal of AASL.

Join us for Memorial Day festivities. We have specials available Friday, May 24th through Monday, May 27th. Call us for details on offerings for these dates. We have outdoors activities scheduled throughout the weekend. Whether it be relaxing at our outdoor pool or grilled burgers and dogs, we have it covered. 1-800-TheElms.

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266

About The Elms Resort & Spa

The Elms Resort & Spa offers a premier meeting and conference venue that uniquely blends yesterday's ambiance with today's needs. Guests and meeting attendees experience the charm of a historic retreat plus the many thoughtful amenities and services of a contemporary hotel.

The Elms Resort & Spa is situated on 16 acres of gently rolling hills above the Fishing River in Excelsior Springs, Missouri. It is just 30 minutes from Kansas City International Airport and the Kansas City downtown business and convention district.

The property was originally built in 1888 as a luxury resort featuring mineral waters believed to possess healing powers. It was a wide, wooden veranda structure, with pine interior and hand-made terra cotta fireplaces. Twice destroyed by fire around the turn of the century, the present Elms was rebuilt of native Missouri limestone and opened for business on September 7, 1912. Its colorful history bears silent witness to the famous and not-so-famous who met or visited here in an earlier day. The Elms' glory is one of serving its guests' diverse purposes: a Presidential retreat for FDR and Harry S. Truman; a training facility for Jack Dempsey; a getaway for Al Capone; and a spectacular venue for galas hosted by the who's who of early Kansas City society.

In its present restored state, The Elms Resort & Spa offers a unique, pastoral setting in which to enjoy the ultimate in lodging comforts and convenient access to the Kansas City metropolitan area. Come, reserve your group's place in history.

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Features

The Elms Resort & Spa offers 152 guest rooms (of which 42 are suites).

Typical Guest Room

Accommodations

- Communications system with voice mail and dataport
- In-room coffee maker
- In-room iron and ironing board
- Hair dryer

Club Level Lounge

Guest services

- Concierge services available - Club Floor only
- Transportation services available
- Complimentary self parking
- Business center services available
- Safety deposit box
- Room service (available weekends only)
- Gift Shop

For Information, Reservations or Gift Certificates

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268

Spa Services

In today's health conscious society people are looking for true and natural therapies to refresh their minds and to help them feel good all over. We invite you to rediscover yourself and enjoy the benefits of total well being.

Our heritage of service celebrates a cultural blend of time-honored healing practices discovered by the local Indians of Excelsior Springs. Their lives were lived in balance with the rhythms of nature combining the health benefits of the local mineral water springs and the healing properties of herbal medicine. The legacy of their testimony has inspired our unique menu of extraordinary spa services. Our concept... to rebalance with water and to restore with the essences of plants. The waters begin the process of transformation and the essences of plants continue the momentum. Ageless traditions brought to our modern world. Our selections of spa menu services are brought to you by the uncommon expertise of our team of qualified and professional therapists. Relax and enjoy. Every treatment is a pleasure, an aria of sheer rejuvenation and deserving rest.

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THE POWER OF THE HEALING WATERS

Resource and rediscover yourself in our healing water, a natural mineral pool to soothe, warm and relax your spirits before your spa journey begins. We invite you to indulge yourself in this perfect compliment to your spa experience and take a moment for yourself. The remineralizing benefits of our pure mineral waters will prepare you for your treatments ahead. We recommend to arrive 30 minutes early and don't forget your bathing suit, we're coed.

CAPTURING THE ESSENCES OF PLANTS

Aromatherapy, the art and science of the therapeutic use of the life-blood essences of plants, these precious oils are extracts obtained from the roots, bark, leaves and flowers of aromatic plants. Containing powerful healing and mood-altering characteristics, we unleash their nurturing properties through a selection of facials, masks, body scrubs, herbal wraps and customized massage. Pure and natural, these subtle fragrances will bring sheer pleasure to your overall experience with us.

FACIAL CARE

Our holistic method of attaining beautiful skin is tailored to suit the individual needs and desires of each client. All services are easily adapted to skin type, age and overall condition. Each facial commences with a back diagnostic; a unique process inspired by Oriental tradition, using digito or "finger" pressure, often referred to as Shiatsu. This approach allows our trained estheticians to isolate areas of stress and determine a specific skin care regime

AROMAPLASTY for all skin types 25minutes - $55

Multi-active skin care treatment promotes deep nourishment and hydration that revitalizes the skin at all

levels. Your expert skincare therapist will customize your facial based on your skin type.

NUTRI-SOIN for dry and dehydrated skin 50minutes - $75

An innovative treatment to restore and nourish water and nutrient starved skin. The skin immediately regains a feeling of comfort and suppleness while fine lines and wrinkles are smoothed away.

HARMONIE EXTREME for sensitive and reactive skin 50minutes - $75

A prescription for even the most delicate of skin types. This treatment calms, soothes and refreshes your skin's tolerance – offering it a moment of peace.

REGULATING FACIAL for oily skin 50minutes - $75

This treatment utilizes a complex of highly concentrated, specifically targeted ingredients designed to absorb excess sebum and dissolve and eliminate impurities.

ULTIMATE RELAXATION FACIAL for all skin types 60minutes - $100

This calming and relaxing experience includes a customized facial based on your skin type and then continues with a face, neck and shoulder massage. A hand and foot paraffin dip along with a foot and leg massage is included.

BODY CARE

Purely exotic body treatments from around the world customized to leave your skin feeling soft, smooth, and enriched with nature's abundant goodness. Cocoon yourself in one of our full body experiences. All services include exfoliation, wrap and scalp massage.

From the Earth a full body wrap 50minutes - $110

This thick, creamy body mask composed of clay and enzymes provides gentle exfoliation, detoxification and conditioning of the skin. A perfect way to renew and rebalance your body. This service is concluded with a Vichy shower.

From the Sea a full body wrap 50minutes - $110

Seaweed plants and essential oils are combined in this complete body wrap. Designed to improve circulation and eliminate toxins, this treatment also redefines the body contours. This service is concluded with a Vichy shower.

Aloe Tea Tree Wrap a full body wrap 50minutes - $85

Combinations of warm essential oil and aloe vera gel soothe and heal damaged or dry skin. You will love how soft and wonderful your skin feels after this treatment! A head and foot massage accompanies this service

Massage and Aromatherm a massage and full body wrap 75minutes - $ 150

We offer a selection of four unique essential oil wraps that focus on relaxation, detoxification,

revitalization or circulation. Your therapist will assist you in selecting the blend of aromatic oils just right for you. A 30minute massage begins this wonderfully relaxing treatment.

Scalp Treatment and Massage 25minutes - $55

Our scalp massage is a mosaic of various techniques from eastern philosophies that guarantee instant relaxation. Warm aromatic oils are applied to the head, neck, shoulders and scalp comforting the skin and soothing the senses. A luxurious addition to any service or perfect pleasure just by itself.

MASSAGE CARE

The primary goal of massage is to encourage relaxation, healing and well being through touch. We believe regular massage alleviates symptoms of stress, bringing balance to your life. Our team of professional massage therapists combines a variety of techniques to promote relaxation, relieve muscle tension, improve circulation and reduce anxiety.

Head, Neck & Shoulder Massage 25minutes - $55

Enjoy a relaxing upper body massage designed to immediately relieve stress and tension.

Sulis Massage 50/75minutes - $75/$110

Our highly skilled and dedicated professional massage therapists combine various massage techniques based on traditional therapies to ease tension, relieve stress and promote a general state of well-being. Please indicate a lighter or stronger bodywork style based on your individual preferences.

Deep Tissue Massage 50/75minutes - $85/$120

For those chronic areas of pain, try a deep tissue massage. Using a variety of techniques, the therapist will address your specific areas of need to release and relax your tired muscles. (Not a full body massage).

Sports Massage 50/75minutes - $85/$120

Designed to prepare the body for a sporting event and/or to help in the recovery process after an event. It specifically works to loosen and stretch the appropriate muscle groups used in the event. (Not a full body massage).

Spirit of Renewal 50minutes - $85

Ayurveda is believed to be the oldest healing science in the world. Its principles are based on the theory that each person had a combination of physical, mental and emotional characteristics. These doshas, as they are called, must be in harmony to live a healthy life. This Ayurvedic treatment begins with a localized relaxation and grounding massage followed by a cascading stream of herbally infused oil applied to the forehead to clear psychic pollution and restore an inner calm to the mind while balancing emotions and soothing the nervous system.

Reiki 90minutes - $110

Reiki is a Japanese word meaning "Universal Life-Force-Energy". The "Ki" part is the same word as Chi or Qi, the Chinese word for the energy which underlies everything. Reiki is a system for directing that energy to someone for the purpose of relaxation, stress reduction and healing. Reike works to aide body's natural ability to heal itself on all levels, physical, mental, emotional or spiritual. We are proud to offer our guests this service performed by a Reiki master.

Reflexology 25minutes - $65

This Chinese compression foot and hand massage is based on stimulation of specific points of the body to affect and benefit various areas or organs of the body.

Aromatherapy Massage 75minutes - $120

This beautiful, aromatic massage combines the powers of sandalwood, incense, and myrrh with the healing traditions of Swedish massage. Experiences that will awaken your senses, soothe your body, and restore your spirit.

River Rock Massage 75minutes - $120

Following tradition that has been used by many cultures throughout the ages, this massage uses warm, smooth stones in conjunction with aromatic oils to produce a deep sense of relaxation while ridding your body of it's aches and pains.

Couples Massage 50/75minutes - $150/$200

Enjoy one of our many massages with a partner or a friend in a special treatment room built for two.

HEALING WATER CARE

The Bath

Our baths represent the very essence of pleasure and well being. This exceptional multi-therapeutic experience provides you with an underwater jet massage while enjoying the pleasures of your own private bath. We enhance your experience by adding highly active seaweed and essential oils to stimulate circulation and tone the skin and body. The effect will leave you feeling invigorated and surprisingly relaxed. A great service to discover all by itself or in conjunction with a massage.

Serenity Bath with Moisturizing Milk and Essential oils 20minutes - $35

Recommended as an anti-stress treatment. Brings equilibrium, balance and a sense of calm back to the body and mind.

Energizing Bath with Uplifting & Refreshing Essential Oils 20minutes - $35

Recommended as treatment to fight fatigue and restore energy and vitality. Beneficial during moments of overwork and exhaustion also combats feeling of jet lag.

Fitness Bath with Sulis Signature Mud 20minutes - $55

Recommend as a soothing and relaxing experience designed to relieve sore muscles through enhanced circulation of the blood and lymph systems. A great precursor to a deep tissue massage.

The Vichy Shower Rain Massage 25minutes - $55

Vichy shower originated in the small French Village of Vichy. This unique hydrotherapy device massages you while lying under multiple showerheads carefully positioned on the entire body. The alternating pressures of the rain-like shower in addition to the light temperature fluctuations of the water provide you with a serene, peaceful and relaxing experience.

Salt Scrub 50minutes - $85

Begin with an exfoliation of the entire body using a wonderful mixture of essential oils and sea salts that lightens and purifies the top layers of the skin. The treatment is concluded with a Vichy shower, leaving your skin feeling silky and smooth to the touch.

Sugar Scrub 50minutes - $85

Our special seasonal treatments features organic sugar mixed with fresh botanicals and a synergistic blend of essential oil which are massaged in a circular motion to cleanse, exfoliate and invigorate you. The treatment is concluded with a Vichy shower. Your spa reservationist can provide you with more detailed information based on the season.

Sulis Signature Scrub 50minutes - $85

First we massage your body with our exclusive blends of lemongrass and orange essential oils. Sea salt is then sprinkled over the body to enhance the sensory factor. Next we gently rub this mixture in a circular motion to cleanse deeply, exfoliate and invigorate. The treatment is concluded with a Vichy shower.

NAIL CARE

Regardless of shape or length, well-manicured hands and feet say a lot about your overall appearance. Our nail treatments are designed to make your nails as healthy as possible. This natural approach will help you achieve beautiful hands and feet and leave your skin feeling smooth and soft. Service length varies with individual needs and are generally 30 to 45 minutes.

Classic Manicure $25

This traditional manicure includes a cuticle soak; a hand and arm massage, nail shaping and enamel application.

French Manicure $35

This is a classic Manicure with a French polish application at the end. Great for a natural look.

Signature Spa Manicure $55

This is a classic manicure that begins with a gentle skin exfoliation, massage with a specialty lotion and a warm paraffin dip. Includes a perfect nail shaping, a push back of the cuticles and application of enamel.

Classic Pedicure $55

A traditional pedicure that includes a special soak in a whirlpool bath followed by an exfoliation of the skin from the knee down, an invigorating foot and calf massage and of course a nail shaping, a push back of the cuticles and application of enamel.

Signature Spa Pedicure $65

A classic pedicure that begins a special soak in a whirlpool bath followed by a gentle skin exfoliation from the knee down, massage of the foot and calf with a specialty lotion and warm paraffin dip. Included is a perfect nail shaping, a push back of the cuticles and application of enamel.

ADDITIONAL SALON SERVICES

SHAMPOO AND STYLE - $30	PARAFFIN DIP - $10
LADIES CUT - $35	MAKE-UP APPLICATION - $25 +
MEN'S CUT - $20	WAXING - $15 +

MAKE THE MOST OF YOUR SPA EXPERIENCE

Commonly asked questions.

How early should I arrive for my treatment?

You want to arrive as early as you can for your treatment in order to take advantage of all of the wonderful amenities that Spa Sulis has to offer. Please keep in mind that your late arrival will determine the length of your treatment time. Your service will end as scheduled, so that the next guest may begin on time.

What if I'm running late? Can I cancel at any time?

Cancellations received less than 24 hours prior to treatments will be charged 50% of the treatment price. Without notification full price will be charged.

Can I request a male or female therapist?

Absolutely! We will always try to accommodate a guest's request. Please keep in mind that all of our therapists are highly trained and that you will be properly draped throughout your treatment.

What should I wear to my treatment?

We suggest that you undress to your level of comfort and communicate with your therapist any concerns and or issues that you might have. Robes and lockers are available for your convenience, but please try and leave your valuables in your room.

What if I'm pregnant?

Receiving spa treatments is a wonderful way to take care of yourself throughout your pregnancy. However, it is important that you notify both the spa reservation as well as your therapist so that we can book the most appropriate services for your condition.

How Old Do I have to be to receive a treatment?

Guests 18 and older with scheduled treatments have complimentary use of the Spa facilities. Use includes locker rooms, fitness area, spa pool, and sauna. The pool is available to guests of all ages when accompanied by an adult.

What About Gratuities?

Gratuities are not included in your service price and are left to the discretion of individual guests. A gratuity of 15% to 20% may be used as a guide.

What Are the Hours Is the Spa Open?

The spa is open from 8:00 am to 6:00 pm Sunday through Thursday and until 9:00 pm on Friday and Saturday. Please call the Spa for reservations or other information at 816.630.5500.

*** Price and services are subject to change without notice. Advance reservations required. Spa gratuity not included in prices. 4/5/02

For Information, Reservations or Gift Certificates

Call 816-630-5500 or 1-800-THE-ELMS (843-3567)
816-630-5380 (Fax)

Use our Request for Information Form

Online Reservations Cancel Reservations

275

Dining and Entertainment

The atmosphere of our restaurants is one of relaxed elegance. The Elms offers a wide variety of dining experiences for your pleasure.

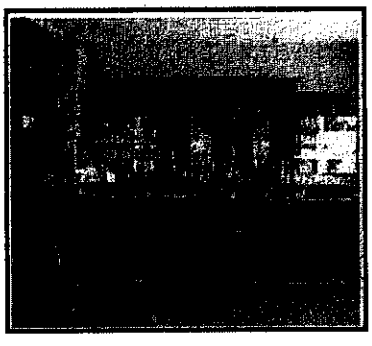
Dining:

- ADEGA - offers an Original American Cuisine Created with a Fresh Passion for the Enlightenment of your Senses Contact us at 816-629-2550 or 816-630-5500
- The Dining Room - enjoy breakfast, lunch or dinner assured to please your palate
- The Library Lounge - located on the second floor where you can enjoy your favorite cocktail and scenic view of the grounds
- Lobby Lounge - the perfect place to meet and unwind
- Join us for our Sunday Vodka Buffet (11am to 2pm)

Click on the images below for full sized pictures

Adega

Dining Room



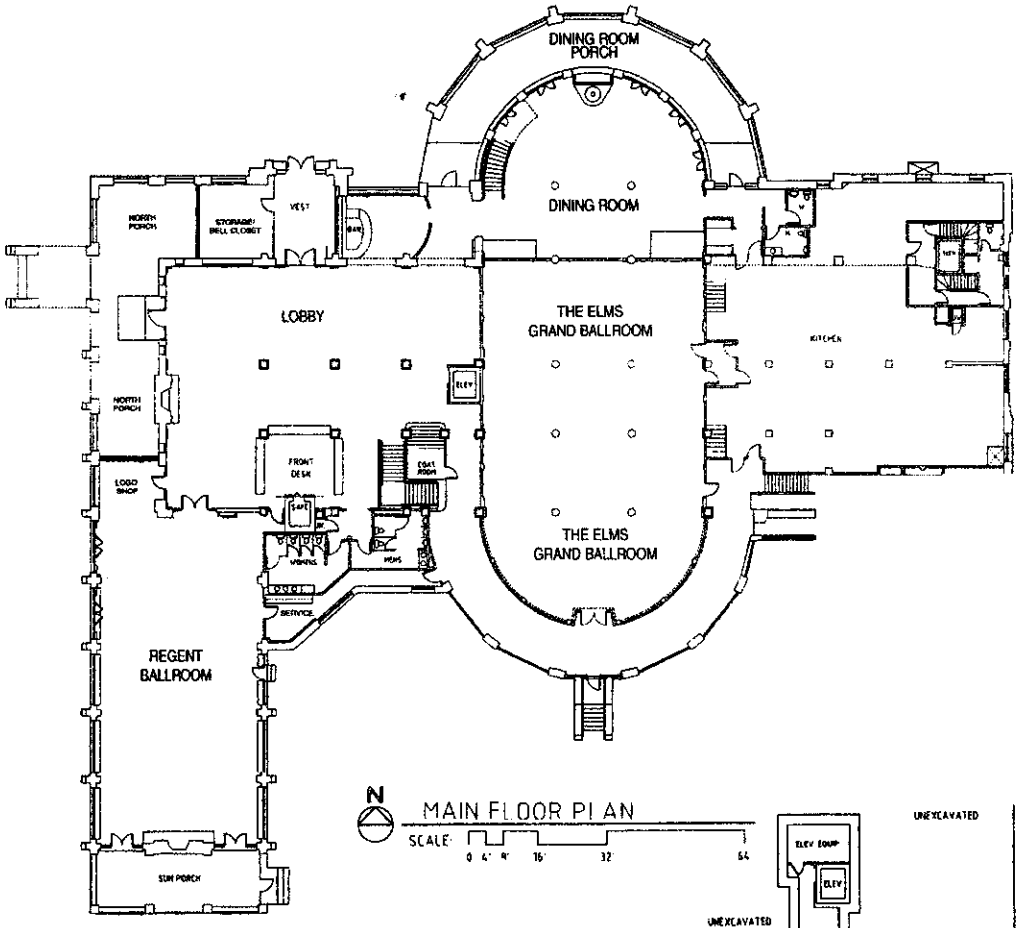
Lobby Lounge

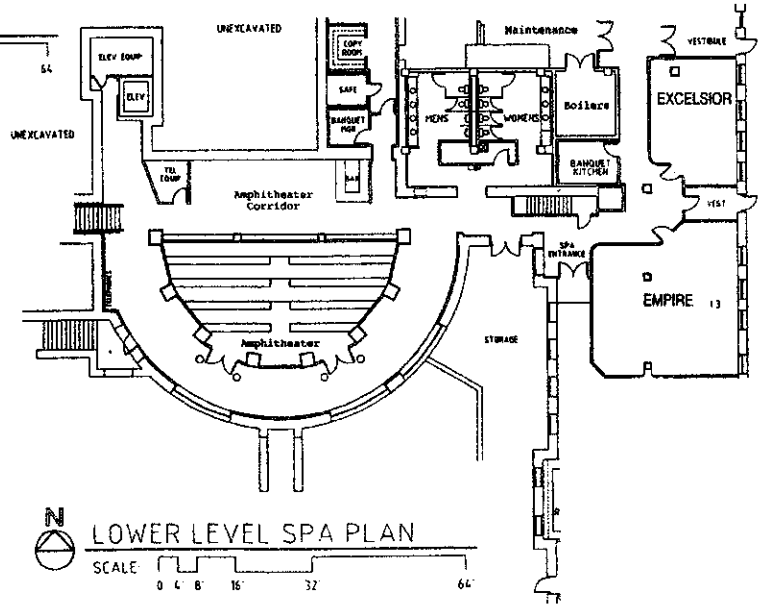
Entertainment:

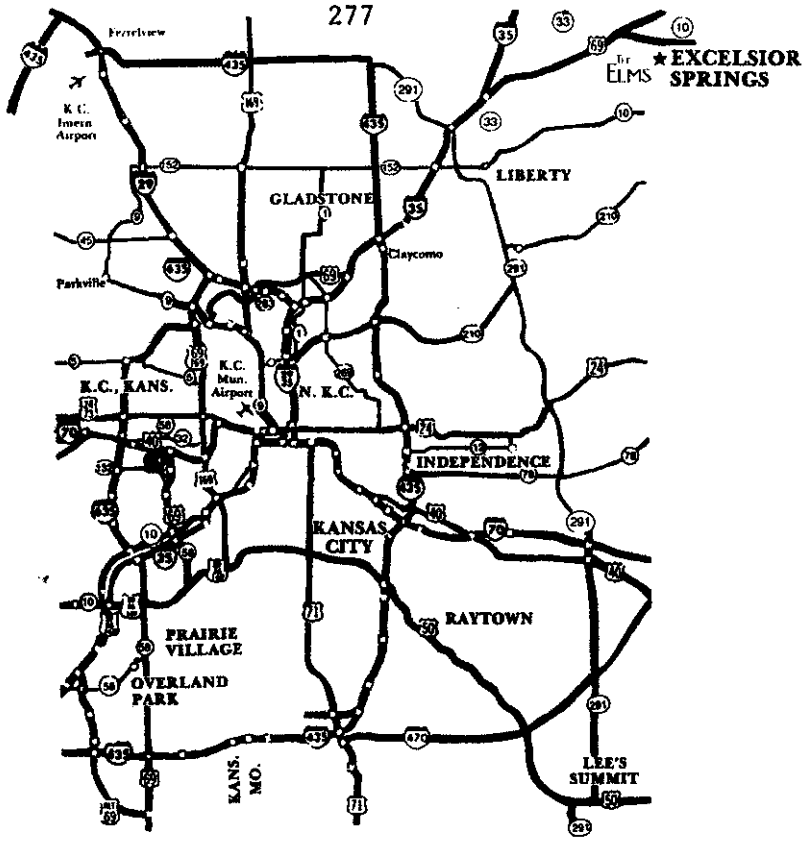
- Ask us about our schedule of upcoming events and entertainment
- "Fun in the Sun by the outdoor pool". Enjoy your favorite cocktail poolside while tanning or perhaps one of our new Spa treatments or Spa snacks
- Other outdoor summer recreational activities available, see Fitness and Recreation page

Excelsior Springs & Special Events:

MEETING ROOM	SQUARE FEET	WIDTH X LENGTH	CEILING HEIGHT	BANQUET	THEATER	CLASS ROOM	CONFER-ENCE	U-SHAPE	HOLLOW SQUARE
THE ELMS GRAND BALLROOM	3,900	50' X 78'	14'	390	490	315		50	60
EMPIRE	810	30' X 27'	8'	90	100	65	40	30	36
CARRIAGE HOUSE	1,247	43' X 29'	10'6"	100	125	80	50	40	45
AMPHITHEATER	1,176	24' X 49'	12'			70	70		







DIRECTIONS FROM KANSAS CITY

I-35 North to Exit 20, the Excelsior Springs exit via 69 Hwy. Follow 69 Hwy. 10 miles to Route 10. Follow Route 10 East to Elms Boulevard. Turn right and proceed to intersection of Elms Boulevard and Regent Street.

DIRECTIONS FROM KCI AIRPORT

Exit airport on I-435 East toward St. Louis. Exit 291 Hwy. toward Liberty to I-35 North. Take Exit 20, the Excelsior Springs exit via 69 Hwy. Follow 69 Hwy. 10 miles to Route 10. Follow Route 10 East to Elms Boulevard. Turn right and proceed to intersection of Elms Boulevard and Regent Street.

THE ELMS
RESORT & SPA

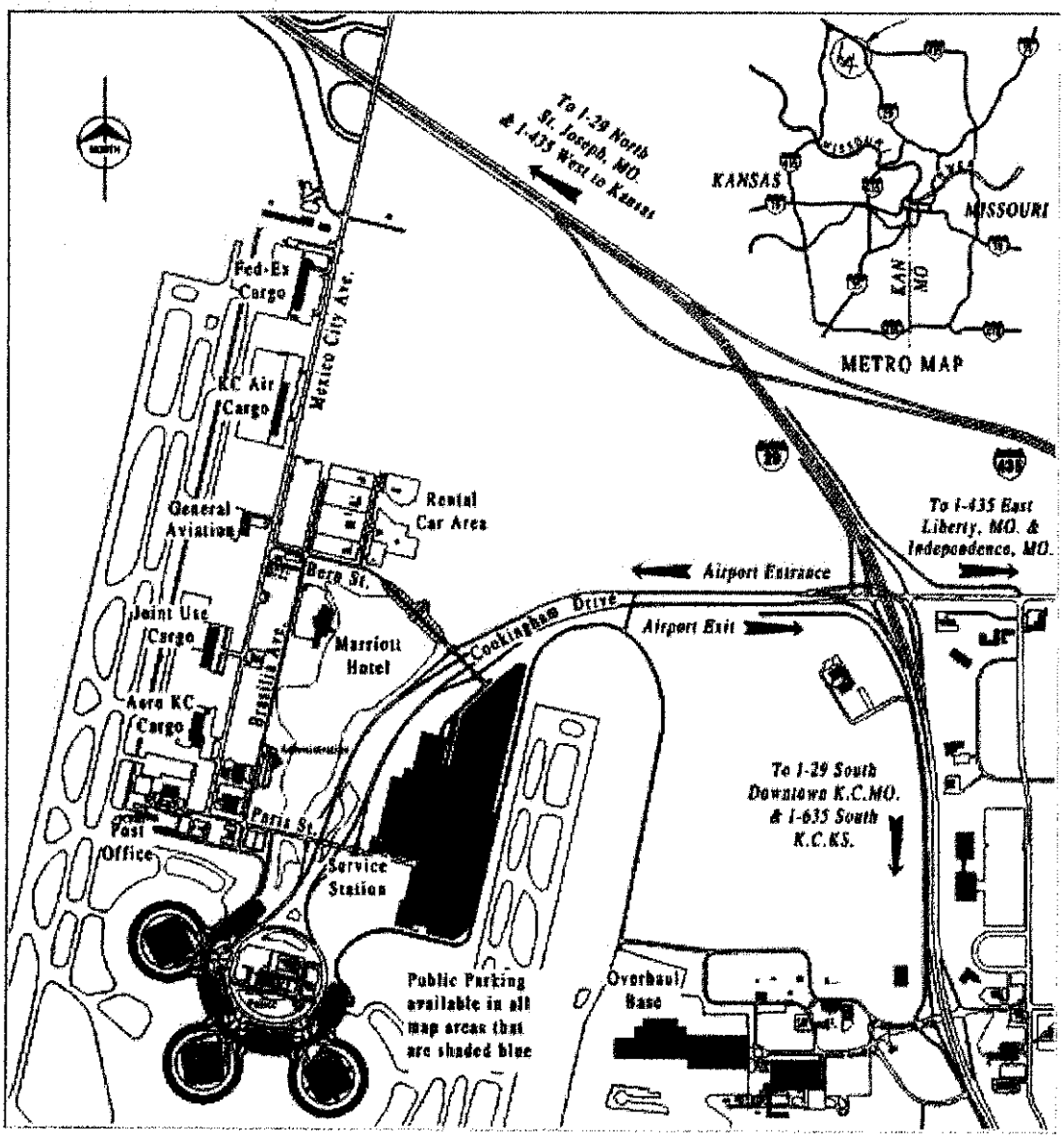
The Elms Resort & Spa
401 Regent
Excelsior Springs, MO 64024
816-630-5500 FAX 816-630-5380

278

City of Kansas City, Missouri Aviation Department

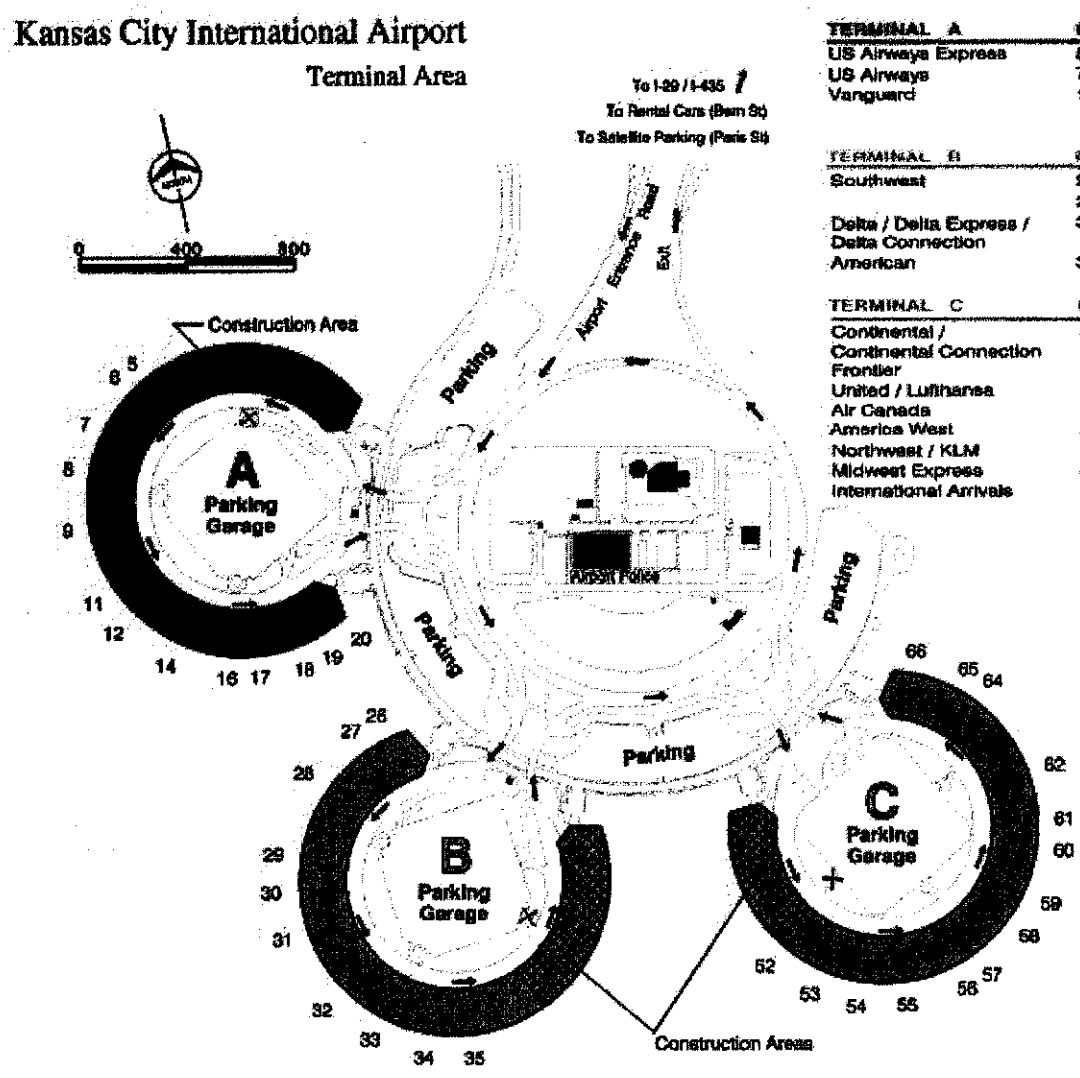
Parking | Airport Map | Airlines | Flights | History | Air Cargo
Map of Area | Business Opportunities | Ground Transportation | ADA Accessiblity | Home

Kansas City International Airport Map



Terminals

Click on the specific terminal for a closer look.



TERMINAL A	GATES 1-20
US Airways Express	5,6
US Airways	7,8,9
Vanguard	16,17a,17b,18,19,2

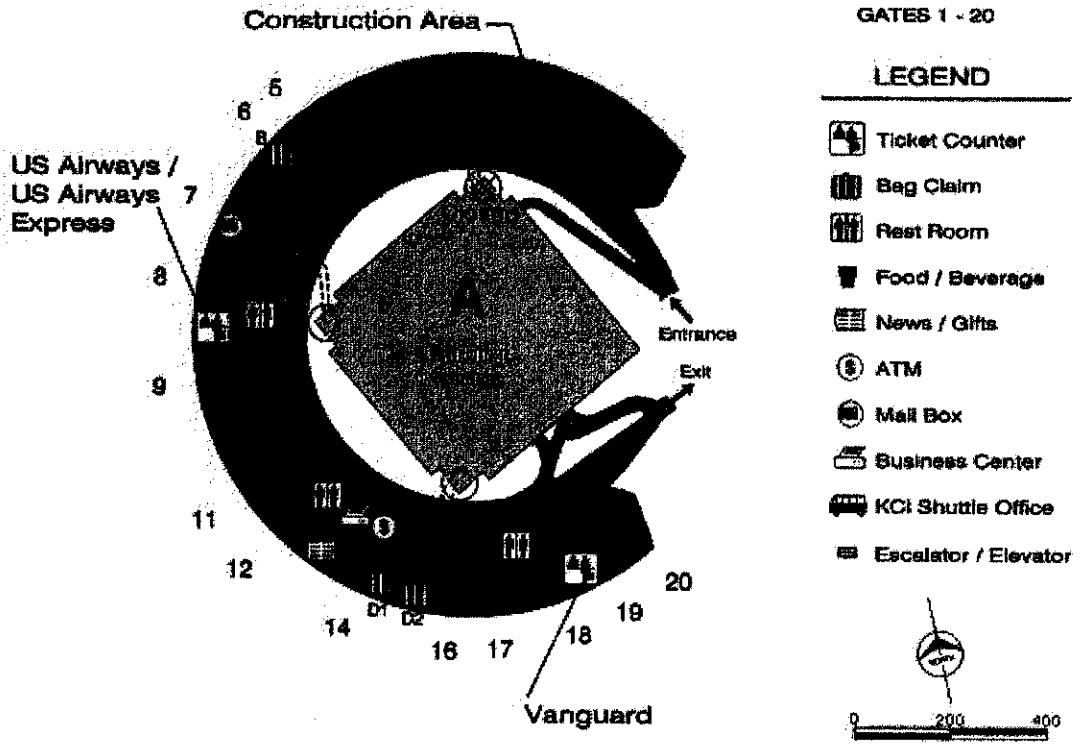
TERMINAL B	GATES 26-40
Southwest	26,26a,27,28,28a, 29,30,31,31a
Delta / Delta Express / Delta Connection	32,32a,33,34a
American	34b,35,36a,36b

TERMINAL C	GATES 50-66
Continental / Continental Connection	52,53
Frontier	52
United / Lufthansa	54,55,56,57
Air Canada	
America West	58,59
Northwest / KLM	60a,60b,61
Midwest Express	62,64,65,66
International Arrivals	66

Click here to return to the airport map.

280

Terminal A

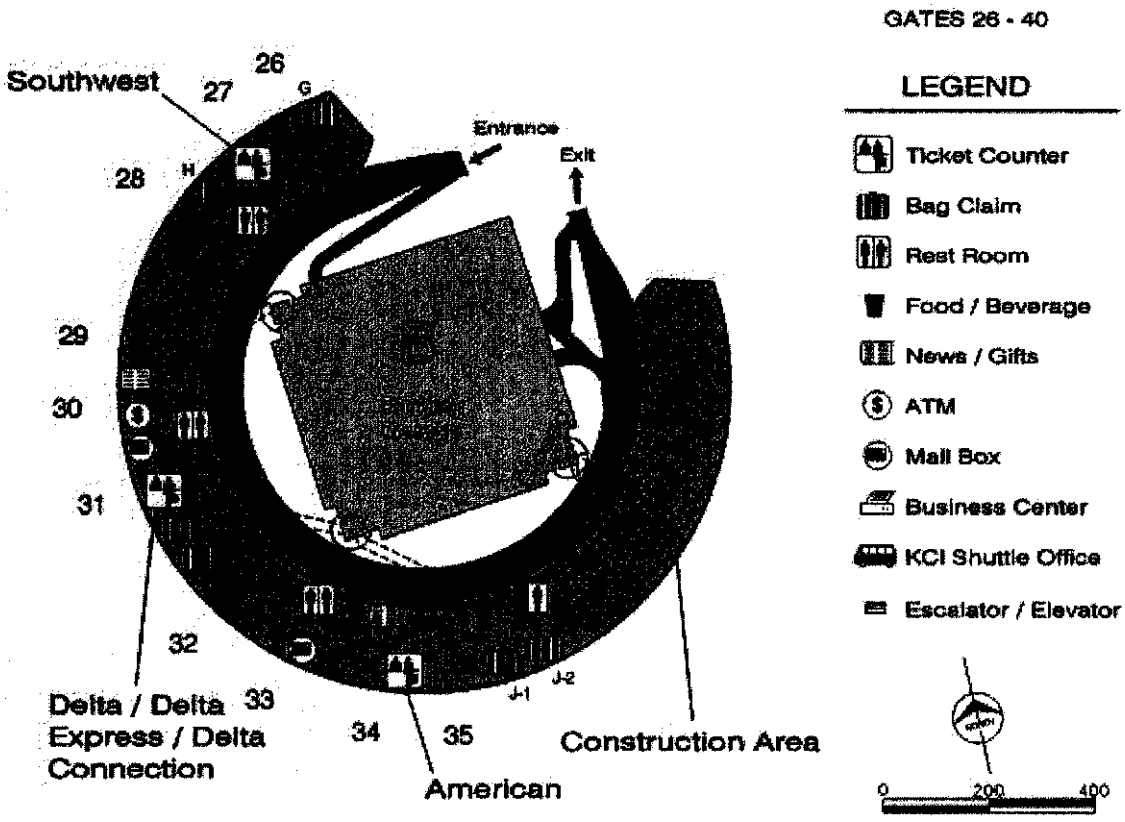


Click here to return to terminals map.

The TM10 Shuttle Vans will pick up and drop off near the KCI Shuttle icons noted above.

281

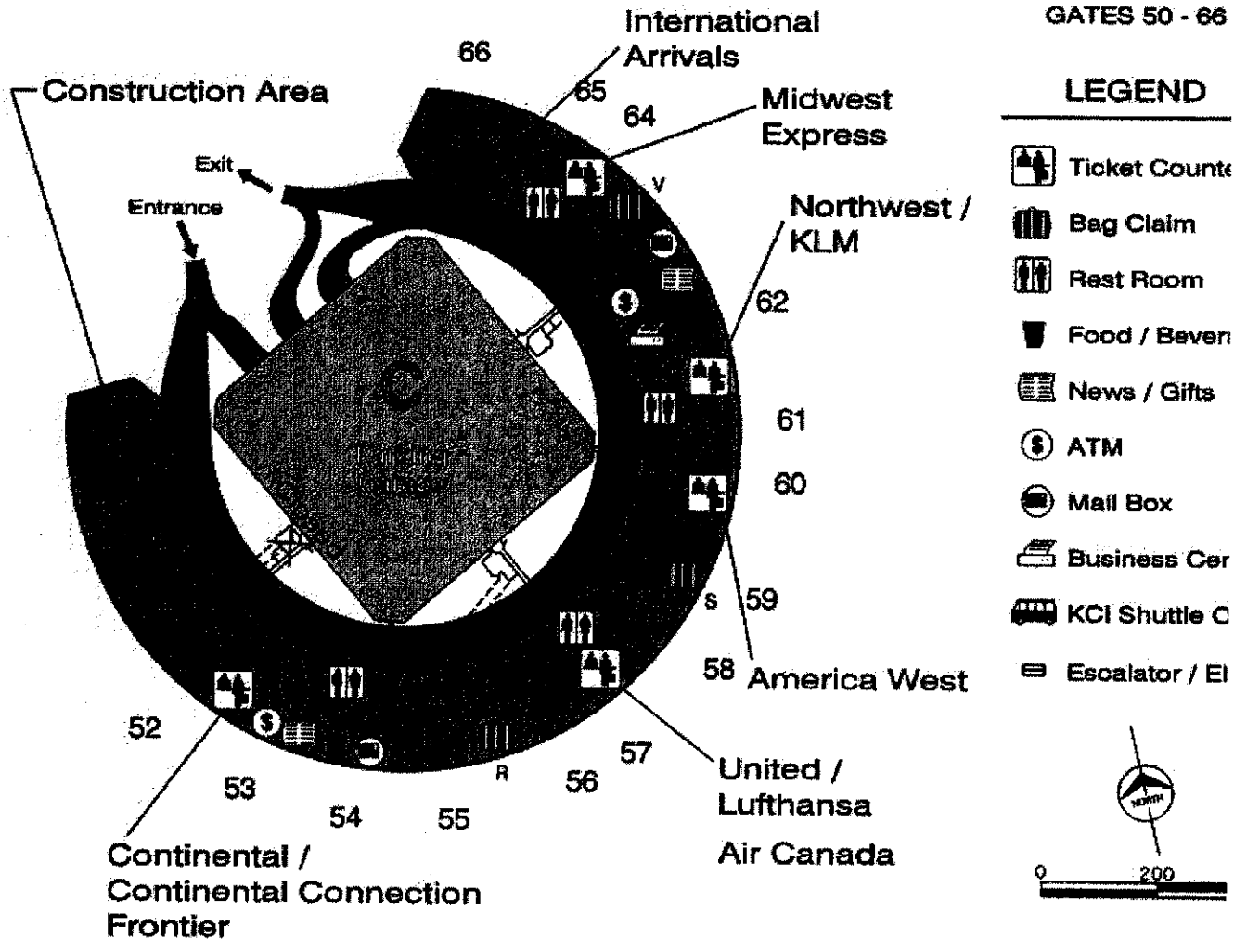
Terminal B



Click here to return to terminals map.

The TM10 Shuttle Vans will pick up and drop off near the KCI Shuttle icons shown above.

Terminal C



Click here to return to terminals map.

The TM10 Shuttle Vans will pick up and drop off near the KCI Shuttle icons shown above.

Selections from

School Library Media Research

An Official Journal of the American Association of School Librarians
http://www.ala.org/aasl/SLMR/index.html

Daniel Callison, Editor
Professor and Executive Associate Dean
School of Library and Information Science
Indiana University, Indianapolis
E-mail: callison@iupui.edu

Carol L. Tilley, Assistant to the Editor
School of Library and Information Science
Indiana University, Indianapolis
E-mail: ctilley@indiana.edu

CONTENTS

Writing for SLMR 2

Abstracts 3

Sample Articles from SLMR

Preschool Education through Public Libraries (Herb and Willoughby-Herb) 18

Toward a Conceptual Path of Support for School Library Media Specialists with Material Challenges (Hopkins) 53

School Library Media Specialists' Perceptions of Practice and Importance of Roles Described in Information Power (McCracken) 76

Constructing Mental Model Paradigms for Teaching Electronic Resources (Tallman and Henderson) 97

WRITING FOR SLMR

As the scholarly refereed journal of the **American Association of School Librarians,** SLMR seeks to distribute major research findings worldwide through both electronic publication and by linking to substantive documents on the Internet. **SLMR seeks manuscripts that will provide researchers and practitioners with concepts and ideas that will enhance school library media programs.**

Manuscripts may be based on **original research, an innovative conceptual framework,** or **a substantial literature review** that opens new areas of inquiry and investigation. The primary audience for SLMR includes academic scholars, school library media and instructional specialists, and other educators who strive to provide **a constructive learning environment for all students and teachers.**

Manuscripts are reviewed through a **blind referee process,** which involves reviewers from the academic ranks of library education and established professionals in building-level, district, or state-level library media services. The review will involve three to five referees. The editor, in consultation with the editorial board, will have final responsibility for action taken on manuscripts.

The review process normally takes eight to twelve weeks. Only manuscripts that meet the extensive review criteria are published. Once published, manuscripts are open to continued review from readers of the scholarly community and practicing educators.

School Library Media Research is indexed by *H. W. Wilson's Library Literature* and by the *ERIC Clearinghouse on Information & Technology.*

Complete instructions for writing for SLMR—including review criteria, style guidelines, and submission format—are available online at **http://www.ala.org/aasl/SLMR/mspolicy.html**

We look forward to receiving your submissions.

Daniel Callison, Editor
callison@iupui.edu

Carol L. Tilley, Assistant to the Editor
ctilley@indiana.edu

ABSTRACTS

Propelling Young Women into the Cyber Age: Gender Considerations in the Evaluation of Web-Based Information

Volume 4 (2001)

Denise E. Agosto

(Assistant Professor, College of Information Science and Technology, Drexel University)

This paper discusses the results of a Douglass Project for Rutgers Women in Math, Science, and Engineering research grant titled "Leading Young Women to the Sciences and Technology," founded by the Toyota USA Foundation. The project resulted in the creation of the Gender-Based Web Site Evaluation Model for selecting Web sites of high interest to young women. The model includes eight evaluation criteria related to gender: social connectivity, flexibility and motility, contextuality, personal identification, graphic and multimedia concentration, collaboration, inclusion, and confidence. To develop this model, the project investigator analyzed related literatures, created a working model, tested the working model using group interviews with adolescent females, analyzed the group-interview transcripts using iterative pattern coding for qualitative data (Miles and Huberman 1994), presented the working model and data-analysis results to an expert panel, and subsequently created a revised model. The revised model and a list of questions to assist adult intermediaries in selecting Web sites for young women are presented and discussed.

http://www.ala.org/aasl/SLMR/vol4/gender/gender.html

Information Overload and Children: A Survey of Texas Elementary School Students

Volume 1 (1998)

Lynn Akin

(Adjunct Assistant Professor, School of Library and Information Studies, Texas Woman's University)

Information overload is a frequently mentioned negative consequence of the Information Age. Research on information overload focuses on adults and little exists on even whether children suffer from overload. Two hundred sixty-five Texas fourth and eighth graders responded to a survey asking them whether they had experienced information overload, what strategies did they use to reduce the overload condition, and what words would describe their feelings while overloaded. Suggestions to the school library media specialist include altering bibliographic instruction, identifying library behaviors, and considering information-fatigue-syndrome. Results are analyzed by grade level, gender, and content. This study is limited by the small number of subjects, extensive complexity of issues, and brief self-reports from young people of their perception of their own thoughts and feelings.

http://www.ala.org/aasl/SLMQ/overload.html

Children's Search Engines from Information Search Process Perspective

Volume 3 (2000)

Elana Broch

(Graduate Student, School of Library and Information Science, Rutgers University)

A crucial component to using the Web satisfactorily is locating what one is looking for. The paper begins with a description of some of the cognitive and affective characteristics of children and teenagers that may affect their searching behavior. It reviews some of the literature on children's searching in online public access catalogs (OPACs) and using digital libraries. The focus of the paper is on Web search engines. Two search engines are profiled. Some of the difficulties children have searching the Web are discussed in the context of the Kuhlthau's Information Search Process (ISP) model.

http://www.ala.org/aasl/SLMR/vol3/childrens/childrens.html

Locating Categories and Sources of Information: How Skilled Are New Zealand Children?

Volume 4 (2001)

Gavin Brown

(University of Auckland, Auckland, New Zealand)

The ability of New Zealand students to locate information using library structures and systems was measured through the standardization of six new Information Skills tests on students (N=5,400) in years 5 through 8. The paper and pencil tests are based on an information problem-solving perspective of the New Zealand Curriculum Framework Essential Skills. The tests focus on a formative exploration of students' understanding of the information skills involved in using library-related resources, specifically libraries, parts of a book, and reference sources. Girls, students in higher socio-economic schools, and students in higher year levels outperform their counterparts, though the literacy level of students is not controlled. The strengths and weaknesses of students are identified for each test. There is strong evidence from all six tests that students experience difficulty with sorting through the various dimensions of a search task in order to select an appropriate category (Dreher and Guthrie 1990), specifically the volume, page, or library section that the required information will be in.

http://www.ala.org/aasl/SLMR/vol4/newzealand/newzealand.html

Library Skills, Information Skills, and Information Literacy: Implications for Teaching and Learning

Volume 1 (1998)

James O. Carey

(Assistant Professor, University of South Florida)

One intent of national-level reports such as the Secretary's Commission on Secondary Skills and America 2000 is to foster approaches to the education of our children that go beyond factual information to conceptual learning; beyond isolated rules to principles for application; and beyond textbook problems with known, predictable solutions to real problems with solutions that are unique to students and their interpretations of their resources and environments. Discussions of higher-order learning are not new. Bloom's taxonomy includes analysis and synthesis skills. Bruner describes "problem finding," and Gagné distinguishes problem-solving and cognitive strategies as categories of learned capability, while constructivist thinking includes authentic, situated problem solving. Although abundant theoretical viewpoints exist, guidelines are still developing for designing teaching/learning strategies that ensure higher-order outcomes in information literacy. This paper will (a) review characteristics of learning outcomes and environments that define higher-order learning in information literacy, and (b) describe some guidelines from two branches of cognitive psychology for designing information literacy instruction. The paper closes with an appraisal of research trends and current practice in the teaching of information literacy.

http://www.ala.org/aasl/SLMQ/skills.html

Independent Reading and School Achievement

Volume 3 (2000)

Bernice E. Cullinan
(New York University)

This paper is a review of the research literature about the effects of independent reading on school achievement and the identification of common factors in programs designed to promote independent reading. The purpose of the review is to provide information to policy makers, curriculum developers, parents, teachers, and librarians about the importance of independent reading and programs that support it. Section 1 defines independent reading and describes its role in learning. Section 2 surveys research studies and evaluation reports assessing the effects of independent reading on learners. Section 3 describes programs designed to promote reading in schools, homes, and libraries. Sections 2 and 3 are organized by the age or grade level of the learners: preschool and kindergarten, primary and elementary grades, and middle school and young adults.

http://www.ala.org/aasl/SLMR/vol3/independent/independent.html

An Evaluation of the Documents Provided to School Library Media Specialists by State Library and Education Agencies

Volume 3 (2000)

Nancy Everhart
(Division of Library and Information Science, St. John's University)

One of the services state libraries and departments of education provide is information to assist the building-level school library media specialist do his or her job better. This study examines state documents for all fifty states and the District of Columbia in order to determine the types and relevancy of the information rendered. Relationships between the presence of a director of school media services at the state level and the impact on the resulting information are also investigated. It was found that the typical state has a director of school library media services who spends fifty percent of his or her time on this aspect of the job in the state department of education. Having a full-time director at the state level has a significant impact not only on the quantity but the quality of those publications. The states with a full-time director provide a mean of 4.2 documents for school library media specialists compared to 2.5 for states having a part-time director and 1.4 for states with no director. The mean number of pages of all documents is 160 for full-time, 108 for part-time, and 79 for no director. This is significant at the .05 level for full-time versus no director. Separating out the number of pages of specific to school library media services in the documents reveals that full-time directors furnish 140 pages that are relevant, part-time directors provide 60 pages, and no director, 47 pages. This is also significant at the .05 level for full-time versus no director. This research project was funded by the Association of Specialized and Cooperative Library Agencies 1998 Research Grant.

http://www.ala.org/aasl/SLMR/vol3/statedocs/statedocs.html

Evaluating Information: An Information Literacy Challenge

Volume 2 (1999)

Mary Ann Fitzgerald

(Assistant Professor, Department of Instructional Technology, University of Georgia)

The new Information Power contains information literacy standards that emphasize, among other skills, the ability to evaluate information. This skill is difficult and complex. Evaluation consists of a number of component processes, including metacognition, goals, personal disposition, signals (which initialize an evaluative episode), deliberation, and decision. Research shows that specific problems may occur during several of these components. Contextual factors, including environment, problem structure, and processing depth, impact evaluative processing as well. In addition, research shows that a number of factors influence evaluation, including cognitive development, epistemological stance, affect, and level of prior knowledge. Considering all of these factors in relation to K–12 education, this article explores methods for overcoming challenges as school library media specialists strive to implement information literacy programs.

http://www.ala.org/aasl/SLMR/vol2/evaluating.html

School and Public Library Relationships: Essential Ingredients in Implementing Educational Reforms and Improving Student Learning

Volume 3 (2000)

Shirley A. Fitzgibbons

(Associate Professor Emerita, School of Library and Information Science, Indiana University)

This paper explores the range of successful, cooperative relationships between public libraries and school library media centers. The author delineates factors that need to be considered when building successful relationships. It is assumed that such relationships improve library services and ultimately provide youth better access to resources in their quests for information, knowledge, and learning. The work is based on the premise that cooperative relationships between the two separate institutional settings are essential ingredients in implementing educational reforms and improving student learning. A major literature review of both current and historical research studies, policy documents, and opinion articles sets the stage. Specific cooperative efforts, including combined school-public libraries, networks, and resource-sharing arrangements and general efforts at cooperation and collaboration are analyzed to elicit factors that lead to success in such projects. The factors identified include a shared vision and common goals; a process of formal planning that involves the establishment of joint policies and procedures; commitment on the part of administrators, decision makers, staff, and the general public; active communication and interaction; and adequate funding and staffing that allows innovation and risktaking.

http://www.ala.org/aasl/SLMR/vol3/relationships/relationships.html

The Effects of Concept Mapping on the Searching Behavior of Tenth-Grade Students

Volume 3 (2000)

Carol A. Gordon

(Head Librarian, Educational Resources Library, Boston University)

A qualitative study addressed the effect of concept mapping on the searching behavior of tenth-grade students engaged in research projects based on their instruction in a classroom-based genetics unit. The setting was an automated library of a private American school in Europe. Ten biology students were chosen by purposive sampling. Selection criteria, monitored by user profiles, included student age, computer experience, native language, grades, and test scores. One group used concept mapping, while the other received the same classroom instruction without mapping. Data on searching behavior were collected using think-alouds, interviews, debriefing, and journals. Calculations based on Bayesian statistics and the Fano measure from information theory were triangulated with qualitative analysis of data. While the entire research process, as defined by Kuhlthau's model, was examined to include stages from pre-focus formulation to writing the research paper, this article centers on the information search. Fano's information measures showed there was a greater probability that concept mappers will use print rather than electronic means, that they will search in SIRS rather than the OPAC, and that in electronic searching they will use subject heading rather than keyword. In print, as opposed to electronic searching, measures showed mappers applied a larger number of search terms, employed opening moves, re-formulations, search operations, and relevancy judgments more often and executed more depth than breadth searching. In all cases probability measured at least half a nat (one nat equals 2.718), indicating chances were approaching twice as likely that searchers exhibiting these

characteristics in print indexes will be mappers. Larger differences between the groups emerged in electronic searching, where mappers spent less time. Quantitative data verified mappers were more thorough and efficient, reformulating by shifting synonyms and moving from general to specific search terms and terminating searches to read rather than when they depleted their search terms. Stronger focus formulation emerged as the most important determinant of searching behavior. Further research is recommended to replicate the study with a larger sample, using information theory as an alternative to classical statistics in hybrid qualitative-quantitative studies.

http://www.ala.org/aasl/SLMR/vol3/mapping/mapping.html

Students as Authentic Researchers: A New Prescription for the High School Research Assignment

Volume 2 (1999)

Carol Gordon

(Head, Educational Resources Library, Boston University)

Can tenth graders go beyond writing reports to conduct "authentic" research? English teachers and the school librarian collaborate to gather data in a qualitative action research study that investigates the effectiveness of an assignment that requires primary research methods and an essay of two thousand words. The unit is designed as a performance-based assessment task, including rubrics, student journals, and peer editing. Students develop research questions, write proposals, design questionnaires and interviews, and learn techniques of display and analysis. Concurrently, their teachers gather data from observation, journals, and questionnaires to determine the strengths and weaknesses of the assignment. The research assignment has become analogous to "Take two aspirins and call me in the morning." It doesn't seem to do any harm and may even do some good. Educators adjust the dosage for older students: the length of the paper grows with the time allotted to the task but the prescription is the same. It is universally accepted as a benign activity, as evidenced by the prevalence of standards and objectives for research skills in school curricula. It has become a staple in the educational diet of the high school student. Librarians promote the research assignment because they want students to get better at searching, retrieving, and evaluating information. English teachers see it as an opportunity for sustained writing. Parents like it because it is good preparation for college. Everyone likes it because it gets students into the library and reading. So, what is wrong with research as it is traditionally taught in secondary schools? And what do students think?

http://www.ala.org/aasl/SLMR/vol2/authentic.html

The Implications of Selected School Reform Approaches for School Library Media Services

Volume 4 (2001)

Gary N. Hartzell

(Professor, Educational Administration & Supervision, University of Nebraska at Omaha)

This paper explores the implications of selected school reforms for library media services. Each reform is described and its individual implications for library media services identified. From these implications, general themes are noted and conclusions are drawn. Even though many of the reforms selected have stirred controversy, it is not within the scope of this paper to evaluate any of them. Some reference to quality or viability is necessary and inevitable in the course of discussion, but the objective here is only to identify the implications of selected approaches for school library media services where and if they are implemented.

http://www.ala.org/aasl/SLMR/vol4/reform/reform.html

Preschool Education through Public Libraries

Volume 4 (2001)

Steven Herb
(Associate Librarian and Head, Education Library, Penn State University)
Sara Willoughby-Herb
(Professor of Early Childhood and Special Education, Shippensburg University of Pennsylvania, Rowland School for Young Children)

This paper examines public library services to young children and their families and the possible effects of those services on preschool learning. The authors find that the American public library's democratic service mission, coupled with its ability to provide children with appropriate preschool educational experiences, has the potential benefit of preparing all children to be ready to learn when they enter school. The types of learning experiences naturally suited to public library services and library-community partnerships are those in the area of literacy, the crucial foundation for the learning that takes place both in and out of school. The four sections of the paper focus on the rationale and context for connecting public libraries and literacy (the introduction); analyzing the readiness-to-learn literature, especially as it pertains to literacy (Readiness to Learn); constructing a framework for literacy based on current theory, research, and exemplary practice (The Framework); and applying the framework to a discussion of readiness practices and programs in public libraries (Exemplary Public Library Practices and Programs for Preschoolers and Their Caregivers).

http://www.ala.org/aasl/SLMR/vol4/preschool/preschool.html

Toward a Conceptual Path of Support for School Library Media Specialists with Material Challenges

Volume 1 (1998)

Dianne McAfee Hopkins
(Associate Professor, School of Library and Information Studies, University of Wisconsin–Madison)

The value of support during challenges to library media materials has been touted for years within the profession through its literature and its professional associations. Support groups such as state intellectual freedom committees and supportive statements such as the Library Bill of Rights (American Library Association 1996, 3–4) are examples of resources that are

available to library media specialists who might experience challenges to the presence or appropriateness of library media center materials.

http://www.ala.org/aasl/SLMQ/support.html

A Case Study of One District's Implementation of Information Power

Volume 4 (2001)

Kathy Latrobe

(Professor, School of Library and Information Studies, University of Oklahoma)

Anne Masters

(Director, Media Services and Instructional Technology, Norman Public Schools)

One district sought to institutionalize the implementation of Information Power: Building Partnerships for Student Learning into its established planning and evaluation activities. The rationale for this implementation strategy was that the stakeholders could be simultaneously informed about the principles of library media programming that support the standards and also enabled to evaluate their programs and apply their findings to annual action plans. This implementation strategy modeled the principles of Information Power in that it was a collaborative endeavor, overseen by district and building-level leaders who utilized technology. As reported in this case study, teachers, library media specialists, and principals evaluated their building-level library media programs according to the principles of teaching and learning, and they also evaluated the involvement of stakeholders in implementing those principles. By responding to the survey instrument, "Assessing the School Library Media Program and Its Partnerships" (appendix), these stakeholders provided data to inform future district implementation strategies and to inform decision making at the building level. Descriptive statistics, including correlation coefficients for the relationship of program involvement to program progress, thus can inform discussions for developing building-level action plans that include library media programming. Teachers' responses indicated consistently positive correlations between the school community's involvement in the library media program and positive assessments of the program. Furthermore, the district's secondary library media programs had higher average ratings for teaching and learning activities than did the elementary programs.

http://www.ala.org/aasl/SLMR/vol4/action/action.html

Colorado Librarian Internet Use: Results of a Survey

Volume 1 (1998)

Rochelle Logan

(Research Analyst, Library & Information Services Department, University College, University of Denver)

Use of the Internet is growing rapidly among the U.S. population. The Internet increasingly is the only immediate source of the most current information for librarians and library media specialists. In 1995, a group of systems librarians in Colorado understood this potential and decided to offer training and a free Internet account for one year to library media specialists, public librarians, and staff. The three goals of the Internet grant project were:

- To provide librarians and staff who had no previous Internet experience with a Colorado SuperNet account;

- To assess librarians' Internet use, and the overall impact on librarians' professional relationships with patrons; and
- To measure effectiveness of librarians' initial and ongoing training.

Two years passed between the time librarians took initial training and started using the Internet and the time the survey was administered. During that interval, a direct relationship between the grant project and current use may have been impacted by a wide variety of factors.

http://www.ala.org/aasl/SLMQ/logan.html

School Library Media Specialists' Perceptions of Practice and Importance of Roles Described in Information Power

Volume 4 (2001)

Anne McCracken

(Library Program Specialist/Project Manager, Fairfax County Public Schools, Virginia)

To determine if practicing school library media specialists perceive they have been able to implement their roles as described in Information Power: Guidelines for School Library Media Programs (1988) and Information Power: Building Partnerships for Learning (1998), a survey was developed by the researcher. The survey further sought to determine if school library media specialists perceive it is important to assume a leadership role in the use of instructional technology. The survey was distributed to a random sample of 1,000 school library media specialists. Analysis of the 505 returned surveys indicates that school library media specialists perceive they are unable to fully implement their roles in practice. The most frequent barriers to full implementation were lack of time, including lack of time to plan with teachers; lack of adequate funding; lack of interest and support of classroom teachers; use of a fixed schedule; lack of clerical staff; and too many schools or students to provide for. Elementary school library media specialists who use flexible scheduling perceive they are able to practice more roles than library media specialists who use either combination or fixed scheduling.

http://www.ala.org/aasl/SLMR/vol4/perceptions/perceptions.html

Do Scribes Learn? Copying and Information Use

Volume 1 (1998)

Joy H. McGregor

(Assistant Professor, School of Library and Information Studies, Texas Woman's University)

Denise C. Streitenberger

(Doctoral Candidate, School of Library and Information Studies, Texas Woman's University)

Two qualitative field studies observed the behavior of eleventh grade students as they used reference sources to write research papers. In 1993, a naturalistic case study took place in a high school in Alberta, Canada. In 1996, a second study in Texas examined in depth particular findings of the Alberta study. The first phase of analysis in both cases compared students' final papers with the original sources of information. The first group received little direction in proper citation and the avoidance of plagiarism. The second group was very conscious of the need to cite properly and to avoid plagiarism due to emphasis by the teacher. Although both groups demonstrated a fairly high rate of direct copying from the source, copying in the second group differed from that of the first group. Students in the first group tended to copy directly from original sources. Students in the second group were more likely to parenthetically reference information, but omit to enclose the quoted passages in quotation marks. Few of the papers demonstrated the connection between paraphrasing and citing ideas. Citation errors in such passages suggested that students were simply scribing—trying to fulfill a requirement—and not considering the topic or synthesizing the information. Teacher interventions regarding the format and rules of correct citations seemed to limit the amount of blatant copying but did not help students learn from the sources or construct their own understanding of their research topics.

http://www.ala.org/aasl/SLMQ/scribes.html

The Role of the Principal in an Information Literate School Community: Design and Administration of an International Research Project

Volume 3 (2000)

Dianne Oberg
(Professor, Department of Elementary Education, University of Alberta, Canada)
Lyn Hay
(Lecturer, School of Information Studies, Charles Sturt University, Australia)
James Henri
(Senior Lecturer, School of Information Studies, Charles Sturt University, Australia)

Support of the principal is a key factor in the implementation of effective programs in schools. An international study of the principal's role in developing and supporting information literate school communities was conducted in Australia, Canada, Finland, France, Japan, Scotland, and South Korea. The study sought to inform the efforts of principals and teacher-librarians throughout the world seeking to develop information literate school communities. Such school communities place a high priority on the mastery of information-use processes by both teachers and students; that emphasis on information literacy is reflected in policy, benchmarking, funding, and evaluation. One of the unique features of this international study was the use of online data collection and analysis techniques. In this paper, the researchers describe the design and administration of the study and explore the methodological issues involved. This information will be of use to researchers interested in replicating the study or in designing a similar study.

http://www.ala.org/aasl/SLMR/vol3/principal/principal.html

The Role of the Principal in an Information Literate School Community: Cross-Country Comparisons from an International Research Project

Volume 3 (2000)

Dianne Oberg
(Professor, Department of Elementary Education, University of Alberta, Canada)
Lyn Hay
(Lecturer, School of Information Studies, Charles Sturt University, Australia)
James Henri
(Senior Lecturer, School of Information Studies, Charles Sturt University, Australia)

An international research project conducted in Australia, Canada, Finland, France, Japan, Scotland, and South Korea investigated the role of principals in developing and supporting information-literate school communities. Principals and teacher-librarians completed three survey instruments examining the participants' perceptions and beliefs about their current and future roles, and their views on such concerns as the strengths and challenges of the school library, the contributions of teacher-librarians to teaching and learning, the nature of information literacy, and barriers to integration of information skills. In this paper, the researchers explore the findings of the research project and present cross-country comparisons.

http://www.ala.org/aasl/SLMR/vol3/principal2/principal2.html

Designing Motivation into Library and Information Skills Instruction

Volume 1 (1998)

Ruth V. Small
(Associate Professor, School of Information Studies, Syracuse University)

Effective library and information skills instructional programs not only help students acquire the skills they will need to solve their information problems, but also stimulate intellectual curiosity and encourage continued information seeking and exploration. This article describes some well-known theories and concepts of motivation and how they relate to library and information skills instruction. Illustrations of the integration and application of motivation models to library and information skills instruction and some relevant areas for future research on motivation in this context are suggested.

http://www.ala.org/aasl/SLMQ/small.html

An Exploration of Motivational Strategies Used by Library Media Specialists during Library and Information Skills Instruction

Volume 2 (1999)

Ruth V. Small
(Associate Professor, School of Information Studies, Syracuse University)

Research on and development of library and information skills instruction has focused more on content and student outcomes than on the presentation methods that motivate student learning. This paper describes a study that was designed to identify motivational strategies used and resulting on- and off-task behaviors of students. Results indicate that library media specialists (LMSs) use mostly attention-focusing strategies, middle school LMSs utilize more

strategies than elementary LMSs, and extrinsic motivators are more common that intrinsic motivators.

http://www.ala.org/aasl/SLMR/vol2/motive.html

The Enchanted Imagination: Storytelling's Power to Entrance Listeners

Volume 2 (1999)

Brian W. Sturm
(Assistant Professor, University of North Carolina at Chapel Hill)

Consciousness has been described as both a variety of discrete states and a constantly changing flow. Charles T. Tart has developed a systems approach to consciousness in which he describes a baseline state of "normal," waking consciousness and multiple altered states induced by a disruption of that baseline. This concept of a system of interrelated components is applicable to the altered state of consciousness associated with listening to a story: the "storylistening trance." This research was designed to be exploratory and to elicit information concerning the characteristics of the storylistening trance and any influences (positive or negative) that affect it. The methodology was naturalistic, combining interviews and participant observation. The results show that many listeners do experience a qualitatively different state while listening to some stories. The article addresses characteristics of this trance state and influences upon it, and it concludes with a theoretical model of the storylistening trance and the applicability of the findings to library media specialists.

http://www.ala.org/aasl/SLMR/vol2/imagination.html

Constructing Mental Model Paradigms for Teaching Electronic Resources

Volume 2 (1999)

Julie I. Tallman
(Associate Professor, Department of Instructional Technology, University of Georgia)
Lyn Henderson
(Senior Lecturer, School of Education, James Cook University of North Queensland Australia)

Library media specialists activate numerous mental models when teaching electronic information literacy database access, research, and retrieval in the context of authentic school assignments. The paper identifies these models and examines what occurred when the mental models in a study sample interconnected in the complex changing environment of a lesson. Discussion focuses on the changes to the mental models the library media specialists held with respect to the electronic database, the role of the library media specialist, the lesson goals, and their teaching strategies. Findings suggest that (a) most of the library media specialists' mental models of teaching with electronic databases were influenced by their models of teaching access, research, and retrieval with print resources and (b) even though many library media specialists identified the necessity to incorporate mental model changes

for more effective teaching, these were not sufficient to counteract their habituated teaching behaviors.

http://www.ala.org/aasl/SLMR/vol2/mental.html

Preschool Education through Public Libraries

Volume 4 (2001)

Steven Herb
(Associate Librarian and Head, Education Library, Penn State University)
Sara Willoughby-Herb
(Professor of Early Childhood and Special Education, Shippensburg University of Pennsylvania, Rowland School for Young Children)

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This paper examines public library services to young children and their families and the possible effects of those services on preschool learning. The authors find that the American public library's democratic service mission, coupled with its ability to provide children with appropriate preschool educational experiences, has the potential benefit of preparing all children to be ready to learn when they enter school. The types of learning experiences naturally suited to public library services and library-community partnerships are those in the area of literacy, the crucial foundation for the learning that takes place both in and out of school.

The four sections of the paper focus on the rationale and context for connecting public libraries and literacy (the introduction); analyzing the readiness-to-learn literature, especially as it pertains to literacy (Readiness to Learn); constructing a framework for literacy based on current theory, research, and exemplary practice (The Framework); and applying the framework to a discussion of readiness practices and programs in public libraries (Exemplary Public Library Practices and Programs for Preschoolers and Their Caregivers

At the heart of a true democracy stands the principle that all the people have equal access to the opportunities available in that society. The effects of schooling on the individual in achieving that access, although profound, pale in comparison to the effects of the individual's early childhood and preschool experiences. How a child talks, how a child listens, how a child thinks and learns are all formed before any school experience. How a child interacts with others, solves problems, and resolves conflicts are all shaped by early childhood experiences. It is not simply the logic of its developmental chronology that makes School Readiness the first of the National Education Goals. The learning that takes place in the preschool years is the foundation upon which all future learning is built.

The School Readiness Goal

In 1989 in Charlottesville, Virginia, the nation's governors established the education priorities designed to prepare America's citizens for the twenty-first century. The president and the governors jointly adopted the six-goal initiative in 1990; two goals were

subsequently added, and the National Education Goals were incorporated into law in March 1994 when the 103rd Congress passed Goals 2000: Educate America Act.

Three objectives were established to meet the School Readiness Goal that "by the year 2000, all children in America will start school ready to learn:

1. All children will have access to high-quality and developmentally appropriate preschool programs that help prepare children for school.
2. Every parent in the United States will be a child's first teacher and devote time each day to helping such parent's preschool child learn, and parents will have access to the training and support parents need.
3. Children will receive the nutrition, physical activity experiences, and health care needed to arrive at school with healthy minds and bodies, and to maintain the mental alertness necessary to be prepared to learn, and the number of low-birthweight babies will be significantly reduced through enhanced prenatal health systems." (National Education Goals Panel 1994, 8)

Public Libraries and the School Readiness Goal

The relationship between public libraries and the school readiness goal is an ideal and natural partnership for four major reasons:

1. From a professional standpoint, public libraries already have identified themselves in that crucial role. Preparing preschoolers for learning was identified as one of the eight major roles that libraries can play in their communities in the Public Library Association's widely accepted planning and evaluation document, *Planning and Role Setting for Public Libraries: A Manual of Options and Procedures* (McClure et al.1987).

2. From an advocacy perspective, the importance of this public library role as the preschoolers' door to learning was presented in a landmark paper entitled "Kids Need Libraries" developed by members of the three youth divisions of the American Library Association (ALA) for the Second White House Conference on Library and Information Services (Mathews, Flum, and Whitney 1990). Among the readiness-related activities advocated for meeting the developmental needs of children are encouraging parents to carry out literacy activities at home, thereby becoming involved in their children's learning, reaching out to youth who are at risk for learning failure, and sponsoring community reading celebrations. The strength of this position paper was further enhanced by the endorsement of eighteen national organizations concerned with the welfare of young children, including The National Black Child Development Institute, National Council of La Raza, Child Welfare League of America, and the Children's Defense Fund. Library advocacy for children received an additional boost when it was made the primary focus of the 1996-97 ALA President Mary Somerville's highly visible "Kids Can't Wait" campaign. The position paper prepared for Somerville's campaign continued the strong advocacy message begun in "Kids Need Libraries" (Mathews 1996).

3. From an historical perspective, public librarians already are working directly with preschoolers, providing storyhours and additional readiness experiences, as well as supporting readiness by providing materials for preschoolers' parents, teachers, and caregivers. Eighty-six percent of the public libraries surveyed in a study by the National Center for Education Statistics report offering group programs for preschool and kindergarten children (Heaviside and Farris 1995). Forty percent of those libraries also offer group programs for infants and toddlers, an increase from 29% in 1988. Sixty-six percent work directly with preschools, and 56% work with day care centers. Clearly, public libraries already accept their role in providing readiness activities for preschoolers.
4. From a practical viewpoint, public libraries are at the hub of community-wide efforts. In Goals 2000: Educate America Act, the most impoverished rural and urban communities are targeted for community partnerships to support "sustained collaborations" among a variety of educational, community, and business agencies. Libraries are specifically mentioned as appropriate agencies for these collaborations (U.S. National Commission on Libraries and Information Science 1992, 136–37). One might conclude that *every* community serviced by a public library should make that library an integral part of any plan designed to be community-wide and comprehensive, because the nature of public library service is to meet the specific needs of the individuals in the whole community that library serves.

Literacy as the Main Focus of the Public Library-School Readiness Partnership

Although libraries and librarians can and should support a wide array of developmental needs associated with getting preschoolers ready for school (e.g., physical health by providing relevant material and community resource referrals), the major focus of this paper is on the public library's contribution to school readiness through the provision of literacy experiences for preschoolers and the support of parents' and caregivers' efforts to provide those experiences. Support for this focus on literacy is drawn from four sources:

1. The National Education Goals Panel (1994) selected 16 indicators for measuring the attainment and progress of the 8 National Education Goals. Four of those indicators were assigned to the School Readiness Goal—two pertaining to children's health and two pertaining to children's learning. "Participation in preschool programs" and "family-child reading and storytelling" are the two learning indicators, the latter being the prime pathway for children becoming literate. It is clear that the Panel judges literacy as a significant aspect of readiness since the indicators were selected based on characteristics such as comprehensiveness across all goals, how critical indicators are in determining whether the goals are actually achieved, and how "policy- actionable" they are. The Panel's 1994 report, *Building a Nation of Learners,* states that "early, regular reading to children is one of the most important activities parents can do with their children to improve their readiness for school, serve as their child's first teacher, and instill a love of books and reading" (24).
2. The 1991 National Survey of Kindergarten Teachers, conducted by the Carnegie Foundation for the Advancement of Teaching (Boyer 1991), found that deficiencies in language—certainly associated with literacy—were named most often as the cause

of children entering kindergarten not being prepared for school. The data indicate that 42% of the teachers surveyed believed that their entering students were less ready than the students that entered their kindergarten classes 5 years earlier (7) and that they see an average of 35% of the entering kindergartners as "not ready to participate successfully" (149). Of the problems or missing skills cited for this lack of readiness—e.g., physical well-being (6%), moral awareness (21%), social confidence (31%), general knowledge (38%), emotional maturity (43%)-deficiencies in language were considered the most serious problem in 51% and a moderate problem in another 37% of these children who were not ready to learn (37, 150).

3. Theoretical and empirical research studies document and support the wide-ranging effects of becoming a literate person—enabling persons to think about the world, to learn though social interactions, to evaluate and debate issues, and to do better in school (Garton and Pratt 1989). A literate learner is the basic requirement for most effective instruction, and literacy is the primary path for all advanced learning.
4. Even with the increased use of technology in libraries, books still retain a prominent role. It seems important to state the obvious—literacy, especially early literacy training for young children, should take place where the primary means of providing literacy instruction reside. The means are children's books, and their primary home in our culture for the past 100 years has been the public library.

Readiness To Learn

Defining Learning Readiness Regarding Literacy

In this section, the foundation for public libraries' contribution to literacy development in young children is explored through an analysis of the readiness-to-learn literature. This analysis describes the precursors to literacy as they emerge across the preschool years, identifies variables that promote this early literacy, and examines significant variations in early literacy both within and across preschool populations. This latter section has particular relevance for drawing attention to the kinds of individual differences that may put children at risk for failing to acquire literacy during their formal schooling and for suggesting effective educational intervention strategies to increase their readiness for, and success in, learning.

Literacy

This paper will refer to literacy in its broadest sense, encompassing the mastery of reading and writing skills, and also the skills of listening and speaking. This broader definition is commonly used by those who study literacy due to the interrelatedness of those skills (Garton and Pratt 1989, 1).

Literacy involves more than the skills of reading, writing, speaking, and listening in isolation. Literacy also implies communication and development within a meaningful social and cultural context (Vygotsky 1978). In addition, a truly literate person is disposed toward lifelong literacy in that he or she reads, writes, and converses because those activities improve one's life by leading to enjoyment, understanding, self-expression, and learning about oneself and the world (Slaughter-Defoe 1992).

In the context of how public libraries contribute to the literacy of preschoolers, literacy is characterized by children enjoying listening to songs and stories, talking about stories and books, and reading, and writing as purposeful, meaningful activities within their own social and cultural worlds.

Readiness

Readiness is a more elusive concept to define. At one time readiness for literacy was thought of as a set of prerequisite skills (e.g., recognition of alphabet letters or auditory discrimination skills) whose accomplishment would lead to development of conventional literacy. These skills were thought to emerge in a predictable sequence, to be directly measurable, and to be accessible to be taught through direct instruction. For decades school reading programs reflected this view of literacy readiness until research over the past twenty-five years began to challenge the status quo. Naturalistic studies of how children develop oral, reading, and writing abilities demonstrate that young children learn best about literacy through informal yet meaningful interactions with literacy in their homes and communities (e.g., being read to, helping with the grocery list, answering the telephone). This newer view of readiness requires literacy-rich environments in the early years joined by later schooling experiences that build upon the learning and skills children already have developed at home (Morrow 1993, 1–13). Instead of teaching children discrete readiness skills, teachers should endeavor to learn about the literacy that each child brings to school—literacy that has emerged through the influence of family and community throughout the preschool years.

This concept of emergent literacy has influenced the definition of readiness. Literacy readiness now can be viewed as understandings, skills, and attitudes that begin to develop very early in life, develop through meaningful interactions in one's environment, and show different developmental paths and timing among children (Teale 1995). The match between home and school literacy, that is, the continuity and developmental appropriateness of children's learning opportunities, influences how well the child learns when formal schooling begins. Clearly, a child's readiness for school is related to how responsive schools are to children's unique backgrounds and experiences (National Association for the Education of Young Children—NAEYC 1990).

The Growth of Literacy across the Preschool Years

The foundation for emergent literacy is in preschool experiences with language. Without language play and language practice, there is no future reader, writer, or conversationalist. Although the course and sequence of development vary from child to child, years of research provide a sound collection of developmental abilities *typically* found at particular ages. The National Association for the Education of Young Children (Bredekamp 1992) recommends the following as examples of age-appropriate experiences:

- Infants: caregiver responding to baby's cries and coos, talking and singing to baby, imitating baby's sounds, taking turns vocalizing.
- Toddlers: naming objects and events for child, reading storybooks, helping the child with words to express him/herself, providing crayons and paints for experimenting.

- Three-year-olds: answering child's questions, singing songs and saying rhymes together, using clear and easy-to-understand language with the child, using language for reassurance.
- Four-year-olds: helping the child carry on conversations, pointing out print in the environment, encouraging pretend play, writing words for the child

In studying the typical progressions of child development, one also can make predictions about likely literacy-related behaviors emerging at particular ages. This kind of knowledge helps adults working with preschool children to recognize, affirm, and expand upon children's emerging literacy—an infant's attempts to attract and hold the attention of the caregiver, a toddler's repeated words and mimicked animal sounds, a 3-year-old's request to hear a favorite story, and a 4-year-old's telling of a joke (Herb and Willoughby-Herb 1994, 10–14).

When studying the literature on typical developmental behaviors of young children and the correspondingly appropriate experiences that adults can provide for children, one notices that the roots of literacy appear to be strongly grounded in the playfulness of oral language interactions between a child and an adult. In fact, playful oral language experiences prepare children to understand and experiment with written language later. In his passionate call for our society to reinvest in our children's literacy, Sanders speaks of a growing number of violent and illiterate young people as "post-illiterates . . . at home neither in orality nor in literacy" (1994, 78). Sanders' historical research leads him to conclude that children need to be immersed in an oral literacy environment—speaking and listening—that is intimately connected to their personal-social lives (within the family) before they will profit from experiences with text and writing. This view of the importance of oral literacy from a personal-social perspective is also a recognition of the importance of "story" in an individual's life, especially the story of one's own existence.

Oliver Sacks, in a moving account of Karsakov's syndrome (sufferers often are unable to remember what they did even a few minutes previously, and confabulation, or the invention of stories, may occur to make up for gaps in memory), writes of the importance of one's own story, one's own narrative or history as the very confirmation of one's existence. "To be ourselves we must *have* ourselves—possess, if need be re-possess, our life-stories. We must 'recollect' ourselves, recollect the inner drama, the narrative, of ourselves. A man *needs* such a narrative, a continuous inner narrative, to maintain his identity, his self" (1987, 111). Gardner's recent study of 11 world leaders describes that what they had in common was "the fact that they arrived at a story that worked for them and, ultimately, for others as well. They told stories—in so many words—about themselves and their groups, about where they were coming from and where they were headed, about what was to be feared, struggled against, and dreamed about" (1995, 14). If indeed one can define one's life through narrative, what is the nature of the life that occurs in the absence of story?

In summary, two universal themes can be derived from developmental and historical studies of literacy readiness:

1. Enough is known about general patterns of developmental growth across the preschool years to identify when particular literacy-related learning is likely to emerge and to describe the kinds of environmental interactions that fit those emerging behaviors. In fact, resources already have been developed to guide adults in observing and providing developmentally appropriate activities for children's emergent literacy across the preschool years (Glazer and Burke 1994; Hart, Burts, and Charlesworth 1997).
2. Conventional literacy is dependent on a grounding in rich experiences with language play and oral literacy. Infants as young as 8 months old remember and respond to words found in stories they have heard repeatedly, even 2 weeks after last hearing the story (Jusczyk and Hohne 1997). The observations and experiences of Vivian Paley (1990, 1995) and Susan Engel (1995) provide justification and techniques for enhancing children's development through storytelling.

Providing Supportive Environments for Preschool Literacy

Children's understandings, skills, and attitudes about literacy develop through each individual's particular social interactions, which vary considerably from child to child. One cannot create the same pathway to literacy for all children, but rather should create many successful pathways so that literacy can be attained by all children, especially those who have difficulty in learning. This section identifies conclusions from theoretical and research literature that describe how early literacy can be supported. It begins with several broad conclusions derived from developmental and learning theory and proceeds to the identification of research findings that substantiate the effectiveness of specific, replicable variables on literacy development.

Theoretical Literature

Vygotsky (1978) proposes that children's mental abilities develop as a function of social interactions with members of the child's culture. Learning first occurs within this social context, and only later does the child internalize it so that it becomes "part of the child's independent developmental achievement" (90). Vygotsky further distinguishes between development and learning: "Learning is not development; however, properly organized learning results in mental development and sets in motion a variety of developmental processes that would be impossible apart from learning. Thus, learning is a necessary and universal aspect of the process of developing culturally organized, specifically human, psychological functions" (90).

Learning takes place when a more competent person gives the child the support needed to engage in a task that would be too difficult to do alone at the child's present developmental level. Vygotsky calls this area in which learning occurs the *Zone of Proximal Development.* Examples of enhancing literacy through working in the Zone are (1) a parent who remembers that her 4-month-old baby squeals excitedly at a particular page in a cardboard book, keeps track of the book, and reads it to the baby regularly, and (2) a librarian who notices a 2-year-old say "pumpkin-eater" when he touches a jack-o-lantern at the library and takes a moment to squat down to chant the whole rhyme with the child, perhaps repeating it at storytime. Notice that in both examples there is a shared cultural context between child and adult: the

mother who can "read" baby's emotions and pairs that with a cultural idea of a favorite book; the librarian who is knowledgeable of the songs and rhymes taught by families at home. This cultural sharing is necessary for learning because it provides continuity between what is already known and the new learning to be offered.

Bruner (1983), in his writing about language, agrees with Vygotsky about learning occurring through social interaction. He uses a concept similar to Vygotsky's Zone of Proximal Development in his focus on a teaching technique he calls "scaffolding." Scaffolding involves an interaction that provides support for a child's learning. For example, the use of "motherese" language—in which parents frequently employ a higher pitch to speak to babies or toddlers in clear, short sentences, and use longer pauses between sentences—increases the chances of the child's understanding and possibly imitating or using the language. Researchers have found that the prosodic qualities of motherese provide infants as young as 7 to 9 months with cues to the units of speech that correspond to the grammatical units of language (Nelson et al. 1989) In other words, motherese teaches infants syntax.

Scaffolding works best when the adult is able to lead the child just a bit ahead, provide a pace for learning that suits the child, use familiar contexts, and keep the child an active participant. Even the very young child who actively participates in scaffolding is taking an important step in lifelong learning, one that allows instruction from others to be an important part of his or her development.

Bronfenbrenner (1979) proposes that a child's development is affected by interactions within, between, and among various contextual settings ranging from those in which the child interacts nearly daily (e.g., family, child care center, and neighborhood playground) to those that are more removed but affect the child directly and indirectly (e.g., social service systems, parents' place of employment, and local, state, and national governments). This theory of development matches the philosophical wisdom of the African proverb, "It takes a whole village to raise a child."

Bandura's (1977, 1986) work in social learning theory contributes much evidence on the power of learning by imitation, one of the primary methods of acquiring literacy. For example, at the most basic level, early readers tend to come from homes where reading can be observed. Bandura's research on imitational learning informs practitioners that children are more likely to imitate models who are similar to them and are respected members of their community.

In summary, learning is facilitated when children have the following:

1. Opportunities to participate in literacy activities that are guided and paced by a more skillful member of the child's social-cultural world (Vygotsky 1978; Bruner 1983).
2. Opportunities for learning that enable the child to be an active participant, regardless of the modality being used (e.g., listening, looking, speaking) (Bruner 1983).
3. Opportunities for intimate learning; that is, learning with support from someone who knows the child well enough to make appropriate judgments about when and what the next learning steps should be (Bruner 1983). The emphasis on parents as first teachers

in Goals 2000 is certainly supported by this aspect of Bruner's theory (Goals Panel 1994, 8).

4. Opportunities to acquire positive literacy attitudes through interacting with and observing models who will be most influential for individual learners, especially those models who share similar characteristics with the learner, and whom the learner respects and admires (Bandura 1977). The importance of acquiring a positive "literacy attitude" is amply demonstrated in much of the emergent literacy literature (Morrow 1993, 132–33).
5. Opportunities for support for learning that resides not just in their families and schools, but across a range of cultural contexts that directly and indirectly influence children's development (Bronfenbrenner 1979).

Research Findings

While developmental and learning theories offer broad guidelines for evaluating and planning literacy programs, this section includes several findings about specific, effective practices in support of the theoretical conclusions. These findings may also serve as recommended practices for librarians designing programs. While there is a large body of research addressing the topic of effective techniques in support of early literacy development, this section focuses on practices derived from literature reviews and from more than one study; practices that seem possible to adapt to librarians working with children, families, and caregivers; and practices that are related to the roles that librarians can reasonably serve.

Some research findings regarding children's books follow:

1. Children's early experiences with children's books are among the most significant correlates with their success in learning to read in school. Specific aspects of these books, such as the interest level for children and ease of understanding and remembering the story, make the experience even more effective (Mason and Kerr 1992; Morrow 1993).
2. Children are more motivated to request being read to, and to "read" or explore on their own, from books with which they are already familiar or have heard or read before and have enjoyed (Brock and Dodd 1994; Dickinson et al. 1992; Herb 1987; Schickedanz 1993).
3. There is a positive relationship between how much children have been read to and how well they will read (Lancy 1994; Scarborough, Dobrich, and Hager 1991; Wells 1985).
4. Storybook reading is a more effective influence on literacy development when children have opportunities to engage in conversation about the story (Mason and Kerr 1992; Norman-Jackson 1982; Pellegrini and Galda 1994).

The research also produced findings regarding additional literacy factors:

1. Children benefit most from the opportunity to interact with on-the-spot literacy events in their everyday lives, such as watching for the McDonald's sign along the highway,

finding a correct page in a catalog, or looking at one's own name on an envelope or name tag (Taylor and Strickland 1989; Teale 1995).

2. Literacy is enhanced when adults join in with children's pretend or symbolic play; for example, playing restaurant or playing school (Norman-Jackson 1982; Pellegrini and Galda 1994).

In addition to guiding library practice in programming for preschoolers, these findings also might suggest content for workshops in which librarians, parents, caregivers, and preschool teachers share techniques for enhancing children's literacy.

Children at Risk for Difficulties in Acquiring Literacy

Identification of the variables or conditions associated with difficulty in literacy acquisition is a good first step toward assuring that all children find a successful pathway to literacy.

The Socioeconomic Status Factor

The socioeconomic circumstances of a child's world can interact with a child's literacy development in many ways. Hart and Risley have found that one of the most frightening ways econcomic circumstances affect a child's literacy development is through the relative frequency of social interaction between parents and young children. As Bloom points out in her foreword to *Meaningful Differences* (Hart and Risley 1995):

> Hart and Risley discovered that some things don't matter [in literacy development]. For example, race/ethnicity doesn't matter; gender doesn't matter; whether a child is the first in the family or born later also doesn't matter. But what does matter, and it matters very much, is relative economic advantage. First, . . . children living in poverty, children born into middle-class homes, and children with professional parents *all have the same kinds of everyday language experiences.* They all hear talk about persons and things, about relationships, actions, and feelings, and about past and future events. And they all participate in interactions with others in which what they do is prompted, responded to, prohibited, or affirmed. But children in more economically privileged families hear some of these things more often and others less often, than children in poverty and working-class homes. The differences between the families . . . were not in the kinds of experiences they provided their children but in the differing amounts of those experiences. The basic finding is that children who learn fewer words also have fewer experiences with words in interactions with other persons, and they are also children growing up in less economically advantaged homes . . . It turns out that *frequency matters* . . . And the finding is heartbreaking that by the time the children were 3 years old, *parents* in less economically favored circumstances had said fewer different words in their cumulative monthly vocabularies than had the *children* in the most economically advantaged families in the same period of time (x–xiii).

Poorer preschool children and those from working-class homes are also less likely to have children's books in their homes, are less likely to be read to frequently and at an early age,

are less likely to have opportunities to talk about books with an adult, and are less likely to have opportunities to engage in imaginative storytelling (Mason and Kerr 1992).

The effects of poverty on a child's learning history may continue into a child's schooling as well. McGill-Franzen and Langford (1994), in case studies of preschool children and their teachers, noted great differences between private and public urban preschools. Two of these differences likely to affect literacy were an absence—the public preschools included far fewer books for children to hear read and to play with independently, and a presence—the public preschool had teachers who already perceived the children as deficient learners in literacy areas. Seeing great differential effects on children's learning caused by these disparate preschool environments led the researchers to note their agreement with Kozol's assessment that these are indeed, "savage inequalities." It is reasonable to further conclude that a paucity of literacy opportunities, due to the economic status of the child, becomes more serious as children encounter less than appropriate schooling experiences along the way. Modell and Siegler (1993) report on the cumulative deteriorating effects of poverty on children's learning-by third grade, children from lower SES groups average one year behind their middle-class peers, but by sixth grade, the gap has doubled.

In spite of Head Start's great efforts, poor children are underrepresented in preschool enrollment. According to the National Center for Education Statistics, 21% of our kindergarten enrollment in 1992 was lower income children, while only 14% of our preschool enrollment was lower income children (Smith et al. 1994).

Statistics indicate that growing numbers of preschoolers are poor. The Child Welfare League of America's 1993 statistics book reports that "young children are more likely to be poor than any other age group in the United States" (Merkel-Holguin 1993, 13). The report on the state of America's children indicates that in 1994 over 21.8% of all children living in the United States lived in poverty, a slight improvement over the 22.7% reported in 1993, but the youngest children continue to be overrepresented—25.1% of children under 6 years are poor (Children's Defense Fund 1996). One reason posited by the Children's Defense Fund for these growing numbers is that the inflation-adjusted median income of young families with children dropped 34% between 1973 and 1992. The statistics also reveal a disproportionate number (54%) of poor children living in families with a single parent, typically the mother (Children's Defense Fund 1995). To have any hope of succeeding, emergent literacy programming efforts must address the particular circumstances of the single-parent family.

Children Who Are Ethnic and Language Minorities

Some children who are members of ethnic and language minority groups are found to be at risk for difficulties with acquiring literacy for the following reasons:

1. The lack of congruity between the expectations and routines of the school curriculum and the children's entry knowledge, ways of knowing, and experiences (Gutierrez 1993).
2. Their disproportionate representation among children living in poverty. The National Center for Education Statistics reports that in 1992, black children were almost three times as likely to live in poverty as were white children (Smith et al. 1994). In 1994,

43.8% of all black children and 41.5% of all Latino children lived in poverty, compared with 16.9% of non-Latino white children (Children's Defense Fund 1996).

3. The lack of enrollment in preschool programs. The majority (62%) of U.S. children enrolled in preschool programs are in private preschools, thereby making the economic circumstances of a family a factor in preschool selection. While U.S. kindergarten minority enrollment is 30%, preschool minority enrollment is only 20% (Smith et al. 1994); therefore, only two-thirds of minority children who attend kindergarten have been in a preschool program.
4. The growing numbers of children coming from homes where English is not the primary language. Many of these children have difficulty acquiring literacy skills in English, not having had the opportunity to listen to and speak English before having to learn reading and writing English. In 1990, 14% of all U.S. children ages 5 to 17 lived in homes where English was not spoken, and one-third of these children had difficulty speaking English themselves (Smith et al. 1994, 130).

Research documents specific kinds of family literacy practices that seem to place children at a higher risk for failure to acquire literacy. These include:

- Families in which adults are nonreaders or poor readers and do not engage in story discussions (Scarborough, Dobrich, and Hager 1991);
- Families in which adults do read to children, but do so in a word-by-word manner and stop for conversations about letters and sounds as opposed to the story itself (Mason and Kerr 1992);
- Environments in which adults discourage children's verbalizations (Lancy 1994; Norman-Jackson 1982); and
- Environments in which there are no special places for books to be kept, nor special times/routines for sharing them (Scarborough, Dobrich, and Hager 1991).

Data regarding children's experiences in preschools, child care centers, and child care homes also demonstrate many factors that seem to place children at a higher risk for failure to acquire literacy:

- Many children are cared for away from their homes. For example, 60% of married women with children under 6 years work. Approximately 57% of their children are cared for in child care homes or child care centers. Concerns continue to grow about the appropriateness of the care children receive as
  - professional standards for quality care are not in wide compliance,
  - researchers studying family child care homes have observed care so poor in some that they believe it may actually harm children's development, and
  - poor and minority children are more likely to be in lower quality child care situations (Children's Defense Fund 1996, 25–33).
- Concerns about the expertise and consistency of nurturance among staff in child care settings grow in proportion to the escalating staff turnover and in inverse proportion to the declining salaries of child care staff (Merkel-Holguin 1993, 75–78).

Children Whose Learning or Behavior Characteristics Put Them at Risk

Many children develop negative feelings or attitudes toward literacy at an early age, which may interfere with later literacy. There is, for example, a significant relationship between children who as preschoolers spent little or no time exploring/looking at/playing with books on their own and children who have difficulty learning to read (Scarborough, Dobrich, and Hager 1991; Schickedanz 1993).

Children with learning problems sometimes face the additional difficulty of parents and teachers lowering their literacy expectations. Many children who are receiving assistance for specific learning problems are overlooked when it comes to the provision of everyday literacy experiences (e.g., going to the library), or literacy development is not one of the higher educational priorities for the adults working with them (Marvin and Mirenda 1993).

Children Who Are Experiencing Great Stress in Their Lives

The problems some children face in their daily lives seem to transcend the problem of being at risk for failure to acquire literacy. How can one worry about children learning to read if they do not have homes or they are being abused? The answer lies in coupling literacy efforts with all essential social programs, so that children facing difficult enough circumstances do not face the additional burden of illiteracy and its common partner, school failure. It is especially important to remember that education and literacy sometimes can provide an avenue for escape (Elder, Modell, and Parke 1993, 13). It is also important to note the prevalence of children facing these difficult circumstances:

1. Of a total population of nearly 72.3 million children from birth to age 19, 2.7 million were reported abused or neglected in 1991—a 333% increase since 1976. Nearly a third of these children (31.8%) were between the ages of 1 and 5 (Merkel-Holguin 1993, 55–56). The National Committee to Prevent Child Abuse reports that this number rose to 3.1 million children reported abused and neglected in 1994 (Children's Defense Fund 1996).
2. Of the nearly one-quarter million children in foster care in 1989, 26.8% (59) were between 1 and 5 years (Merkel-Holguin 1993, 128–129).
3. Families with children are the fastest growing homeless population in the United States, representing 39% of the total. On any given day, 100,000 children are without homes (Children's Defense Fund 1995).
4. The Children's Defense Fund (1995) reports that each year between 3.3 and 10 million children are exposed to domestic violence (depending on definition of violence).
5. The estimated number of children with serious emotional disorders now exceeds 3 million, many of whom go unserved (Children's Defense Fund 1996).

Successful Intervention Strategies for Children Who Are at Risk for Failing to Acquire Literacy

These intervention strategies are drawn from two types of studies—intervention programs for at-risk children (e.g., Head Start or family literacy training), and studies that compare environmental characteristics of children who do and do not do well in acquiring literacy.

1. Broad-based program efforts are needed that reach the family and child as a whole unit. This strategy is not limited to literacy-based programs by any means, but the library must become part of the community network of agencies, professionals, and other interested persons serving the needs of families (Children's Defense Fund 1995; Slaughter-Defoe 1992; Strickland 1994).
2. Children's developing literacy fares better when we help families and community agencies in obtaining numerous and appropriate (interesting, portraying diversity, good literature and art, meaningful) books for young children; when we see to it that children are regularly read to (Harris 1993; McGill-Franzen and Lanford 1994); and when children and their families are regular visitors to libraries and bookmobiles (Marvin and Mirenda 1993).
3. Children who are most at risk need the resources of the very best trained staff—people who know about literacy development, child development, and family and community relations, as well as the content of their profession (e.g., librarianship) (NAEYC 1990; Strickland 1994); and the staff working with these children need to develop appropriate ways to interact with and respect children and families from diverse cultures (Crompton and Phillips 1995; Derman-Sparks 1989).
4. Children learn better when they and their families are involved in programs whose overall designs are characterized by
    - having aspects relevant and unique to their own family, community, and culture (Crompton and Phillips 1995; Strickland 1994);
    - involving families in ways that are affirming, inclusive, and empowering (Zigler and Muenchow 1992);
    - utilizing family and community members as paid employees (McConnell 1989; Zigler and Muenchow 1992); and
    - recognizing that in spite of numerous disadvantages, many parents are willing and able to learn a variety of literacy-supporting techniques with their young children (Mason and Kerr 1992).
5. For the most part, successful intervention programs for children who are at risk for difficulties with acquiring literacy are those with components drawn from the theory and research on how to support literacy development in all children. The following strategies are most effective when implemented in conjunction with the previous four.
    - Children acquire literacy better when they are actively involved in meaningful experiences with it (Slaughter-Defoe 1992).
    - Children acquire literacy better when their literacy experiences build on their existing knowledge, strengths, and interests, instead of participating in experiences that focus on their disabilities (Slaughter-Defoe 1992).
    - Although experience with high-quality children's literature is the single most effective influence on literacy development (Mason and Kerr 1992; Morrow 1993), sometimes books are not the most effective starting place for intervention. Other paths (e.g., pretend play, drawing, storytelling, puppetry) also can be successful and may be more appropriate places to start for some children and their families (Pellegrini and Galda 1992).
    - Supportive efforts that begin very early in life have the best chances for success. This is especially crucial for children dealing with additional

difficulties such as learning problems or family support problems (Children's Defense Fund 1996; Lancy 1994; Scarborough, Dobrich, and Hager 1991).

- Children need opportunities for intimate, individualized literacy support-to interact with an observant, skilled adult (Pinnell 1993; Strickland 1994). When possible, it is best for parents to assume this role during the early years, but data regarding high school dropout rates, declining reading achievement, and the many stresses facing poor families (Children's Defense Fund 1995) indicate that young, vulnerable children cannot always wait until their families are ready to support their learning. All young children need this informed, responsive interaction from the start of their lives, whether it is provided by parents or a supporting community.

A Framework for Literacy

Programs created to enhance literacy in public libraries should be designed, implemented, and evaluated within the following framework, derived from the literacy and literacy readiness literature summarized in section 2.

Broad Guidelines Derived from Theory

1. Provide children with opportunities to interact around literacy-related events with someone who knows the children well and is skillful in pacing their learning.
2. Provide literacy experiences that are characterized by active and meaningful involvement.
3. Provide literacy models whom children are likely to imitate-persons children respect and with whom they share some similarities.
4. Provide literacy programs that are rooted in the child's sociocultural world.

Specific Practices Derived from Research

1. Increase children's opportunities to interact with a range of appropriate literature—at the library and in their homes, preschools, and child care centers.
2. Support children's developing positive attitudes toward books by carefully selecting, sharing, and providing repeated readings and enjoyable opportunities for experiencing and playing with books.
3. Increase children's opportunities to be read to by a skillful reader and to engage in conversations about stories.
4. Help children's families and caregivers recognize and find ways to support children's literacy growth through daily routines and events (including storybook reading, pretend play, and participating in everyday family activities that involve reading, writing, speaking, and listening).

Additional Practices Derived from Literature Regarding Children At Risk

1. Make literacy a part of all broad-based family intervention programs in the community. Help make the public library an active part of the community network of service providers who work with children and families in need.
2. Provide literacy experiences that
   - are characterized by all the specific practices recommended for all children;
   - begin early in life and are continuous rather than disjointed;

- include literature that is appropriate and interesting for the children;
- are guided by persons who know the child well enough to competently provide interactions that will support the child's continued learning and who are (preferably) members of their community/culture or are very knowledgeable regarding that community/culture; and
- are provided by highly trained caregivers, librarians, preschool teachers, etc., who are respectful of and knowledgeable about the children's culture and are affirming and empowering in relationships with their families and communities.

Exemplary Public Library Practices and Programs for Preschoolers and Their Caregivers

National Advocacy and Initiatives

The Association for Library Service to Children (ALSC), an ALA division, has existed in various forms and under several names since its founding in 1901, but ALSC's role as an advocate for the library and literacy rights of children has never wavered. ALSC's current leadership recognizes the importance of many of the concepts in this framework for early literacy as evidenced by ALSC's recent position papers and guidelines.

In ALSC's document *Competencies for Librarians Serving Children in Public Libraries* (1989), the Association's leaders sampled a wide range of children's services and librarianship sources to define the "role of librarians serving children in public libraries." All the guidelines identified in the "Knowledge of Client Group" section of the document are directly relevant to the Framework for Literacy presented in Section III of this paper: knowledge of child development; recognition of how societal developments influence children's needs; developing an understanding of the local community, including the needs of ethnically diverse populations; being aware of and responding to the needs of those who care for children; and interagency communication for the benefit of children. Other role statements for librarians pertaining to collection development, programming, advocacy, and networking skills include a focus on providing outreach programs, providing services to underserved populations, and developing a convenient and positive environment in which early literacy skills and dispositions can grow and be maintained throughout life (ALSC 1989, 219–223).

In 1995, ALSC President Therese Bigelow's message to the members highlighted the division's continued dedication to the welfare of children, as represented in ALSC's new motto: "Preparing the nation's children today for the world of tomorrow" (Bigelow 1995, 1). In that same issue of the *ALSC Newsletter,* the division's Goals and Objectives for the New Millennium were recorded. Emphasizing and extending the *Competencies for Librarians Serving Children in Public Libraries,* much of the content in these goals underscores ALSC's knowledgeable advocacy of education for early literacy. Included are calls for advocacy of important legislation affecting children; advancing the profession of children's librarianship and "achieving a pluralistic work force"; promoting training for librarians, based on the *Competencies* document; and ensuring that children have "full access to all emerging information technologies" (ALSC 1995, 3).

Developmental psychologist Urie Bronfenbrenner's ecological theory of human development (1979) emphasizes that the welfare of children involves their interaction with complex and changing environmental contexts and systems such as family, friends, school, neighborhood, parent's employment, community resources, social support systems, and the larger culture's beliefs and values. According to Bronfenbrenner's perspective, if intervention programs are to be truly successful, they must include a plan for appropriate impact across these varying spheres of influence. The selected national literacy initiatives and partnerships that are presented below indicate that the members and leaders of ALSC already are working hard to effect change across these varying spheres. Sometimes it is advocacy on the national level that provides the impetus or support for a regional effort that demonstrates results with children and their families. These successes then can be replicated in other communities with similar needs through programs that fit the sociocultural characteristics of a particular area.

"Kids Need Libraries" and "Kid's Can't Wait."

The strong advocacy position presented in the papers "Kids Need Libraries: School and Public Libraries Preparing the Youth of Today for the World of Tomorrow" by Mathews, Flum, and Whitney (1990); and "Kid's Can't Wait" by Mathews (1996), has become a rallying cry for libraries and literacy advocates around the country. Representing the service missions of all three ALA youth service divisions, the two papers provide a sound, overarching rationale for libraries' investment in children and contain checklists for assessing what libraries need to serve youth well. Early literacy concerns are prominently featured in both.

The *Journal of Youth Services in Libraries,* the quarterly journal of ALSC and the Young Adult Library Services Association, divisions of ALA, which published the "Kids Need Libraries" article, is the preeminent source for research, strategies, and practical ideas regarding literacy initiatives in public libraries. One of many excellent examples is "Helping Parents Who Want to Teach Their Preschool Children to Read" by Peterman and Kimmel (1990), which links research to practice and gives sound advice to librarians who are helping parents foster young children's emergent literacy.

Many publications regarding literacy, libraries, and preschool children grow from ALSC's mission and goals, are written by ALSC members, and published by ALA. Three such publications from the 1990s that are philosophically attuned to and practically supportive of this paper's Framework for Literacy are *Achieving School Readiness: Public Libraries and National Education Goal No. 1,* edited by Immroth and Ash-Geisler (1995); *Book, Babies and Libraries: Serving Infants, Toddlers, Their Parents and Caregivers,* byGreene (1991); and *First Steps to Literacy: Library Programs for Parents, Teachers, and Caregivers* (ALSC 1990).

Coalition for America's Children.

Using the slogan, "Who's for kids and who's just kidding," the coalition, based in Washington, is an alliance of more than 350 national, state, and local nonprofit organizations working to call attention to the serious obstacles impeding children's well-being and to boost children's concerns to the top of the public policy agenda. Sponsored by the Benton

Foundation, the strategic goals and objectives of the Coalition for America's Children are as follows:

1. Articulate a cohesive children's issue agenda that becomes the focal point for collaborative action among advocacy groups.
2. Increase the public consciousness of the scope and urgency of these children's issues in America.
3. Reposition children in America as a public policy issue and articulate the appropriateness and legitimacy of the government's role in addressing their issues.
4. Build an ongoing and powerful constituency for children.
5. Use well-researched public awareness campaigns as the springboard to a broader, long-term effort to win new momentum for children's issues.
6. Strengthen the capability of children's advocacy organizations to collaborate on and mount sophisticated public outreach efforts.

Library-Museum-Head Start Partnership.

Sponsored by the Center for the Book in the Library of Congress and the national Head Start program of the U.S. Department of Health and Human Services, in cooperation with ALSC, the partnership began in the summer of 1992 to produce and test a multimedia resource package that demonstrated how Head Start agencies and libraries could work together in literacy programs at the community level. The materials were introduced at regional workshops for librarians and Head Start teachers and were provided to Head Start teachers around the country. In the autumn of 1994, museums were added to the partnership through the participation of the Association of Youth Museums. The first expanded conference was hosted by Florida's Center for the Book in February 1995. The goal of the conference was "to develop guidelines and ideas for cooperative projects that bring libraries, museums and Head Start programs together at the community level to promote reading and family literacy" (Library of Congress 1995, 129).

In addition to being an exemplary community partnership in literacy for children, the Library-Museum-Head Start effort also stands out in its reflection of the Head Start program's priorities of family literacy, parent involvement in children's learning, and parent training and technological assistance to teachers and volunteers. Recognition of the continuing success of the Partnership Project was received in the summer of 1995 when it was funded for an unprecedented fourth year.

In her research on the role public libraries have and might have in helping urban Head Start families enhance their children's early literacy skills, Nespeca (1995) found that although most of the small sample of mothers did not use the public library due to problems of transportation and scheduling, nearly all saw the library, and reading to their children, as important. Librarians designing programs can draw much from the candid responses of these mothers who, because of their belief in Head Start's value, still manage to get their children to Head Start despite neighborhood dangers. Nespeca concludes that more research should be conducted to find out how to meet the serious literacy needs of lower income families, and suggests a stronger outreach component for public libraries. One mother in the study suggested that the libraries should have workshops for Head Start parents, a suggestion at the very heart of the Library-Museum-Head Start Partnership.

Born to Read: How to Nurture a Baby's Love of Learning Project.
Originally funded by The Prudential Foundation and administered by ALSC, Born to Read—now part of ALSC's continuing program—builds partnerships between librarians and health care providers. These partnerships are designed to help at-risk, expectant parents ensure that their children are "born to read." The major goals of the project are:

- to develop models of how library-health care provider partnerships can work together to break the intergenerational cycle of illiteracy;
- to help at-risk expectant parents improve their reading skills and impress upon them the importance of reading to their children; and
- to promote greater public awareness of health and parenting resources available in libraries.

The initial demonstration sites to receive the $30,000 grants were the H. Leslie Perry Memorial Library in Henderson, North Carolina, The Carnegie Library of Pittsburgh, and the Provo (Utah) City Library. All three projects, which began in March 1995, were selected because of innovation and creativity, evidence of community need, and enthusiasm and commitment to the project goals.

The H. Leslie Perry Memorial Library Born to Read project includes training literacy volunteers, conducting storytimes, and hosting programs for teenage parents of newborns. A collection of picture books was placed at the Granville-Vance District Health Department and parenting classes and storytimes were held at three local housing projects and the Health Department on Prenatal and Well-Child Clinic days.
The Provo City Library's program includes a special series entitled "Time with Fathers." This series for fathers and their babies promotes a child's early interaction with his or her father. In the first six months of the project, parents of 3,000 babies born at two local hospitals received parenting materials and follow-up visits. A van was used to distribute toys and books to at-risk families, and two program series—"Book Babies" and "Mother Goose Time"—were held for parents and their babies at the library.

The Carnegie Library of Pittsburgh's Born to Read project extended the already existing "Beginning with Books" program described later in this paper in the section "Some Community Success Stories."

Two additional Born to Read sites—the Sutter County Library in Yuba, California, and the Memphis-Shelby County Public Library and Information Center in Tennessee—were selected in the second and final rounds of the project. Targeting a multilingual population in Sutter County, the Born to Read program collaborates with four health care agencies and eleven community organizations, including the local Migrant Head Start Program. In addition to a major public relations campaign, programs are held for parents and storytimes for infants and their parents.

The Memphis-Shelby program expands the services of Training Wheels, a mobile classroom that provides at-risk expectant and new parents with materials and programs on early literacy skills and child development topics. Also planned are the production of three videos,

parenting classes, library programs, and home visits by staff from the LeBonheur Children's Medical Center's Healthy Families program (Top of the News 1996).

Following the completion of its third year of funding, the Born to Read project ensured its continuation on two simultaneous fronts. The *Born to Read: How to Nurture a Baby's Love of Learning Planner's Manual* and *Born to Read Video* were published by ALSC. Intended to guide any library and health care agency wishing to pursue the Born to Read model, the manual and video also serve as a model for the importance and potential of library-based literacy programs that focus on the families of young children.

The second boost was provided by First Lady Hillary Rodham Clinton. At a ceremony at Georgetown University Hospital in January 1997, Clinton unveiled a "Prescription for Reading" campaign that focused on the physicians' ability to "prescribe" reading the way they might prescribe cough medicine for a cold. Supported by the American Academy of Pediatrics, the Prescription for Reading launching was followed by a huge mass media interest in a growing body of brain research that demonstrates the positive physiological effects of early language and literacy stimulation in infants.

At the ceremony, Clinton recognized the Born to Read project and the Reach Out and Read project (a Boston-based, physician-led effort to prescribe reading and provide books through visits to a pediatrician's office), and named both as national models for those agencies wishing to implement the Prescription for Reading goals. Susan Roman, former executive director of ALSC and the American Library Trustee Association, was the director of the Born to Read project and was present at the Georgetown University ceremony. In follow-up planning sessions for the Prescription for Reading Partnership, as it came to be called, Roman (1997) listed the following as the important goals required to make the project a success:

- To create a nation of readers
- To support at-risk parents in their roles as their children's first teachers
- To ensure that every child has the opportunity for healthy brain development through early stimulation of language and listening skills
- To ensure that every child will develop a love of reading as the basis for lifelong learning
- To meet the America Reads Challenge of having every child reading on level by the end of third grade
- To break the cycle of illiteracy and poverty, and allow all children to reach their dreams

Among the many regional and national efforts working toward a fully literate public by focusing on literacy for children, perhaps the most ambitious is President Clinton's America Reads Challenge, directed by Carol Rasco in the U.S. Department of Education. Although the legislation is still working its way through both houses of Congress, the America Reads Challenge "asks every American to identify what role he or she can play—professionally and personally—to help all of our children to read independently and well by the end of third grade. While remaining sensitive to the unique learning needs of each child, we must work

hard to instill in each of them and in ourselves, high expectations for their reading skills" (America Reads Challenge 1997).

Expanding on existing national programs (e.g., the U.S. Department of Education's Read!Write!Now! summer program), the America Reads Challenge focuses on activating an army of tutors, including college students in work-study jobs, to finally draw the line in the sand across which no illiterate child may pass. Another major focus of America Reads is actively promoting the crucial idea that the parent is a child's first teacher, and that every effort should be made to work through families. The Prescription for Reading Partnership is poised to be an active component of the America Reads Challenge across the nation.

First Book.

Established in the spring of 1992, in recognition of the "central role played by underdeveloped literacy skills in social problems including poverty, hunger, unemployment, drug addition, and crime," First Book's (1996) primary goal is distributing new books to children at risk of failing in school or at risk of failing to develop adequate literacy skills to succeed in life. Two of First Book's great strengths are its ability to work with existing community-based programs that already focus on family-oriented literacy efforts through tutoring and mentoring and the practice of involving children's librarians on local First Book boards. From the Corporation for Public Broadcasting's "Ready to Learn" Initiative [Goal: To ensure that by the Year 2000, all children enter school ready to learn], which places board members in contact with local PBS stations throughout the country, to their scores of partnerships with funders, publishers, booksellers, and professional organizations, First Book's national impact has been felt in the heart of America—the home, where a child's first book now occupies its rightful place of importance.

Some Community Success Stories

Beginning with Books.

Pittsburgh's "Beginning with Books" program turned 16 this year, and during these years has placed more than 200,000 quality books in the hands of young children and their families and provided "countless hours of informal counseling or more intensive training on why, how, and what to read to young children" (Turning Pages 1995). In 1984, project directors Elizabeth Segel and Joan Friedberg began this program of prevention-oriented literacy in an effort to reach children and families who were unserved and unaware of the value of good literature in nurturing early literacy. The outreach efforts began through collaboration with well-baby clinics, and 1,000 families were reached in the project's first year (Segel and Friedberg 1991). The project has been affiliated with The Carnegie Library of Pittsburgh since 1985.

Project directors and staff have remained faithful to their commitment to reach under- and unserved children and families. In addition to the original gift book program, their outreach efforts now include collaboration with adult literacy tutoring programs, read-aloud clubs for Head Start parents, providing storyhour and literacy experiences for children and staff in more than 70 day care homes and centers in low-income neighborhoods, and two storymobiles that visit public housing communities. Finally, the project offers training and

support for others interested in implementing or adapting Beginning with Books in their own community.

The Born to Read grant allowed the Carnegie Library to expand the read-aloud clubs to additional mothers and their babies and to add presentations from the staff members of the Allegheny County Health Department and the Magee-Women's Hospital on nutrition, child development, and immunizations. Not only is Beginning with Books a stellar example of a public library's outreach programming potential, but the individual components and the project's recommended methods and philosophies mirror the conclusions presented in the early literacy framework. The longevity and success of the project help to establish that the guidelines set forth in the framework are sound from a theoretical, as well as a practical, perspective.

Targeting Child Care Providers.

Donna Dengel, the early childhood specialist at the Multnomah County Library in Portland, Oregon, provides book collections and care providers' collections for children and staff in private and public child care centers and Head Start programs in the communities served by the county's 17 branch libraries. Dengel's belief in librarians' being knowledgeable of their clients and communities is apparent in her visits and conversations with the children and staff in these centers her libraries serve. Her advocacy of librarians using theoretical and research-based practices is also clear from her collaboration with the Oregon Association for the Education of Young Children, as well as her selection of the Core Collection for Child Care Providers—an excellent example of public library and early childhood education people working together to enhance the quality of preschool learning for the community's children (Dengel 1994).

Targeting Special Populations.

Sometimes the very specific needs or circumstances of a particular portion of a community's preschool population require special attention or services. Originally presented at the ALA Annual Conference in June 1993, and sponsored by the ALSC Committee on Library Service to Children with Special Needs, three librarians and a program specialist for Reading is Fundamental discussed their approaches to serving homeless children in a program entitled "Libraries Can Serve Homeless Children." Pam Carlson at Orange County Public Library in Costa Mesa, California, Sherry (Norfolk) Des Enfants at DeKalb County Public Library in Decatur, Georgia, and Daryl Mark at the Cambridge Public Library in Cambridge, Massachusetts, reported success in reaching this underserved population through diverse methods suggested by the characteristics of their communities and the sociocultural world of their clients. All took their support services to the children at the shelter and found immediate effects in children's attitudes toward books, increased opportunities for children to be read to by skillful readers, and opportunities for collaborating with other community agencies in funding and planning programs beneficial to the whole community (Carlson 1994; Des Enfants 1994; Mark 1994).

Every Public Library's Duty

The first step a library must take in serving preschool children well is to proclaim the importance of young patrons in all library business—from building design, to policy formation, to administrative equity in budget distribution and desk staffing patterns, to the conducting of the simplest circulation transaction (Herb and Willoughby-Herb 1994, 55).

Advocacy for preschool children within the public library's service mission should include the following persons and elements:

1. Trained, experienced children's librarians whose areas of specialty include early childhood education and child development, in addition to the more traditional training in librarianship, children's book selection, and storytelling.
2. An administrative spokesperson who represents the views of preschool children and children's librarians in all administrative, policy, and budget decisions.
3. Sufficient budget, resources and staff to adequately serve the literacy needs of all of the communities' preschool children, their parents, teachers, and caregivers—those who enter the library building, and those who are unable to visit but still need the library's resources and the children's librarian's skills.
4. Continuous assessment of the climate of the public library to help ensure the success of its mission of providing equal access to all its services. Barriers to equitable service delivery often develop accidentally because of convenience or tradition. An ongoing examination of the climate of the public library might include reviews of personnel and hiring policies, collection development and selection policies, and staff development and service practices—these are among the many elements affecting public library service to preschoolers.

Summary

A comparison of public libraries' mission statements and activities in advocacy and program development with the early literacy framework described in this paper indicates a nearly perfect fit in philosophy and methodology. The aforementioned initiatives and programs reflect dispositions and practices rooted in beliefs about working within children's families and within families' sociocultural worlds. They deliver quality programming to underserved children and good books into the hands of all children. They increase children's opportunities to be read to by experienced readers and help families support their young children's developing literacy.

Public libraries have demonstrated their dispositions and abilities to collaborate, to be resourceful, to be adaptable, and to work within a range of communities. Public libraries have been, and continue to be, engaged in the best practices known to the early childhood education field while carrying out their commitment to working with children and their families in ongoing programs, as well as seeking out unserved children and their families. Furthermore, because of their missions to serve all children, as well as their goals for training and recruiting staff, public libraries are unique among public education service providers. The public library is often the only agency poised to reach those children not being reached

by various educational programs (e.g., Head Start and early intervention). As Dengel states in her article on providing library outreach to child care providers (1994, 39), "If, as the saying goes, it takes a whole village to raise a child, then the library should be the hub of that village."

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Toward a Conceptual Path of Support for School Library Media Specialists with Material Challenges

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Dianne McAfee Hopkins

(Associate Professor, School of Library and Information Studies, University of Wisconsin–Madison)

The value of support during challenges to library media materials has been touted for years within the profession through its literature and its professional associations. Support groups such as state intellectual freedom committees and supportive statements such as the Library Bill of Rights (American Library Association 1996, 3–4) are examples of resources that are available to library media specialists who might experience challenges to the presence or appropriateness of library media center materials.

Introduction

The value of support during challenges to library media materials has been touted for years within the profession through its literature and its professional associations. Support groups such as state intellectual freedom committees and supportive statements such as the Library Bill of Rights (American Library Association 1996, 3–4) are examples of resources that are available to library media specialists who might experience challenges to the presence or appropriateness of library media center materials.

While the profusion of recommended resources, both human and material, may give the impression that assistance during a challenge is readily available, how likely is the library media specialist to actually seek assistance from others during a challenge? That question was among those posed in a national intellectual freedom study (Hopkins 1991b, 1993). The study of middle, junior, and senior high school library media specialists who had recently experienced challenges to library media center materials focused on identifying factors that influenced the outcome of those challenges. It was found that half of library media specialists responding sought no assistance from others within the school or district when a challenge occurred. An even larger percentage (88.4 percent) sought no assistance outside the district. The natural subsequent question is, Did it matter that assistance was not sought by the library media specialist during a challenge?

The answer is clearly yes. When assistance was received within the district from district library media directors or principals, for example, challenged material was more likely to be retained. Similarly, when assistance was provided by others outside the district such as library media specialists in other districts or state library media association officials, challenged material was also more likely to be retained. In fact, the national study found support, whether from within or without the school or district, to be one of the primary factors in the retention of challenged library media materials.

Given the value of support during a challenge, several questions emerge that guide further study:

- Why do many library media specialists choose to deal with a challenge to school library materials without professional support?
- What contributions can support make to the library media specialist during the challenge process?
- What support systems are likely to be most beneficial to the school library media specialist during the challenge? Why?
- What is known in support research, generally, that can assist in understanding responses of the school library media specialist to a material challenge?

The answers to these questions were sought through a review of research studies in library and information studies, sociology, psychology, and communications. The research review sought to identify the major findings and theories relating to support research. While primary sources were studied, especially works deemed seminal, major summary sources that synthesized and interpreted the research were emphasized. By examining research findings, the answers to these and other questions relating to support for the library media specialist could begin to be formulated.

Considerations about which studies to consult were framed by two assumptions. The first assumption is that a challenge to the appropriateness of library media material is likely to represent a stressful time for the library media specialist. Secondly, while support systems may vary from setting to setting, all library media specialists facing challenges have internal or external professionally related options for support.

For purposes of the research review, support is defined as assistance provided to the library media specialist during the period in which library media materials are challenged. An important emphasis must be placed on the library media specialist's initiative in seeking support during a challenge. Studies consistently show that challenges to school library media materials are rarely known outside the school environment in which the challenge occurs. It is therefore the responsibility of the library media specialist in most instances to seek support during a challenge, for others have few opportunities to learn of challenges.

Review of Selected Research within Library and Information Studies

There is little research in library and information studies that examines the phenomenon of support, particularly that offered to the library media specialist during a challenge to library media materials. Summaries of research by Fiske, Hopkins, and England provide some useful background. The well-known research of Marjorie Fiske (1959) on book selection, challenges, and censorship focused on school and public libraries in selected California communities. While support to librarians experiencing challenges was not a major focus of her research, some findings are useful to note. Fiske reported that the local school board, through its adoption and use of a materials selection policy, was often valued as a source of protection by school administrators and library media specialists alike. Positive local media support during a challenge could also be helpful.

Fiske (1959) suggested that role models who publicly articulated intellectual freedom principles and defended the right to read provided support by example to library media specialists experiencing challenges. Those viewed as role models could include school administrators, and especially national, state, and regional library association leaders. The following quote illustrates the importance of role models: "On the few occasions when leaders of the profession have taken a strong and open stand on controversial issues, many librarians throughout the state have silently applauded, and felt strengthened in dealing with their own problems . . ." (105).

Some insight into whether the library media specialist feels supported is given in other intellectual-freedom research concerning the library media specialist's feeling of being pressured in the selection of library media center resources. Hopkins (1991a, 1996) found that library media specialists who experienced recent material challenges were more likely to feel pressured in the selection of lmc materials than those without challenges. England (1974) found that the perception of the community environment and views of others were definitely associated with precensorship activities of public librarians in Canada. Research suggests that the library media specialist who feels under pressure in making selections may be less likely to make challenges known when they occur. A lack of assertiveness may contribute to the removal or restriction of materials. Although support is less likely to be sought by the library media specialist under pressure, support may be especially important given these circumstances.

Hopkins (1989, 1993) cited the research summaries of Price and Roberts (1987) in providing insights into reasons why library media specialists may not seek support. Library media specialists may feel that popular opinion is going against them or that others do not support them. Price and Roberts discussed the spiral of silence research of Noelle-Neumann, in which Noelle-Neumann concludes that people who perceived from media reports that trends of opinion were running counter to their views would refrain from expressing their opinion for fear of social isolation. Thus, even if such people constituted a numerical majority, withholding their views strengthened the opposition and created the spiral of silence. Asch, also cited by Price and Roberts, provided a theoretical foundation for the spiral of silence theory. Asch found that even a single partner siding with an individual enabled that individual to hold her or his own course against the majority. Might not this notion of support also be applicable to library media specialists?

Related research in library and information studies examines support as a response to stress and burnout. Since the library media specialist experiencing a challenge is assumed to be involved in a stressful situation, that research is relevant here. Among those who have examined this area are Bunge (1987), Haack, Jones, and Roose (1984), Nauratil (1987), and Caputo (1991). Their publications emphasize that levels of stress experienced varies according to the individual.

Bunge reported on a series of workshops that he conducted on stress in the library. While many commonalities existed, he found that there were differences in satisfaction and stress levels according to type of library as well as type of work within libraries. Bunge concluded that stress and its sources are unique to each individual librarian, and to the situation in which

librarians find themselves. Bunge concluded that we all need resources. These resources include physical health and stamina, positive attitudes toward ourselves, support and encouragement from those around us, and effective strategies and skills for restoring physiological and psychological balance when confronted with stressors.

Haack, Jones, and Roose reported the results of a nongeneralizable burnout pilot survey of reference librarians attending a professional conference. Using a Staff Burnout Scale for Health Professionals, they concluded that many public service librarians were suffering from major stress at work similar to that of related occupational groups. They noted that much of the stress related to interpersonal relationships with clients, coworkers, supervisors, and the work environment.

Nauratil recognized burnout as a growing phenomenon among human service professionals. She characterized burnout as a manifestation of alienation. While noting that the most effective intervention occurred at levels beyond the librarian, she suggested that individual coping could also be useful.

Of particular interest because of references to censorship as a stressor are the findings of Caputo. Caputo's focus on stress and burnout was based particularly on the research of stress researcher Hans Selye and Selye's theory of three reaction stages to long-term stress. In stage 1, the alarm stage, the body recognizes a stressor and responds to the stressor both physiologically and physically. In stage 2, the resistance stage, the stressor is either removed or remains. If the stressor remains, the body stays alert at stage 1 levels, and moves eventually to stage 3, the exhaustion stage, that if not relieved, results in death. Selye's studies suggested that stress was a cumulative process of increasing stress levels without appropriate reductions after initial alarms. Caputo also described personal and work environment causes of stress. Caputo cited research that suggested that the causes of stress were found within the person as well as within the work environment.

Caputo provides a list of stressors that are specific to the library environment. Censorship is one of nine stressors listed. Noting that the most carefully selected materials could be considered controversial by someone, and having no limit of time in which a challenge might or might not occur (including challenges to titles owned for decades without complaint), the most stressful censorship efforts reported were those highlighted in the media, those ongoing for long periods, and those presented directly to a governing body with no prior notification to the librarian. In these cases, librarians felt that they were forced to act as crusaders for freedom of choice whether they personally supported the materials or not. They felt unfairly attacked, and felt that censorship challenges suggested that they were bringing harm to the community. Caputo ended by offering suggestions to managers for effective stress management and burnout reduction. Supervisory support including mentoring was suggested. Peer support and active staff discussion were also encouraged, especially for controversial or pressure-generating issues.

Research from Sociology, Psychology, and Communications

With limited research in library and information studies on support to librarians experiencing challenges, it became increasingly important to learn more about support and stress in other relevant fields. The fields of sociology, psychology, and communications offer a wealth of research from which we may draw.

Beginning with the general topic of stress, a broad research-based definition is suggested: "a perceived dynamic state involving uncertainty about something important" (Schuler 1984, 36). The dynamic state, as used in the definition, can be associated with opportunities, constraints, or demands. As such, the definition incorporates the knowledge that organizational stress can be positive (an opportunity) or negative (a constraint or demand). Stress is a dynamic condition that most individuals try to avoid, resolve, or take advantage of.

Much of the research on stress is related to job stress. When this is taken into account, another definition emerges. Job stress is a condition in which job-related factors interact with the worker to change (disrupt or enhance) her or his psychological or physiological condition such that the person (mind, body, or both) is forced to deviate from normal functioning (Haack, Jones, and Roose 1984, 6-7).

The interest in stress in the workplace is compounded in light of adverse effects that stress places on employee behavior. These effects include neuroses, coronary heart disease, alimentary conditions such as ulcers, cancers, asthma, hypertension, backaches, and the use of alcohol and drugs. For the past two decades, an estimated $45 billion dollars in lost economic productivity has been attributed to stress each year. Another indicator of stress's importance is worker compensation laws that include mental as well as physical illness due to or made more severe by employment (Beehr and Bhagat 1985).

Social support is the term used most often within sociology, psychology, and communications research. It has been defined as "the verbal and nonverbal communication between recipients and providers that reduces uncertainty about a situation, the self, the other, or the relationships, and functions to enhance a perception of personal control in one's life experience" (Albrecht and Adelman 1987, 19). Support is seen as a vital link in an individual's ability to respond to stressful situations on both psychological and physical levels (Wilcox and Vernberg 1985). Research shows that individuals who have good, solid support systems regain their health more quickly than those with fragmented or weak support systems (Wasserman 1988). Additionally, support is seen as critical in making social environments less stressful, more healthy, and more conducive to effective adaptation to stress (House 1981). A massive body of research on the role of social support in health and wellbeing has accumulated over the past two decades. Research has identified an empirically demonstrable link between social support and health (Burleson and others 1994). That link can be positive or negative for the person receiving the support.

A summary of early social support research history is relevant. Researchers John Cassel and Sidney Cobb are identified as having primarily influenced the initiation of cross-disciplinary study of social support. They did so in part through seminal papers published independently in 1976 (Sarason, Sarason, and Pierce 1990). John Cassel (1976) focused on the role of social support in preventing disease and maintaining health. He linked stress and susceptibility to

organic disease, psychological distress, or both. Cassel's principal hypothesis was that increased susceptibility to disease occurred for individuals who did not receive evidence that their actions were leading to desirable or anticipated consequences. Cassel noted that group supports could be protective of health (Wasserman and Danforth 1988).

Sidney Cobb's research (1976) in clinical medicine found that social support had a buffering effect on stress and crisis situations. He saw social support as information leading to one or more of three outcomes: the feelings of being cared for; the belief that one is loved, esteemed, and valued; and the sense of belonging to a reciprocal network.

The research on social support since the 1970s has emerged primarily from three general approaches (Burleson and others 1994): sociological or social network approaches, psychological or perceptual approaches, and communicative or interactional approaches. The discussions of support research, however, generally take an interdisciplinary, interdependent approach that acknowledges and builds upon, rather than separates, the research of other disciplines (Tardy 1985).

Of these research approaches, the sociological perspective is said to be the earliest. Early sociological research investigated support's relationship to health as promoted through social networks. This approach focused on how the size, density, multiplexity, and other features of an individual's social network correlated with various indices of health and wellbeing. Findings from this research particularly related to the individual's perceptions of the quality and availability of support, and led to a focus on psychological approaches to social support. Psychological approaches emphasize the individual's perceptions of support availability and satisfaction.

Perceptions of support availability can prevent a possible stressful event from being appraised as stressful (Winnubst, Buunk, and Marcelissen 1988). The perception of support can thus hinder the onset of physiological and psychological strains. This perception of a sense of support is believed to be a relatively stable personality characteristic that begins in attachment experiences early in life. This stable sense of support is believed to serve as an important buffer against stress and health problems (Sarason, Sarason, and Pierce 1990).

The psychological approach raises questions that are addressed in communications research, namely the examination of communicative and interactional processes through which social support is sought and conveyed. Most recently, communications support research has been strongly supported as the lens through which social support should be viewed (Burleson and others 1994). It is believed that communication behavior is inextricably woven into support behavior, for interactions that assist individuals through the anxiety and uncertainty of difficult life events represent the kind of supportive communications that truly help. Researchers have noted that social support is ultimately conveyed through messages directed by one individual to another in a relationship that is created and sustained through interaction. Thus, researchers focusing on communications emphasize a focus on the messages through which people seek and express support, the interactions in which supportive messages are produced and interpreted, and the relationships that are created by the supportive interactions in which people engage.

Important to the study of support is research on coping with stressful situations, on perceptions of individuals of support available to them, and on the type of support that is best. The findings are summarized in the next section.

Perceptions, Coping, and the Best Types of Support

A provocative discussion of conceptual and theoretical dilemmas in social support research is presented by Wilcox and Vernberg (1985). Based on their analysis of research done to date on the question "Does social support work?" and its corollary "How does it work?", they answer, "It depends!" They suggest the following parameters that shape relationships between environmental stressors, health, and social support:

- The nature of the stressor may dictate whether social support will be a viable coping option. Some stressors may be so intense that all coping resources are ineffective.
- All sources of support are not equally effective for a given problem.
- Individuals vary in their need for support, and in their reaction to support. Among the individual differences are demographic variables of gender, age, race, and psychological constructs such as locus of control and self-esteem.

Albrecht and Adelman use their definition of social support to summarize current research findings, for the definition itself is based on a careful review of support research (Albrecht and Adelman 1987, 19). The definition places a major emphasis on the uncertainty that is associated with stress support. During uncertainty, the individual is less likely to believe in her or his ability to produce positive outcomes. Supportive communication can help decrease anxiety and stress, thus helping the individual develop a sense of perceived control.

Drawing from research on the uncertainty experience during illness, Albrecht and Adelman (1987) note the value of satisfying the need for information early as a means of orienting the individual during succeeding stages of the stressful event. Thus, individuals in need of support can be influenced by those who offer messages of clarity and information that may affect the meaning they assign to their stressors, as well as how they see themselves and interpret similar or pertinent future events.

People are generally motivated to seek support for a reason. Supportive interactions usually affect recipients and providers alike in meaningful and usually positive ways. Bonds start to form as information is exchanged. As greater amounts of mutual information are shared, uncertainty is likely to be reduced and a relationship may develop that may endure over time. Social support functions by emphasizing control and mastery in order to facilitate the achievement of personal goals and to aid in personal coping.

In summary, a primary benefit of social support to the recipient is a reduction of uncertainty that results in enhanced self-control and self-acceptance. This benefit facilitates the individual's ability to cope.

Research shows that the types of support offered vary greatly (Tardy 1985). Many researchers select the studies of House (1981) as providing the most useful topology of

support content (Beehr and Bhagat 1985; Wells 1984; Winnubst, Buunk, and Marcelissen 1988). In fact, it has been suggested that the types of social support identified by House encompass the entire spectrum offered by the research literature (Schuler 1984). House notes four types of support: emotional, instrumental, informational, and appraisal. Emotional support, named as the most important, focuses on caring by providing empathy, trust, and love. Instrumental support involves helpful behaviors such as the giving one's time and skill, or even the loan of money. Informational support offers advice or information useful for coping with the problem. Appraisal support offers feedback support. It is relevant to self-evaluation.

A complaint about school library media materials represents a problem to be solved. Several studies demonstrate that supportive messages improve subjects' performance on problem-solving tasks (Tardy 1985). Even supportive messages offered by persons who are not close to those experiencing stress can improve subjects' performance (Tardy 1994). People in distress who face problem-solving tasks are sensitive and responsive to messages. Statements offering assistance and indicating concern or giving advice improved performance while neutral statements did not. Minor, noninvolving, and costless efforts can make a positive difference. Nonintimates can provide instrumental and emotional messages of support, thus demonstrating that the provision of emotional support is not limited to close personal relationships. Supervisors and coworkers can be an important source of support. However, supervisors themselves are often cited as sources of stress.

The words "perception" and "coping" occur frequently in research discussions of stress and social support. Both areas represent special, interdependent interests that may apply to library media specialists' responses to challenges to materials.

Perceptions

Of particular interest to researchers concerned with those experiencing stress is the individual's perception of support available to them or received by them (Albrecht and Adelman 1987; Winnubst, Buunk, and Marcelissen 1987; Sarason, Sarason, and Pierce 1990). The perception of social support is closely related to health outcomes, for example (Sarason, Sarason, and Pierce 1990). Research shows that perceptions of both the need for social support and its availability affect the amount of stress that is experienced. Thus, the manner in which support is offered is less important than the perception of value experienced by the individual in need.

Support offered by a significant other may not be as effective in reducing uncertainty as that offered by a coworker. Support may be fully realized only by those sharing the organizational context, for people in the workplace share common organizational referents which include a shared code and value system. Supervisors and coworkers are likely in a better position than nonorganizational members to provide support (Ray 1987).

Values held by the referent group also impact perceptions. Such values influence whether events or behaviors are labeled as serious problems. Gender may also influence problem perception. In research by Fisher and others, women were more likely than men to regard their difficulties as problematic, acknowledge a need for support, and actually seek aid

(1988). Demographic variables such as age and socioeconomic status and the personality of the stressed individual may also affect her or his problem-solving behavior (ibid).

An individual's experience of stress depends upon the interaction of her or his own perception of the environment with individual skills, needs, and characteristics (Wells 1984). Thus, something that produces stress for one person may not produce stress for another. An individual's response to stress may alleviate the stress or provoke even more stress.

Coping

The act of coping is an important response to stress. Wells provides a basic definition: "Simply, coping is what people do, either behaviorally or psychologically, to deal with stress in their lives, and social support is what others do to help people cope" (1984, 137). Drawing on research, coping has been more specifically defined by Schuler as a "process of analysis and evaluation to decide how to protect oneself against the adverse effects of any stressor and its associated negative outcomes, and at the same time take advantage of its positive outcomes" (1984, 46).

Several aspects of coping are associated with Schuler's definition:

- Coping is an intentional, cognitive act of analyzing the perceived qualities or conditions in the environment that are associated with a stressful experience.
- The degree to which the stressor is identified, uncertainty over the outcomes, and its importance determine the challenge and effort involved in coping.
- Stress can be tied to positive or negative outcomes, as long as they are important to the individual, and the process of coping can take place in either circumstance. In negative outcomes, an individual copes in order to protect. In positive outcomes, an individual copes to take advantage.
- The selection of a coping strategy is influenced by an evaluation and analyses of the personal environmental resources and constraints in addition to personal values and needs. Selection is also influenced by the immediate and future costs and benefits. The potential effectiveness of various strategies is also taken into account.

While similar in approach to Schuler, Rosenbaum (1988, 1990) emphasizes learned resourcefulness, which he suggests is a set of behaviors and skills by which individuals self-regulate internal responses that interfere with the smooth execution of an ongoing behavior.

Rosenbaum believes that any effort to cope with stressful events involves attempts at self-regulation in three phases of representation, evaluation, and action. In representation, the individual experiences an automatic emotional or cognitive reaction or both to real or imagined changes within herself or himself or within the environment. The reactions trigger automatic thoughts about one's self-worth and one's basic beliefs. The automatic reaction is followed by a conscious evaluation of its meaning for the individual. The individual can regard the stressor as a threat, a source of harm, a loss, or more benignly, as a challenge. If the individual is concerned and finds the disruption important, an evaluation of whether anything can be done to minimize adverse effects and maximize potential benefits takes

place. When the individual concludes that negative effects can be minimized, coping results. Thus, coping is seen as the action phase of the self-regulatory process.

Research suggests that highly resourceful people do not differ from less resourceful individuals in their initial reactions to stressful life events or in their evaluation of the stressor. They do differ in their ability to reduce the interfering effects of stress reactions on ongoing behaviors. Thus, learned resourcefulness has its major impact on the third phase, the action phase, where coping takes place.

It is believed that individuals ultimately choose the alternative that has the most favorable cost–benefit ratio to them (Fisher and others 1988). They may calculate the benefit either at a conscious, deliberate level or at an emotional and reflexive level. Factors in their calculations include the likelihood that it will actually yield the benefits sought, as well as the perceived psychological and, where applicable, financial and effort-related costs of the option.

It is also possible that individuals may seek help in ways that we may not understand. Gottlieb (1985) recalled studies from his undergraduate years that showed people receiving psychotherapy did not fare better than their matched colleagues on a waiting list for psychotherapy. Only later did he appreciate the likelihood that those "untreated" probably availed themselves of other naturally occurring helpful resources.

Useful research has focused on social support among colleagues. Gottlieb reviewed the research of Stanley Schacter, who found that threatened individuals had a drive to compare their feelings, abilities, and judgments with others in similar situations. When people facing similar developmental challenges or situational crises are given an opportunity to compare notes with one another, the process of social comparison is set into motion. This facilitates the ventilation of fearful emotions, normalizes feelings of undesired uniqueness, and minimizes threatening appraisals of the stressful circumstances. It further prompts joint problem solving about ways in which to cope with the common stressor or shared stressful emotions. Thus, the availability of peer consultants and advocates can add to the individual's confidence in her or his ability to master the demands of the stressor (Albrecht and Adelman 1987). These event-centered mutual-aid support groups are composed of others who have found themselves in the same situation and whose subjective experience of stress is cushioned by the cognitive guidance, emotional reassurance, and behavioral coping strategies they exchange with one another.

The dynamics of preexisting relationships between the individual and the social support provider influence the individual's choice of the people she or he seeks for help (Albrecht and Adelman 1987). Hence, simple contact with valued primary group members or links to significant associates may be an important factor in determining where a person turns for support (Gottlieb 1985).

Previous research has suggested that in times of stress, individuals seek support from those they know well. However, research has also suggested that where stressful conditions are perceived as irreversible, the selection of similarly stressed persons may not occur, for this could exacerbate the individual's feelings of helplessness. Personal credibility and higher status may also determine their selection of providers, with persons of higher status more likely to be selected.

In summary, coping is an important response to stress that can be enhanced through social support. Social supports give individuals greater control and efficacy over their lives that may positively condition them to believe that other goals can be accomplished through collective resources. An individual's effectiveness at coping is determined by several factors. Among them are the individual's learned resourcefulness and strategy effectiveness. In addition, an individual's confidence in her or his ability to overcome a stressor will either be augmented or diminished by the reaction of the referent group.

Individuals experiencing stress may find support from others in similar situations to be helpful unless they feel stress conditions are irreversible. A variety of factors determine whether persons known or unknown, in the workplace or outside, may be supportive in terms of work-related stress.

Implications of Research Review for Support during Challenges

This section summarizes the findings of stress and social support research as they may apply to the support of library media specialists experiencing challenges to library media center materials. Hypotheses and a conceptual path on the nature of support during challenges are then proposed.

The review of research literature was guided by four basic questions, as posed in the introduction. Those questions were "Why do many library media specialists choose to deal with a challenge to school library media materials without support?"; "What contributions can support make to the library media specialist during the challenge process?"; "What support systems are likely to be most beneficial to the school library media specialist during the challenge process and why?"; and "What is known in support research, generally, that can assist in understanding the responses of the school library media specialist to challenges?"

Social support research represents a major area of interest to sociology, psychology, and communications researchers. While conceptual frameworks relating to support research are still evolving, the literature clearly suggests that actual support to individuals experiencing stressful situations, or the perception that support is available, is an important contributor to effectively coping with stressful situations. Social support effectiveness is dependent upon the individual's personal characteristics, the message that is conveyed, the person(s) delivering the message, and the environment in which that message is given. Support that serves to reduce uncertainty and enhance the individual's ability to problem-solve and gain mastery of the situation seems to be the most effective in improving individual skills and in promoting self-acceptance.

The research on stress and social support can help library and information studies researchers and professionals gain a better understanding of the nature of effective support to library media specialists experiencing challenges to school library media materials.

House (1981) posed a question that will be adapted for the review of the support research from the standpoint of challenges to library media materials: "Who gives what to whom regarding which problems?" It can be more specifically worded, "What support should be provided to school library media specialists experiencing challenges to school library media materials, and from whom should the support come?" In library and information studies, the emphasis is on which individuals or groups are likely to be best suited to provide support, who is likely to seek support, and what kind of support should be provided.

Who

Research suggests that support during stressful situations can be provided by a variety of individuals. Some support providers may seek out the library media specialist who is experiencing challenges. However, since most challenges are not known outside the school, it is necessary to focus on whom the library media specialist chooses for support (Wilcox and Vernberg 1985). Who is sought for support depends on many factors, including which library media specialist is experiencing the challenge. Personal characteristics such as gender, age, race, and psychological constructs such as locus of control and self-esteem affect the library media specialist's choices for support. Within a work setting, these may be coworkers and supervisors such as teachers, principals, and district library directors (Ray 1987). Other sources of support are peer consultants and advocates such as other librarians who have experienced challenges to materials
themselves or who have unique knowledge about challenges to materials (Albrecht and Adelman 1987).

Research also suggests that the relationship that already exists between the library media specialist and a potential supporter can influence the choice of who is sought out for support. For example, if tensions already exist between the library media specialist and a potential supporter, or if past support has been ineffective, the school library media specialist may not select that person. Where confidence already exists with certain individuals, they may be most readily selected, and offer the most valuable social support available (Fisher and others 1988).
The school library media specialist may seek to identify others who have faced challenges in order to compare notes, ventilate fearful emotions, learn that the situation is not unique, and learn or reinforce coping skills. However, persons with similar experiences may not be sought if the challenge creates much stress and the belief that the conditions are irreversible, in which case support from others who faced similar challenges may only exacerbate the library media specialist's feelings of helplessness (Gottlieb 1985).

Other research suggests that the school library media specialist may seek or be influenced by persons believed to have higher status, such as district library supervisors, or representatives of state and national intellectual freedom associations or agencies (Fiske 1959; Gottlieb 1985). In addition, family members and friends outside the school or profession might also offer support. Their support may be emotional, rather than informational. Library media specialists are also likely to seek and value support from those with whom they are not close. Such nonintimates can also provide positive benefits, including emotional support (Tardy 1985).

Thus, *who* gives support to the school library media specialist experiencing challenges varies depending on several factors. Supporters may be other librarians including library media specialists who have had challenges themselves. Support providers may be teachers, the principal, or the district library director. Supporters may also be family members or friends. Supporters may be well known to the library media specialist or known by reputation or status.

It is also possible that the library media specialist may not seek the support of others. Several reasons are suggested for why this might occur. The costs of seeking support may outweigh the benefits, or the challenge may not viewed as a problem. Specialists may fail to seek support because they believe that stress conditions are irreversible (Gottlieb 1985). It is also possible that the library media specialist may not believe that sufficient support exists (Price and Roberts 1987). In these cases, it seems important to communicate fully the benefits to the school library media specialist of receiving support (Fisher and others 1988). Librarians may not seek support because they already have a sense of control and confidence. They may be able to psychologically call upon support strengths based upon previous experience with successful support (Gottlieb 1985).

What

Although there are several possible sources of support, each is not equally effective in dealing with challenges to materials. Interactions between who provides the support, the support itself, who receives support, and characteristics of the problem are all important. The type of support that is provided to the school library media specialist is likely to be one or more of the following: emotional, instrumental, informational, or appraisal. In emotional support, caring is shown through empathy, trust, and love. In instrumental support, helping behaviors are demonstrated by the giving of time, skill, or even money. In informational support, advice is given, and in appraisal, feedback is provided (House 1981).

Neutral statements intended to provide support seem to be less effective than those offering assistance, indicating concern, or giving advice (Tardy 1985). Support may have positive or negative effects on librarians receiving it (Burleson and others 1994). It is influenced by both objective and perceived characteristics of supportive relationships. For the person in need, feeling valued may be more important than the kind of support that is offered (Sarason, Sarason, and Pierce 1990). How support is communicated is also important, for it is only when it is effectively communicated that uncertainty can be reduced (Ray 1987).

Research suggests that the most effective social support is that which most enhances the library media specialist's sense of control and efficacy over her or his life (Albrecht and Adelman 1987). Thus, the best support encourages the library media specialist to be self-accepting and to feel a mastery of the situation. Research also suggests that the earlier support is received, the better. Messages of clarity and information can aid in how library media specialists perceive themselves and how they interpret similar or pertinent future events. Such support can decrease stress (Gottlieb 1985). Library media specialists can gain a sense of reliable alliance with others and they may become conditioned to believe other goals can be accomplished through collective resources. Thus, social support provides resources for coping with stress (Bunge 1987; Caputo 1991; Schuler 1984).

The kinds of communications that are most helpful are those that assist library media specialists with anxiety and uncertainty, and enable them to cope independently with stress and perceive some personal control (Albrecht and Adelman 1987; Bunge 1987). It is likely that where social support is effective, both recipients and providers benefit. It is also possible that, where support has been successfully given, the strategies the library media specialist learns and the sense of worth that she or he receives will undergird responses to future stressful situations (Gottlieb 1985).

The Library Media Specialist Who Experiences the Challenge

Because each school library media specialist is unique, considering the library media specialist who might seek support is complex. Research tells us that library media specialists can be expected to respond in different ways when a challenge to material occurs. Individuals vary in their need for support. Response to stressors is a product of the individual's own perception of the environment as set against the individual's unique skills, needs, and characteristics (Beehr and Bhagat 1985; Schuler 1984; Wilcox and Vernberg 1985).

The state of the library media specialist's physical and mental health is likely to affect her or his response to a challenge. If the specialist has a good, solid support system in place in the school or the home, she or he is more likely to recover quickly from the stress of a challenge (Wasserman and Danforth 1988). If the library media specialist feels that others are available to help, the challenge may not be appraised as stressful or the degree of stress may be lessened. The library media specialist's sense of support is important, and may relate to attachment experiences early in life (Winnubst, Buunk, and Marcelissen 1988).

Support systems existing in the workplace represent an important consideration. Stressful conditions may already exist in the workplace when a challenge to materials occurs. The day-to-day working relationship that the library media specialist has with teachers and the principal will affect how she or he responds to the challenge. Role ambiguity, role conflict, work overload, and difficult relationships with principal, teachers, and students all promote stress in the school. Research suggests, however, that if the library media specialist is in a participatory management situation such as site-based management, or already is involved in meaningful participatory decision-making in some way, stress is likely to be reduced (Wells 1984).

The referent group with whom the library media specialist identifies is important, for the reaction of the referent group to the stressor can augment or diminish confidence in overcoming the stressor (Wilcox and Vernberg 1985; Fisher and others 1988). The referent group can also influence whether an event is viewed as a serious problem. In school librarianship, library media specialists have two likely referent groups. One group consists of those within the school itself who are the principal and teachers. The other referent group can be said to be the library profession, which includes both librarians in the individual's life and professional tenets undergirding the profession. The reactions of the school referent group and the professional referent group may differ, and this difference may heighten conflict for the librarian. For example, the school referent group may believe the best way to resolve a challenge is to quietly and quickly remove the challenged title from the collection. The

library media specialist's professional referent group, on the other hand, regards access to information as a critical tenet of the profession. Whether this group is actually knowledgeable about the specific challenge or not, the importance of intellectual freedom is likely to be embedded in the professional value system of the library media specialist dealing with a challenge.

Library media specialists are likely to attempt self-regulation when a challenge occurs. The challenge will trigger an automatic emotional or cognitive reaction that triggers thoughts about self-worth and basic beliefs. The library media specialist will then decide whether the situation represents a negative threat or a positive challenge. If the challenge is viewed as a threat, the specialist will choose action in order to cope (Rosenbaum 1988).

Coping action will involve attempts to resolve the challenge alone, or attempts to seek or receive support. For most who seek it, support is likely to empower the library media specialist. She or he will gain a sense of reliable alliance with others, and become conditioned to believe that other goals can be accomplished through collective resources (Gottlieb 1985). For others, however, it may negatively affect self-esteem, lead to feelings of obligation and guilt, and have a negative effect on future coping efforts (Sarason, Sarason, and Pierce 1990).

Thus, library media specialists are unique individuals who will respond in different ways to challenges to materials and who will vary in their need for support. The school environment, including existing relationships with principal and teachers, affects the existing stress environment. The perception that support is available is important. Finally, the presence of an existing good support system affects the degree to which a challenge will be viewed as stressful (Winnubst, Buunk, and Marcelissen 1988).

Hypotheses and Conceptual Path

The research from sociology, psychology, communications, and library and information studies suggests tentative support hypotheses focusing on library media specialist characteristics, the school environment, and effective support.

1. Characteristics of the library media specialist
    A. Good physical health
    B. Good mental health
    C. High internal locus of control
    D. High sense of self-esteem
    E. Perception of solid support system in school
    F. Perception of solid support system at home
    G. Low degrees of dogmatism
2. School environment
    A. Positive ongoing working relationship with principal
    B. Positive ongoing working relationship with teachers
    C. Support of principal during challenge
    D. Support of teachers during challenge

3. Effective support
    A. Received early
    B. Pertinent to coping
    C. Promotes materials-retention
    D. Received from educators known to library media specialist
    E. Received from librarians known to library media specialist
    F. Received from nonintimates with professional knowledge
    G. Emotional, instrumental, informational, and appraisal
    H. Promotes the library media specialist's perception of value

Social support and library information studies research, particularly the research of Hopkins, Schuler (1984), Rosenbaum (1988, 1990), and Gottlieb (1985), suggest the following conceptual path relating to support for the school library media specialist (figure 1).

In the path, the school library media specialist exists in a school environment featuring varied professional relationships and levels of work stress. The state of the library media specialist's physical or mental health also varies. A challenge to materials occurs. The library media specialist's response relates to these existing conditions. The library media specialist considers whether the challenge is a problem. If the challenge is not considered a problem, action is taken and the challenge is resolved (i.e., retained, restricted, or removed).

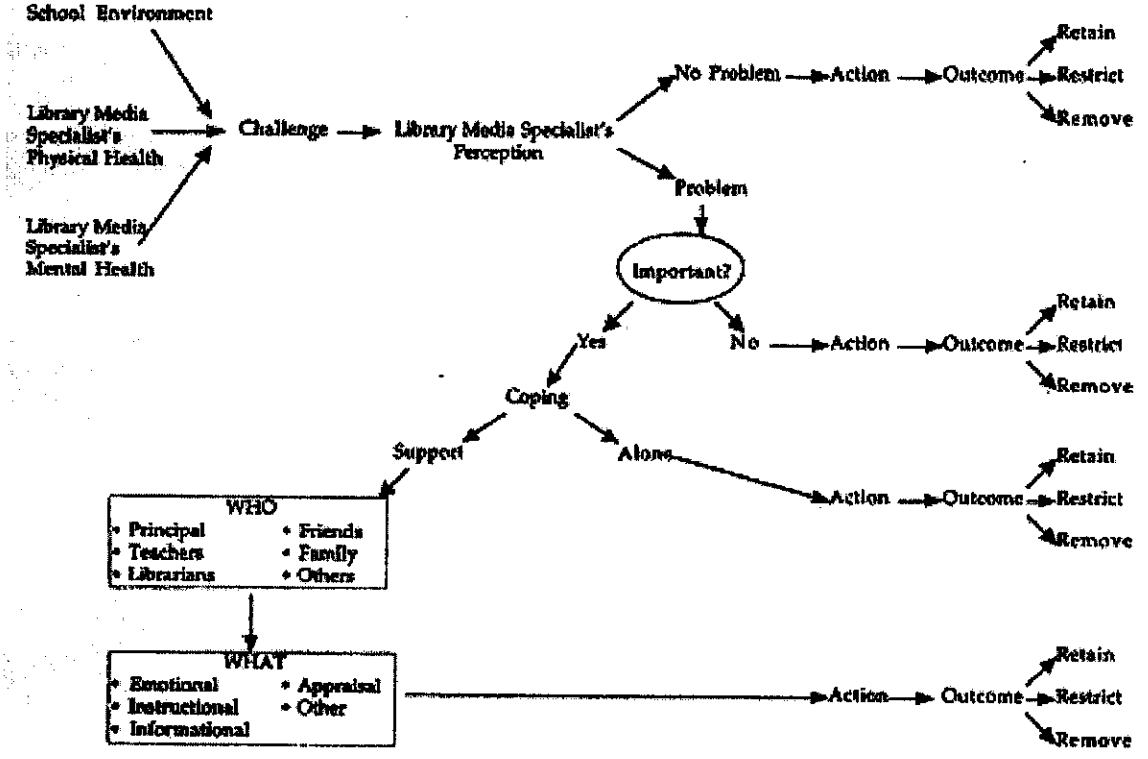

Figure 1. Library Media Specialist Response to Challenges: Emphasis on Support

If the library media specialist considers the challenge to be a problem, she or he considers whether the problem is important. If the problem is not important, action is taken and the challenge is resolved. However, if the library media specialist considers the challenge to be an important problem, then coping begins. If she or he copes alone, action is taken and the challenge is resolved. If the library media specialist receives support, the type of provider and support become important. The library media specialist responds to the support, takes action accordingly, and the challenge is resolved.

With the knowledge that assistance to the library media specialist during a challenge makes a difference in the outcome of the challenge, it is important to learn more about the nature of support.

Further research by the author will test the hypotheses suggested by research and the suggested conceptual path in regard the following questions: "Under what conditions is the school library media specialist most likely to seek support during a challenge to school library media materials?", and "Under what conditions is the library media specialist likely to receive effective support during a challenge to school library materials?"

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School Library Media Specialists' Perceptions of Practice and Importance of Roles Described in Information Power

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Anne McCracken
(Library Program Specialist/Project Manager, Fairfax County Public Schools, Virginia)

(**NB**: The tables have been omitted from this reprint. Please view the original article online at http://www.ala.org/aasl/SLMR/vol4/perceptions/perceptions.html in order to see the tables that accompany this article.)

To determine if practicing school library media specialists perceive they have been able to implement their roles as described in Information Power: Guidelines for School Library Media Programs (1988) and Information Power: Building Partnerships for Learning (1998), a survey was developed by the researcher. The survey further sought to determine if school library media specialists perceive it is important to assume a leadership role in the use of instructional technology. The survey was distributed to a random sample of 1,000 school library media specialists. Analysis of the 505 returned surveys indicates that school library media specialists perceive they are unable to fully implement their roles in practice. The most frequent barriers to full implementation were lack of time, including lack of time to plan with teachers; lack of adequate funding; lack of interest and support of classroom teachers; use of a fixed schedule; lack of clerical staff; and too many schools or students to provide for. Elementary school library media specialists who use flexible scheduling perceive they are able to practice more roles than library media specialists who use either combination or fixed scheduling.

Research demonstrates that there is a correlation between student achievement and the presence of a well-funded school library media center with a professional library media specialist. Where school library media centers are better funded, academic achievement is higher, whether schools are rich or poor and whether adults in the community are well or poorly educated. Among school and community factors that determine academic achievement, the size of the library collection and the presence of a professional library media specialist is second only to the absence of at-risk conditions of poverty and low educational achievement among adults (Lance, Welborn, and Hamilton-Pennell 1994). Research also demonstrates that students in schools with strong library media programs score higher on tests for reading and basic study skills (Didier 1984; Yoo 1998) and a correlation between academic achievement and the use of the school library (Koga and Harada 1989). Students in schools with library media specialists not only read more, they enjoy reading more (Krashen 1993). The presence of a school media center with a library media specialist also contributes to students' positive self-perception (Hopkins 1989).

Research also indicates that, despite the positive impact of the library media specialist, many education professionals do not have a clear understanding of the library media specialist's role. Principals, teachers, and library media specialists themselves share many

misconceptions about the role (Dorrell and Lawson 1995; Horton 1989; Naylor and Jenkins 1988; Ceperley 1991). Even though library media specialists have been characterized as "instructional leaders, curriculum developers, and resource consultants par excellence" (Craver 1986, 183), they suffer from actual and perceived isolation from other aspects of the instructional process (Naylor and Jenkins 1988). Some professionals have questioned if the different occupational titles library media specialists have assumed in the last 30 years (librarian, teacher-librarian, and library media specialist) were legitimate attempts to define the role of the library media specialist, overcome an unfavorable stereotype, or provide a more comforting self-image (Wilson 1979).

Rapid advances in technology have increased the confusion over the library media specialist's role. One professional has stated that "working with young people in library media centers in times of tremendous social, educational, and technological change is like attempting to maintain balance while running across a series of tightropes in the midst of a tornado" (Vandergrift 1997, 28). Others state that unless librarians distinguish their role, particularly in relation to information technologies, they may disappear from schools (Yates 1997).

Misunderstandings among educators, including library media specialists, exist despite the description of the library media specialist's role in professional literature and in statements published by professional organizations. In 1988 the American Association of School Librarians (AASL) and the Association for Educational Communications and Technology (AECT) published *Information Power: Guidelines for School Library Media Programs*. This landmark publication defined the role of the library media specialist as teacher, information specialist, and instructional consultant. In 1998 AASL and AECT published *Information Power: Building Partnerships for Learning*. It defined the library media specialist's role as teacher, instructional partner, information specialist, and program administrator.

Research on the Perceptions of the Roles of School Librarians

In addition to documenting the value of school libraries, research shows misunderstandings regarding the role of the school librarian. A review of Craver's research conducted from 1950 to 1984 revealed that the instructional role of the school librarian had changed only slightly. Craver concluded that there is a lag of at least 10 years between the role being prescribed in the literature and that being practiced (1986). A review of the literature since 1984 reveals little change (Pickard 1993).

Differing perceptions among librarians, principals, and teachers about the role of the school librarian can be a significant barrier to implementing change. Naylor and Jenkins (1988) researched the evaluation process of school librarians by principals in North Carolina. They found that school principals did not have a clear understanding of the school librarian's role but that librarians themselves did. They concluded that this provided school librarians a valuable opportunity to define their role. This lack of understanding about the school

librarians' role was demonstrated in research conducted by Ervin in 1989. She found that the majority of school librarians surveyed in South Carolina agreed with the roles specified in *Information Power: Guidelines for School Library Media Programs* (1988), but that they were able to practice them only occasionally. The main barrier to further implementation was lack of time and understanding of their role by teachers and principals.

This confusion over the role of the school librarian was echoed in other research studies. A survey of principals and library media specialists in Alberta revealed that principals and library media specialists both viewed the information specialist role to be of primary importance. The survey also demonstrated that principals and library media specialists have different perceptions of the importance of library media specialist's involvement with curriculum and instruction (Hauck and Schieman 1985). A 1987 survey of teachers and principals in Kansas revealed that both groups had generally positive views of school library media specialists, but that the two groups viewed the roles of the library media specialist differently (Hortin 1989). In 1995 secondary-school principals in Missouri were surveyed (Dorrell and Lawson, 1995) to determine if they thought it was important to practice the roles prescribed for school librarians in *Information Power: Guidelines for School Library Media Programs* (1988): information specialist, teacher, and instructional consultant. The results of the survey revealed that principals held a more traditional view of the role of the school librarian. The principals put the most importance on the information specialist role, selecting materials, and providing reference services to students; of less importance were the teaching and consultation roles (Dorrell and Lawson 1995).

A 1988 statewide survey of library media specialists in Nevada found that library media specialists viewed themselves as instructional leaders (Master and Master 1988). Survey results revealed that library media specialists were particularly involved in language arts, social studies, and science programs in a support capacity. The survey also found that school principals set the tone for the reception of the library media specialist by the school staff. Similar results on the role of the school librarian in supporting education reform were found in Kentucky (Shannon 1996). Shannon found that librarians were active members of their school. They served on school committees, provided training in the use of technology and library resources to teachers, and looked for opportunities to show teachers how they could support their teaching. One of the primary barriers to school librarians taking a more active role in instruction was lack of understanding on the part of school administrators about the role of the school librarian.

Research also demonstrates that many times school librarians do not perceive the instructional consultant role prescribed in *Information Power: Guidelines for School Library Media Programs* (1988) as being of primary importance. A survey of librarians and principals in Arizona (30% response rate) revealed that librarians and principals both rated the instructional role of the school librarian as being low in priority (Schon 1991). Johnson found that Illinois school librarians did not regard the instructional consultant role prescribed in *Information Power* (1988) as highly important. The librarians viewed their role as providing information and support to teachers and students.

Even when librarians perceive an instructional role as being important, they infrequently

practice that role. In 1993 Pickard researched the instructional role practiced by school librarians in DeKalb County (Georgia) public schools. She found that, although the majority of the librarians perceived the instructional role as important or very important, fewer than 10% indicated that they practiced the role to a great or very great extent. Many of the librarians viewed the prescribed role of an instructional leader and innovator as belonging to the instructional lead teacher and assistant principal for instruction rather than the librarian.

In 1994 Van Deusen and Tallman conducted research to determine if scheduling method affects the teaching and consultative role practiced by school librarians. They found that the consultative role is generally practiced at a low level. In the majority of cases in which it was practiced at a high level, flexible scheduling was used for the school library. They also found that more planning and teaching with classroom teachers occurred when a flexible schedule was used.

In 1996 Putnam surveyed 296 elementary school librarians who were ALA members on their perceptions of the role of the school librarian. She found that school librarians practice the instructional consultant role less than they thought they should. Librarians who used a flexible schedule placed more emphasis on instructional consulting than those who used a fixed schedule. A survey of school librarians in Georgia showed similar results (Jones 1997). The survey found widespread agreement across all instructional levels that participation in the curriculum development process is important. However, few librarians acknowledged such involvement to any appreciable extent.

In order to determine how well school librarians are able to realize the mission and objectives of *Information Power: Guidelines for School Library Media Programs* (1988), McCarthy (1997) studied 48 school library programs in New England. She found that the school librarians were strongly committed to the mission and objectives. However, no school had fully implemented all the guidelines. Of the librarians, 58% thought that *Information Power* was not realizable in their school. The main barriers were lack of support from administrators (for budget, scheduling, staff, and resources) and from teachers (for collaboration and integration).

Purpose of the Study

This study sought to determine if practicing library media specialists perceive that they have been able to implement the 1988 and 1998 national standards and if they think it is important to implement the standards at their school. The study also examined the role library media specialists perceive they should practice—and do practice—in relation to instructional technology. The study considered the following descriptive variables:

- Level of school (elementary or secondary)
- Number of years of professional experience as a library media specialist
- Number of years experience as a classroom teacher
- Amount of available technology
- Type of scheduling used (flexible, fixed, or a combination)
- Reported practices and views of library media specialists

Correlations were determined between the descriptive variables and views of library media specialists. The full research questions are provided in appendix.

If library media specialists perceive it is important to implement the standards, and that they have been to implementing the standards in practice, the profession will be in a strong position to educate teachers and principals about the importance of their role and its effect on student achievement. It is also important for university educators and for those developing continuing education programs to know where misunderstandings exist so that they may improve the education of future and practicing librarians.

Method

An extensive review of the literature on the role of the library media specialist was conducted, including *Information Power: Guidelines for School Library Media Programs* (1988), *Information Power: Building Partnerships for Learning* (1998), and similar research (Pickard 1993; McIntosh 1994; Lai 1995). A survey was designed based on items selected from this review. The survey statements were designed to determine (1) if librarians perceive the roles described for them in national standards to be important and (2) if they are practicing those roles in their schools.

The survey consisted of 46 statements from four major categories. The following four major categories were used in the survey:

- Roles unique to *Information Power: Guidelines for School Library Media Programs* (1988): instructional consultant.
- Roles unique to *Information Power: Building Partnerships for Learning* (1998): program administrator and instructional partner.
- Roles in both *Information Power: Guidelines for School Library Media Programs* (1988) and *Information Power: Building Partnerships for Learning* (1998): teacher and information specialist.
- Use of technology

Respondents were asked to rate the statements using two scales. The Theoretical Role Scale asked the respondents to indicate the degree to which they perceived a statement to be important as a role for library media specialists. The question prompting the response was "Is this important to you?" A practical scale asked respondents to respond based on the extent to which they perceived they practice the activity described in the statement. This question was "Do you practice this?" A Likert-type scale of five levels was used for responses to both scales. The responses are 1= not at all, 2= to a small extent, 3= to a moderate extent, 4= to a great extent, 5= to a very great extent. Using the same response set for the theoretical and practical scale permits direct comparisons of responses to both scales for a given statement.

Two open-ended questions were asked at the end of the survey to attempt to determine what barriers library media specialists face as they attempt to change and expand their role and what factors promote and support an expansion of their role. The open-ended questions were (1) What factors promote your ability to expand your role? and (2) What barriers do you face

in changing and expanding your role? The instructions for the open-ended questions asked the respondents to reply in lists and phrases.
The survey began with a series of descriptive questions. The descriptive information requested includes the number of years of experience as a library media specialist and as a classroom teacher, the amount and kinds of technology available in the school library media center, the presence of an automated cataloging and circulation system, the grade level of the school where the library media specialist is employed, and the type of scheduling used in the library media center (i.e., fixed, flexible, or a combination).

A pilot study was conducted to verify the clarity of the questions and to identify problems. The pilot survey was administered to a group of 80 library media specialists attending the Virginia Educational Media Association's Leadership Conference. Respondents were asked to identify any questions that were unclear. The wording of the survey was modified, where necessary, for content and clarity.

Data Collection and Analysis

The survey was administered to a random sample of 1,000 library media specialists in the United States. Market Data Retrieval (MDR), an educational marketing firm, provided a simple random sample of 1,000 names and school addresses of library media specialists in kindergarten through 12th grade in public schools. Two mailings, the first in October 1999 and the second to all nonrespondents in November 1999, yielded a total of 505 usable returned surveys (surveys that were only partially completed were not used).

The mean was computed for the responses to the practical and theoretical scale for each survey statement grouped according to four major categories used in the survey (see tables 1 through 6). Responses to the open-ended questions survey (What factors promote your ability to expand your role? and What barriers do you face as you attempt to expand your role?) were examined to determine what common factors promote and hinder the library media specialist in the change and expansion of their role in schools. Responses to the open ended questions were categorized and frequency of response noted (tables 7 and 8).

Survey Respondents

Table 9 summarizes the descriptive information. Library media specialists in elementary schools accounted for half of the respondents. Thirty percent of respondents had no experience as a classroom teacher, but slightly more than half of respondents had 11 or more years as a school librarian.

The survey found that fixed scheduling is dominant in elementary schools—slightly more than half of the elementary school respondents use this method (see table 10). Approximately 40% use a combination of fixed and flexible scheduling. Fixed scheduling is used less in middle and high schools. Flexible and combination scheduling is dominant in middle schools, where approximately 48% use flexible scheduling and an equal share use a combination of fixed and flexible scheduling. Flexible scheduling is also dominant in high

schools. Eighty-four percent of high schools use flexible scheduling; only 4% used fixed scheduling.

More than seven in ten school library media centers had the majority of the technology listed in the survey (see table 11). The technology most available in high and middle schools is Internet access. Ninety-nine percent of high schools, 95% of middle schools, and 84% of elementary schools provide access. Videocassette players were the next most common technology in elementary schools. Eighty-seven percent of elementary schools, 94% of middle and high schools had access to a video cassette player in the library media center.

However, there were a few exceptions. Only 60% of elementary school library media centers had an online catalog, although 77% had an automated circulation system. TV studios and editing equipment were not present in a majority of schools at any level. Of high school library media centers, 37% had a TV studio, although only 25% had video-editing equipment. Videodisc players were also less common, present in 45% of elementary schools, in 63% of middle schools, and in 57% of high schools.

Findings

The Relation between Perception and Practice of a Role

Research question 1 asked, "If a school library media specialist perceives a role to be important, are they more likely to practice that role?" Results indicate that library media specialists regard all roles described in both *Information Power: Guidelines for School Library Media Programs* (1988) and *Information Power: Building Partnerships for Learning* (1998) to be more important than they are able to implement in practice.

The Primacy of the Teacher and Information Specialist Roles

Question 2 asked, "Will library media specialists perceive the roles of teacher and information specialist to be more important than the roles of instructional consultant, instructional partner, and program administrator?" Question 3 asked, "Will library media specialists perceive they *practice* the roles of teacher and information specialist to a greater extent than the roles of instructional consultant, instructional partner, and program administrator?" Library media specialists perceive the role of information specialist to be the most important role, followed by the roles of program administrator, teacher, instructional partner, and instructional consultant. The library media specialists report that they practice the roles in the order of their perceived importance.

Perceived Importance and Practice of the 1988 and 1998 Roles

Question 4 asked, "To what extent do library media specialists perceive themselves as having implemented the roles described in *Information Power: Guidelines for School Library Media Programs* (1988)?" Question 5 asked, "To what extent do library media specialists perceive the importance of the roles described for them in *Information Power: Guidelines for School Library Media Programs* (1988)?" The roles are information specialist, teacher, and instructional consultant. Questions 6 and 7 sought the same response to the 1998 *Information*

Power publication. These roles are information specialist, teacher, instructional partner, and consultant.

A comparison of the mean response rate for both the theoretical scale (perceived importance) and the practical scale (perceived implementation) found in tables 1 to 5 indicate that the roles of information specialist, teacher, and instructional consultant are perceived to be practiced to different degrees. The role of information specialist is perceived to be most important and practiced to a greater degree than any other role. Responses for the theoretical scale were 3.5 or higher (table 5). The practical scale had a mean of 2.9 or higher. This indicates library media specialists perceive the information specialist role to be important and practiced to a moderate extent, a great extent, or a very great extent.

The role of program administrator is perceived to be second in importance and practice. All statements for the program administrator role (table 3) were rated 3.5 or higher on the theoretical scale. All program administrator statements were rated 2.7 or higher on the practical scale. The role of teacher is rated third in importance and practice. The mean response to statements for the teacher role were 3.4 or higher on the theoretical scale and 2.2 or higher on the practical scale (table 4). The roles of instructional partner and instructional consultant are rated fourth and fifth in both levels of importance and practice (tables 1 and 2).

Library media specialists perceive that the following factors are important in helping them expand their roles: supportive administrators and teachers; use of new technology, including the Internet; professional development opportunities; their own abilities and attitudes; adequate funding; and clerical support (table 7).

Library media specialists perceive the following factors to be barriers in expanding their role (table 8): lack of time, including lack of time to plan with teachers; lack of adequate funding; lack of interest and support of classroom teachers; use of a fixed schedule; lack of clerical staff; and too many schools or students to provide for as the library media specialist (i.e., many library media specialists cover several schools or they are the only library media specialist at schools with more than 1,000 students).

Perceived Importance and Practice of Technology Instruction

Research question 8 asked, "To what extent do library media specialists perceive themselves as having integrated technology into their practices?" Research question nine asked, "To what extent do library media specialists think it is important to integrate technology into their practices?

Most school libraries have access to the Internet and a computer for student use. However, high school library media centers have more technology than middle or elementary schools.

Middle school library media centers have access to more technology than those at the elementary school level.

Respondents believe it is important to use technology in their practices as a library media specialist (table 6). The more technology a library media specialist has access to in the media center, the more important the library media specialist perceives the use of technology. The greater the amount of technology the library media specialist has access to, the greater extent the library media specialist perceives they use technology.

The Correlation between Descriptive Variables and Perceptions and Practices

The final research question asked, "Is there a correlation between descriptive variables and the reported practices and views of library media specialists?" As earlier discussed, the variables addressed in this study were level of school (elementary or secondary); the number of years of professional experience as a library media specialist; the number of years of experience as a classroom teacher; the amount of available technology; and the type of scheduling.

The study found no significant differences in the perceptions of library media specialists at different levels with regard to the importance of the roles of instructional consultant, program administrator, instructional partner, and teacher. There is, however, a significant difference in the perceptions of the importance of the information specialist role. Library media specialists at the elementary level perceive the role of information specialist to be less important than those at the middle and high school levels.

There was no correlation between the number of years of experience as a library media specialist and the effect on the perception of importance of the roles of the library media specialist or on the perception of the importance of the use of technology.

This study does show that there is a correlation between the type of scheduling used and the ability to practice the roles as described in *Information Power*. Elementary school library media specialists who use flexible scheduling perceive they are able to practice more roles than library media specialists that use either combination or fixed scheduling. Those who use fixed scheduling perceive they are able to implement fewer roles than those who use either combination or flexible scheduling.

Discussion

The results of this survey indicate that library media specialists feel they are unable to practice any role to the degree that they feel they should. Without exception, each role was perceived to be more important than library media specialists perceive they are able to implement in practice. This survey further sought to identify the barriers to appropriate implementation of roles.

Perception and Practice of Roles

The role of information specialist—finding information in print resources and using nonprint resources—has been the dominant role of the library media specialist since its inception. The

results of this study indicate that library media specialists still perceive it to be their most important role. They also perceive that they practice that role more than any other role.

Library media specialists perceive the role of program administrator—managing the school library—to be next in importance. They also perceive that they practice that role to a greater degree than any other role except information specialist. Next in importance are the roles of teacher, instructional partner, and instructional consultant. These findings are consistent with research that has been conducted in the past on the practices of library media specialists.

These findings are frustrating to many leaders in the profession who advocate that library media specialists take a more active role in planning and administering instruction in coordination with classroom teachers. A 1963 report by the U.S. Department of Health, Education, and Welfare, *The School Library as Materials Center,* noted that library media specialists are "overly concerned with books" (5). The report also stated that library media specialists need to become more involved with helping teachers teach all aspects of the curriculum and in teaching with teachers as part of the team.

Information Power: Guidelines for School Library Media Programs (1988) described the role of instructional consultant. A review of literature indicates that the role of instructional consultant was practiced less than the other roles identified in the publication, those of information specialist and teacher. *Information Power: Building Partnerships for Learning* (1998) described a role of instructional partner, not an instructional consultant. This study demonstrates that library media specialists perceive the role of instructional partner to be more important than that of instructional consultant. However, library media specialists perceive that the role of instructional partner is still practiced less than any other role described in *Information Power: Building Partnerships for Learning* (1998).

Lack of Time to Implement Roles

This study indicates several possible reasons why library media specialists do not embrace instructional roles to a greater degree. One of the primary reasons is lack of time. In response to the open-ended question "What barriers do you face in changing and expanding your role?," the reason cited most often was lack of time. One library media specialist wrote:

> I need to say this to someone—the questions in this survey indicate that I should be doing all of these wonderful things, keep up with current research and practice and do wonderful PR [public relations]! When am I to do this? Unless I work until 10:00 P.M., all weekend and all summer, it would be impossible to be the superwoman that all the academics and policymakers seem to think I should be. Real-life schools are understaffed and underfunded and all of these supposed to do's mean nothing.

Written comments indicated that librarians feel overwhelmed by the lack of time and the number of responsibilities they have. There were many comments such as "I wish I had the time to be the person your form reflects" and "Can anyone do everything on your form?" Library media specialists clearly perceive they do not have the time to perform all the duties

described for them in *Information Power*. This finding is consistent with the prior research by McCarthy (1997) described earlier in this paper.

Closely related to lack of time is the lack of professional and clerical staffing. Many library media specialists noted that they were the only professional library media specialist for several schools. Many also noted that they had little or no clerical support. Adequate professional and clerical staffing is essential if the library media specialist is to perform all the roles described in *Information Power*.

Lack of Resources

Lack of time and shortage of clerical help were not the only resources library media specialists said they were lacking. The second most cited barrier was lack of resources, primarily funding to purchase materials and equipment. In particular, the highly ranked role of information specialist requires comprehensive and current information resources. Such resources, print and nonprint, are expensive.

Many library media specialists noted that they do not receive the funding necessary to purchase resources that adequately support the curriculum. For instance, the advent of CD-ROM and online materials has created an additional category of resources for which most school library media centers were not given additional funding. Library media specialists noted that they did not have funding to purchase needed equipment, especially computers and other technologies.

Comments such as "technology is expensive" and "cannot upgrade technology" were frequently made. Other respondents gave specific examples of funding levels and sources to demonstrate that existing funding was inadequate. Comments such as "I have no funding except for PTA gifts" and "for the past six years I received only $4 per student for books and nonprint materials" were often made.

Expectations of Principals and Teachers

Library media specialists are also prevented from taking a more active role in instruction because of the perceptions and expectations of teachers and principals. As discussed above, prior research demonstrates that, despite the positive impact of the presence of a library media specialist, many education professionals do not have a clear understanding of the role of the library media specialist (Haycock 1995). In response to the open-ended question "What factors enable you to expand your role?" the two reasons cited most often were support of administrators and teachers. The positive benefits that can result from a good relationship with teachers and principals is evident in responses such as "I once worked under an administrator who expected promotion and program. I rode that wave for all it was worth" and "positive projects with a few teachers show the others the possibility that the library offers."

Frustration caused by this confusion was also evident in the responses to this survey. In response to the question "What barriers do you face in changing and expanding your role?" the third most cited barrier was lack of interest and support by teachers. Frequent comments included "most teachers have a traditional view of the librarian's role—it is challenging to get

them to view me as a teacher, too," "teachers aren't eager to collaborate—or don't always see the need to do library projects," and "teachers are set in their ways and do not want to cooperate." Lack of administrative support was also noted as a barrier to expanding the role of the library media specialist. One respondent noted, "The administration does not consider how important the library is to developing a solid and well-rounded curriculum that promotes maximum learning." Other respondents were more pessimistic: "Administrators think all we do is check out books" and "administrators have little or no interest in the library program."

Zemelman, Daniels, and Hyde (1993) note that change cannot be forced from the outside. The success of any change or innovation depends on the choices made by teachers as they move throughout the school day. Many of the changes called for in *Information Power* cannot take place without the understanding by teachers and principals of the role of the library media specialist. Full implementation of the roles described in *Information Power* will also require that library media specialists and teachers have the time to develop relationships that support an instructional partnership. Giorgis and Peterson (1996, 477) stated, "Creating an environment in which teachers and librarians can work together requires time, dedication, and the willingness to take risks."

Impact of Scheduling Practices

The type of scheduling used, particularly in elementary schools, has a strong impact on the roles the library media specialist is able to implement. Use of a fixed schedule was the fourth most common barrier to fulfilling perceived roles. Survey responses also indicate that elementary library media specialists who use a flexible schedule perceive they are able to implement more roles than those who use either a fixed or combination schedule. Those elementary library media specialists that use a fixed schedule perceive they are able to implement fewer roles than those who use a flexible or combination schedule. In response to the open-ended questions, many library media specialists indicated that they were told they must use a fixed schedule in order to provide planning time for teachers or because teachers requested a scheduled library time. Several library media specialists felt they were used as "babysitters." In addition, library media specialists cited the use of a flexible schedule as a factor that enables them to expand their roles.

The finding that the flexible schedule enables the library media specialist to assume more instructional roles is consistent with prior research. Van Deusen and Tallman (1994) conducted a research project to determine if the type of scheduling used affects the teaching and instructional consultant role practiced by library media specialists. They found that the instructional consultant role is practiced at a low level. In the majority of cases where it was practiced at a high level, flexible scheduling was used for the school library. They also found that more planning and teaching was done with classroom teachers when a flexible schedule was used.

Impact of Technology

The introduction of technology into the school library media center, accompanied by the rapid advances and changes in the technology since its introduction, have had a profound impact on the library media specialist. Little research has been done on this topic. Studies conducted in the 1980s demonstrated that computers were being increasingly used in school

libraries but not always to their full potential. By the mid-1990s many library media specialists were taking a leadership role in school technology use. This role is advocated by many leaders in the field. *Information Power: Building Partnerships for Learning* (1998, 54) calls for library media specialists to be "a primary leader in the school's use of all kinds of technologies—both instructional and informational to enhance learning." Yates (1997, 2) warns that if library media specialists do not define for themselves a leadership role with respect to the use of technology they may "disappear from schools."

The results of this study show that many school library media centers have been equipped with at least one of each type of the technology resources asked about in the survey, as shown in table 11. Approximately 70% of respondents indicated that they had seven or more of the types of technology listed in the survey. Ninety percent of school library media centers had Internet access.

The use of technology was the third most cited factor enabling respondents to expand their roles. Many library media specialists made comments such as "I have an avid interest in technology" and "becoming a technology leader enables a new respect from staff and students." Several library media specialists noted that students are eager to use the new technologies. In response to the question "What barriers do you face as you attempt to expand your role?" factors related to technology were often cited. The factors included lack of technology—especially Internet access—lack of knowledge about how to use technology, and lack of technical support. While the survey indicated that library media centers had access to different types of technology, the lack of adequate technology resources to meet the needs of students and teachers is a frustration.

Despite the overall positive reactions of many library media specialists to the use of technology, some concerns were noted. There were several comments such as "Why do we keep pushing technology and forgetting literature?" and "No mention of literature. *Why!!?? Only technology, technology, technology."* Clearly some library media specialists view technology as diminishing their role with regard to literature and books.

Attitudes of Library Media Specialists

In response to the question "What factors enable you to expand your role?" the fifth most commonly cited factor was the attitude of the individual respondent. The personal factors cited include:

- My own input and willingness to move forward
- My own continued interest in my own learning
- My willingness to try new things
- My own creativity
- Determination
- My desire to serve
- Lack of fear of change
- Having a clear idea and plan about what is best to do to benefit others
- Genuine enjoyment of helping staff and students

The number of responses citing the attitudes and inner strength of library media specialists reflects positively on the profession of library media specialists. Clearly, many library media specialists entered the profession with a desire to serve and support both students and teachers. When facing pressures to expand their role, they draw upon their own resources and focus on meeting the needs of others in the school.

The positive impact that a library media specialist with a strong desire to serve can have in a well-funded and supported school library is evident in the comments of one respondent:

> I started the media center in this school and my principal more or less turned me loose and said to do what it takes. As a result I have an efficient library, well-organized and much used by teachers and students. The inviting atmosphere—plants, classical music, cute uncluttered décor—are very inviting. I run a TV show, am the main technology teacher, and I am turned to with computer questions often. I have a great relationship with the teachers and paraprofessionals, which can make all the difference in the world.

Recommendations for Further Research

The results of this study have yielded valuable quantitative and qualitative data regarding the perceptions of library media specialists regarding their roles and practices. Further research needs to be performed in order to determine what factors will enable library media specialists to fully implement the roles described for them in *Information Power*. Such research could address the following areas:

- Administer the survey developed for this research to principals and teachers.
- Compare the roles that principals and teachers perceive to be important for library media specialists, as well as the roles they perceive library media specialists are implementing. Library media specialists have traditionally suffered from isolation. It is important that we understand the perceptions of library media specialists, but also of other education professionals. The first step in creating more collaborative relationships is learning the viewpoint of others.
- Perform more qualitative research on the practices of library media specialists.
- Further investigate how some library media specialists are able to implement more roles than others. The responses to the open-ended questions revealed that some library media specialists are succeeding and thriving, while others are drowning in a sea of frustration. It is difficult to discover the cause for the differences in views through the use of surveys and other quantitative methods. Face-to-face and group interviews with library media specialists, and the principals and teachers with whom they work, would provide revealing information.
- Perform research that combines the use of quantitative data on funding and support to library media specialists (i.e., library materials funding, professional and clerical staffing, available equipment, and facilities) and quantitative or qualitative data on the implementation of the various roles in *Information Power*.
- Explore correlations between the instructional impact of the library media specialist and the support provided to the specialist. This research reveals that library media

specialists do not practice the roles in *Information Power* to the degree they desire. It also reveals that lack of sufficient resources is a frustration of many library media specialists. Documenting the relationship between support and impact would be useful information to those seeking increased funding for school library media programs.

Appendix : Research Questions

1. If a library media specialist perceives a role to be important, are they more likely to practice that role?
2. Will library media specialists perceive the roles of teacher and information specialist (roles found in *Information Power: Guidelines for School Library Media Programs* (1988) and *Information Power: Building Partnerships for Learning* (1998)) to be more important than the roles of instructional consultant, instructional partner, and program administrator?
3. Will library media specialists perceive they practice the roles of teacher and information specialist (roles found in both *Information Power: Guidelines for School Library Media Programs* [1988] and *Information Power: Building Partnerships for Learning* [1998]) to a greater extent than the roles of instructional consultant, instructional partner, and program administrator?
4. To what extent do library media specialists perceive themselves as having implemented the roles described for them in *Information Power: Guidelines for School Library Media Programs* (1988)?
5. To what extent do library media specialists perceive the importance of the roles described for them in *Information Power: Guidelines for School Library Media Programs* (1988)?
6. To what extent do library media specialists perceive themselves as having implemented the roles described for them in *Information Power: Building Partnerships for Learning* (1998)?
7. To what extent do library media specialists perceive the importance of the roles described for them in *Information Power: Building Partnerships for Learning* (1998)?
8. To what extent do library media specialists perceive themselves as having integrated technology into their practices?
9. To what extent do library media specialists think it is important to integrate technology into their practices?
10. Is there a correlation between descriptive variables (level of school [i.e., elementary or secondary]; the number of years of professional experience as a library media specialist; the number of years of experience as a classroom teacher; the amount of available technology; the type of scheduling that the librarian uses (flexible, fixed, or a combination); and the reported practices and views of library media specialists?

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Constructing Mental Model Paradigms for Teaching Electronic Resources
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Julie I. Tallman
(Associate Professor, Department of Instructional Technology, University of Georgia)
Lyn Henderson
(Senior Lecturer, School of Education,
James Cook University of North Queensland Australia)

Library media specialists activate numerous mental models when teaching electronic information literacy database access, research, and retrieval in the context of authentic school assignments. The paper identifies these models and examines what occurred when the mental models in a study sample interconnected in the complex changing environment of a lesson. Discussion focuses on the changes to the mental models the library media specialists held with respect to the electronic database, the role of the library media specialist, the lesson goals, and their teaching strategies. Findings suggest that (a) most of the library media specialists' mental models of teaching with electronic databases were influenced by their models of teaching access, research, and retrieval with print resources and (b) even though many library media specialists identified the necessity to incorporate mental model changes for more effective teaching, these were not sufficient to counteract their habituated teaching behaviors.

Introduction

New policy thrusts in education are increasing the range of electronic learning technologies for use by students, placing them as central to the core curriculum, and calling for equitable access to information via these technologies (Tallman 1998). Part of this equity includes individualized instruction to help students "develop a systematic mode of inquiry to gain physical and intellectual access to information and ideas that reflect diversity of experiences, opinions, and social and cultural perspectives" (American Association of School Librarians and Association for Educational Communications and Technology 1988, 29). Effective teaching of computer-based electronic resources requires library media specialists to have appropriate mental models of the characteristics and protocols of these resources and strategies to teach competent problem-solving access, research, and retrieval skills to meet the needs of individual students. One method for constructing mental-model profiles of library media specialists is to explore their mental models in situ. This involves identifying changes to the mental models during and after teaching episodes. This paper demonstrates that constructing a representative teaching paradigm for the library media specialists in the study sample involved examining the relationship between various mental models. It reports the study of the interconnected relationships of various mental models utilized by ten American and Australian library media specialists when involved in one-on-one teaching-learning episodes with students using electronic resources in the context of information-seeking for authentic school assignments.

Mental Models

Mental models "are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (Senge 1990, 8). They can be defined as a schema or internal domain-specific representation of an object, system, or event that may be incomplete. Through the mental model, the individual can explain, infer, predict, and understand phenomena in order to decide what action to take to control its execution (Johnson-Laird 1983; Bliss and Ogborn 1989; Renk, Branch, and Chang 1993). Thus, mental models are created for a purpose; they are not optional extras (Green 1990). They act like tools to allow individuals to understand problem situations, choose potential solutions, and predict outcomes as a consequence of their actions. Students and library media specialists are continuously processing their schemata for each situation as a "runable" event. This concept of "runability" is a core defining characteristic of a mental model. As a processing mechanism, runability is a process rather than a product (Jih and Reeves 1992; Randell 1993; Rogers and Rutherford 1992). When mental models are run, they are constantly in a state of change in a teaching-learning situation as new information is attached to them or context-irrelevant information is deleted.

"Mental models" is an accepted concept in the human-computer interaction literature (Staggers and Norcio 1993). Even so, the research literature dealing with mental models and use of electronic information literacy databases tends to have a narrow focus. First, it concentrates on the learner, user, or instructional designer rather than the library media specialist, librarian, or teacher (for example, Stine and Wildemuth 1992; White 1994). Second, information literacy database research usually attempts to establish whether there was a transition in the user's mental model conceptualization of the information literacy database from naive to expert, and proceeds to explain why this did or did not occur (Carmel, Crawford, and Chen 1992; Doomen and Leuven 1997; Jacobson and Jacobson 1993; Moray 1986). Third, electronic information literacy database literature devotes little attention to the multiplicity and interactions of the mental models simultaneously held by the participants and, significantly, how these various mental models interact when they are being run (Randell 1993). Thus, this paper does not concentrate on the student as user or on a comparison of the library media specialists' initial and final mental models (cf. Carley and Palmquist 1992; Randell 1993). Rather, it examines what occurred during the running of various interconnected mental models held by the library media specialists in the complex changing environment of a lesson.

Methodology

Sample

The researchers employed a purposeful sample in the United States of one elementary, one middle school, and four secondary media specialists, each with two student participants. These library media specialists, located in Georgia, were selected by the differences in experience and teaching background. The study was replicated in Queensland, Australia, with library media specialists chosen to correspond as closely as possible to the United States sample. The students were chosen by the classroom teacher at the request of the library

media specialists and had an authentic assignment that required the use of an electronic database resource.

Data Collection

According to researchers (Mevorach and Strauss 1995; Rowe and Cooke 1995; Sasse 1990), mental models are not directly observable; they must be inferred from performance on some measures. There is no agreed-upon method, but the following, including combinations, have been found useful: interviews, think-aloud protocols, stimulated recall interviews, videotaping, computer tracking of the user's interactions, and multivariate statistical techniques. A qualitative study with the following data collection instruments was utilized. The variety allowed necessary triangulation of the data in order to obtain before, in-action (Mevorach and Strauss 1995), and after mental model paradigms.

Individual Pre-Episode Interviews

Audiotaped interviews using structured, open-ended questionnaires were conducted with each participant at the beginning of each teaching-learning episode. These interviews asked "big picture" questions, such as "Tell me your mental image of this database." The open-ended questions were grounded in the data, that is, they were based on a pilot interview with an experienced library media specialist and the work of researchers who had previously investigated mental models.

Video- and Audiotaping of the Teaching-Learning Episode

Each teaching-learning episode, which was conducted in situ in the library, was video- and audiotaped. In order to obtain a realistic situation (Reeves 1995), the library media specialists were asked to replicate their normal teaching practice. Thus, the sessions varied in length, lasting as long as the library media specialists maintained the instructional interaction. Special videotaping apparatus was required to create a split-screen effect for the stimulated recall sessions. To provide the best stimulated recall, participants needed to see both what was on the computer screen and their own verbal and nonverbal reactions. To achieve this dual image, the video portrayed a picture within a picture. The researchers used a mixer to pair images from a video camera focused on the participant with the digital signals from the computer screen showing the database content and keystroke and mouse responses.

Process-Tracing Stimulated Recall Interviews

Individual process-tracing stimulated recall interviews based on the videotaped episode were then conducted. The methodology adhered to the strict protocol developed in Australia for text and interactive multimedia qualitative studies (Marland, Patching, and Putt 1992; Putt, Henderson, and Patching 1996). Each videotape was replayed to the library media specialists to stimulate their recall of their thinking during the episode. The researchers took each library media specialist individually back through their interactions during the episode. The researchers asked the library media specialist to volunteer their own statements about their thoughts at the time of various verbal or nonverbal incidents depicted in the video replay or respond to the researchers' questions asking them what they were thinking during those incidents. These videotape-replay interviews were audiotaped and conducted as soon as possible after each video session in order to diminish intervening distractions. Both

researchers jointly interviewed each library media specialist to strengthen internal research validity.

Post-Interviews

Two individual post-interviews containing a set of open-ended questions were administered and audiotaped. One was conducted immediately after each stimulated recall interview while the final, smaller post-interview was administered to each library media specialist at the conclusion of all previous data collection sessions. The purpose of both post-interviews was to increase detection of any changes in the library media specialist's mental models. The post-stimulated recall interview gave the library media specialist a place to explain the relationship between the mental models they held prior and after each teaching-learning episode. Importantly, it also allowed the library media specialists to comment on any perceived changes to their mental models during each lesson. Besides providing a last opportunity for reflection, the final post-interview permitted the library media specialists to identify any changes they in the second teaching-learning episode as a consequence of the first lesson or the research itself. Thus, by having the library media specialists each teach two students, the researchers could identify any adjustments in the library media specialists' mental models in response to each student's needs and the library media specialists' reflections.

Findings and Discussion

From analysis of the data, the researchers identified various mental models utilized by the library media specialists during the teaching-learning episodes. By triangulating the data, it was possible to construct a "before," "in-action," and "after" profile of the mental models of the library media specialists' as teachers of electronic information literacy databases. Those selected for discussion are mental models of: (a) the electronic data base, (b) the role of the library media specialist, (c) their lesson goals, and (d) their teaching strategies. This paper is concerned with examining the runability of these mental models in the in-action stage of the teaching-learning episode. Hence, the before and after profiles are summaries of the findings that, nevertheless, help provide a contextual overview.

The "Before" Profile

The before profile contained [several] the following types of mental models. All media specialists held perceptions that their mental model of the database was satisfactory. Their mental models of the role of teachers contained samples of teacher-as-expert, teacher-as-director-of-events, teacher-as-colearner, and teacher-as-facilitator. Their teaching strategy mental models advocated a hands-on approach with the student in control of the keyboard and mouse. Their mental models of what constituted appropriate planning resulted in the following sorts of preparation: only a couple had one or more practice sessions on the database; none developed pencil-paper lesson plans; most reactivated their schema to massage certain teaching strategies into some sort of mental procedural list and some relied on their years of experience to allow them to utilize their mental model "on the fly." There was variation in the teachers' mental models of their lesson goals: some saw student procedural understanding as the outcome; a few aimed for a conceptual framework in which were located the procedural steps of access, research, and retrieval; many saw a tangible

outcome-a printout of a list of references or information-as the appropriate goal. Teachers employed additional mental models, but this summary nevertheless illustrates the number of mental models that library media specialists use in any teaching-learning episode and the range that occurred within the research sample.

The In-Action Profile

An examination of the in-action library media specialist profile highlights the effect that changes in one mental model had on other mental models.

Mental Models of the Electronic Information Databases

Not surprisingly, all the library media specialists perceived they had an adequate mental model of the electronic database for the lesson they chose to meet the students' assignment needs. The teaching-learning episodes exposed discrepancies with these perceptions. Analysis revealed that the mental models ranged from flawed to reliable depending upon the level of working knowledge of the database that the teachers possessed. Significantly, understanding of the complexities of the databases fluctuated within several of the inadequate models. Such inconsistencies in their mental models of the database had repercussions for the library media specialists' mental models of (a) the role of the library media specialist and (b) the teaching strategies utilized during the lesson. The following example helps clarify what happened due to inconsistencies.

Two media specialists experienced nearly identical "technical nightmares," that is, breakdowns in their mental model conceptualization of the database protocols when attempting to establish dial-up access through the Internet to a university and a public library, respectively. Certain of their other mental models impacted the inadequate mental model in practice to produce different scenarios. One media specialist's mental model of herself as a library media specialist of electronic databases was that of co-learner with the student. Putting her mental model into practice, she openly discussed her bewildered lack of success with the student and ensured that the student was co-solver of the library media specialist's predicament. During the stimulated-recall interview, the library media specialist stopped the video and pointed to the TV screen:

> . . . I was thinking there, I see it as valuable, the fact that they see their teachers learning too, that I don't know everything. I've never ever claimed to know everything and I don't hide that. I see that as a valuable part of their learning.

The library media specialist stressed that she consciously thought that her teaching strategy demonstrated her mental model of the library media specialist as co-learner and that it would help the student create a new (or reinforce her existing) mental model of the legitimacy of the library media specialist as a continuing learner. In contrast, another media specialist's mental model of herself as library media specialist permitted ambiguity: it allowed her to admit errors while still maintaining the role of director-of-events:

> The modem is actually dialing out . . . We're waiting. I heard somebody talking but I don't know why. It didn't connect. Maybe [I] forgot the number!

> [She did and told the student the correct number to dial.] Now enter. Did you mash enter? . . . I don't hear it dialing. Mash enter again. Back up. It's not letting us escape out either. Let's start over . . . I don't know what happened. It's connected now.

She reported that her overriding consideration during technological "moments of panic and discomfort because of unfamiliarity with the database," involved a mental model of the role of library media specialist as expert: "I was concerned a little bit about my own image . . . I didn't want to come across as if I didn't know what I was doing." Her mental model involved her normal immediate preference for "abandoning ship" and asking the student to come back later. Time-out would allow her to develop a more consistently near-expert mental model of the database that, in turn, would reestablish her mental model of herself as library media specialist-as-expert with electronic information databases in both her own and, ipso facto, the students' eyes. Because of her mental model of the appropriate role for a media specialist, she overlooked the possibility of inviting her student's involvement in finding solutions.

Mental Models of Lesson Goals

Most library media specialists' mental model of the lesson goal were for the students to (a) acquire procedural understanding, that is, be able to repeat the procedures for access to the database and location of appropriate content and (b) obtain the best immediate resources for their assignments. These objectives dovetailed nicely. For these, the goal was that the session be useful for the students. "Useful" was interpreted as having a resource of value, a printout of reference call-numbers of books located in the public library or printouts of articles from the World Wide Web. Thus, the library media specialists had a mental model of the electronic database as a tool to be used by the students when finding resources for assignments. Their aim was that the students follow and be able to repeat the procedures necessary for access to, searching, and retrieval from, the database.

A few of the media specialists helped their students form a mental model or image of the resource itself in its broader dimensions. According to researchers (Borgman 1984; Brown, Collins, and Duguid 1989; Schmalhofer and Kuhn 1990), in order for students to acquire a reliable mental model they need to be exposed to the use of a domain's conceptual tools through how-it-works-instructions in an authentic activity. Teaching with the goal of obtaining a successful product, such as a list of appropriate resources, has been a traditional approach for text-based resource location and access. The approach concentrated on imparting a set of procedures for the student to follow. Its transferability to teaching with electronic resources, as demonstrated by some of the media specialists, is problematic. When confronted with electronic resources, users do not have the opportunity to see everything that the database contains or how the content is structured, which they can easily do by flicking pages of print resources. They are confronted with one computer screen with one page of information. It is therefore difficult to create a reliable mental model of the database, its type of information, and the role of hypertext and hypermedia linkages to the information necessary for successful information literacy searches.

Mental Models of Teaching Strategies

All the media specialists held mental models of how to teach database access, research, and retrieval that reflected an important tenet in Piaget and Bruner's learning theories, that of direct experience. Students were to have hands-on experience with the computers: "You need hands-on if you're dealing with a computer . . . if a learner does not have that concrete touching interaction that's personal, then the retention is just minimal." Some library media specialists shared this mental model with their students, thereby making the rationale visible in terms of student learning outcomes: ". . . you will remember more if you do it yourself instead of my just telling you how to do it." Most initially had an image of sitting beside the student who had control of the keyboard; some did not succeed because their mental model in-action was affected by their assessment of the student's ability: "The temptation to touch the keyboard was too much given the student's hesitancy, and I sort of jumped in." Others encompassed a show-and-tell-then-copy-me strategy whereby the students took control during the latter half of the lesson in order to demonstrate their ability to replicate the library media specialist's procedures.

Although all allowed hands-on, many library media specialists used directive statements or questions; only a few adopted a questioning technique that involved procedures, predictions, and consequences of the database's navigational and hypermedia features. An examination of the interconnectivity of two library media specialists' mental models with respect to their lesson goals, teaching strategies, and role of the library media specialist helps clarify these points.

One media specialist concentrated on the student's acquisition of procedural skills while the other saw conceptual as well as procedural understanding as the important learning outcome. Both used questioning strategies. A simple tally of the number and types of questions from the transcriptions of the videotaped lessons revealed significant differences. The first library media specialist asked 79 questions, of which 30 (38 percent) required a yes/no answer and a further 34 (43 percent) were also of the closure type needing the correct answer. The second library media specialist asked 54 questions, of which 11 (20 percent) required yes/no answers

with a further seven (13 percent) being closed-answer questions. For the first library media specialist that left a mere 15 (19% percent) questions that demanded higher level thinking from the student; for the latter, a substantial 36 (67 percent). Both sought answers requiring deduction, prediction, and interpretation; however, the teacher whose goal was for the learner to be able to conceptualize the relevance of the hypermedia and navigational features of the database also required the student to compare, explain, synthesize, and extrapolate. Not surprisingly, the former teacher's mental model held the teacher-as-director-of-events whilst the latter depicted the teacher-as-facilitator. Analysis of the data revealed that there was no conflict among the media specialists' mental models of their teaching strategies, their lesson goals, and their role as the teacher.

The After Profile

The profile of the teachers' mental models at the conclusion of the study revealed that some media specialists made dramatic changes to some of their mental models, for the better, in their perception; others made modifications to counteract weaknesses; and some maintained the status quo. This last group retained a mental model that essentially held that there was one way to teach electronic database skills regardless of the student's age, learning style, level of computer and database expertise, student outcome needs, and, indeed, the database itself. Data suggested that they did not recognize the inappropriateness of these mental models, particularly when teaching the lessons. Data also revealed that the "status quo" group and a few of the other media specialists had no perception that their mental models as carried out in practice (the in-action stage) did not reflect their "before" mental model. Interestingly, some media specialists did perceive this, and acknowledged this verbally in their first post-stimulated recall interview. However, the mental models evidenced during their second teaching-learning episode did not reflect their earlier statements and belief that they had now, indeed, incorporated the changes to their mental models.

Conclusion

The purpose of the study was to delineate the implicit in-action mental models of library media specialists when teaching information literacy access, research, and retrieval with electronic databases. The before, in-action, and after mental model paradigm highlighted how different mental models influenced the library media specialists' teaching when rescuing an inadequate mental model (in this instance, the database dial-up protocols), how the mental models interacted, and how questioning was affected. Findings indicated that the in-action mental models of their conceptualization of the database, role as library media specialist, lesson goals, and teaching strategies directed the library media specialists' teaching. Indeed, their mental models acted as a controlling element, defining the library media specialists' responses to situations occurring in the teaching-learning episode.

Our study suggests that mental models are ingrained during initial experience with print resources and the procedures used to teach access to information in print resources. Thus, transition to electronic resources requires changing some mental models to incorporate a reliable conceptualization of electronic databases into their mental models. Acknowledgment of flawed mental models after a teaching-learning episode appears to be inadequate for change to occur in subsequent teaching-learning sessions.

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