Emerging research communities and the World Wide Web: analysis of a Web-based resource for the field of museum learning

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Abstract

In this paper we contrast the possibilities of the World Wide Web to transform communities of educational researchers with actual patterns of use of The Museum Learning Collaborative Web site. We highlight patterns of user interaction that have emerged and discuss the problems and opportunities of creating shared research resources in emerging fields such as museum learning research. Our findings have direct implications for three stakeholders: program funders, ourselves as project researchers, and the larger museum research community. © 2001 Elsevier Science Ltd. All rights reserved.

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In what ways might the use of the World Wide Web as a location for museum literature information, the public display of instructional courses on museum learning, and the presentation of research tools be used and be useful? This article explores answers to that question through the examination of the design and use of one particular Web site. The Museum Learning Collaborative (MLC) has chosen to share on its Web site both its ongoing progress on reviewing current museum literature and its ongoing progress on conducting museum learning research (http://mlc.lrdc.pitt.edu/mlc). This sharing represents a dramatic departure from the traditional means by which educational project work is reported. The general scientific tradition and certainly the tradition in the world of museum learning research is to issue complete, polished, well confirmed, and somewhat conservative reports at the end of a project. Furthermore, because existing

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museum research has often been conducted in the context of proprietary evaluation, instrumentation and analytic processes for museum learning studies have generally not been widely shared. The presence of the World Wide Web has provided an opportunity and a challenge to that way of doing business. In this article we discuss the underlying motivation, the core decisions, the contents, and the use of the MLC's Web site.

The Museum Learning Collaborative is funded by a consortium of federal agencies to advance a body of theoretically motivated research on learning in museums. As part of the MLC's charge, we were asked to find ways to make public to the museum community the research that had already been conducted on learning. This charge resulted from the recognition by the funders of a problem — a great deal of research on learning in museums had been conducted but it was widely dispersed, existed in non-archival form, and was hard to find. The MLC proposed that, rather than writing yet another literature review that would be frozen in time, we should work on building an easily accessible, continuously growing database in which literature relevant to museum learning research could be listed and gradually annotated.

We decided to build up a corpus of literature and annotate it in a systematic and consistent way. Thus, each annotation that appears on the MLC Web site follows a specific substantive format (author, author's identification, six to eight sentence summary, limitations or criticisms, relevance for the socio-cultural themes of the MLC, and valued contributions) and explicitly addresses theoretical issues within the MLC (the central ideas of identity and motivation, explanation, and learning environments). We decided to be focussed and somewhat extensive in our reviews not generic. We also decided to categorize the literature based on a framework of constructs as well as to provide a search engine that could be flexibly tailored to individual user inquiries.

A second layer of motivation for the Web site was the desire to make the research activities and decisions of the MLC public as they occurred; to make tools and research designs available on line; and to explore other ways in which we might open a dialogue that can sometimes be hampered by proprietary interests. In doing this we were mindful of the charges and criticisms launched by Friedman (1995) and Bitgood, Serrell and Thompson (1994) of the need for research on museum learning to become connected with the larger fields of research on learning in other settings. We were also mindful, however, of the gulf that often exists between various elements of the practitioner community and the world of the so-called ivory tower academic. We felt, as do Roschelle and Pea (1999), that making use of the Web could help bridge that gulf and blur the traditional distinctions. To this end, the Web site also hosts a newsletter, contains course syllabi from around the country that emphasize museum learning and a socio-cultural approach to research in museums, and includes emerging tools and procedures as they are field tested by researchers affiliated with the MLC.

In this article we contrast the promissory stance of the World Wide Web with the actual patterns of use of our Web site. We highlight patterns of user interaction that have emerged and discuss the problems and opportunities of creating shared research resources in emerging fields such as museum learning research. In designing the MLC Web, we hoped to widen visitor use including extensive re-use and quite reasonable levels of deep exploration. We anticipated that this relatively new type of electronic communication might well prove even more useful over time. But we were also concerned that some parts of the museum community that are not connected to the Web might feel excluded rather than included.

1. Arguments for the Web

Proponents of the World Wide Web emphasize its many virtues in a series of often unsupported claims. These virtues can be considered along two dimensions: distribution of information and the nature and quality of information. We review the most repeated and probably realistic of those claims here.

The Web dramatically alters the distribution of information (Butler, 1999). First, with the advent of the Web, the cost of sharing information drops almost to zero. Costs of constructing and maintaining a mailing list and of the actual printing and mailing of dissemination materials virtually disappear. Second, the Web is fast and quickly revisable. Gone are the 5 week waits for inter-library loans. Many Web pages are updated daily or hourly, but even our own slower pace of monthly updates is remarkably faster than issuing a new publication. Because of this cheapness and speed, the Web allows us to be intellectually generous — we are not in competition with other forms of information provision and benefit from pointing visitors to other Web sites and hard copy information.

Third, and perhaps most often repeated, the Web democratizes information and access to it on a global scale. This actually means several things at once. People who are searching the Web by category — such as "learning in museums" — can find the information that they want without needing to know individual names of people nor do they have to be in easy mail contact. In emerging fields such as museum learning, this is particularly important since the relatively small number of researchers currently in the field are widely dispersed geographically and also come to the new discipline from home disciplines (e.g. education, anthropology, museum studies, cognitive science, art history) and institutions (museums, universities, evaluation or design firms) that have little overlap in terms of publications and conferences. The Web site becomes a central point of contact for such diverse groups — contact that may develop into the beginnings of a virtual community.

These three promises (cheap information, rapid revision, and democratized access) all relate to the distributional features of the Web. But there are also promises for the general improvement of information quality that Web supporters often make. This improvement is of a particular type, namely, it is made up of an enrichment of detail and dimension of information. First, because isolated information becomes more public, the general public becomes more informed. Second, different levels of examination and public presentation can be simultaneously supported, ranging from a general overview of project themes or findings to the complete details of proposed research-designs and instruments. This level of detail is often excised from paper-based project reports because of costs associated with length and the limited size of the interested audience. Third, by making these details public as they are developed and by inviting the field to criticize and comment, researchers can then revise and strengthen their constructs and methods as they develop projects.

Finally, contextual information about the project, researchers, funders, and locale is available through inspection of the combination of content choices, expanded details of the researchers identity, links to related institutions, etc. From a history and philosophy of science perspective, this latter feature may be the most important aspect of the Web, because it reveals contextual aspects of scientific activity that, although may have a essential role in shaping the nature of the research, are nonetheless "scrubbed out" of traditional reports and journal articles (Thagard, in press; Tweney, in press).

Although these features of the Web may help accelerate the development of emerging disciplines such as museum learning research, each of them depends on the intentions and designs of those who build Web sites, the intentions and interests of those who might visit and use the site, and the abilities of potential visitors to locate and successfully navigate through the site. When we initially proposed the use of the World Wide Web as a location for and means of distributing our annotated bibliography and other project material, both we and our funders were nervous about its actual utility for its intended audience. The museum world is not, in general, a leader in the use of technology and many museums do not have facilities for their employees to log on to the Web. The central question, therefore was do people use it? If people use it, do they actually go to the annotated bibliography and investigate it? Do they return and use it on more than one occasion?

2. Methodology

Each time a user accesses a Web site, the Web site automatically records a variety of information about that event in a log file. In this article, we report on data collected from August 1997, when the MLC Web site first went on-line, through May 1999.

Fig. 1 contains a single line of data from our log file. Every time an individual's Web browser sends a request to the MLC server, the server notes, among other things, the following information in the log file: date and time of request, address of the users internet connection, particular file requested, the referring IP address and search string, and the success of the request. For example, imagine that you are sitting at your computer and you have opened your Netscape browser and gone to Yahoo! to find information about museum learning research. You type in "learning in museums" and Yahoo! sends back a list of links to related Web sites. You then click on the link to the Museum Learning Collaborative. The MLC home page appears on your screen, in the meantime the MLC server has written a new line in its log file that records your visit.

As others have noted, such extensive record keeping of what some may consider private actions may appear troublesome (Elgesem, 1996). In the field of museum learning research, museum and
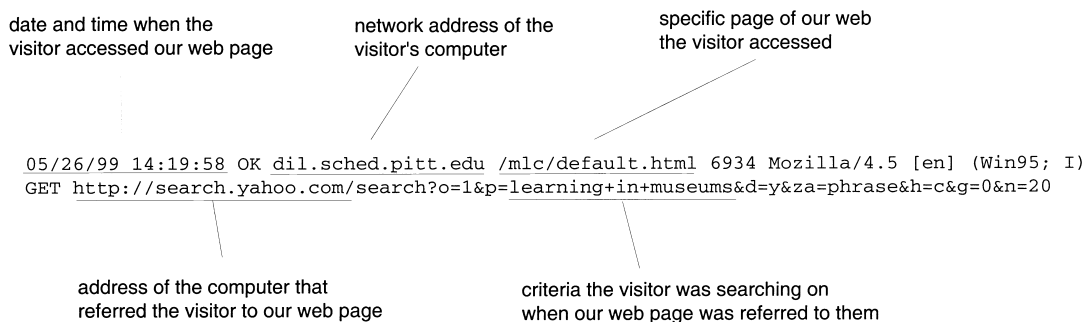

Fig. 1. An example of the data recorded in the log file for a visitor who finds our Web page by first visiting Yahoo!, searching for "learning in museums", and then choosing our address from the list of possibilities offered by Yahoo! The pieces of this data we analyze for our research are labelled. Other data, for example the particular Web browser and operating system of the visitor's computer are also recorded, however we do not analyze them here.

educational researchers in live research settings are beginning to converge on a protocol for human subject research. Traditionally, university-based researchers have been and continue to be required to obtained informed consent from research subjects. In addition, this process is vetted through an internal review board. In contrast, museum researchers working for and with the museum as an economic location have traditionally had far fewer institutionalized requirements. In many ways museums collect data in a manner that is similar to that collected by one's local grocery store. Many of us are unaware that each time we use a payment card the information of what we bought and how much is recorded and then used as a way of targeting specific advertisement. We have become accustomed, however, to the fact that if we purchase camping equipment through a catalogue we will shortly received a large number of catalogues for camping equipment.

The issue here is that behavior in the grocery store, in the museum, and on the Web is considered public behavior. Every time an individual logs on anywhere on the Web information about that event can be and probably is recorded. On the other hand, we tend to think of the situation of sitting at our own computers in our offices or homes as private. What is actually happening here is the very ease with which one enters the Web tends to disguise it's inherently public nature. In our own work we have collected information at the categorical not personal level. We imagine that the specifics of these issues will continue to be discussed and that the discussion will evolve (Ess, 1996).

2.1. Data processing and analyses

To make sensible use of these data it is necessary to exclude certain lines of data. For example, the project members make frequent use of the Web site but we are not particularly interested in discussing our own use. Therefore, we have excluded our own visits from the data. Essentially what we are trying to do is to accurately profile the use of our Web by people who are interested in research on museum learning in general or in the details of our project in particular.

There are numerous shareware and freeware programs to go through these records and count various attributes (e.g. Analog and WWWStat). Such programs typically provide only the most general information about visitors to a Web site. However, our research questions required that we know more about repeat visitors, how visitors explored the site, and how visitors found our site from the Web. Thus, we decided to write our own program to tailor analyses to our research and evaluation questions. The program, written by the third author, works with log files produced by most major Web server software. In addition to other features, the program computed measures for each of the four dimensions we analyze: growth; spread; usage; and finding.

2.1.1. Growth

To provide a picture of the increase in site use over time, the program records hits, pages served, and number of individual visitors. A hit (or request) is either a text file or a graphic file that is requested by the visitor's browser. Each individual page in a Web site can be composed of multiple individual files. Thus, our server can record multiple hits every time a visitors accesses a single page on our Web. We include data on hits because it has become a standard measure of Web usage. However, our analysis program also computed the more informative measure of the number of individual pages accessed by our users. Finally, the program scanned the log file to

count the number of individual visitors who have accessed the site. It did this by counting the number of unique internet addresses of visitors throughout the entire log file.

2.1.2. Spread

In order to determine if we are reaching a widely dispersed audience or not, the program looks up the text domain names that correspond to each IP address of a visitor. Domain names end with a suffix that generally indicate in which country a visitor is located (e.g. an address that ends with ".fr" is a user from France). The location is then displayed on a global map.

2.1.3. Usage

In order to know how visitors are using the site, the program tracks four measures of usage. First, it counts repeat visitors by scanning the log file to locate the first point at which a computer with a particular address visited the site and then looking through the remaining log file to see whether that same computer visited on a subsequent day. Second, it counts how many different pages in our site each visitor has viewed across all of his or her visits to the site. Third, it counts how many times each page in the site has been accessed by visitors overall.

2.1.4. Finding the MLC Web page

Visitors find our Web page in a variety of ways. If they know the address, they can enter it directly into their browsers. If another Web page, an e-mail message, or a post on a discussion group includes a link to our site, visitors can get to us by clicking on that link. Visitors can also find us by using the major Web search engines such as Yahoo! or Lycos. When visitors come to us through one of the major search engines, our Web site log records the search criteria the visitor had entered. Our analysis program extracts these criteria and saves them into a text file for later coding by hand. Thus, we can know something of the nature of some of our users inquiries when they found and visited our site.

2.1.5. Sources of imprecision

All empirical analyses contain sources of imprecision. These can range from measurement problems to counting problems. Analyzing log file data from a Web site has its own unique sources of imprecision. Three particular problems lead to underestimates of actual Web usage. First, some popular service providers such as America Online use proxy servers to store Web pages and then serve them internally to their customers, making it difficult to know how many actual AOL users have visited our site. Second, visitors from countries other than the US may sometimes have ".com" or ".net" suffixes in their address, creating a situation where we under-detect the number of international users because we treat ".com" and ".net" as US hits. Third, we only know the IP addresses of computers that access our site. We do not know who is using that computer. If computers are shared by several people in an office (which is a common situation in the museum world), we would count all of those people as a single user. There are also imprecisions that potentially inflate some measures. For example, if a single individual accesses our site from two different computers, our analyses would treat that activity as if it were two different individuals. Likewise there may be artificial visitors (Web robots) that one might argue should not be counted as visitors. On the whole, however, inaccuracies result in an underestimate of actual Web usage not an inflation.

3. Results

To address questions about whether the promise of the Web has been realized, we present a series of increasingly fine grained analyses of the ways visitors have used the MLC Web.

3.1. Growth

Fig. 2a presents two measures of Web usage: hits and pages served. From August of 1997 to May of 1999, the MLC site received 161,828 requests (hits) from visitors who were not local MLC users. As shown in Fig. 2a, there has been a steady pattern of growth in Web usage from about 100 hits in August 1997 to more than 18,000 in February of 1999. We report hits because this has become a common measure of use and growth. However, since a single page may contain multiple files and thus be recorded as multiple hits, we also present the more precise and conservative measure of pages viewed. By this measure, usage has grown from 36 pages viewed in August 1997 to 6036 pages viewed in February 1999.

Fig. 2b shows that there has been a comparable growth in the number of new users who have visited the site for the first time. Over the 22 months analyzed, the MLC Web site has been visited by at least 11,003 distinct users. In August 1997 there were six new users while more than 1000 users found our site for the first time in February 1999. Since February we have averaged around 800 new users each month.
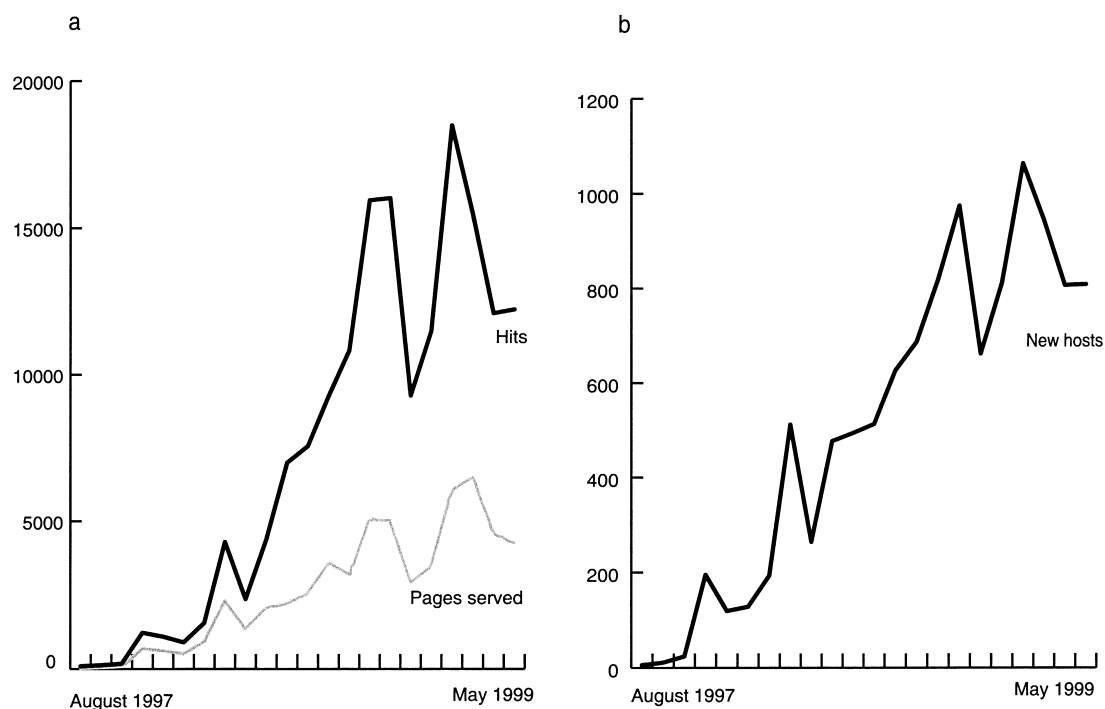

Fig. 2. Monthly growth of MLC Web site use from August 1997 to May 1999 measured as (a) number of hits and pages served and (b) number of users who visit the site for the first time in each month.

How much can a simple analysis of hits tells us about our users? Despite the fact that not all museum professionals and researchers have ready access to the internet, we can argue that a large number of interested individuals have made contact of some kind with the MLC. Populations that would have no access to the normal distribution channels for museum research now have access. It is our hope that those who are currently excluded because of a lack of technology will, over time, become included.

The growth in hits and users is probably a function of increased use of the Web in general as well as an increased interest in the MLC site in particular. In the 22 months we analyzed for the MLC site usage, the internet grew from about 21 million to 90 million hosts (ftp://ftp.isoc.org/), an increase of 429%. As more computers come on line, larger numbers of potential visitors have the means to access the MLC site and so we would expect that usage would increase. However our own growth during this time was around 18,000%, so simple increases in the number of people on-line accounts only partially for our growth.

We think our growth is probably not atypical for Web research sites. As a rough comparison, it might be useful to examine other sites that provide research resources. For example, MIT's Whitehead Institute maintains a human genome site where weekly access grew in its first 22 months from 260 to 74,541. The latest usage statistics available on the site suggest that usage has since leveled off at roughly 150,000 accesses per week (http://waldo.wi.mit.edu/usage). Although museum research is a smaller field than molecular biology, patterns of growth between the two sites are similar. There is an initial rapid expansion as people in the field start to visit the site. Once most of the core audience is aware of the site, growth probably levels off. We may see the beginnings of this leveling the last few months of data in Fig. 2.

3.2. Spread

In the months analyzed, the MLC Web site was visited by users from at least 73 different countries on four continents. As Fig. 3 illustrates, visitors find us from developed and developing countries, from the UK and Norway, to Botswana and Mauritius. The argument we have made is that the Web permits a world-wide instantaneous connection among people with similar interests. Fig. 3 provides evidence that this claim is justified. When we built the Web we never imagined this level of international interest. The simplest way of thinking about this is that the scope of dissemination does not depend on our preconceived notions of who our target audience is. Nor does it depend on our financial capability to send out information.

3.3. Usage

Finding that 11,003 visitors hit your site is analogous to selling a book or having someone subscribe to your journal and knowing that they at least looked at the table of contents. By this standard, the MLC site has come in contact with a large audience considering that the average educational research volume sells about 1000 copies and a journal such as *Educational Researcher* which is sent to all members of AERA — the largest educational research society — has a circulation of about 23,000. However, the hope in all cases is that an individual will look beyond the first page and engage with the content. We have three measures of engagement: repeat visitors; number of pages viewed by each visitor; and the specific content of pages viewed by visitors overall.

Of the users who have visited our site, 1355 have so far returned to the site on at least one subsequent day. Of these repeated visitors, 45% have returned for one additional visit, 19% for two additional visits, 8% for three additional visits, and the remaining 28% ranging from for four to 158 additional visits. Within this 28%, there is a group of 97 frequent users who have accessed the site 20 or more times since we went on line.

The number of different pages on our site that any individual visitor has viewed ranges from 1 to 1463. Of visitors to our site, nearly 50% have gone beyond the first page: 17% have moved beyond the introductory page to view one additional page, 7% viewed three different pages, 4% viewed four pages, and the remaining 20% viewed five or more different pages. Similar to the

Argentina	Croatia	Indonesia	New Zealand	Spain
Australia	Czech Republic	Ireland	Nicaragua	Sweden
Austria	Denmark	Israel	Norway	Switzerland
Bahamas	Dominican Republic	Italy	Panama	Taiwan
Bahrain	Ecuador	Japan	Philippines	Thailand
Belgium	Egypt	Jordan	Poland	Turkey
Bolivia	Estonia	Latvia	Portugal	Ukraine
Botswana	Finland	Lebanon	Qatar	United Arab Emirates
Brazil	France	Lithuania	Romania	United Kingdom
Brunei Darussalam	Germany	Luxembourg	Russian Federation	United States
Bulgaria	Greece	Malaysia	Saudi Arabia	Uruguay
Canada	Hong Kong	Malta	Singapore	Venezuela
Chile	Hungary	Mauritius	Slovenia	Yugoslavia
China	Iceland	Mexico	South Africa	
Columbia	India	Netherlands	South Korea	

Fig. 3. From August 1997 to May 1999 the MLC Web site was visited by users from at least the 73 countries marked by black and listed below the map.

analysis of repeat visitors, the analysis of pages viewed suggests that the Web site serves a core group of frequent users who engage deeply with our content: 125 users have viewed at least 50 different pages on our site.

What kinds of site content do visitors use the most? The data presented in Table 1 show the distribution of pages accessed across the home page and the six kinds of content offered on the MLC Web site. The location in the Web used most frequently is the literature review, with the indexing pages of citations, search engine, and the individual annotations accounting for 61% of all pages accessed by our visitors. We take this as evidence that we are providing a unique and useful resource for the whole museum research community. Although the percentages for the remaining types of content on the MLC Web page are small due to the heavy use of our bibliography, the raw numbers of pages served are still quite high compared to traditional means of disseminating project information. For example, the MLC Web has responded to 1700 requests for pages from the small section of our Web that contains six course syllabi focusing on museum learning. For comparison, in our combined 35 years of teaching at the university level we have received maybe 15 syllabi requests from colleagues.

Table 1 also depicts the ways that visitors chose to access individual citations in the bibliography. The literature data base was most frequently accessed (4696 times) through the pages presenting citations listed alphabetically by author. The interactive search engine was the next most popular route into the literature (3271 times), followed by pages where citations were sorted by the type of museum (3054 times), by a page of dissertation and thesis citations only (2212), pages where citations are sorted by project theme (857), and pages where citations are sorted by framework categories (60).

These data are especially helpful for the formative evaluation of our Web site. For example, it is clear that maintaining and improving our search engine is an important activity because visitors have used it 3271 times. However, it is costly and difficult to code our annotated articles and theses by our original research frameworks and since this has been of use only 60 times in two years, we might consider ending this aspect of the Web. Finally, although searching the literature by

Table 1
Frequency of use of different aspects of the MLC Web site

Area of Web	Number of pages served	% of pages served
MLC home page	9828	16.7
Philosophy and purpose	1136	1.9
The collaborative	6967	11.8
University courses	1734	2.9
News and related links	2607	4.4
Research designs	348	0.6
Annotated literature (total)	35,852	61
a. Alphabetical listing	4696	8
b. Interactive search engine	3271	6.7
c. Theses and dissertation list	2212	3.8
d. Listings sorted by museum type	3054	5.2
e. Listings sorted by project theme	857	1.5
f. Listings sorted by framework categories	60	0.2
g. Individual annotations	21,702	36
Total pages served	58,472	100

project theme has also been limited (857 times), this is a relatively simple feature to maintain and is of some use.

3.4. The accidental tourist

We earlier raised the possibility that one useful aspect of Web-based dissemination for educational research projects is that it might break down traditional barriers between communities (for example researchers and practitioners) that have traditionally had difficulty sustaining meaningful dialog due, at least in part, to separate journals, newsletters, and conferences. If we had not established a Web presence for the MLC, we are confident that colleagues from our familiar professional circles would have been able to find out about the MLC and to request reprints of our articles. But how would an exhibit designer from a museum find out about the project and utilize our resources, particularly if he or she was from outside the US?

The large commercial search engines such as Lycos, Yahoo!, and Excite allow Web users far broader search options than previously possible. They create the possibility that people from a broad range of communities looking for a broad range of information can come into contact with the MLC. While the majority of visitors come to us directly by typing in our address, following a fixed link from another site, or following a bookmark they previously made, many find us through a search engine. When visitors are referred to our site through one of the large commercial search engines, the text they searched on is recorded in our log file. Most of these users (38%) came to our Web page having searched on the names of specific museums, agencies, or associations. The next most common search category (21%) includes learning, education, and research topics, followed by searches for names of specific people or objects (18%). Requests for literature reviews per se comprise 9%. Courses and university-related topics comprise 4%. A final 10% of searches covered a wide variety of idiosyncratic categories.

While we are fairly certain that the majority of visitors who come to our site do so with some level of intentionality, some arrive quite by accident. For example, one user found us by searching on the string "Say that you lave me". The change of the "o" to an "a" linked to Jean Lave (an author on articles in our literature review) and thus the search engine suggested our site rather than the more romantic locations the user might have imagined. The point of this anecdote is to indicate that some of our 11,003 visitors arrive by accident, take one look at our homepage, and probably leave. Others however, may arrive somewhat accidentally, appreciate what they see, and linger. For example, visitors often arrived through searching for the name of our collaborating museums or on general issues such as informal learning. Although these visitors did not set out to find the MLC in particular, our Web page contains related content that they may well find useful enough to warrant further exploration [see Huberman, Pirolli, Pitcow and Lukose (1998) for formal analysis of search decisions on the Web]. Serendipitous connections with such accidental tourists provide a unique opportunity to expand the audience for research on museum learning.

4. Summary and conclusions

When people consider how the World Wide Web changes communication in research and education they often do so in conceptual pieces that emphasize the potentials of the Web to

dramatically transform communities of students, teachers, and researchers (Fetterman, 1998; Roschelle & Pea, 1999; Windschitl, 1998). Alternatively, we see many articles that are concerned with the mechanics of analyzing Web usage in general or descriptions of particular Web pages that have been used in education and research, (McGlamery, 1997; Wu, Yu, & Ballman, 1998). Our purpose in this article is to approach a middle ground. We have discussed the details of the use of the MLC's Web page in terms of the larger promissory notes of the World Wide Web. As we describe below, meeting the promises of increased distribution and improvement in quality have, we believe, implications for three stakeholders: program funders, ourselves as project researchers, and the larger museum research community.

What funders of social science research want is to reach the widest possible audience including researchers, practitioners, politicians, and the general citizenry. Normally reaching each of these populations requires separate and distinct forms of dissemination. Furthermore, there is a substantial production and publication time lag involved in converting the various intellectual products of a research project into usable information for each of these audiences. We found that MLC Web usage 2 years into the project has grown dramatically and that we have reached at least 11,003 interested people in 73 countries. We did not know, a priori, the size, location, or sophistication of our audience. In this case the Web has reversed the normal processes — our visitors have chosen to use our information rather than us sending out information to people on mailing lists who may or may not have been interested. Furthermore, unlike direct mailing of project information, once project information is on the Web, there is no additional cost to increasing the size of the audience. Using traditional dissemination means would have surely been a more costly, more limited, and less effective strategy for the funders' goals of effecting change through support of this project.

As project researchers we want to be in strong dialog with the research community as we are designing, conducting, and analyzing our museum learning research. What we mean by strong dialog is that we want to receive thoughtful questions and criticisms of our tools and methods and we want to be able to respond, justify, and/or revise our tools and methods. Like many social science researchers, we are often frustrated with the ways that the 3 to 5 year time lag associated with publication and response to new ideas stymies timely communication among interested research colleagues. By making public our design and core constructs as we go, we have facilitated timely dialog with other researchers in the field. We have been gratified at the response. For example, one researcher has engaged us in a serious discussion of the appropriate locales for assessing conversation in museum settings, prompting us to justify and test aspects of our planned procedures.

The Web also allows us to share a very complete presentation of our thinking with colleagues. Like many other researchers we have often chafed under the limitations of the 12 to 20 minute conference presentation which, if one speaks quickly, covers about 10 pages of text written at a "guestimated" level of technical detail. The depth and layering of a Web page permits the causal conversations that develop through face-to-face meetings or e-mail exchanges to go much deeper, much faster. Thus, what might have previously been only a casual exchange has the potential to develop into a shared piece of thinking. To date, at least three new collaborations and extensions of the MLC have occurred in this manner.

Beyond its role in promoting our own research project, we think we can also argue that the MLC Web page benefits the wider field of museum learning research. At the most direct level, our data show both a wide and deep use of the annotated bibliography on the MLC Web site. In

emerging research fields without an institutionalized archival journal structure, a serious obstacle to progress is simply finding out what has been done and where, if anywhere, it has been published (McManus et al., 1998). The MLC annotated bibliography provides an important resource for identify prior work that would otherwise be difficult if not impossible to locate.

One of the problems that faces the museum learning research community is that it is often closed, proprietary, and weakly connected to academic communities (Bitgood et al., 1994; Friedman, 1995) The MLC Web page and others like it help to nibble at the proprietary nature of research tools and findings. It presses the field to become more informed, more accountable, and more open. This, in turn, democratizes the system and helps blur distinctions between members of different communities (entrepreneurial practitioner, museum designers, evaluators, and academic researchers). This goes to the general point that the Web and related internet technologies have the potential to create unique virtual communities out of people who are in different places and from different institutional venues (Thagard, 1994, in press). The general problem, particularly in a small emerging field, is wide geographic dispersal and low density of interested people. Conferences solve this problem once or twice a year. The Web solves it every day.

By emphasizing issues of wide distribution and speed we do not want to ignore or underplay the critical importance of synthetic interpretation of ideas and evidence. The Web has the unfortunate potential to perpetuate trivial and even erroneous information. The hallmark of scholarship has always and should continue to be the thoughtful integration and synthesis of accurate information into cogent argument. We see the Web as facilitating the process not being in competition with it.

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