"Current Topics in Health Sciences Librarianship": a pilot program for network-based lifelong learning*

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The long-term objective of this project is to make health sciences librarians more effective in their role by using emerging technologies to deliver timely continuing education (CE) programs to them regardless of their physical location. The goals of the one-year planning project at the William H. Welch Medical Library are to plan, implement, and evaluate a pilot CE program that includes (1) a three-day general-interest session organized in four tracks: Market Forces and Management, Information Technology and the Internet, Publishing and Copyright, and Education; (2) a one-day special topic session on the Informatics of the Human Genome Project; and (3) an electronic poster session in parallel with the general-interest session. The program will be offered in three simultaneous formats: (1) on-site, in a distance-learning classroom in Baltimore; (2) as a telecourse, in a similar classroom outside Washington, DC; and (3) online, via the World Wide Web. An electronic proceedings of the entire program will be published on the Web to serve as a continuously available CE resource for health sciences librarians. This paper gives an overview of the planning process, presents a status report on the programmatic and technical implementation of the pilot project at its midpoint, and discusses future directions for the program.

BACKGROUND

Importance of lifelong learning

Health sciences librarians improve health care by enhancing the use of biomedical information by scientists, educators, health practitioners, administrators, and students. The services they provide include (a) building systems that improve access to a rapidly expanding body of medical information in both print and electronic formats; (b) teaching their clients how best to use these systems in their daily work; and (c) retrieving information from these systems for their clients and delivering the information to them in a timely fashion.

The rapid rate of growth and change in the biomedical and information technology knowledge bases has placed a great burden on health sciences librarians to develop a strategy for continuous learning that goes beyond their formal professional education.

The classic 1982 Matheson Report predicted many new developments that would affect the health sciences library and identified skills that would have to be continually honed for the health sciences librarian to remain competent and effective [1]. More recently, the Medical Library Association (MLA) recognized the need for lifelong learning strategies in the MLA *Platform for Change* [2], which states that "lifelong learning must be a cornerstone of every individual's professional development plan." This point is further emphasized by the recommendation that "individuals must assume personal responsibility for aggressively seeking lifelong education and professional development opportunities from a variety of sources."

Most health sciences librarians acknowledge that continuing education (CE) is critical and should be as much a part of an individual's professional life as reading the literature. Mayfield suggests that as the medical library profession changes during the next decade, competence in the workplace will be directly related to the individual librarian's commitment to self-directed learning [3]. The health sciences librarian, unfortunately, often rejects CE opportunities because the content of the courses offered is irrelevant at the time the courses are given, they are geographically inaccessible, or they are not offered at the "teachable moment," that is, when the individual is ready and willing to accept and retain new information [4].

Messerle discusses the role of health sciences libraries in CE and suggests that by developing innovative approaches to learning, librarians can link the library with the lifelong learning goals of its users [5]. Our proposed project echoes Messerle's notion of expanding the CE role of librarians, but it also goes one step further to address colleagues within the profession instead of the biomedical scientists traditionally served by the Welch Library.

Limitations of current lifelong learning mechanisms

Successful continuing education opportunities must be delivered in such a way that the participant can get the instruction just when it is needed, regardless of where the individual happens to be located in relation to the delivery site. Although there are many continuing education opportunities available for health sciences librarians, each has inherent drawbacks.

Continuing education courses at national and regional meetings. An array of workshops is offered at national and regional meetings sponsored by MLA, the Special Libraries Association (SLA), the American Society for Information Science (ASIS), and others. While the number of courses is high and the subject matter is diverse, the participants must attend the annual meeting to enroll in the scheduled workshops. For some librarians, this is impossible because of lack of funding or the inability to be away from the library.

Summer institutes and short courses. Summer institutes, such as the Institute on Leadership and Change in Libraries sponsored by Syracuse University, the University of Pittsburgh School of Library and Information Science's summer courses [6], and SLA's Middle Management Institute, are designed to bridge the gap between library school education and the time when librarians move into new and challenging positions in the workplace. Although the content of the institutes is up-to-date and relevant, the expense, location, and required time commitments are likely to prevent many from participating.

Short courses, such as Stanford's Medical Informatics Introductory Short Course [7], generally cover a wide range of topics in a relatively short time. Geographical limitations, cost, and the length of time away from work may prevent many interested individuals from registering for such courses.

Distance learning, online courses, and self-study. The health sciences librarian community has produced some, but not many, resources for distance learning and self-study. Several library schools deliver parts of their M.L.S. curricula by means of distance education [8–10]. Some schools have put course materials on the Web. For example, the University of Michigan has a list of academic prototypes [11], and "Introduction to Internet Resources and Services" from the University of Texas at Austin is available [12]. MLA provides materials for self-study and has a Web site [13], but CE materials are not yet available this way.

Current topics symposia, online meetings, print and electronic proceedings. Publications such as the *Annual Review of Information Science and Technology (ARIST)* provide a succinct review of trends in a particular field. While they are useful for providing an overview, these publications are not timely, given the length of the book publishing process. Meeting proceedings in print format are a useful reminder of the presentations, but are of limited instructional value.

Extending the Welch Library education program

The experience and knowledge gained through our education program, and the synergistic fit between the goals of the National Library of Medicine's (NLM) "Education and Training of Health Sciences Librarians" Request for Applications [14] and the Welch desire to extend our own education program to new

clientele are two very important reasons why the library responded to the request. A short description of the programs appears below; a more complete description can be found in a recent publication [15] or on the Web [16].

The library provides three levels of on-site training across broad content areas; nearly 5,000 individuals attended almost 400 class sessions in 1994/95. The first level of instruction comprises free short sessions that focus on library resources and services. The second level includes paid courses that range from one to two days and offer greater detail and wider scope in instructional content. These courses include training in computer applications and systems, networking, the Internet, data analysis and delivery, and scientific writing. Many of these programs are largely self-supporting; revenue is used to support instructors, administrative staff, and future programmatic developments. The third level provides instruction for credit, either as stand-alone courses or as lectures and workshops within other courses. This instruction is offered through the Division of Biomedical Information Sciences, of which the Welch Library is a part, and in conjunction with other departments and divisions in the School of Medicine, School of Hygiene and Public Health, and School of Nursing.

GOALS OF THE PILOT PROJECT

The Welch Library's extensive educational program has been adapted and extended to plan and implement "Current Topics in Health Sciences Librarianship," a pilot CE program for health sciences librarians. This program will include instruction in a general-interest track, instruction in a specialized track, and participation in an online poster session parallel to these tracks. The content of the general-interest track is being built from components of our instructional programs in scientific communication and from our collaborators' strong programs in business and management. The specialized track in the pilot will focus on "The Informatics of the Human Genome Project," a topic of keen interest in biomedical research, for which there is ample local expertise through the presence of the Genome Data Base project at Johns Hopkins [17–18]. The content will be delivered through four distinct means: an on-site course, a telecourse, an online course, and an electronic proceedings.

On-site course. Up to twenty participants will attend a state-of-the-art distance learning facility at the Johns Hopkins Medical Institutions in Baltimore.

Telecourse. The on-site course will also be delivered to participants at a similar distance learning facility in suburban Washington, DC. This other facility will support interactive audio and video communication with the Baltimore site.

Online course. For those who cannot participate in the on-site course or the telecourse, the course will be offered simultaneously on the World Wide Web, and will include an electronic poster session combining contributions from on-site, telecourse, and online participants. The Web version will include real-time delivery of speakers' audio and slides to the desktops of registered participants. Other parts of the course will be open to unregistered persons who may browse freely.

Electronic proceedings. After the course, an enhanced, reformatted version of the instructional materials, posters, and discussions of the posters will be published on a Web server. This will be an electronic proceedings that will take advantage of future improvements in Web and network functionality by including, for example, video and interactive elements. Publishing the proceedings electronically provides a mechanism for ongoing annotation of documents and commentary by readers.

PLANNING PROCESS AND PROGRESS REPORT

Overall planning and personnel

The project consists of three overlapping phases: (1) planning: eight months' planning for implementation and evaluation; (2) implementation: four months' development, recalibration, and implementation of the pilot; and (3) evaluation: four months' evaluation from the beginning of the pilot to the conclusion of the project year. Three planning groups guide the project:

Core Planning Group. This group provides central direction to the project. It meets weekly throughout the entire period of the grant and is composed of the principal investigator and two co-investigators. Collaborators join this group as appropriate, particularly early in the planning phase.

Operational Planning Group. This group provides input on detailed operational issues. Members of the group meet as needed until the implementation phase begins, weekly during the implementation phase, and as needed during the evaluation phase. It is composed of the investigators and instructors, with support personnel and collaborators as appropriate.

Advisory Group. This group provides objective feedback and a continuous "reality check" during the entire project. Ten external advisors, who were chosen to provide input in important areas such as pro-

gram content, technology issues, accreditation, and evaluation "meet" informally via electronic mail.

Other personnel. A project assistant is responsible for publications and administrative assistance, and for maintaining program information on the Web server. Division of Biomedical Information Sciences systems staff are available on an informal basis to assist with Web server administration and the technical implementation.

Shortly after the award was made, the full research plan of our proposal was placed on a Web server [19]. This made it easy for the advisors and other interested parties to retrieve detailed background information about the program when needed.

Development of program content

Survey. The content of the pilot program will draw on the strengths of existing educational programs for our Johns Hopkins clientele and local instructional expertise. Because these programs and expertise are wide-ranging, we designed a survey early in the project to help select content areas for the pilot and future programs. The survey was announced several times to discussion lists such as MEDLIB-L, which have a total subscriber base of about 2,000 persons. It was made available as a questionnaire on the Web [20]. The survey was designed to ascertain which topics potential participants were most interested in; which instructional formats they would prefer for specific topics; the timing, arrangement, and length of track they would prefer; and the importance of certification.

While we did not intend this survey to be a scientific sample or to reach a majority of health sciences librarians, we were somewhat disappointed with the low number of hits and responses. Seventy-five individuals responded, of about 150 hits on the survey form. The average respondent had an M.L.S. as his or her highest academic degree and more than ten years' experience in the field. The results did confirm our assumptions about what topics would be most attractive and provided some guidance in designing the content and format of the program. A summary of the survey responses is shown in Table 1.

Curriculum design. In response to these results, the general topics are organized in four separate tracks, with each day concentrating on either larger environmental trends, library applications and case studies, or tutorials. The specialized topic was placed on day four. An important principle guiding the design is modularity. Both during the program and especially after, it is easy for participants to select topics according to their interests and available time. The pro-

Table 1
Summary of responses to survey for pilot CE program "Current Topics in Health Sciences Librarianship"

Topics of high interest

Information technology, the Internet, and Web publishing
Library education programs, instructional systems design and teaching skills
Intellectual property, copyright issues and the library
New ways to organize the library and provide new services
Support of remote users
Grant-seeking skills

Topics of low interest

Instruction in specific computer applications
Technical aspects of computer networking
Medical informatics
Research study design and methods

Other preferences

Format for participation: online > telecourse > on-site
Poster submission: optional > required
Poster logistics: on program server > on participant server
Allocation of time: general-interest session> specialized session
Session type: course/instructional > poster/conference
Session focus: skills/hands on > general concepts
Certification: MLA CE credit > Johns Hopkins certificate

gram will incorporate a mixture of lecture, panel presentations, case study, and hands-on instruction.

Online poster session. Participants must submit posters to be placed on the course Web server. These contributions will be organized into five separate topical sessions to correspond with the themes of the program sessions. They will be presented and discussed by the on-site telecourse and online participants through the Web. The topics and focus of the contributions will be defined broadly. For example, full research studies, case studies, "thought pieces," and other items are welcomed.

Preliminary program and faculty. Figure 1 shows the preliminary program as of this writing. Course faculty are being drawn from the Welch Library, the Division of Biomedical Information Sciences, the School of Medicine, other parts of Johns Hopkins, and other institutions in the Baltimore-Washington area and beyond. A guide for presenters is being developed to facilitate the preparation and placement of all materials on the Web.

Program announcement and Web site. Upon completion of preliminary curriculum design and technical planning (see below), a World Wide Web site [21] was established and announced to several listserv lists in mid-March. A call for participation, preliminary program, and application form were mounted on the server. A summary of this information was also faxed to selected individuals and institutions to widen the dissemination. Applications completed on the Web were routed in a CGI script by electronic

Figure 1
Preliminary program for network-based pilot CE program "Current Topics in Health Sciences Librarianship," June 24–27, 1996

THEME	EDT	GENERAL SESSIONS			SPECIAL TOPIC
		Monday 6/24 *Environmental Trends*	Tuesday 6/25 *Applications and Case Studies*	Wednesday 6/26 *Tutorials*	Thursday 6/27 *Informatics of the Human Genome Project*
Market Forces and Management	9:30-11:00	Welcome, Opening Remarks Economic Forces the Academic Medical Center: Managed Care, Reengineering, and the Funding Environment	Organizational and Economic Models for a Changing Library Environment (panel)	Grant Proposal Development i. Writing an Effective Proposal ii. Agency Perspective	Human Genome Project: Biology and Informatics Overview
		Break			
Information Technology and the Internet	11:15 - 1:00	Information Technology in the Academic Medical Center	Managing Library-Based Information Systems	Administrative and Technical Aspects of Serving Information on the Web	Using Genomic Databases: Tutorial I
		Lunch			
Publishing and Copyright	2:00 - 4:00	Intellectual Property and Copyright in the Digital Environment (panel)	Electronic Publishing and Libraries (case study)	Appropriate and Effective Design for the Web Author	Using Genomic Databases: Tutorial II
		Break			
Education	4:15 - 6:00	Trends in Biomedical Education (panel)	Building a Library-Based Education Program (panel)	Pedagogical Concerns in Distance Education and Delivery of Instruction via WWW Closing Remarks General Session Critique 5:30 - 6:00	Supporting Remote Users: Lessons from GDB User Services Special Topics Critique 5:45 - 6:00

AVAILABLE THROUGHOUT:
Student Lounge (general discussion area, topical forums) - *Course Library* (including speakers' bibliographies) - *Posters*

mail to the project assistant, who downloaded them into a database. This site is the nucleus for the full program; it is continuously updated with new program details and will become the starting point for program participants and for the electronic proceedings. The recruitment of speakers and further program development is ongoing.

Technical implementation of the program

One of the strengths of this instructional system is its multiple delivery methods. Each of the four meth-

ods—the on-site training, the telecourse, the online training, and the electronic proceedings—offers separate and unique pedagogical and distribution benefits. Consequently, each method of delivery presents a separate set of challenges. What follows is an examination of some technical complexities we have encountered during planning and the solutions we subsequently discovered.

On-site. The on-site delivery mechanism is most representative of the traditional mode of classroom in-

struction. Including a series of lectures, workshops, seminars, and electronic laboratories, this instruction is offered in the Distance Learning Classroom of the Johns Hopkins Medical Institutions on the East Baltimore campus. Since this facility is the primary point of origin for the telecourse and online course, we provide technical support for these delivery methods. This provision includes the hardware and expertise to operate the distance learning facility. The facility will also include the configuration of networked laptop computers for instructional events requiring hands-on training. Finally, we will store all instructional events through both digital and magnetic means. These archives will comprise much of the electronic proceedings at the end of the four-day program.

Telecourse. This delivery method most closely replicates traditional classroom interaction, through an interactive audio and video system. In the telecourse, the instruction is provided to remote sites by a bidirectional signal shared by similarly configured distance learning facilities. Instructors and students in participating classrooms are able to interact through a system of fixed and moving cameras, video monitors, omnidirectional gated microphones, and high-fidelity speakers. The signals are uncompressed and shared on a broadband network to ensure production-quality audio and video. By exploring this technology, the library hopes eventually to provide enough points of reception to make a local instructional event a national one.

There have been two problems in implementing the instructional technology that supports this facility. The largest problem is associated with the Local Access and Transport Areas (LATA). The tariffs incurred while crossing LATA are considerable. The issue of support at remote sites must also be examined.

Online course. The online course represents the broadest possible implementation of real-time instruction. Based on the technology now available, it includes three components: (1) a Web-based classroom and poster area, (2) an electronic "student lounge" where participants will be able to discuss the posters and course session topics in text format, and (3) a "library" or reference area where students can read other papers and get additional detailed information about a given topic.

Since the World Wide Web is an information environment that is widely available, it has been selected for the online classroom portion of this program. Used in conjunction with several helper applications, the Web and its most popular client, Netscape Navigator, will provide the foundation for online delivery. In addition to electronic versions of all instructional elements, we will be providing the

audio portion of all instructional events in real time. Through the use of Progressive Networks' RealAudio technologies [22], audio events associated with the program will be captured and distributed to students taking the online course. CU-SeeMe architectures may also be used to deliver audio and video to a select group of students.

A student lounge will use many of the same tools prevalent in the classroom and conference area; they will be used, however, in an unmoderated environment, and the interactions will not be archived. This will be an area for virtual breakout sessions and informal discussion. A course library will be delivered by the Web and include links to supporting materials created by faculty and staff of the library, students of the program, and colleagues in the information science community.

Electronic proceedings. These electronic proceedings will be publication-quality and will appear on the Web shortly after the pilot concludes. The purpose is twofold: (1) to offer a polished version of the instructional materials on demand, at any time or location, and (2) to publish the participants' presentations from the poster sessions in final format. In addition, we are planning to incorporate systems that allow health sciences librarians worldwide to annotate and discuss the contents of the proceedings, thereby continuing programmatic growth after the course concludes. The result is a dynamic Web-based instructional system that improves upon the current static electronic conferences.

Like the online course, the electronic proceedings will be driven by the combination of multimedia elements and interactive information resources. Sessions will be provided through the same visual instructional resources and RealAudio archives provided by the online course. When applicable, this instruction will be supplemented by additional supporting materials, links to related information resources, and previously archived comments and discourse.

Evaluation of program

Constraints on time and technology limit the evaluation methods available to us. We recognize, however, the importance of instructional evaluation in determining the success of this project, and are creating quasi-evaluative instruments to help assess the students' mastery of the objectives. These tools compress the concepts of pre- and post-testing into a single brief evaluation. The initial portion of the instrument assesses the knowledge with which the student entered the program by using a short-answer construct. This is followed by a brief examination based on the objectives for each session. The evaluative in-

strument concludes with an area for measurements of attitude and perspective. The evaluations will be given at the end of each day and will include all the sessions for that day.

Evaluations for the on-site course will be collected locally, either as a short paper document or as a Web-based form. Students attending the telecourse will receive a paper version of the same text. The online course will include a Web-based form that will also include the same text. While evaluation instruments for the electronic proceedings will generally include the same content, the text and format may be altered slightly to suit this delivery system better.

The evaluation will give us three important data groups. The first, mastery of learning objectives, will help us gauge the effectiveness and efficiency of the sessions within the program. More specifically, it will help us to determine whether students mastered the objectives we established. The second will help us to examine the growth of skills and knowledge by examining the difference between their skills and knowledge before and after the instructional event. Finally, we will be able to examine and compare the relative success of students participating in each delivery method, to attempt to determine what, if any, effect the instructional environment had on the instruction.

Certification

Most of the respondents to the survey identified MLA CE contact hours as the most important form of certification, since these hours are required for acceptance into the Academy of Health Information Professionals. We are submitting the necessary documentation to obtain this certification. In addition, we are asking MLA to offer equal contact hours for on-site, telecourse, and Web participants.

BEYOND THE PLANNING GRANT

The knowledge gained from planning, implementing, and evaluating the pilot program will provide the foundation for developing an exciting new continuing education tool for health sciences librarians. Drawing on our experience during the pilot, we will convert the pilot into a production operation as quickly and efficiently as possible. As the program shifts from pilot to production, several important issues will be considered, including sustained funding, content, audience, faculty pool, certification, delivery mechanisms, relationship to a professional curriculum, and the application to other programmatic areas within the library. Each of these points is briefly discussed in the following text.

Funding. Sources of co-funding have been investigated continuously during the planning period. We

will continue to aggressively pursue additional sources of funding for year two and beyond. We have extensive experience, as do our collaborators, with administering fee-based CE programs and employing other methods of generating revenue. If this were a production operation, participants would probably pay tuition to attend the courses. Publication revenue could also be a source of income, if we created a subscription-based model for the electronic conference proceedings. Furthermore, there may be demand for a print version of these proceedings, and there may also be a market for videotapes or audiotapes of many of the sessions.

Content. The content of the specialized track will change from year to year, rotating through several major subject areas to reflect what is most needed by the community. The general-interest track will certainly evolve with the needs of health sciences librarians. Annual surveys of the community will be used to determine content.

Target audience. One of the most obvious extensions of the program is to go beyond the academic setting to include other types of health sciences librarians. For example, the needs of the hospital librarian are not specifically addressed in the pilot curriculum. The content of the specialized tracks in a subsequent year may be directed at the needs of the library school graduate students who are planning to specialize in health sciences librarianship. There is also reason to believe that this program could serve as a model for extension to many areas of librarianship. Since Internet-based continuing medical education (CME) programs for physicians are also needed, collaborative efforts between the library and the School of Medicine's Office of Continuing Medical Education are being investigated.

Faculty. Initial success of the pilot and additional sources of revenue would allow us to recruit faculty from across the nation, thereby expanding the scope and content of the program. Since the instruction can be delivered in distance-learning facilities or via the Internet, the importance of travel schedules and logistics is diminished, and more time is left for the primary task of planning course content.

Certification. The program may evolve so that academic credit could be available through The Johns Hopkins University for those rotating through several tracks in subsequent years. Alternatively, completion of network-based assignments with suitably designed evaluation and testing mechanisms could lead to formal academic credit.

Delivery mechanisms and format. Given the pace of change in information technology and networking, the delivery mechanisms and possible formats are difficult to predict. We know, however, that it will become ever easier, through new technologies and better networks, to conduct distance learning and teaching and to convene virtual meetings. We expect that as more distance-learning facilities become available, it will be possible to run a multisession course or conference in a distributed fashion: Track 1 in Baltimore, Track 2 in Los Angeles, Track 3 in Chicago, for example, with different content emanating from each site and being received in the others.

Applications of the program in the professional curriculum. Our proximity to several schools of library and information science and our mutual interest in integrating some aspects of the program into the M.L.S. curriculum have created a fertile environment for collaboration. This integration would be an ideal mechanism for providing a much-needed, improved tie-in between professional education and real-world practice.

Application of knowledge and skills to other programmatic areas of the library. The content for the pilot was a deliberate programmatic extension of proven curricula from the library's education programs. It is reasonable, however, to expect that this model can be extended to other education programs or focus on another programmatic area as easily as it can be extended to other types of librarianship. For example, it might include a track on scientific writing and grantsmanship, which are addressed in another successful education program [23], or the focus might be on collection development in an era of increasing electronic resources.

A possible scenario: the fifth annual "Current Topics In Health Sciences Librarianship," June 2000

The following hypothetical scenario illustrates our vision in a more concrete way:

Julie is a librarian at a small hospital in rural Montana. Her supervisor approved her participation in the Johns Hopkins Current Topics course, for which her hospital has paid the full registration fee. She is half-way through an M.S. degree program in biomedical information sciences at Johns Hopkins. She will receive a certificate upon completion of the course, and if she submits the required papers and exams she will also receive academic credit. She will join about 200 other librarians across the nation who were accepted into the one-week course.

Julie has decided to attend the course from her home to avoid the inevitable distractions of the hos-

pital. She told her supervisor that she would keep her workstation's video link to the hospital off during the course. She brings a laptop home from work, and attaches it to a twenty-five-inch flat-panel color display mounted on the wall above her desk. She turns on the built-in videocamera and connects the laptop's network port to an outlet in her study with a fiber-optic cable. This outlet connects her home to the one-gigabit-per-second BigSkyNet and then out to the Internet. Once the connection to BigSkyNet is made, a fifteen-second ad proclaims that the Network now reaches more than 90% of homes in Montana.

As the starting time on the first day of the course draws near, Julie dresses professionally but comfortably and takes a seat in front of her workstation. She opens a connection to the course address and enters the authorization code. The course logo appears, and her screen divides into four quadrants. The logo now moves into the upper left. In the upper right, the course organizer in Baltimore welcomes the participants throughout the world, which today include a class of twenty-five M.L.S. students at a distance-learning facility in Maryland. He introduces the first speaker on digital libraries from Washington University in St. Louis, who appears in the lower right quadrant. After the organizer's introduction is complete, the speaker's image moves to the upper right quadrant of the screen.

The speaker displays graphics, animations, and videos, which replace the course logo in the upper left quadrant. He is, occasionally, interrupted by a question. In the first such instance, the questioner is from the University of Michigan, and while speaking he appears in the lower left quadrant of Julie's screen. When the talk concludes, a discussion period ensues. When a comment is made, the speaker's image, identity, and affiliation immediately come up on Julie's screen. When she makes a comment, her image appears. When the discussion period ends, the system presents a complete transcript of the talk and the discussion, properly formatted and hyperlinked. Every word, image, and sound from every session will be available to subscribers in a proceedings "volume" on the course server. Readers may click on a video-link icon to speak with the instructors in real time if they are available. They can also leave text or video-mail comments for access by all subscribers.

After the break and before lunch, Julie decides to attend a limited-enrollment, hands-on tutorial on using a new version of a popular client-server online catalog system. She clicks on the appropriate icon and is told that she is now one of fifteen participants, who are located in eight states, in a virtual classroom. The instructor in England speaks from the upper right quadrant of her screen, his computer display appears in the upper left, charts and graphs appear in the lower left, and her own client's interaction with the

database server, which is in Chicago, is shown in the lower right.

After lunch, Julie will attend a clinical data systems seminar that will include demonstrations of patient information systems and virtual tours delivered from five hospitals around the world. To conclude her first day of the course, she will take part in a team-building skills workshop, part of the general-interest track in management, led by a representative of MLA. It will include a role-playing exercise for the ten students, most of whom who are located in California.

Tomorrow Julie will present her paper "Using BigSkyNet to Provide Information Services for Telemedicine to Physicians in Rural Montana" to the full class of 200 participants as part of this year's specialized track on "Information Needs in Telemedicine." Although it will be her first telepaper presentation on the Net, she feels confident; she practiced the talk last weekend from her study through a link with three colleagues in New York, Baltimore, and Montreal. A brief text and video abstract of the paper have been available for registrants on the course server for about a month.

Tonight, Julie is looking forward to the videoconferenced virtual welcome party for the course participants "at" Johns Hopkins. Unfortunately, she will have to provide her own wine and cheese.

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