# The education function in a digital library environment: a challenge for college and research libraries

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### Abstract

Digital libraries have been a feature of the information arena for some time. They have re-defined the concept of “bibliographic instruction” in which the connotation “library” is implicit, but has become inadequate in a digital library context. This article relates the results of pilot studies of Internet use in academic libraries in the New York metropolitan area to the education of users in a digital library environment. It attempts to crystallize vital concepts and issues generated by interviewing users and information professionals, which could not be quantified in an earlier publication. The studies revealed an urgent need to develop user-education programs that emphasize: the nature and various types of digital collections; interfaces; hardware and software requirements; telecommunications access modes; and making such programs part of continuing education.

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#### Introduction

The phrase “digital library” refers to a collection of information bearing artifacts whose unit records have been encoded in electronic formats in “digital” as opposed to “analog” mode and stored in machine readable form. Library and information science literature has variations of this definition mainly because the concept has recently been grafted on to conventional libraries which have a predominant print hard copy base. As currently articulated, the concept bears several semantic connotations: electronic library – records are in electronic form; library without walls – virtual library; hybrid library – contains both hard copy and electronic formats; library of the future – hopefully (eventually) all records will be in digital form; digital library – an ambitious statement implying that all records are presently in digital form (Bowden and Rowlands, 1999). According to Stephen Griffin, manager of the Digital Libraries Initiative at the US National Science Foundation, “It is true that use of these labels is often in reference to the same sort of environments – people mean the same thing...”(Griffin, 1998, p. 24).

Such attempts at defining the digital library imply that its conceptualization, content development, and setting up of management structures, are in a state of flux. In spite of the apparent lack of an acceptable common definition, the existence of digital collections either in the library or as part of access services is a reality among all libraries in the United States. User need to access and utilize such collections is not only vital to college and research library services, but also urgent. Such a need has been accentuated by the ubiquitous Internet requiring both in-house and external access to digital collections.

Obviously accessing digital collections requires a different mode of access, equipment, and skills, for both library users and staff, in contrast to print hard copy. The need to access digitized multimedia sometimes requires conversion, calling for more than one level of access to make the information obtained useable. In earlier electronic information access, text was the main mode of storage and transmission. Availability of downloadable graphics, images and animation on the Internet and intranets has markedly changed the concept of online access.

These trends have mandated changes in the nature of conventional “bibliographic instruction” for college and research libraries. It may be argued that the use of such a phrase in describing teaching end-users how to use information resources in the library is an anachronism. As we delve deeper into the super digital information age “biblio” must give way to “digital” or even more appropriate “information resources”, which covers both electronic and hard copy resources. The hype and constant use of search engines sometimes blinds end-users to subject focused digital resources in-house or outside the home academic library.

The purpose of this article is to relate the researchers’ study of the end-users’ use of search engines in academic libraries in the New York metropolitan area to the problem of user education in a digital library environment (Kibirige and DePalo, 2000). We have attempted to include research information obtained from both respondents and information specialists, which could not be quantified in the published work. Four academic institutions participated in the study done between 1997 and 1999. Findings of the study pointed to the urgent need to re-educate end-users in their perception and utility of search engines in accessing digital collections in and outside the library. Awareness and focusing on this need will allow them to facilitate end-user optimum utilization of digital resources provided through the library.

#### Phases in digital library development

The many facets of the concept of “the digital library” make it rather difficult to find models to be used in digital library planning and development. Two institutions which almost equate the generalized definition seem to indicate a dire need for collaborative effort. But even before the planning committees are selected, the commitment of the administration is paramount in getting the projects off the ground. Whoever has to write or otherwise endorse the vital checks must be convinced that developing a digital library is central to the mission of the organization(s) for which it is being created. The two institutions are: The University of Edinburgh (UK) – Edinburgh Electronic Virtual Library (EEVIL); and the University of California system – California Digital Library (CDL). Based at the University of Edinburgh and sponsored by grants from the British government, EEVIL was launched in 1995 to collect and make available to British research institutions, material in digital collections developed by EEVIL staff members. In addition, it provides links to digital collections held by member institutions – those that have agreed to make their digital collections accessible under the UK Electronic Library Programme - eLib (MacLeod and Kerr, 1997). EEVIL is a multi-institution collaborative effort with the basic goal of making information readily available to researchers in the UK. On the other hand, CDL is a one-institution organization. The University of California System, happens to have a multi-unit structure of constituent universities. The CDL is the 10th research library in the system and the university librarian has the same status as the others managing conventional libraries (Quint, 1998). Although these two are on different sides of the Atlantic, their basic goal is similar – to create an electronic environment for fast, readily accessible information for users.

Judging by the reports of the two prototype digital libraries, the planning process pays a lot of attention to user needs and mission objectives of the participating institutions. The participants in planning are multi-disciplinary, drawing on the expertise of computer scientists, librarians, and telecommunications engineers. In addition, planning is typically dynamic, as the changing technology environment demands that projections be made as to mode of operation; user base and especially user expectations; and the technology in use has to be constantly modified.

Digital library development is fraught with problems and issues that need perpetual attention. Examining the literature reveals several fundamental issues that include: cost at both the initial level and recurrent costs when the library is established; the basic organizational infrastructure – independent unit vs incorporation in existing conventional library set up; needs of internal and external users; negotiating license agreements for vendors of proprietary collections; access rights, among the intended users; technology options to use; developing interfaces to use in accessing the digital collections; and training both the staff and patrons. However the digital library is defined, these issues seem to crop up at the design, implementation, and regular operational levels.

Given the definitions in current literature cited at the beginning of this article, partial digital libraries abound in most industrialized countries in Western Europe, North America, and the Pacific Rim. These are the libraries in the second stage of the metamorphosis to fully developed digital libraries. In their article, Oppenheim and Smithson referred to them as “hybrid libraries” and provided an elaborate exposition about: their content, characteristics, and services (Oppenheim and Smithson, 1999). They gave some of the European examples, which included: The Royal Dutch Library and the University of Tilburgh Library in the Netherlands. The five British examples were:

1. (1) University of East Anglia;
2. (2) Kings College London;
3. (3) University of Birmingham;
4. (4) University of Northumbria; and
5. (5) The London School of Economics.

Within the USA, several projects have been developed – many with US Federal Government funding (Griffin, 1998). Among these are: The Carnegie-Mellon University Informedia Project; Virginia Tech’s Networked Library of Theses and Dissertations Project; and Cornell University Electronic Text Center Project (Engel, 1998). At the national level, The Library of Congress American Memory Project (Davis, 1998) and The British Library Electronic Library Programme (Alexander, 1996) are some of the most prominent ones in the world. While the examples cited in this article are illustrative, no attempt was made to provide an exhaustive listing. The authors are aware of many more deserving libraries which should be on the “hybrid library” list as defined by Oppenheim and Smithson.

Most libraries characterized as hybrid-libraries have many common features. First, they have licensed digital collections such as CD-ROMS, DVD, or locally loaded databases obtained from external sources. Second, they provide remote access to in-house or external digital collections, the latter being mainly via the Internet. Third, they have internally developed digital resources, which may include in-house reports, statistics, local historical archives, or material digitized by scanning hard copies. Fourth, they may provide on their Web site, a subject oriented summation of the Internet sites most relevant to their clients. Fifth, if organized separately, they may also provide access to general image, video, or animated databases. Finally, all do provide training programs for their staff and users about the nature of digital resources and how to use them.

Hybrid-libraries are ordinarily access nodes in the global digital library environment. While the usual definition of node implies ownership of a domain name, in this context, node means the “main access point” to digital resources on the Internet. Coupled with their “hybrid-library” features, this connotation calls for the need to design interfaces that incorporate external and internal digital collections with a seamless search and retrieve mode. Several issues crop up at this level. First, provide an interface that is user-friendly and is cognizant of the idiosyncrasies of digital collections. Second, design interfaces for both novices and advanced users. Features should be incorporated in the design which allow the latter to skip some of the steps. Third, develop access rights which limit access to licensed databases, but at the same time allow external users access to institutional digital resources as well as resources obtained from state and federal agencies. Fourth, differentiate between access and availability, especially for remote sites to which the local library serves merely as a pointer. User frustration will be greatly minimized if they are informed in advance that external digital resources may have restrictions on access rights. Finally, subject categorization of digital resources is usually necessary for Web links provided on the library’s Web site. Such classified links facilitate clients’ ease of access to digital Web resources and may require indexing and other methods of surrogation.

As already intimated, fully-fledged digital libraries, as contrasted to digital collections are in their formative stages and relatively few. While it might be argued that discussing their characteristics and the services they should render is speculative, one can discern trends in the current so called “hybrid-libraries”. Some of the expected features are: commitment to user services; user friendly interfaces, which recognize diversity in the structure and content of digital resources; speedy and timely delivery of information services; and multi-media digital resources, which include: text, images, video and animation. They provide an electronic digital information-rich environment aimed at satisfying user needs with optimum convenience.

#### Educational needs of the digital library user

For decades, academic libraries recognized their education function and developed elaborate bibliographical instruction programs, which are available in most US colleges and universities. While the suggestions made in this article capitalize on some of the experience gained from such programs, current technological innovations demand new operational paradigms. For instance, in the days of the card catalog, access knowledge acquired lasted a long time before it became obsolete. However, in the digital age an ever-changing information technology complicates assimilation and retention of the requisite access language information. Consequently, an information seeker in a digital library environment needs a lot of initial training and constant handholding. An obvious potential remedy is the fact that many of the library users have access to computers at home and at work and thus have the basic computer access skills before they come to the library. The need to understand the equipment may be as simple as getting on the system and logging off – to how does one download or e-mail the downloadable material to one’s e-mail address. Downloading images and animated video material requires knowing the capacity of the equipment the end-user is working with. If remotely accessed from the office or home, the equipment – computer and telecommunications links must have the capacity to accommodate the type of image desired. The end-user will be frustrated when the home or office equipment does not have enough memory or storage on the hard disk to manipulate an animated graphic vital to his or her work. The user must thus be apprised of the limitations of the equipment to be used for access whether at home, office or in the host library. In addition, the access computer may not have the appropriate software for the graphics the user needs to manipulate.

The user also needs to understand the nature of digital collections. Several issues come into play. First, he or she may have to use more than one interface to access dissimilar digital collections within the same library. As demonstrated by the research done at the US Library of Congress, a single, all purpose interface may not be appropriate for all digital collections, especially in large research libraries (Marchionini et al., 1998). Second, the user may also need to know the nature of the content of the digital collection(s), whether text, graphics, or both and their characteristics. Third, the licensing issue for particularly proprietary databases may baffle the end-user, as some vendors insist that their products can only be used within the library. Fourth, links to digital resources have to be clearly differentiated, internal as distinct from external. Some of the external links to digital resources may need user ID in contrast to internal collections. The Michigan Electronic Library[1] is a good example in this respect. It was established as “an online information system that provides residents of Michigan with no-charge Internet access to a basic set of electronic resources. MEL’s ‘virtual library’ is selected by librarians and is designed to be a significant information tool for the state’s libraries and its citizens...sponsored by the State Library of Michigan and the University of Michigan, University Library.” (State Library of Michigan and University of Michigan, University Librarary, 2000, par. 1). The site is linked to the Digital Resources section of the University of Michigan’s Library homepage. Once the site is accessed, the researcher is advised that “commercial databases are available to Michigan residents only” (State Library of Michigan and University of Michigan, University Library, 2000, par. 1). The researcher who is not part of the Michigan community cannot access such databases as SIRS or OCLC’s Firstsearch. These databases have limitations imposed by licensing agreements comparable to restrictions on many Web sites. When instructing students about Web page access for digital resources, one must be aware of disclaimers like Michigan’s. Although one may not necessarily have access to all of the links appearing on the Michigan Web site, it is still a very valuable research tool. It offers a keyword search option and offers the “outside” researcher links to a myriad live links. The Automotive Information Center can be accessed through the Business, Economics and Labor link and is a particularly comprehensive source that is universally available. The incentive for this free access to such comprehensive industry oriented data may be that Michigan is a major car-manufacturing center in the United States. Nevertheless, it is the responsibility of the Instruction Librarian to point out that ready access points to the collection may or may not be available in the recommended source. Finally, even in a fully digitized library some of the collections may not have been digitized yet. If “undigitized” or “in process” material must be indexed in the same interfaces as digital collections, they must be clearly labeled to avoid confusion.

Digitized multimedia must be clearly understood before the end-user accesses it. For sound/voice recordings, an appropriate sound card and speakers must be available in order to take full advantage of the recordings. Similarly, digitized artwork requires an appropriate video card for near-original-image reproduction. If the multimedia has to be imported into a text document for presentation or publication, image handling software must be accessible to the end-user. Currently, several relatively inexpensive image editors are available on the market for example, PhotoShop Pro. Some software suites like the Microsoft Office 2000 have these utilities bundled into their generalized offerings, for instance, Microsoft Photo Editor.

A perennial problem with digital libraries is accessing remote collections to which the host library has pointed the end-user. Similar to earlier online public access catalogs (OPACs) connections via Gopher, the end-user will be faced with the idiosyncrasies of the system to which he or she connects. When utilizing electronic resources at the local library, one may have a degree of hand holding which may have the luxury of voice or e-mail. The remote site identifies the user as “external” and by definition not entitled to human intervention type of help, unless done by special arrangement. In addition, remote site digital collections have a “transience element” which the end-user should be made aware of. Frequent users of the Internet would probably discover through trial and error and experience that some material on remote links have a way of disappearing without apparent notice to external users. The onus will be on the host library to explain the vicissitudes of external digital collections to its users during training sessions.

Access languages for digital libraries emanate from research efforts like the one supported by The Library of Congress. The resultant interfaces may need a higher learning curve on behalf of the staff and end-users. In their development effort at The Library of Congress, the research team headed by Marchionini tested an experimental interface they called WebToc and reported:

...a pilot study was conducted to evaluate the usefulness of WebToc versus plain browser for website navigation tasks. Results suggest that the complexity WebToc adds to the display makes simpler tasks more difficult but in the case of more complex tasks it adds enough value to outweigh display complexity (Marchionini et al., 1998, p. 544).

Some information professionals have indicated that online public access catalogs (OPACs) are difficult to use (Borgman, 1996). With layers of interfaces to plough through, digital library users will experience even more complex access tools. This will require a higher level of hand holding or very carefully developed online help files.

#### Relevance of pilot studies to digital library environments

Between 1997 and 1999 the authors conducted pilot studies to investigate the use of search engines for information sources in the academic libraries in the New York metropolitan area. Search engines were contrasted to online databases which may be URL (Universal Resource Locator) accessible online via an Internet browser; stand alone on CD-ROM or DVD, or on CD-ROM towers linked by a library local area network. The goal of the pilot studies was to compare search engines to online databases as sources of topical information needed by academic library users. One of the articles analyzing the pilot studies was published in the March 2000 Information Technology and Libraries issue (Kibirige and DePalo, 2000). However, many of the issues raised by the study, for example education for digital libraries, could not be adequately covered in that article.

#### Methodology

We selected four metropolitan New York institutions for study: Borough of Manhattan Community College; Iona College; Queens College of the City University of New York; and Wagner College. A sample was selected from these institutions to participate in the study. It was a dynamic and self-selected sample, in that whoever was sitting at “the Internet Terminal” was a potential research subject. End users as contrasted to information professionals/librarians were used in the study. Users were requested to complete the questionnaire while they sat at the terminal and return it to the reference/information desk.

The research and data collection instrument (questionnaire) was deliberately designed to be simple. It was a multi-colored single page entitled, “Internet Use Questionnaire.” We estimated that it would take the subjects four to seven minutes. Since the subjects were already at the terminal, they were time conscious and thus the need to minimize the time to complete the questionnaire. Forty copies were given to each of the selected academic institutional libraries, making a total of 160. Useable returns were 155 (97 per cent).

To supplement the questionnaire, we also conducted exit interviews with some of the subjects who were using the Internet terminals after handing in the completed questionnaires. The purpose of the interviews was to have some idea as to how the users perceived the utility of the Internet in getting electronic-based information including digital collections. Four questions were used:

1. (1) How do you find the internet as an information source?
2. (2) Did you get what you needed from the Internet?
3. (3) Do you have a favorite search engine?
4. (4) Is there any point when you would seek the assistance of the reference librarian/information specialist?

Data was analyzed using the SPSS (Statistical Package for Social Science). We used descriptive statistics for general group tendencies – frequency of Internet use and preferred sources for topical subject search. For inferential statistics we preferred the non-parametric pairwise two-tailed correlation coefficients, Kendall’s tau\_B and Spearman’s rho statistics. Microsoft Excel package was used to draw some of the diagrams.

#### Results

The study revealed that an overwhelming majority of the subjects (91 per cent) use the Internet at least once a week (this includes those who use it daily). Some users used it to access the Library of Congress – American Memory digital collection as well as other digital collections on the Internet. An almost equal number (45 per cent) use it weekly – (at least once a week); 46 per cent use it at least once a day (see [Figure 1](http://www.emeraldinsight.com/Insight/ViewContentServlet?contentType=Article&Filename=Published/EmeraldFullTextArticle/Articles/#2630190501001.png)). As [Figure 2](http://www.emeraldinsight.com/Insight/ViewContentServlet?contentType=Article&Filename=Published/EmeraldFullTextArticle/Articles/#2630190501002.png) shows, search engines are the predominant preferred tools for searching topical subjects on the Internet as contrasted to online or CD-ROM databases. We used the two-tailed pairwise correlation coefficients to see whether there are correlations between frequency of Internet use and tool preferences.

As [Table I](http://www.emeraldinsight.com/Insight/ViewContentServlet?contentType=Article&Filename=Published/EmeraldFullTextArticle/Articles/#2630190501003.png) and [Table II](http://www.emeraldinsight.com/Insight/ViewContentServlet?contentType=Article&Filename=Published/EmeraldFullTextArticle/Articles/#2630190501004.png) indicate, subjects who used the Internet monthly or weekly had high correlations with online databases. Daily users, however, tended to have high correlations with search engines as tools to get to topical subject information sources.

The pilot studies were relevant to digital libraries in many ways. First, with the hype of search engines and their information seeking capabilities, several users will continue to use them as the main access channels to digital collections. Re-orientation and training of users to perceive them as the means to the end rather than the end will still be needed. Second, in developing training programs, there will be a need to distinguish between “digital collections” and general Web sites so that the end-user is not lost in the morass of general Web-browsing on the “home” Web site. Third, even among the digital collections subject categorization will be needed to facilitate ease of access. Library Web sites will find this aspect of Web organization more relevant to facilitate speedier navigation of collections. Fourth, the studies revealed that the need for designing user-friendly interfaces for use in navigating digital collections will be more urgent than usually regarded. Whether accessed via search engines or directly, interfaces meant for end-user surfing, must minimize jargon and optimize ease of access. Finally, the studies pointed out the need for constant continuing education for the end-user to master digital library access languages.

#### The role of the information specialist in educating the digital library user

Merging information technology with information sources skills is needed in re-defining the educational role of the information specialist in a digital library environment. Nature vs nurture has been a debate in the social sciences for decades. The debate extends to college and research libraries when dealing with digital collections today. Academic librarians are in a state of flux when trying to shape their role based on the nature of resources needed to meet the needs of users. The very name “librarian” is clearly derived from “liber” or “book” in Latin. In the heydays of the print hard copy materials, there was a very linear connection between the nature of information sources utilized and the mission librarians needed to nurture to best serve users.

The information age exploded on the scene fanned by the demands of the Internet and the World Wide Web and blurred the dividing line in this dynamic. There is no longer the linear connection between the paper sources “liber” and the academic librarian’s role in meeting users’ information needs. As Hoadley and Bell (1996, par. 1) elucidate, “Like most technological innovations, we must focus not only on how tools help us with the same old tasks, but how the nature of the task itself may be changed”. Knowledge of information technology and knowledge of information resources must coalesce for the benefit of the information user. As the sources are progressively becoming digital, their nature is changing the vocabulary of the profession and the mission librarians need to nurture to best serve users in academic environments. Within this transition period, their role has become that of eclectics in that they must provide users with the best that print and digital resources have to offer.

In some libraries, information professionals have retained the conventional designation of “librarian”, while in others new experimental titles such as “cybrarian”, “digital librarian”, “net librarian”, and “Internet librarian” have been tried. In the Brookdale Community College library in the town of Lincroft, New Jersey, for instance, reference librarians do not staff a Reference Desk. Instead, they staff an Information Commons Area, where professional librarians work alongside trained computer technicians. This practice integrates computer technicians’ skills with librarians’ skills so that Reference Desk functions are adjacent to Information Technology Help Desk functions. In some libraries the roles can be combined in one individual who possesses degrees in computer science and library science.

In the new millennium, students will be working more and more directly with computers: accessing Web based library catalogs, CD-ROM based databases, and full text digital resources. Their demands will call for the integration suggested in this article. In her article “Reflecting on our future: what will the role of the virtual librarian be?” Cherrie Noble explores the state of flux that librarians are currently experiencing as they try to function in the information age. She points out that “Librarians have the opportunity to assume the role of instructor, but this may mean instruction in computer proficiency as well as in information-seeking habits” (Noble, 1998, p. 53). With this scenario, a number of questions come to mind. What will the new vocabulary for instruction services be in the virtual digital library? How will information professionals function in an instructional role in the new environment? Will more college and research libraries follow the Brookdale Community College’s model and have reference librarians work alongside computer technicians so that reference questions and information technology questions are directed towards two sets of experts at the same Information Desk? A dynamic needs assessment strategy is imperative to define missions and establish procedures.

In our pilot Internet studies of the New York Metropolitan area, we found that many academic library users directly access digital resources on the Internet from homes and thus by-pass the library. What implication does this phenomenon suggest for the mode of “bibliographic instruction” or better still “information resources instruction” to be performed in a digital library setting? The independence created by such a situation puts a lot of pressure on the end-user to ferret out information. Given the expertise in information seeking and retrieval, the librarian must provide the end-user with the know-how to function without necessarily having the ready access to a one-on-one reference service. This traditional concept of reference involves a transaction that takes place in a synchronous learning environment provided in house between librarian and patron at the reference desk. Although a digital environment may not necessarily be conducive to such an information transfer, information professionals have been making great strides in meeting the needs of remote users with the potential of providing 24/7 support. E-mail reference has become the driving force behind the University of Michigan’s School of Information sponsored Internet Public Library (IPL)[2]. This project is run with the help of volunteer librarians in the United States. The Library of Congress is working to establish “a digital reference network comprised of an international consortium of libraries” (Tennant, 1999, p. 30) to bring reference service closer to the threshold of 24/7 availability with librarians participating globally to bridge date and time gaps worldwide. Information about this program and its developments can be found at “Reference in a digital age”[3]. Tennant discusses moving beyond e-mail reference to serve remote users. In order to bridge time delay inherent in the e-mail process, there is the potential to supplement e-reference with video conferencing and chat functions, and thus moving from the asynchronous learning environment that e-mail reference provides toward a real-time synchronous learning environment realized during a traditional one-on-one reference services transaction.

Online tutorials are another avenue to provide guidance to the digital library user. Brooklyn College, an affiliated campus of the City University of New York, has been successful with utilizing this medium to promote digital information skills transfer. Utilizing technology to expand and enhance Library Instruction is the driving force when information professionals “us[e] a customized web site as a backup to live instruction or writ[ing]a self-paced tutorial or even develop a complete online library course to be delivered through the Web” (Evans, 2000, p. 41). The possibilities are numerous in meeting the challenge of bridging the gap between real-time synchronous learning associated with the traditional modes and methods of information transfer, and developing ways to bring these synchronous learning features into the asynchronous learning environment associated with the digital age. It is up to individual libraries to determine which avenues to pursue to optimally utilize resources to provide quality service to the community of users.

Shirley Duglin Kennedy discussed the maze of Web sites on the Internet and the amount of confusion they cause when one tries to select the appropriate ones to search for a given subject (Kennedy, 1998). To enable users to quickly access relevant digital resources on the Web, information professionals have utilized a number of methods. They have provided a subject listing of links on their own Web site; provided links to other sites which have comprehensive subject indexes, like the Librarians’ Index to the Internet, affiliated with the California State Library[4] or both options. Other than letting users find this type of guidance by serendipity, training sessions or online tutorials must clearly point out these features on the library’s Web site or in hard copy hand-outs in case the library does not have a Web page.

Another aspect of educating the digital library user concerns the requisite equipment needed for accessing digital collections. Hardware, software, and telecommunications characteristics must be clearly explained to minimize user frustration. When appropriate, the difference between modem access and other modes of access such as: ISDN, Asynchronous Digital Subscriber Line (ADSL), and cable modems, must be clearly explained. The level and mode of instruction depends on whether the user accesses the digital resources from the library or from home or office. Collaboration between the computer center and library staff is imperative in this effort. In addition, an effort has to be made to present the material in a non-intimidating manner in order to accommodate users in the humanities and social sciences.

The education function must include analysis of the nature of digital resources so that the end-user understands the environment he or she is functioning in. Instruction preparation must be proactive and anticipate some of the user questions by asking why? how? or when? For instance, why the end-user must use different interfaces to search different digital resources from the same organization; how the digital resources differ in format, for example plain text, still images, and animated images; how internal links differ from external ones; how “undigitized” material which appear in the same Web page may be accessed; and when will some or all this type of material appear in digital form. The definition of “full record” among commercial database vendors may differ. Some databases that provide abstracts as opposed to bibliographical citations claim to have “full records”, but such a definition differs from full text databases that give full text records, like the Harvard Business Review database, which gives full texts of articles.

#### Emphasis of the importance of multimedia

A significant portion of educating the end-user about digital libraries concerns analysis of multimedia inherent in many college and research libraries. The American Memory collection of the Library of Congress[5] is an example of a site which relies heavily on multimedia. Often students come to the library looking for historical information. This type of research may require primary source material. The digital library movement has created opportunities to search for historical material in an electronic format. The American Memory Collection is a digital library project that offers images, sound and video to bring historical collections alive. When bringing this collection to students’ attention in an instruction session, however, one must ensure that the library computers have such software components as RealAudio Player. If a computer is not equipped with such software, chances are it can be downloaded from the Internet and this particular site offers instruction on how to do so on its page “American Memory Viewer Information Viewing and Listening to American Memory Collections.” This information can be accessed by clicking on the “How to View” link on the home page. One must also ensure that the computers themselves are capable of running such software. In a controlled environment like the academic library, chances are that the computers on hand are updated often enough to handle such software applications. When patrons hear that a digital library is available, they may assume that remote access is readily available. Unfortunately, their own computers may not be equipped to handle such data. It is advisable for any instruction sessions to include information about digital data issues. Once again the changing role of the academic librarian is apparent. During a session, is it the responsibility of the librarian teaching the session to talk about the mechanics of downloading software or data? Are teaching librarians paired with Help Desk technicians to discuss the software and data aspects of remote access? In any case, the patrons must be advised that even though the potential for remote access exists, the reality may be that they may have to research the collection on campus in order to have the tools needed to use the resource.

The multimedia aspect of digital library collections has needs that are comparable to the traditional library usage of items such as phonographs and film. One needs a phonograph player and a projector to utilize the materials. In the case of the digital library, one needs a computer with the capability to load and run certain software in order to utilize the collection. As students in the past have come to the library to use projectors and record players, they may still need to make the trip to the library to have access to computers that have the capability to view digital library collections. If instruction sessions focus on digital library collections, one must consider whether there are enough Internet terminals in the library to handle the increase in use as students are encouraged to view multimedia digital collections. Academic librarians must also consider the technology instruction aspect of referring students to digital collections and decide if it is the librarian who advises the students about hardware and software aspects, or if students are referred to an information technology (computer systems) department. Perhaps instruction librarians are to be paired with technicians during sessions for effective training of end-users of digital libraries.

#### The globality of digital resources

Since digital libraries are Web accessible, a global availability is implicit in their design. The Digital Libraries Initiative at the National Science Foundation and the British Library Digital Programme are the vanguard of the international effort for collaboration. In “Taking the initiative for digital libraries” Griffin explains that “as part of the Digital Libraries Initiative, …five international working groups [have been established] to focus on building research agendas for technical as well as social and economic issues. This effort is jointly funded by the National Science Foundation and the European Union… [Initiatives are being taken to allow] access to information across languages and location [to bring] fuller understanding of a particular subject and the relationships between topics” (Griffin, 1998, p. 24).

Global access to information is imperative in the changing academic and work environment. Digital resources have the potential to help advance a multicultural community in the academic environment and assist students who will be employed in a multicultural workforce and a global business environment. Instruction librarians are doing their patrons a great service by bringing these issues to the forefront and including international digital resources. For instance, the Royal Dutch Library in The Netherlands and the British Library should be used as examples in as many instruction sessions as possible. Use of the available international digital library samples currently in the information arena will create the demand to push for further improvements to make the globality of the digital library movement a reality.

Access languages for digital collections will certainly be different from the regular OPACs, and information professionals must be prepared to educate the end-user appropriately in this area. While searching for author and title in the conventional OPAC designs is relatively easy, searching for key words still baffles the end-user. Furthermore, application of Boolean operators or proximity searching implemented in some OPACs sometimes makes it worse. Searching digital collections via the Web whereby some of the Web pages have different interfaces will accentuate the problem. Again care must be taken to present the material in the least intimidating manner as the level of computer literacy differs among end-users.

#### Summary and conclusions

#### From bibliographic instruction to digital resources education

There has been much discussion about the changing role of the librarian and other information specialists in the digital age. This changing role extends to how librarians in college and research libraries perform instruction services in a predominantly digital environment. The phrase “bibliographic instruction” is closely tied to the print formats traditionally used in sessions. The early twentieth century witnessed the development of the library as an institution with a definitive structure that served as a storehouse for book collections. Access greatly depended on ownership. The latter part of the twentieth century saw the burgeoning of the information age and with it the vision of the library as an access node on information networks. Access is not as dependent on ownership of print materials and is becoming more and more dependent on the utilization of electronic resources. Library instruction had to begin to include information about how to access information in CD-ROM formats.

Electronic resources and Internet access has made remote access to information a reality for patrons. There are increasing opportunities for patrons to bypass the library altogether to do research

Web-based digital resources are now becoming more and more prevalent and encompass more than “surfing the net”. Computer instruction is becoming increasingly important for our users. Different models are being tested as to how to incorporate technology skills into the research process. Libraries need to examine their mission in light of the changing information arena and decide how this is to be accomplished. Brookdale Community College has opted to have technicians handle technology related issues while the librarian handles the research issues during the one-on-one instruction at a shared common Reference Desk, or Information Commons Area, as the case may be.

Electronic resources and Internet access has made remote access to information a reality for patrons. There are increasing opportunities for patrons to bypass the library altogether to do research. In order for patrons to optimally utilize these information sources, library education services are tantamount to providing researchers with the evaluation tools to function in the digital age. Library education is increasingly known as end-user education to reflect the dynamic of the independent researcher reliant on technology to access information. As remote users continue to grow as a segment of our academic library community, then instruction services have to change to accommodate their needs as well. One way is to feature a subject guide to reliable Internet sites for research purposes on the library home page. Another is the development of Web-based online tutorials linked to the library Web site so patrons have immediate access to instruction.

#### Need for continuous user education and training

The college and research library as an institution is in a state of flux and digital resources are in the nascent phase of development and thus while these collections are currently useful they also have endless potential and problems. Professional listservs are a fine tool to help academic librarians keep pace with developments. DIGLIB[6] is an example of a discussion list sponsored by IFLANET, the International Federation of Library Associations and Institutions, and is an excellent avenue for up to date information about digital library developments. The D-lib Magazine[7] is also an excellent source of information based at the Corporation for National Research Initiatives and is sponsored by the Defense Advanced Research Projects Agency (DARPA).

As librarians and other information specialists in college and research institutions become increasingly aware of developments in digital libraries, that knowledge can be passed to users as digital library collections are recommended as sources. Links to digital library collections on the college or university library’s homepage will guide remote users to these sites and instruction sessions can be streamlined if digital collections are linked from a main page. End user instruction is a must for users to have the tools to optimally utilize electronic sources and understand the nature and function of digital collections. Like the Internet in general, digital collections are not necessarily the one-stop-shopping opportunity that patrons may perceive them to be. They have their limitations, such as technology requirements that home computers may or may not possess, and licensing limitations that may or may not be easily overcome.

Creating a “learning communities” approach to end-user education is a step towards filling the need for continuous user education and training. Wagner College, one of the participants in our pilot studies, has developed such a program in which library instruction is an integral part of the classroom experience and is continued as the students advance from Freshman to Senior year. The professor-student-librarian educational interaction is treated as “a learning community” to promote the education enterprise. College and research universities may also develop advanced levels of for-credit research classes and require that they be taken. Another option is to develop a series of Web-based tutorials and have teaching faculty require that they be completed as part of a class. Walk-in sessions may also be an option, allowing users to choose what they need at their own pace, or at the recommendation of a librarian or teaching faculty member. There are a myriad possibilities to advance opportunities for continuous user education. It is up to the library to evaluate its mission and decide how best to proceed in the digital environment.