Use and Users of Digital Resources:

A Focus on Undergraduate Education in the Humanities and Social Sciences

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USE AND USERS OF DIGITAL RESOURCES: A FOCUS ON UNDERGRADUATE EDUCATION IN THE HUMANITIES AND SOCIAL SCIENCES

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EXECUTIVE SUMMARY

Introduction

A "build it and they will come" approach to many university digitization initiatives has precluded systematic investigations of the demand for these resources. Those who fund and develop digital resources have identified the general lack of knowledge about the level and quality of their use in educational settings as pressing concerns.

The purpose of our research was to map the universe of digital resources available to undergraduate educators in a subset of users in the humanities and social sciences (H/SS), and to examine how understanding use and users can benefit the integration of these resources into undergraduate teaching.

Why study users? There are myriad reasons cited for undertaking and conducting user studies. They may range from product design and usability testing, to policing web sites, to facilitating policy and investment decisions. For our purposes there were three interrelated rationales for conducting the present research: (1) addressing questions of strategic planning and investments in digital resource provision and use, (2) identifying the special needs of the humanities and social sciences, particularly as they relate to the future of liberal education in a digital age, and (3) sharing effective strategies for understanding the array of uses and users across a wide variety of educational digital resource initiatives.

Overview of methods

Our specific approach was to employ multiple methods and empirical data to investigate how and if available digital resources are being used in undergraduate teaching environments.

It is important to note that our definition of digital resources is intentionally broad and includes rich media objects (e.g., maps, video, images, etc.) as well as text. These digital resources may reside in or outside of digital libraries and include those developed by individual scholars and by other entities.

Results

There are three broad areas to our work reported here:

1) A literature review and discussions with various stakeholders to provide a scan of the digital resource universe, and where the user fits into that universe

2) Surveys of faculty at various types of California higher education institutions as well as subscribers to humanities and social sciences listservs, and the testing of the combination of transaction log analyses and online surveys as methods for understanding users of specific web resources
3) Interviews of site owners and the organization of a symposium to explore how gathering comparative user and non-user data across a variety of digital resources might be achieved

1. Understanding the humanities and social science digital resource landscape

Through (1) a literature review and (2) targeted discussions with those who create and disseminate digital resources, we assessed the landscape of user studies that target digital resources available to H/SS faculty in undergraduate settings.

Our literature review encompassed the following broad areas:

1) Humanities and technology;
2) Real and virtual classrooms;
3) Undergraduate education reform;
4) Information literacy initiatives;
5) Tools for instructional use of digital resources; and
6) Specific research on digital resource users (electronic resource/digital library use studies; cultural heritage research; site-specific user studies; image-service studies; and complex new media such as interactive video, GIS, 3D applications, games, and social software).

The literature review reinforced our early assessment of the state of the landscape. We discovered that a description of this space entails complicated definitions about, and analyses of, (1) the scope, variety, and origins of the available rich media resources, (2) how the resources are actually used (or not used), and (3) the variation that exists between and among a diverse group of "users" and "owners" (and a recognition that users and owners are often embodied in the same person).

There is an especially complex set of stakeholder interests and agendas when it comes to defining the value of user studies. There are policy makers and administrators who oversee educational reform or digital library efforts, developers who create resources, and technicians or designers who develop tools for the integration of resources into undergraduate settings. This diversity of perspectives and agendas complicates the understanding how an exceptionally diverse set of digital resources is actually used.

Creating a Resource Typology:
We convened a number of groups to discuss the digital resource provider or site owner perspective, and to tackle the problem of common vocabulary. But there are challenges to the construction of such a vocabulary, not least of which is that digital resources of all kinds are proliferating in many different environments and are created by many different kinds of developers.

We began creating a typology by simply describing resource types (e.g., curriculum, video, maps, electronic journals, etc.) based on actual faculty discussion group data (below), thereby generating a useful map for describing digital resources from a faculty perspective. We refined the typology so that resource characteristics are gathered around "centers of value." These centers of value (e.g., what and how content is represented, how can it be found, etc.) can function as broad yet significant guiding principles, with considerable strengths in describing many kinds of digital resources.

What we soon discovered, however, is that users, when compared to resource providers, often use a different level of granularity in defining a resource (e.g., whether they can find on the web a format, a photo, a picture, or a passage). Furthermore, categories of users often comprise diverse individuals with varying and idiosyncratic needs, perceptions, and ways of finding and utilizing digital resources.

The set of roles under the designation "owner," (and the individuals in those roles) ordinarily have different interests, values, and, especially, different levels of access to traces of user behavior. A colleague suggested the following distinction of these roles:

- Aggregators, who select which digital resources are to be available in what combinations, and try to bring them to the attention of users
- Developers of tools, who shape user interactions, export mechanisms, and access paths
- Content creators and owners, who conceive, assemble, describe, and digitize content

2A. Faculty discussion groups and online faculty survey

To determine how, how much, and even if unrestricted digital resources are being used in targeted H/SS teaching and learning contexts among diverse higher education communities, we conducted discussion groups and a survey of potential users (faculty, teaching assistants, and students) from UCs, liberal arts colleges, and community colleges in California.

Faculty discussion groups: In October and November of 2003, we hosted four sessions of discussion groups with thirty-one instructors from three institutions. The discussions formed the basis for the development and creation of the faculty survey. We asked variants of four basic questions in our discussions:

- What digital collections/resources do you use in undergraduate teaching?
- How do you use them in your teaching?
- What obstacles to use do you encounter?
- What would you like to do with digital collections/resources in a perfect world?

The discussion groups are summarized in a separate publication that can be found at: http://digitalresourcestudy.berkeley.edu/pdf/faculty_discussion_group_june05.pdf

Faculty survey: We conducted a survey of approximately 4,500 faculty from specific disciplines at a stratified random sample of community colleges, University of California campuses, and liberal arts colleges in California; the survey was administered both online and on paper. We received 831 valid responses (a response rate of 19%). A follow-up telephone survey of selected non-responders found no convincing evidence of response bias in the survey. We also

conducted a second, parallel survey of instructors from a broader range of institutions, disciplines, and geographic areas, recruited through online discussion groups; we received 452 responses. The results from this second survey corresponded closely with the main faculty survey on most dimensions.

The survey questionnaire focused on eight main domains:

- Teaching background
- Types and sources of digital resources used
- Personal digital collections
- How digital resources are used in teaching
- Motivations for using digital resources
- Motivations for *not* using digital resources
- Barriers and frustrations
- Support and assistance

Results of the survey reinforced our early impressions from discussion groups. There is a broad spectrum of user types, ranging from the non-user, to the inexperienced, novice user, to the highly proficient and advanced user of digital resources. Non-users were themselves diverse. They included those who were passionately opposed to the use of technologies in their classroom for a variety of valid pedagogical reasons (e.g., these technologies cannot substitute for preferred teaching approaches). Non-users also included self-described enthusiasts frustrated by technical and non-technical barriers, and those simply without time to think about, let alone use, technology in teaching. The degree to which personal teaching style and philosophy influence use was striking.

Respondents used a wide range of resource types for a variety of reasons. Images and visual materials were the most frequently used resource, and were often used for classroom presentation or posting on the web. Google-type searches were the most frequent way in which faculty found resources. A faculty member's own "collection" of digital resources was the second most frequent source of material.

Faculty used digital resources to improve their students' learning, to integrate primary source materials into their teaching, or to include materials or teaching methods that would otherwise be unavailable. Some said they used digital resources because it was expected by their students or their colleagues.

The foremost reason for not using digital resources was that they simply did not support faculty's current teaching approaches. Lack of time was a major constraint, regardless of institution. We can say that it was not at all easy for most of our respondents to use the plethora of digital resources available to them. Faculty—including those active and enthusiastic in their use of digital resources—identified many obstacles to using these resources for teaching including how to find, manage, maintain, and reuse them in new contexts. One of the most-cited obstacles to the effective use of digital resources was the availability, reliability, and expense of the necessary equipment, both in the classroom and for personal use. Almost all faculty need support for a variety of tasks. Both novices and advanced users face challenges

when integrating digital resources into their teaching, but they experience somewhat different needs and barriers; thus, support systems that are helpful to one group may not be for another.

Responses also emphasized the importance of personal digital collections in faculty work practices. It is important to emphasize that many faculty want to build their own reaggregated resources by using their own materials and then mixing them with resources they have collected along the way. How to manage the multitude of available resources and integrate them into teaching practice is a major hurdle. Although there may be an array of tools available to faculty for collecting, developing, and managing resources, the efficacy and interoperability of these tools for the immediate tasks that faculty need supported often fall short.

An analysis by discipline revealed variation among scholarly fields. Faculty who use texts extensively depend on different kinds of sources for different pedagogical goals than faculty in art, architecture, history, and anthropology, who rely more heavily on images. Faculty in political science were the heaviest users of data sets, and faculty who teach writing had special needs around information literacy and the use of reference materials. Not only do different disciplines require different types of resources, they use them in different ways and for different reasons.

When the data were analyzed by age, the oldest instructors (age 62 and up) were the lightest users. A multiple regression analysis demonstrated, however, that age alone is a very weak predictor of a person's overall level of digital resource use. Regression and path analysis further showed that individual characteristics have a greater effect on a person's total level of digital resource use than do institutional, disciplinary, or demographic characteristics.

2B. Investigation of transaction log analysis and online site surveys

We set out to evaluate two methods for tracking site usage. Server transaction log analysis (TLA) is a widely used method for studying the usage of particular websites. Many sites also use web-based surveys, either alone or in combination with transaction log analysis, to learn more about their users. The lack of consensus on how best to implement these methods and report on the results, however, makes it difficult to interpret statistics for different sites and to compare one site's findings with another.

We explored the benefits and challenges of these two user research methods by pilot testing their efficacy on two local websites. Our charge was not primarily to generalize our findings about users of these specific sites; rather, we were interested in the efficacy and efficiency of TLA and online surveys as methods for understanding use generally.

Results from the analysis of both survey and TLA indicated that the overwhelming majority of site users on our two test sites were irregular or occasional, rather than regular, users. An analysis of search engine queries that led to each site provided some insight into users' goals and mindsets. The design of each site also affected both the analysis and the usage itself.

Given our knowledge of how site owners report out on user behavior, we were interested in exploring how representative online site survey results actually are. Specifically, combining online surveys with transaction log analysis of the same site during the same time period creates opportunities for measuring the survey's response rate and for estimating response bias. To assess whether the survey respondents were representative, we compared the observed

browsing behaviors of those who did to those who did not respond to the survey. For both sites, results indicated that the users who responded to the survey were noticeably different from the typical site user: survey respondents used each site much more frequently, and each session was longer and more in-depth. Therefore we concluded that the online site surveys suffered from response bias, and the respondents were a non-representative sample. Although the tests we conducted helped to clarify the specific techniques and metrics that provide the most useful insights into site usage, the tests also provided a vivid demonstration of some of the challenges and pitfalls in performing user research and interpreting results. Based on these results, we advise caution in generalizing from online site survey results to the whole population of site users.

3. Why study users? Summary of digital resource provider and researcher interviews and meeting

In keeping with our multi-pronged approach to understanding users of digital resources, we devoted considerable time over the course of the project to talking with digital resource providers about why they studied users, what they knew about users, and what more they would like to learn. In addition to conducting formal interviews, we convened a group of resource providers, funders, and user researchers for a two-day meeting in May 2005.

Interviews with digital resource providers: Interviews with thirteen digital resource providers and two other stakeholders in the field underscored the diversity of projects, tools, and services available to the H/SS community and the difficulty of making comparisons among them. Our sample included sites that provided educational online resources and that had at least some freely available resources. The goals of these interviews were: (1) to test our initial sort of digital resource characteristics, (2) to collect opinions on the importance of user research to digital resource providers, and (3) to determine if certain factors and their attendant digital resource characteristics (e.g., histories, funding models, architectures, etc.) are associated with successful strategies for integrating an understanding of users into development and maintenance activities. Where possible, data on cost and collaborative development strategies were collected.

The interview analyses suggest that there were no common terms, metrics, methods, or values for defining use or users among the targeted projects. One common theme among digital resource providers was the desire to measure how and for what purpose materials were being used once accessed; few providers, if any, however, had concrete plans for undertaking this measurement in a systematic way.

Many digital resource providers targeted faculty as their primary audience. Several sites, however, are exploring expansion to new audiences either through targeted planning or in a more serendipitous fashion. Our research revealed that community building is important to digital resource providers, and many are exploring tools to enable the development or support of user "communities." Some have also suggested that community contributions can hold a key to sustainability challenges.

Sustainability for the initiatives we researched is a pressing, if elusive, question for most sites. Formal agreements or plans to determine long-term financial, technical, and organizational sustainability are practically nonexistent. Success and value were slippery topics, though it is apparent that high-quality projects often bring advantages to their institution's resident

students and faculty, and can also bring some level of prestige to the larger organization. This recognition of value by the sponsoring institution provides a potential route to long-term support and funding.

Site Owner and User Researcher Meeting: In May 2005, we convened sixteen experts for a discussion of "online educational resources" (OER) to explore how and if questions about user behavior are tightly linked to questions of policy and planning. A majority of participants had been interviewed before the meeting (above). Our discussions covered four broad topics:

- Codifying content and contexts
- What do we want to know about users? How do we find out?
- Users, user demand, and sustainability
- What are the larger research questions and agendas that need to be addressed?

The participants represented a variety of perspectives in the field of online educational resources. Their collective expertise included production and delivery of online educational resources, delivery of continuing education, user research, and foundation funding. The following organizations were represented:

- Curricula: CMU OLI, Connexions, MERLOT, UC Irvine, MIT OCW[1]
- Digital libraries: JSTOR, ARTstor, NSDL[2]
- Tools and reuse: Carnegie Foundation, MIT, IKSME[3]
- Foundation and society perspectives: ACLS, Hewlett Foundation[4]

Finding a common framework: Codifying categories of content, users, uses, and user studies

Comparing data among OER projects poses a significant challenge to those who conduct or rely on user studies for decision-making. A valuable goal, according to many participants, would be for the OER community to articulate general principles and standards for user studies, and for sharing usage statistics and results.

Meeting participants agreed that any conversation about users needs to first establish a common framework and vocabulary to ensure successful comparisons among projects. Similarly, when we discuss results of user studies across projects, it is important to codify terms and methods, and to understand the full range and purposes of research methods and tools available for evaluating users. The practicalities of conducting user studies present some obstacles, however: high-quality research is resource intensive, and in-house evaluations can result in a "self-fulfilling prophecy," where studies frequently favor relationships and products that already exist. Another stumbling block to collecting good data is the difficulty of understanding the full range of an OER site's users (e.g., users who do not register, users who

[1] http://www.cmu.edu/oli, http://cnx.rice.edu, http://www.merlot.org, http://learn.uci.edu, http://ocw.mit.edu

[2] http://www.jstor.org, http://www.artstor.org, http://www.nsdl.org

[3] http://www.carnegiefoundation.org/KML, http://www.iskme.org

[4] http://www.acls.org, http://www.hewlett.org

do not log in from recognizable institutions, the difficulty of interpreting transaction log data, etc.).

Sustainability

Definitions of value and approaches to sustainability vary according to each OER's context and goals. It was argued that the only way to understand the value of OER—for individuals, communities, and institutions—is to measure its impact and its outcomes. It was agreed that disaggregating the ingredients of sustainability was essential. Four types of sustainability were subsequently identified: curricular, technical/infrastructural, organizational, and financial.

Curricular sustainability: It was agreed among the participants that creating and sustaining high quality curricular resources can be costly. Real concerns were voiced about the potential for rampant propagation of misinformation and poor quality educational materials on the Internet. While producers can actively control quality by strictly enforcing their own pedagogical and production standards, doing so can make the material difficult to reuse outside the context originally envisioned by the producers. Alternatively, the user community itself can take the place of institutional or individual authority over quality, although fears about diminution of quality are an especial concern among content experts with this model (enthusiasm about Wikipedia in some circles notwithstanding).

The development of user communities among OER sites, as a measure of curricular sustainability, was discussed at length. Participants recognized ongoing problems with community reuse. Currently there is no common set of standard tools or practices to help achieve interactive community on a large scale in educational contexts, though emerging social computing models were again noted by some as promising.

Unintended and informal users. One question that arose was whether OER sites could or should adapt their content or services to unintended users. To some participants, unintended use is an opportunity for creative reuse, while many believed that an OER site should not or could not change course to serve an unintended audience. How a site accommodates unintended use may require a complicated calculus taking into account the site's mission, scope, financial model, desired impact, quality control, and targeted constituencies. It was agreed that studying unintended users is exceptionally difficult, and that accommodating them in site development can incur potentially significant costs.

Technical/infrastructural sustainability: It was argued that OERs, and especially open-access OERs, need a common place where they can be reliably housed, organized, searched, and preserved, perhaps in one or more centralized OER repositories. How a centralized repository would be organized was open to debate, however, and several possible solutions were discussed. Several participants agreed that federating searching among all OER sites would be desirable and most "user friendly."

Organizational sustainability: Organizational value is related to how OER fits into the organization that supports it. To what degree does the host institution value the OER site, and to what degree does the site's value drive institutional support? In many cases there is an *ad hoc* approach in which a faculty member cobbles together local support. If he/she leaves the institution or runs out of funding, the OER can potentially be compromised. Long-term commitment for OER is often unclear.

Financial sustainability: At this stage, many OERs depend on a mix of institutional, foundation, and corporate funding, and few have concrete plans for financial sustainability. Various "business" and financial models were discussed, including endowment models, subscription models, and others. There was discussion about the hesitation in academic circles to endorse the concepts of business models, market research, and sustainability. For those OERs that wish to remain non-commercial entities, a combination of foundation, institutional, and corporate funding nonetheless remains the only source of financial sustainability. The questions remain: how do we define and measure "critical mass" relative to a specific OER, and how do we measure, then demonstrate, successful outcomes with funders?

Imagining a research agenda

We concluded our meeting with a hypothetical scenario in which participants were asked to brainstorm how research funding should be spent on understanding OER users. Participants agreed that all studies should be coordinated to use a similar set of terms and techniques, so that findings can be shared more effectively and made generally applicable. Multiple research topics were suggested, but they converged on one primary and one secondary research priority: faculty and self-learners, respectively.

INTRODUCTION AND RATIONALE FOR THE PROJECT

There is consensus among many scholars, developers, and the public that high-quality knowledge should be freely available where economically feasible. Almost every American research university campus, including those in the University of California (UC) system, has made significant investments in digitizing its intellectual and cultural resources and making them available to faculty, students, and the general public. However, we have little empirical data about how these resources are being used by the originating campus or by other institutions for educational activities. The general lack of knowledge about level and quality of use of "unrestricted," or free, resources has been identified as a pressing concern by those who fund, use, and develop these types of resources. The "build it and they will come" approach has resulted in a widely acknowledged supply-driven movement. For example, after providing millions of dollars for the creation of digital libraries, NSF and JISC (the U.K. equivalent of NSF)[5] are both concerned about the low level of use of available digital resources among the teaching faculty of our institutions. Those who fund open educational resource initiatives, such as the Hewlett Foundation, are interested in users and how understanding them will provide insights into the sustainability of the significant activities they fund in this space.

Our motivations for this study were driven by three interrelated rationales: strategic planning and investments, focus on the humanities and social sciences, and consolidation of effective strategies for understanding use.

1. Strategic planning and investments. Strategic investment decisions by funders and institutions will undoubtedly hang on the question of how to pay for the significant costs of digital resource production and maintenance.[6] The question of cost becomes more pressing in an era of shrinking institutional budgets and deflated expectations of consumer markets for digital curricular materials.[7]

We know very little about how digital resources, such as those produced at research universities, are actually being used by the different tiers of higher education institutions both in the U.S. and abroad. There is an implicit assumption that faculty at a variety of institutions import digital content to enhance their undergraduate teaching. We simply do not know, however, if such importation occurs on a measurable scale. And if it doesn't, why not? This question is of particular importance in California, where there is a presumption that digital assets will flow from the public UC research university system to institutions with fewer resources, such as high schools, community colleges, state universities, and the new campus at UC Merced.

What are the costs to institutions in creating and maintaining these digital assets? That question is perhaps impossible to answer given the mosaic of development and funding models that exist for any one set of assets. In many cases, funding sources are cobbled together from a variety of institutional and foundation budgets. There are the often unpredictable, ongoing costs of maintenance and updating. And what of the significant costs incurred by digital resource developers to simultaneously meet the needs of audiences that range from scholars to school children, both internationally and domestically?

[5] http://www.nsf.gov, http://www.jisc.ac.uk

[6] In reference to digital libraries in particular, see Smith (2001) and Smith *et al.* (2004).

[7] See Matkin (2002) and Cushman (2002).

In addition to institution-sponsored resources, there is the growing mass of "educational" digitized rich media objects created by individual scholars and others. What is their value, and who will maintain and preserve them? As decisions are made about financing resource design and scope, an understanding of the level and type of use of these, as well as more "organized" resources, will be needed in strategic planning.

We believe that a focus on understanding the use of both unrestricted and restricted digital resources can shed some light on whether the investments in production and distribution of "free" resources is warranted by market demand relative to undergraduate teaching (and other) contexts.

2. Focus on humanities and social sciences. Within the academy, there is an abundance of good models for integrating online materials in science and technical courses such as chemistry, physics, biology, and computer science (see, for example, Twigg, 2003 and Fisher and Nygren, 2002). The application of technical solutions to undergraduate teaching in the humanities and social sciences (H/SS), however, has been more elusive and less robustly funded. In fact, some have argued that technical and professional courses, where there is a heavier reliance on codified knowledge, may be more amenable to technological interventions (e.g., Trow, 1997). At this time there appears to be a paucity of literature that has systematically examined this problem, especially as it relates to the integration of non-text, non-library resources.

Our own experience and discussions with faculty suggest that successful integration of technology in H/SS teaching may be stymied in courses that rely heavily on primary source material and significant verbal and written interaction among participants. We have identified a number of factors that might prevent routine integration of rich digital archives in the classroom. They include constraints on faculty time, lack of support structures, and difficulties with finding, analyzing, and customizing the abundance of online material available. Without doubt the most important hurdle may be that each faculty member has precise and personal ideas about how he/she teaches a course and what kinds of primary source materials are useful; not every faculty member will teach U.S. history, Chinese literature, or foreign policy in quite the same way or use the same primary source material. This fact is in marked contrast to many undergraduate courses in scientific, technical, and vocational fields, where scope and sequence are more tightly constrained by the necessities of moving students in a stepwise fashion through a series of linked requirements. Perhaps most importantly, it cannot be ignored that many faculty do quite well teaching without technology and, given the barriers to use, would rather avoid the associated headaches.

Our research targets a better understanding of the variation in user and non-user behavior according to discipline and institution, by focusing on a subset of the HE disciplinary landscape. The humanities and social sciences are not a monolith, nor are user types. Studies that have focused on the use of library materials indicate that patterns of use are influenced by the type of institution and discipline. For example, "survey respondents in the liberal arts colleges and in the biological sciences and the arts and humanities seem to rely on the library and its functions and its services more than their peers in other disciplines do." (Friedlander, 2003). Greenstein and Thorin (2002) point out that an additional obstacle to the use of digital library materials in undergraduate teaching is "the near universal deployment of instructional

technologies that do not integrate with the digital library" and the creation of digital collections that rarely address instructional needs.[8]

Finally, we believe that understanding the technology needs of the humanities and social science community has particular relevance to the future of liberal arts or general education delivery and the increasingly vocationalization of higher education (Rothblatt, 2003; Smelser and Schudsen, 2004). Any discussion about the future of liberal, or general education, cannot ignore the new cohort of "always on" students that is poised to enter higher education institutions. Future planning will be confounded by the fact that we simply do not understand enough about these students who will have been weaned on peer-to-peer file swapping, Google searches, MySpace, and wireless instant messaging (Harley, 2002; Oblinger and Oblinger, 2005; Kvavik and Caruso, 2005). What expectations will these students have about their learning environments and the nature of scholarship? How will institutions respond to students who may have non-traditional concepts of time and space in scholarship?

Indeed, the very future of liberal arts is of concern on a global scale. We do not know how many students will eschew traditional liberal arts curricula for the immediate economic benefits of management and technology education. It is probably safe to assume that as new online education providers proliferate and consolidate, the range of educational choices available to students will increase, and many mature students will forsake a traditional four-year residential college experience for certification and part-time degree programs (Harley, 2002). In a white paper prepared for a meeting sponsored by the Center for Studies in Higher Education (UCB) on the regulation of cross-border e-learning, Kumar *et al.* (2005) posit:

> *One consequence of greater cross-border e-learning may be a narrowing of subject concentration. Seeking to maximize income and meet mainstream demand, much cross-border higher education has concentrated on strongly career-oriented provision (notably business, IT, healthcare, and education). The broader subject mix typical of the comprehensive university has not been widely replicated. With notable exceptions, there is little evidence of constructive relationships between cross-border providers and host governments, and thus little apparent connection between provision and perceived national skills needs. By focusing on more lucrative programs, cross-border delivery may cut across domestic higher education in negative and unpredictable ways.*

The ACLS Commission on Cyberinfrastructure for the Humanities and Social Sciences[9] (2005) lays out in great detail the "grand challenge" of harnessing the potential of information and communications networks to serve the special and diverse scholarly needs of humanists and social scientists. It is our contention that solutions to those scholarly needs and related challenges will ultimately benefit the future of teaching and learning in the humanities and social sciences, and the challenges are worth addressing sooner rather than later.

3. Consolidation of effective strategies for understanding use. It is worth noting at the outset that the terms "digital collections" or "digital resources" are often used synonymously with "digital *library* collections." This study intentionally focuses on rich-media digital resources that may reside in or out of libraries. The variety of digital resources is extensive. Nationally and internationally, unrestricted resources range from ambitious attempts to put up course web

[8] Also see the recent Ithaka faculty survey of electronic resources for a discussion of disciplinary variations in use (Schonfeld and Guthrie, 2004).

[9] http://www.acls.org/cyberinfrastructure/cyber.htm

pages or whole courses (e.g., MIT OCW, World Lecture Hall, Monterey Institute for Technology and Education), to discipline-specific course materials (e.g., LON-CAPA, Connexions), to clearinghouses of individual learning objects (e.g., MERLOT), to digital library/museum collections (e.g., CDL/MOAC, Harvard Open Collections Program), to collections assembled by individual scholars.[10] Moreover, the few available user studies on this vast array of resources are themselves fragmented by purpose, method, and context.

To date, there simply has been no coordinated conversation about user research that could apply across the many types of available digital resources and their sources. Lack of a clear picture about users makes coordination (of user methods, findings, business models, strategic planning) across projects challenging. One focus of our research is to ask whether it is possible, or even desirable, to have projects share methods and results. Is there too much variation among projects—in terms of content, objectives, targeted users, funding models, and need for understanding users—to attempt to coordinate knowledge about users (and methods for studying them)?

What is the overall value of "user" studies? How can we begin to assess overall user demand, and what analytic methods are useful for the various phases of decision-making (e.g., start-up, site design, dissemination, maintenance, scaling, new audiences, etc.)? For example, usability studies or testing of pedagogical applications in the classroom are clearly useful for site and content design, but they will not yield the kinds of data one needs when making decisions about initiating a new project, developing funding models, or assessing/targeting new audiences. There are a number of very good studies of the former type. Unfortunately, they tell us only about relatively enthusiastic users of a particular brand of content, but nothing about whether that brand may be valued or useable by a wider potential audience operating in varied educational contexts.

An additional issue regarding use studies and those who conduct them relates to the return on investment (ROI) of various types of user studies (explored by Hill *et al.*, 1997). Not only is the issue of commensurate quality and quantity of information important for the developer, ROI is equally important for participants in user research. In what ways do investments in use studies actually translate to direct benefits to the user through simplifying their resource search, organization, and reuse needs? We have found that a time burden is placed on users who participate in research. What do they get in return and how do they directly benefit from such participation? Quite simply, can the cost of studying users in academic settings yield commensurate quality in the development of resources, tools, and systems?

[10]http://web.austin.utexas.edu/wlh, http://www.montereyinstitute.org, http://www.lon-capa.org, http://www.bampfa.berkeley.edu/moac, http://ocp.hul.harvard.edu

RESEARCH GOALS AND METHODS

There are three broad areas covered by this study:

- Goal 1, which comprised a scan of the digital resource universe specific to the humanities and social sciences, and where the user fits into that universe;
- Goal 2, which included surveys of faculty at various types of California higher education institutions as well as subscribers to humanities and social sciences listservs, as a way of determining what resources faculty use and why and how they use them. It also included an assessment of how effective the combination of transaction log analyses and online surveys are as methods for understanding users of specific web resources;
- Goal 3, which included interviews with site owners and user researchers, and the organization of a symposium, to facilitate discussion and dissemination of simple, shareable, and cost-effective analytic models/tools. A goal of the meeting was to explore how gathering comparative user and non-user data across a variety of digital resources, by a diversity of audiences, might be achieved.

OVERVIEW OF THE METHODOLOGY

This research project proceeded on parallel tracks. We utilized a suite of methods in our sampling of relevant populations, including unrestricted resource owners, faculty, and other users. More detailed descriptions of our various methodologies can be found in the relevant sections of this report.

Our choice of methods was determined by the nature of our goals. We were not attempting to use our research either for product testing or for rigorous analysis of learning outcomes. Instead our goals were to provide (1) a relatively quick scan of use across a wide range of unrestricted digital resources by a variety of user types, and (2) a possible analytical model that could yield comparable data across a variety of digital resources. Given these goals, we used a combination of surveys, discussion groups, follow-up interviews, and transaction log analysis (TLA) to get a broad look at user and developer behavior. We have chosen to use these multiple methods and to triangulate results because our study is focusing on complex social settings and rapidly evolving technologies (e.g., faculty, random users, developers, technical systems). Marchionini (2000) and Gilliland-Swetland (1998) argue powerfully for such an approach in studies evaluating the integration of digital "repositories" into teaching/learning environments (see Marchionini also for a discussion of quantitative and qualitative methods, and information science research).

For this project, we conducted background research to inform our data collection methods and developed a landscape of existing digital resource use. We selected methods to be complementary. The transaction log analysis gave us a general understanding of how useful this method is for establishing user profiles and for identifying patterns of user behavior based on geographic region and institutional affiliation. We tested online surveys to provide more detailed information from a self-selected subset of digital resource users to inform us about who they are, how they use the resources, and their opinions about online resources in general. Interviews and discussion groups provided information about targeted user groups, and elucidated reasons for non-use among specific disciplinary populations.

The scope and timeline of this study did not allow for a deep analysis of undergraduate student users. This is indeed an area ripe for study but outside our immediate purview, although we held a few focus groups with local undergraduate students and refer to our other work with this population of higher education users where appropriate.

Some thoughts on user research methods

We think it useful in a study such as ours, which is focused on users of online educational content and how to study them, to place our work within the wider context of user studies generally. A wide variety of research methodologies has been used for studying the use and users of online educational materials. To that end, a very brief review of the possible types of user studies follows. Several commonly discussed user research methods are described: surveys, transaction log analysis, observational studies, focus groups, and user testing. Some of these methods, such as surveys, focus groups, and observational or ethnographic methods, can address a variety of topics. Other methods, such as server transaction log analysis, are particularly relevant to studies of computer or Internet usage.

The following is not intended as a literature review. We note references throughout the text for those interested in exploring this topic more deeply. Additionally, we have cited relevant methodological references when appropriate in specific sections of this entire report.

a. Surveys

Many types of surveys are used in social science research, including those distributed by mail, conducted by telephone, face-to-face, or even online. Surveys may be targeted at current users of a particular online resource or at a target group of potential users, such as students or educators. Surveys tend to be the methodology of choice for assessing users' needs, motivations, attitudes, and satisfaction levels, as well as self-reported behaviors (Rossi, Wright, and Anderson, 1983). Presser (2004) provides an excellent examination of methods for evaluating survey questionnaires.

As web-based applications become widespread, more surveys are being administered in an online environment (Fricker and Schonlau, 2002). Online surveys can improve efficiency by automating data collection and analysis. Computerization may also enable more complex skip patterns and allow researchers to customize the questionnaire to the respondent's specific circumstances. Most of the considerations common to other survey modes still apply, however: instrument design, question validity, sampling technique, and response rate. (See also Evans and Mathur, 2005.)

Online surveys encompass several different scenarios with very different research implications, and we should be careful not to conflate these situations.

Surveys can be administered online as part of a traditional, well-developed survey methodology involving a defined population of interest, an explicit sampling method for generating a representative sample, a well thought-out recruitment strategy, carefully calculated response rates, and statistical estimates of the likelihood of response bias (Evans and Mathur, 2005; Fowler, 2002). As with offline surveys, issues of recruitment method and sampling are particularly important. (If recruitment is by email, for example, messages are likely to be ignored as spam.)

Increasingly, however, online surveys are posted on a website and made available to anyone. Such surveys may be part of another webpage, or may appear in a pop-up window. These surveys rarely have a defined population or sampling method; with no way of tracking those who do or don't complete the survey, it is often impossible to report a response rate or estimate response bias. These challenges may make it impossible to know if the resulting statistics have any value; such surveys are more of a "popularity contest", closer to the "American Idol" television show or baseball's All-Star Game balloting than to a real scientific research study. (See Goal 2B, below.)

b. Transaction log analysis

Transaction log analysis (TLA) takes advantage of the computerized log files that automatically record online accesses to any website. By analyzing these logs, one can determine a number of characteristics of the site's users and can summarize site use (Rosenstein, 2000; Kassim and Kochtanek, 2003). TLA is unusual among research methods in that it allows the researcher to measure the actual online behavior of a site's users, rather than relying on self reports. Although it can report a user's behavior with some accuracy, the method's weakness is its inability to report anything about the person actually performing those actions. The quality and detail of the TLA results can depend on a number of factors, including the design and architecture of the site, the use of identifying cookies, and the registration requirement of signing in. Although cookies and site registration may improve TLA's rigor, they raise important privacy and confidentiality concerns, particularly at non-profit educational institutions and libraries. Even in the best of circumstances, there will be gaps in TLA's effectiveness due to proxy servers, caching, blocked cookies, and the lack of accurate geographic information. (For more detail see page 5-2, below.)

c. Observational studies

Observational studies typically use ethnographic methods and involve passive observation of users (or potential users) performing their regular day-to-day activities in their own environments. An in-depth observational study can provide insights that are overlooked by other methodologies. In particular, such studies are ideal for capturing the details of users' true work processes (which often differ from self reports) and for seeing the way a tool of interest is used in combination with other tools. On the other hand, observational studies are usually time- and labor-intensive. Because they typically study only a small number of users, one must always question how representative the results are and the degree to which they can be generalized; the strategy for recruiting representative participants is particularly important. And users may somehow adjust their behavior due to the presence of the observer, skewing the results. See Weiss (1994) and Emerson *et al.* (1995) for excellent introductions to interviewing and ethnographic methods, respectively.

d. Focus groups

Like surveys or interviews, focus groups are a good method for exploring users' motivations, attitudes, thought processes, and satisfaction. Because the participants are usually few and not necessarily representative, the results should be considered suggestive rather than representative or comprehensive. Even if the participants are chosen to be representative, the results may not be, since the participants' comments can influence one another, spark new

ideas, and lead the conversation in a particular direction. Focus groups can be a valuable method for exploring the scope of a problem, examining particular issues in depth, or developing an early version of a survey questionnaire (see Gearin and Kahle, 2001).

e. User testing

User testing is typically performed in a specialized lab, instrumented to record exact keyboard and mouse movements, to videotape the participant (perhaps from several angles), and sometimes to track eye movements (to identify the exact location of a user's attention) (Nielsen, 1994). Usually the participant is asked to complete several specific tasks or usage scenarios and may be asked to complete a short survey or interview before or after the test. Such tests tend to focus specifically on the product's usability rather than on its usefulness or its applicability to the users' real needs and environment. Because the controlled environment is artificial, participants may not behave normally. The prescribed usage scenarios are often somewhat artificial as well, and may not adequately match the users' actual situations. In addition, user testing can be very time- and labor-intensive and often requires a dedicated facility with specialized instrumentation.

Choosing appropriate methods

Different methods are appropriate for different phases of the product development cycle (Nielsen, 1994). User-needs research or "market" research should be conducted prior to the development of a new product or website. Rather than focusing on a particular site, user-needs research will typically involve the study of a particular target user group, to better understand their work practices and their needs; ideally, this research will direct the design and development process (as well as the decision about which systems should be developed). Useful methods for user-needs analysis and market research include surveys, focus groups, interviews, and observational studies; a successful research plan will require the careful identification of the target user group and the tasks or work practices of interest.

The evaluation of an existing online resource is a different problem, and different methods may be appropriate. An existing system will presumably have an established user base with established work processes, making it possible to study the *actual use* of the system. Transaction log analysis and user surveys are probably the most useful methods for this situation, although interviews, focus groups, and user testing may also be appropriate.

The evaluation of a newly designed or prototype system or website poses a particular challenge. Transaction log analysis will generally be unhelpful, since there will be no established user base or established work practices. Surveys and interviews will also fail to reveal much about the actual usage of the system, since users (or prospective users) will have no real experience using the system in a real-life context. In this situation, controlled user testing is probably the best research method; user testing involves an actual product or system, but can simulate the use environment with specific use scenarios.

Well-designed user studies often employ multiple complementary research methods, as appropriate for the specific circumstances and study goals.

GOAL 1: UNDERSTANDING THE HUMANITIES/SOCIAL SCIENCE DIGITAL RESOURCE LANDSCAPE AND WHERE USERS FIT INTO IT.

Primary goal: To define the universe of digital resources available to undergraduate educators in the humanities and social sciences and to examine how understanding use/users can benefit the integration of digital resources into undergraduate teaching. Part of this goal was to facilitate the gathering of comparative use data across a wide variety of humanities/social science (H/SS) digital resources. Activities directed toward this goal included creating a map of the universe of digital resources available to undergraduate educators and consolidating existing knowledge about the use and users of these resources.

A. Defining the universe of digital resources and associated user studies

Our first step was to conduct an analysis and overview of existing knowledge about use, and the methods for tracking use, of unrestricted digital resources. We have (1) reviewed and synthesized the existing literature on user studies relevant to unrestricted digital resources, (2) created a preliminary classification of select unrestricted digital resources in the humanities and social sciences, (3) through interviews, analyzed what developers/funders want to know about how (or if) unrestricted humanities/social science resources are being used in undergraduate teaching contexts, (4) analyzed what select developers/funders are doing, and how much they are spending on user research, and (5) analyzed what developers know and their perspective on the best methods for measuring resource usage.

The key challenges to pursuing an analysis and overview about use included:

- Agreeing on how to define a collection of digital resources
- Agreeing on a set of characteristics for certain types of resources as we developed the digital resource classification
- Determining how to integrate the various perspectives of different types of site "owners" and users
- Identifying those sites most likely to yield information that could be generalized to a wider universe of resources.

1. Unrestricted digital resources: What are they? How can we organize them?

Some background, both on our subject of study and our attempts at classification, is necessary from the start.

The ACLS Commission on Cyberinfrastructure for Humanities and Social Sciences (2004) recently noted that digital objects and data in humanities digital resource collections tend to be far more complex and ambiguous than their counterparts in the sciences. Waters (2004) discusses factors contributing to the sustainability of digital scholarly resources. He notes the significant problem of the sometimes "disconnected jumble" of library digitization projects that do not connect across institutions. Smith (2003) looks at preservation and sustainability issues around "wholly new types of information resources, so novel that no common term except 'digital objects' or 'sites' can describe them." We argue throughout this report that when non-library digital resources (a ubiquitous element in what most users desire from resources) are added to the mix, the impact on ease of use is obvious and profound.

Attempting to classify the mass of material available to users can be approached in myriad ways and presents many challenges, as we describe in some detail below. For example, a major study codified over thirty digital library aggregation services and non-library digital resources into clusters and described a typology for classifying specialized digital resources collections (e.g., American Memory, MERLOT, and Perseus[11]) (Brogan, 2003). Although some useful definitions for classifying the ever-widening field of digital resources are developed, the study analyzes only those digital resources that adhere (to a large degree) to the Protocol for Metadata Harvesting of the Open Archives.[12] As we discuss below, there is a tendency for classification schemes to only focus on small corners of the universe (i.e., cultural heritage institutions or, more often, formal digital libraries).

For our project, we have chosen a much larger universe of digital resources, which requires a rethinking of terminology, classification schema, and analytical approaches.

2. Definitions: What are we studying? What do faculty use in their teaching?

Since the outset, this study has been concerned primarily with *unrestricted digital collections* that support research and teaching in humanities and social sciences. Little did we know when we started that this term would engender so much confusion among the diverse groups with which we have been conversing. We determined shortly after commencing that we were on the right track, but a subtle redefinition of our subject of study was imperative.

We found, for example, that the term "digital collections" is often used synonymously with "digital *library* collections." This study, in contrast, is primarily focused on *unrestricted digital resources* that may reside in or outside of libraries. Our choice of the term "unrestricted" meant we would include resources of digital information that are freely and publicly accessible via the World Wide Web, such as mixed media (encoded texts, images, sound files, video, etc.) as well as metadata. Such resources proliferate in digital libraries (which have for some years now been digitally reformatting materials in special, archival, print, photographic, and other resources), museums (which create and distribute digital surrogates for artifacts and works of art in their resources), and archives. But they are also created by individual scholars (for example, as references to aid their teaching or as supplementary and supportive materials to research publications; Read, 2003), and by scholarly initiatives (e.g., the Oxford Text Archive and UVA's Institute for Advanced Technology in the Humanities[13]). They may also include resources that reside on a variety of media sites (e.g., *The New York Times*) and in government databases (e.g., USGS).[14] As a result, we distinguished such unrestricted digital resources from *restricted* resources of books and journals (e.g., JSTOR, Highwire Press, CIAO at Columbia University Press, NAS Press) and those resources that comprise nothing but descriptive information for, and pointers to, other information objects (e.g., Melvyl).[15]

Our data gathering reinforced our decision to maintain the broadest possible definition at the outset. Faculty, when asked (as opposed to being told what resources are of value), made clear that the variety of unrestricted digital resources available to potential users is extensive and

[11]http://memory.loc.gov/ammem, http://www.perseus.tufts.edu

[12] http://www.openarchives.org/OAI/openarchivesprotocol.html

[13]http://ota.ahds.ac.uk, http://www.iath.virginia.edu

[14] http://www.nytimes.com, http://www.usgs.gov

[15]http://highwire.stanford.edu, http://www.ciaonet.org, http://www.nas.edu, http://melvyl.cdlib.org

diverse; it is not just text and it does not just emanate from libraries or any other single source. As to the term *unrestricted*, it has limited utility. We soon discovered that faculty in research universities use a wide variety of licensed digital resources, but consider them to be "unrestricted." They make no distinction between, say, RLG Cultural Materials and a digital collection such as MOAC.[16] For these faculty, both are accessible; most faculty have no idea (until they are told or lose access) that the former is available only because their institution has licensed it. Another issue is illustrated by using RLG Cultural Materials and MOAC again as examples. The fact that these two digital collections have overlap in their content (and with other resources as well) presents a host of complications in understanding user behavior, especially around the issue of discovery. In a world where digital objects are represented in multiple spaces and places, the user has numerous ways of finding an object and may use various pathways to pluck a desired item out of a "collection."

Therefore, for the purposes of our project, we replaced the ambiguous term "digital collections" with "digital resources." *Digital resources*, for our purposes, encompass those objects that employ rich media and span text, images, sound, maps, video, and many other formats. The source of these resources is equally broad, and can include formal collections of resources developed by well-known institutional entities, such as libraries and museums, as well as those developed by individual scholars. Faculty have various types of digital resources from which to choose, depending on their given needs. Significant digital resources may be located in the *deep web*, buried and beyond the reach of Google (e.g., databases such as JSTOR, RLG, etc.), or behind password-protected course websites. Although we are particularly interested in free content, we considered any resource that faculty said they use, regardless of whether it is restricted or not.

B. Understanding use and users: A literature review.

1. The larger context for understanding technology and the humanities and social sciences.

The overall higher education context of studying humanities/social science users of digital resources is immense and complicated. We outline some major initiatives and thinking here. First, there has been an increased interest in understanding users in the digital library realm (e.g., Borgman, 2003; Waters, 2004; Grant, 2003; Blanford and Buchanan, 2003; George, 2003; Tenopir, 2003; and Marcum and George, 2003). Second, there have been ongoing efforts to understand the technology needs of users in the larger H/SS community and the undergraduate classroom. The available, and often overlapping, perspectives span professional societies, libraries, instructional/educational technology, pedagogical research, and distance education. A few of the notable works are discussed below.

Humanities and technology: In 2000, the Building Blocks project of the National Initiative for a Networked Cultural Heritage (NINCH)[17] conducted a survey by field and discipline in the humanities. The survey was designed to increase the involvement of humanists in the future design of networked computing. NINCH's findings were used to initiate twenty digital

[16] http://culturalmaterials.rlg.org

[17] http://www.ninch.org

projects for humanities resources, aiming at meeting users' expressed needs. Building Blocks built on two seminal projects conducted by the J. Paul Getty Trust.[18]

The Digital Initiatives Database Project queried users about electronic resources and generated a web-based registry of digital projects that were produced by libraries.[19] This effort appears on its face to have stalled, and their list is quite thin when compared to the U.K.'s robust Humbul Humanities Hub database of humanities digital resources.[20] Other active U.K. organizations are the Resource Discovery Network (RDN), the national Arts and Humanities Data Service, and the Digital Resources for the Humanities (DRH) group.[21]

The work of the NINCH and ARL initiatives has clearly influenced, by virtue of common sponsors and/or overlapping personnel, a recent effort by the American Council of Learned Societies (ACLS) Commission on Cyberinfrastructure for the Humanities and Social Sciences. The commission was charged to describe, analyze, and provide recommendations on the current state of humanities and social science cyberinfrastructure; its ambitious draft final report was published in fall 2005 for comment. The commission report does not devote discussions specifically to teaching, however.

Real and virtual classrooms: There are numerous investigations of how digital resources are used in real and virtual classrooms. In our opinion, the most robust work to date in this broad area is concentrated on science, technical, and vocational education. Systematic research concerned with the humanities is much rarer and, when available, tends to focus on limited case studies.

Much work investigating users of technologies in courses has been accomplished by the educational/instructional technology and distance education communities (see, for example, publications by ALN Magazine, Syllabus, the Technology Source, Innovate, etc. [22]) Meta-literature reviews are available on the thorny issue of learning outcomes (e.g., Phipps and Merisotis, 1999; Waxman *et al.*, 2003). Others are more broadly concerned with economic and institutional issues (Fisher and Nygren, 2002, for the A. W. Mellon CEUTT studies; Lorenzo and Moore, 2002, for the Sloan Consortium; Twigg, 2003, for the Pew Course Redesigns). In addition to the burgeoning literature on distance education in the journals noted above and

[18] The Object, Image, Inquiry: The Art Historian at Work Project (1985-1988) and the Research Agenda for Networked Cultural Heritage Papers (1995), http://www.ninch.org/bb/project/history.html

[19] http://www.arl.org/did

[20] http://www.humbul.ac.uk

[21] Links to all of these projects can be found at http://www.ahrc.ac.uk/ictmap. JISC (U.K. Joint Information Systems Committee) (2005) has published a strategic plan for 2004–2006, which includes the goals to "ensure ICT is embedded within post 16 and higher education, develop eResearch infrastructure and use, and help institutions manage investments in ICT."

[22] ALN Magazine. Asynchronous Learning Networks, http://www.aln.org/alnweb/magazine/alnMaga.htm; Association for the Advancement of Computing in Education, http://www.aace.org/pubs; *The American Journal of Distance Education*, http://www.ed.psu.edu/acsde/Jour.html; *Educom Review*, http://www.educause.edu/pub/er/erm.html; *European Journal of Open and Distance Learning*, http://kurs.nks.no/eurodl/eurodlen; *Journal of Asynchronous Learning Networks*, http://www.aln.org/alnweb/journal/jaln.htm; *TechKnowLogia: International Journal of Technologies for the Advancement of Knowledge and Learning*, http://www.techknowlogia.org; *The Technology Source*, http://technologysource.org/; *Syllabus*, http://www.syllabus.com

elsewhere, NSF has recently commissioned a literature review about the implications of information and communications technologies for distance education.[23]

The U.K.'s Joint Information Systems Committee (JISC) and NSF have just recently funded a variety of projects through the Digital Libraries in the Classroom Programme.[24] The charge is to investigate the integration of resources into teaching contexts. One project now underway is Digital Anthropology Resources for Teaching (DART) at the London School of Economics and Columbia University.[25] A report on their progress can be found on their website, although the report is primarily focused on technical issues and includes no work on user studies *per se* (Dahlquist *et al.*, 2005). Another JISC/NSF project is The Spoken Word, now being pilot tested with instructors and students at Michigan State University and Northwestern University.[26] Glasgow Caledonian University[27] is digitizing much of the BBC's radio archives into a collaborative digital sound archive that faculty in history and political science will be able to access, segment, annotate, and wrap into teaching materials. Their website says, "We are simultaneously embracing the socio-technological world of the modern learner. The use of blogs in teaching and showcasing audio, and the investigation of delivery of audio to mobile devices are just two of the ways in which we are responding to the practical needs of our users." A perusal of their website indicates evaluation materials related to users is not yet available from this project. An evaluation to measure the key impacts of the projects developed under the Digital Libraries in the Classroom Programme is being performed separately.[28]

Brogan (2005) in her review of American Literature/American Studies, describes the profusion of resources available to faculty and students in this field, and points to numerous programs focused on integrating these resources into the undergraduate teaching. Among the programs she references are those developed by individual scholars (Voice of the Shuttle), and larger efforts such as the Visible Knowledge Project at Georgetown University and the Center for History and New Media at George Mason University.[29]

The American West Project is centered at the California Digital Library and is funded by the Hewlett Foundation.[30] This ambitious project has among its goals "to assemble an American West virtual collection drawing from the resources of major research institutions." The virtual collection "will be assembled and presented with a range of tools supporting extensive reconfiguration [and] integration with online learning environments." The development of these tools is being informed by assessments conducted with a variety of audiences including university librarians and K–12 teachers.

Improving undergraduate education: There are numerous initiatives that target improving undergraduate education in colleges and universities. Many of these are institutional activities.

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[23] The National Science Foundation under the Implications of Information Technologies Initiative http://srsweb.nsf.gov/it_site/it/infotech.htm.

[24] http://www.jisc.ac.uk/index.cfm?name=programme_dlitc

[25] https://dart.columbia.edu

[26] http://www.jisc.ac.uk/index.cfm?name=project_spoken_word

[27] http://www.gcal.ac.uk

[28] See http://www.jisc.ac.uk/index.cfm?name=funding_diglib. As part of the JISC- and NSF-funded Libraries in the Classroom Programme, a "Tools Focus Study Final Report" identified and documented the software tools being used and developed within the projects so that the sharing of tools across the projects in the program could be facilitated.

[29] http://vos.ucsb.edu, http://crossroads.georgetown.edu/vkp, http://chnm.gmu.edu

[30] http://www.cdlib.org/inside/projects/amwest

Some are national in scale. (Links to and descriptions of many of the existing programs can be found at the UC General Education Commission website.[31])

One example of an institutional initiative is the Shared Pedagogical Initiative: A Database of Electronic Resources for the University of California Community (SPIDER).[32] The project has experimented with the integration of resources for teaching writing and research to undergraduates. Modeled after a virtual pedagogical seminar, the project has a searchable database of modular and peer-reviewed instructional and educational materials for instructors and students. Elizabeth Losh, the writing director for the UC Irvine Humanities Core Course and SPIDER team member, is consulting on our project. She and her colleagues report that with SPIDER, students are doing more research, using more resources at the library, and producing better quality writing. Another notable program is Mellon's 2004 Librarian/Faculty Fellowship on Undergraduate Research at UC Berkeley.[33] It aspires "to create a program that encourages and facilitates faculty collaboration with the library and other partners to build undergraduate knowledge of information resources; enhance student research and information competencies; connect faculty research more effectively with classroom teaching; and provide extended opportunities for faculty to mentor creative student discovery and research both within and beyond the classroom."

An example of a national initiative is the Reinvention Center at Stony Brook University, which focuses on undergraduate education at research universities.[34] Among its work is the sponsorship of various conferences including those on the integration of research and education. It has a new initiative to sponsor forums focusing on undergraduate scholarship in the humanities.

The Carnegie Foundation for the Advancement of Teaching has a number of ongoing projects relevant to the improvement of undergraduate education. These include Initiatives in Liberal Education (ILE), the Integrative Learning Project, the Carnegie Academy for the Scholarship of Teaching and Learning (CASTL), and the Knowledge Media Laboratory (KML), which "develops tools and resources to exchange information, share knowledge and produce innovations that can transform teaching and learning at many levels."[35] The Association of American Colleges and Universities' (AAC&U) "Greater Expectations" report (Ramaley *et al.*, 2004) evaluates the state of undergraduate general education. AAC&U has numerous other initiatives in general and liberal arts education.[36]

The AAU report "Reinvigorating the Humanities" (2004) makes recommendations for improving undergraduate teaching and also describes a variety of outreach innovations taking place between universities and K–12.

The National Institute for Technology and Liberal Education (NITLE) "serves as a catalyst for innovation and collaboration for national liberal arts colleges as they seek to make effective use of technology for teaching, learning, scholarship, and information management."[37] A major goal

[31] http://cshe.berkeley.edu/gec

[32] http://eee.uci.edu/programs/spider

[33] http://library.berkeley.edu/Staff/MellonProject

[34] http://www.sunysb.edu/Reinventioncenter

[35] Links to these initiatives can be found at: http://www.carnegiefoundation.org/ourwork.

[36] http://www.aacu.org/issues/generaleducation

[37] http://www.nitle.org

is to facilitate the development of dynamic curricula that are responsive to innovations in information technology.

The Associated Colleges of the Midwest (ACM) received a grant from the Mellon Foundation to better understand student experiences with their liberal arts education (freshman year experiences, capstone experiences, etc.). This project mainly involves liberal arts colleges and the University of Chicago, and is described in "Engaging Today's Students with the Liberal Arts" (2005).

Information literacy projects: There is significant attention focused on "information literacy" projects, in which students and instructors are the primary audience. They are too numerous to review here, and are often closely linked to the above Undergraduate Education Improvement Initiatives. The Association of College and Research Libraries has developed Information Literacy Competency Standards for Higher Education.[38] The A.W. Mellon Foundation has funded a multi-year collaborative project between Connecticut College, Wesleyan University, and Trinity College for librarians and faculty to develop and host information literacy workshops for other faculty and administrators, and to build a collaborative database for sharing information literacy learning modules and teaching resources.[39] The Committee on Information Technology Literacy (1999) published a major National Academy of Sciences report on the effective use of information technology among college students. And more recently, Tobin (2004) has presented a review of "Best Practices for Online Information-Literacy Courses."

Developing effective tools for instructional use of digital resources: The integration of diverse digital resources into teaching practice, especially the integration of library resources with learning management systems, is seen as a pressing problem (McLean and Lynch, 2003; Flecker and McLean, 2004). We are struck by the many parallel tool development initiatives taking place throughout higher education, both domestically and internationally. We suspect most users are similarly confounded by the many options available or under development.

Minielli and Ferris (2005) provide a description and literature review of the use of course management systems (CMS) in higher education. There is a significant effort toward the development of open-source software tools to support teaching (e.g., Open Knowledge Initiative at MIT[40]). The Sakai project is a consortium of universities developing open-source, standards-based, and extensible collaborative learning environments.[41] Rather than focusing on open courseware applications, Sakai is designed to compete with for-profit course management systems, and includes a suite of CMS tools. The open online educational resource space includes MIT OCW software and content development efforts; eduCommons at Utah State University, Rhaptos from Rice University's Connexions project, and Melete, which is part of the ETUDES project at the Foothill De Anza Community College District.[42]

The LionShare P2P project, based at Penn State University, is an effort to facilitate legitimate file sharing using Peer to Peer (P2P) technology for the easy exchange of image collections, video

[38] http://www.ala.org/acrl/ilcomstan.html

[39] http://camel2.conncoll.edu/is/infolit

[40] http://www.okiproject.org

[41] http://www.sakaiproject.org

[42] http://cosl.usu.edu/projects/educommons, http://rhaptos.org, http://foothillglobalaccess.org/etudes2/melete.htm

archives, large data collections, and other types of academic information.[43] LionShare is open source and should ultimately provide users with resources for organizing, storing, and retrieving digital files.

Brogan (2005) reviews tools specifically for humanities scholars, including NITLE Semantic Engine, designed to access and organize unstructured digital text; the NORA project, which is developing software for discovery, visualization, and exploration across large full-text collections; and the DLF Aquifer project, which is developing a testbed of library tools and services for aggregation and distribution of content.[44]

The 2005 Summit on Digital Tools for the Humanities brought together scholars to "assess the state of development of digital tools for humanities research, as well as the effectiveness of the supporting and integrating cyberinfrastructure."[45] Funded by NSF and hosted at the Institute for Advanced Technology in the Humanities (IATH), the summit will result in a final report.

The management, preservation, and dissemination of the ever-expanding digital material that higher education institutions create in the research and teaching realms is a current challenge. According to Lynch and Lippincott (2005) and Westrienen and Lynch (2005), a large number of institutions they surveyed in the U.S. and abroad have developed or will develop institutional repositories (IR).[46] They note that IRs are becoming well established as campus infrastructure components. As broadly construed, and apparently as understood by those surveyed in the above studies, an IR should house not just e-prints, but datasets, video, learning objects, software, theses, and other materials.

In an article on the emerging need for supporting personal collections, Beagrie (2005) points to the variety of commercial and non-commercial products emerging that support the increasing need of people to capture and store personal digital information, including emails, documents, articles, portfolios, and digital images, video and audio. Examples of software and services include MyLifeBits, Lifeblog, Data Deposit Box, and Ourmedia.[47] As he notes, processing, storage, and software tools available to individuals are increasing in power, volume, and ease of use, and will provide new ways in which individuals can create, manage and disseminate a diverse range of media types.[48]

Given this brief background, we focus below on those robust studies that specifically attempt to understand users of digital resources.

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[43] http://lionshare.its.psu.edu/main

[44] http://www.nitle.org/tools/semantic.htm, http://nora.lis.uiuc.edu, http://www.diglib.org/aquifer

[45] http://www.iath.virginia.edu/dtsummit

[46] DSpace, which was developed at MIT, is perhaps the best-known example. The Portico project (http://www.portico.org) provides a new model for a sustainable electronic-archiving. Its mission is to preserve scholarly literature published in electronic form and to ensure that these materials remain accessible to future scholars, researchers, and students.

[47] http://research.microsoft.com/barc/mediapresence/MyLifeBits.aspx, http://www.nokia.com/lifeblog, http://www.datadepositbox.com, http://www.ourmedia.org

[48] See also Firefox Scholar, a plug-in to the Firefox browser, under development at GMU (http://chnm.gmu.edu/tools/firefoxscholar). It promises to organize citations on the desktop by "automatically [capturing] author, title, all that info that scholars want to save." (Young, 2005).

2. Specific research on digital resource users

Quite simply, existing user research is as diverse as the resources available for study and the motivations for understanding users. As a result, there is no single, uniform approach that can be gleaned from these available studies.[49] For example, and described in more detail below, there is a relative hodgepodge of excellent studies that are germane to the improvement of targeted projects (e.g., Perseus, MOAC, Alexandria Digital Library[50], MIT OCW, Carnegie Mellon's Online Learning Initiative) or reflect broad surveys of librarians and library users in academic settings. Electronic journal and library use studies may be the most abundant. In addition to studies such as Troll Covey (2002), which specifically addressed the types of methods for use and usability of digital library resource collections, there are library studies that, for example, have looked at data mining (e.g., Mento and Rapple, 2003). Meta-research projects, which compile and analyze findings from multiple user studies, offer valuable insights but are limited in number and scope, and each study has its own limitations in the context of our project.

We have organized existing user studies into four primary areas: (1) electronic resource/digital library use studies, (2) cultural heritage research, (3) evaluations of specific sites, and (4) image services. We also identify a fifth emerging area, complex media environments, for which, to our knowledge, robust user studies *per se* are not yet available. These rich media environments include N-way video, Global Information Systems (GIS), virtual reality, simulations, and games. As mentioned above, there is a burgeoning literature on educational technology assessment and evaluation in general. There is also a smaller literature focused on the question of cost effectiveness of educational technologies in various academic environments. Neither of these areas will be covered in detail here.

Electronic resource and digital library use studies: Perhaps the most exhaustive meta-research project is a recent report from the Council on Library and Information Resources (CLIR) (Tenopir, 2003). The research summarizes findings about the use and preferences for print and electronic services in academic libraries, drawing from 200 different studies published between 1995 and 2003. The report concludes that, overall, experts in different disciplines have different usage patterns of digital resources, and that students and faculty alike are more likely to adopt electronic resources if they are convenient, relevant, and save time. This valuable study however, is too "library-centric" for our purposes and does not include research about the use of text or non-text resources developed outside of library contexts.

Ithaka[51] and the Andrew W. Mellon Foundation recently completed a second survey of faculty at four-year U.S. higher education institutions to learn about use of electronic resources. More than 7,000 faculty members responded to the survey. Among the published findings is the fact that even though faculty rely on electronic resources, they still see barriers to use. Differences

[49] Khoo and Ribes (2005) noted the "diverse range of research methods" used by participants in a workshop focused on creating a dialogue among researchers involved in qualitative analysis of digital library users. The Cultural Content Forum (http://www.culturalcontentforum.org) made an initial foray into solving this problem for cultural-heritage institutions (Alice Grant Consulting, 2003).

[50] http://www.alexandria.ucsb.edu

[51] http://www.ithaka.org

among disciplines on various measures of use and satisfaction have also emerged (Kiernan, 2004; Schonfeld and Guthrie, 2004[52]).

The Institute of Museum and Library Services (IMLS)[53] has funded a major Online Computer Library Center (OCLC) study of electronic research titled, "Sense-Making the Information Confluence." The project's goals are to understand the hows and whys of electronic resource use (Dervin *et al.*, 2004).

Brockman *et al.* (2001) developed user-based criteria for guiding digital library development by studying what scholars do in research and writing. They conceptualize the type of information environment that would best support humanists' activities and make recommendations on how information environments can be developed in such a way as to be responsive to the context of scholarly work. In the preface, Dan Greenstein emphasizes that the study provides a variety of lessons, including developing collections that "support specific research aims and thus are formed in close consultation with the scholars who share these aims. "

The EPIC Online Use and Costs Evaluation Project at Columbia University found that a wide variety of electronic resources is used regularly by faculty and students for research, teaching, coursework, communicating with colleagues, or just looking up general information related to their academic work (Electronic Publishing Initiative at Columbia, 2005). When teaching, "faculty often 'surf' to see what information is available both in online databases and in other Internet sources to help demonstrate ideas, give a current context to the lecture material, or find a scientific database that can be used in class." Electronic resources are seen as providing increased convenience and increased access to information. Disadvantages included sorting through good and bad sources, and just having too much information available to sort through.

Foster and Gibbons (2005) focused on understanding "the apparent misalignment between the benefits and services of the DSpace institutional repository (IR) with the actual needs and desires of faculty." Their work entailed interviews and observing how University of Rochester faculty members interact with digital tools and how they organize work in their virtual and physical workspaces. Their findings resulted in a redesign and better alignment of the repository with how faculty work. The findings also resulted in a rethinking of how to explain and promote the local IR.

The "E-journal User (EJUST) Survey" at Stanford (Keller, 2002) was not focused on applications in the teaching contexts. Among its findings, however, was that e-journals improve the efficiency of scientific scholarship. Electronic search engines and online access to abstracts and full-text articles speed up the process of searching and retrieving relevant scholarly content. Another conclusion was that e-journals facilitate new forms of scholarly practice through new relationships to information, knowledge, and peers.

Cultural heritage research: Museums and other cultural heritage institutions, which have a unique and successful history of balancing curatorial demands with public education, are a burgeoning area of user research. These studies often overlap with the digital library sector. As an example, there are a number of relevant papers in the proceedings from the Fifth Annual Conference on Libraries and Museums in the Digital World (2004). Hamma (2004), for instance,

[52] *JSTOR, a History* (Schonfeld, 2003), presents a detailed analysis of JSTOR, a success story that can be measured by its widespread use.

[53] http://www.imls.gov

describes user research at the Getty Museum that resulted in a redesign and rethinking of that institution's site to meet the needs of three different types of user profiles.

The Cultural Content Forum,[54] based in the U.K., commissioned research to identify, analyze, and disseminate material related to the evaluation of digital cultural heritage resources (Alice Grant Consulting, 2003). The 2003 report attempted, through a survey of cultural heritage institutions, to analyze multiple user studies. Its primary goal was to seek an intersection of metrics used across common sites. It also developed user-profile characteristics that could help generate a standardized profiling approach. The work promised further exploration of two areas: (1) the identification and definition of metrics and measurements used in evaluation projects, and (2) the identification and definition of a range of user profiles for use in evaluation work and for establishing methodologies to facilitate comparison across projects and domains. We have not had luck in following up with this group, however, and assume the project is no longer active.

Zorich (2002) conducted a survey of North American–based digital cultural heritage initiatives (DCHIs). The purpose of the survey was to identify the scope, financing, organizational structure, and sustainability of DCHIs. With reference to users, she notes that many DCHIs began their activities with no knowledge of levels of user interest and needs. "Many projects found their usage was much less than anticipated. Even now, most DCHIs feel that no one really understands what users want, despite a recent increase in studies of user needs."

A nationwide 2006 survey by the Institute of Museum and Library Studies of 947 libraries, museums, and archives concluded, "Three-quarters or more of institutions in all groups do not conduct assessments of user or visitor needs…. Almost one-fourth of state library administrative agencies do assessments, which is the highest level among all the groups." (The Institute of Museum and Library Studies, 2006)

In the process of creating a guide to business planning aimed at cultural heritage institutions, Bishoff and Allen (2004) conducted a survey of thirteen institutions. They concluded that these institutions had varying levels of experience with market research, needs assessment, and outcomes assessment. They also concluded that, when compared to libraries, museums must have a good understanding of their markets to develop strategies to maintain or increase gate receipts, an essential source of revenue. Museums therefore tend to break down their "visitors" into several categories.

Site-specific user studies: Marchionini (2000; Perseus), Gilliland-Swetland (1998; MOAC), Borgman *et al.* (2001; Alexandria Digital Library), Hill *et al.* (1997; Alexandria Digital Library), and Carson (2004; MIT OpenCourseWare) are excellent examples of rigorous "product testing" user studies that employ a multiple-data collection strategy or "portfolio" approach. All of these studies, to some degree, have employed a combination of surveys, discussion groups, follow-up interviews, and transaction log analysis (TLA) to get a broad look at site-specific user and developer behavior. This technique is apparently relatively new to the library world, although it has been used on educational sites for some time (e.g., Harley *et al.*, 2002 and other CEUTT studies[55]). Carnegie Mellon University's Online Learning Initiative (OLI) is conducting several studies that combine an understanding of student learning with the implementation of

[54] http://www.culturalcontentforum.org

[55] http://www.ceutt.org

stand-alone online courses.[56] They are using a variety of methods including student demographic information as well as perception and attitudes (through entry, exit, and embedded surveys), instructor information (through casebooks, surveys, and workshop feedback), usability studies, effectiveness studies, evaluation of student achievement, and spontaneous unsolicited feedback.[57]

Triangulation of multiple methods in these studies contributed to the ongoing redesign of the sites for multiple audiences. They also set an emerging standard for methods necessary to an understanding of users, and to evaluating digital resources in complex educational environments. In all cases, a major goal has been the integration of the sites into teaching/learning environments. These studies, taken together, may point the way toward assessing the value of user studies for the user of specific resources.

Image service studies: Art history, a field that has depended heavily on slide libraries for teaching, is a fertile area for the integration of digital imaging. Small case studies suggest significant pedagogical and cost-savings potential for art history faculty (e.g., Burnett *et al.*, 2002).

Penn State's *Visual Image User Study* (Pisciotta *et al.*, 2002) is an excellent internal study and needs assessment of image services that, in addition to assessing that campus' climate and needs, pointed to the limitations of current software, as well as the importance of faculty personal digital collections and resources.

The Research Libraries Group (RLG)[58] is currently involved in various activities to make their cultural materials more amenable to classroom use. RLG has conducted interviews with faculty to probe how they use digital images now, the barriers they encounter, and what they would like to see happen in an ideal world. Among their findings are that faculty use their own materials, rely on PowerPoint for presentation, and are not dependent on aggregated digital collections such as RLG (and may not know about them). The importance of the Google search model is clear, and in a perfect world, the idea of searching across all licensed resources and the web at the same time found many proponents (Waibel, 2004[59]).

The California Digital Library (CDL),[60] one of our partners and with whom we have consulted, conducted an internal assessment of its image demonstrator service, which uses Luna Insight technology (Farley, 2004). The results of their internal evaluation mirror those of Penn State, RLG, and our own findings. Faculty use of personal digital resources is important, and effective tools to manage these resources and reuse them in new contexts need to be developed.

ARTstor is currently conducting an ongoing internal evaluation of their own collection and services. Like other sites, ARTstor has found that ease of use and reusability are primary concerns among users (OER Meeting, 2005). In addition to needs assessments that help the organization make critical decisions about resource investment, a formal survey found that while there appeared to be a greater overall dependence upon digital resources, disciplinary differences were apparent in attitudes of faculty toward and use of digital resources (Shonfeld

[56] http://www.cmu.edu/oli/research/index.html

[57] Personal communication with Candace Thille, Director of OLI.

[58] http://www.rlg.org

[59] Also personal conversation with RLG staff members Merrilee Proffitt and Günter Waibel.

[60] http://www.cdlib.org

and Guthrie, 2004). These early findings suggest that the development of tools and services may need to be customized for specific disciplinary needs.[61]

3. Complex new media (interactive video, GIS, 3D applications, games, social software)

It is generally agreed that humanists and social scientists will depend on complex media tools to realize the full potential of digital resources in their teaching and research (ACLS Commission, 2005; HASTAC, 2004[62]), though this has not yet been fully realized (Ayers, 2003). The potential emergence of robust applications employing GIS, N-way video[63], and virtual reality may finally offer tangible opportunities for those in the humanities and social sciences who want to integrate such technology into their scholarly and pedagogical practice. The embryonic and fragile nature of some of these technologies in real teaching and learning contexts, however, has kept them out of the hands of anyone but those with the most funding and guts, so there are few significant data on their use in undergraduate educational contexts.

Ayers, who has been instrumental in developing innovative approaches to digital scholarship, has been a champion of rethinking how the online environment can go beyond the simple contextualization of knowledge to a space for nonlinear teaching and learning. Specifically in his work with the Institute for Advanced Technology in the Humanities (IATH) and the Valley of the Shadow project[64], he has demonstrated how the basic IT infrastructure can be harnessed to support unique ways of content development and creative reuse (Ayers 2003, 2004).

More robust applications of virtual reality are being developed and utilized, such as the Cultural Virtual Reality Lab, which recreates the Roman forums, and MIDA (Mellon International Dunhuang Archives), which allows scholars to view Chinese cave paintings in 3D using virtual reality technology (cited in ACLS Commission, 2005). And, we are seeing more interest in applications which rely on spatial data, such as ECAI (Electronic Cultural Atlas Initiative).[65]

Since we embarked on this report, many discussions have emerged around social-media applications in support of scholarship (if not always H/SS focused). Various genres of "social computing/software" in particular have garnered an exceptional amount of attention[66]. Social software and social computing as they are broadly discussed in the popular press cover a wide variety of applications, activities, and projects, including blogs, wikis, audio and video remix, podcasting, MySpace, Facebook, Wikipedia, del.icio.us, and Flickr, to name just a few.[67] Much of the enthusiasm is generated by interest in social-network theory, and the ability of users to

[61] ARTstor is undertaking further qualitative investigations to better understand the kinds of organizational structures and local support necessary (Personal conversation with Ithaka staff member Roger Shonfeld, November 28, 2005).

[62] The vision statement of HASTAC (Humanities, Arts, Science, Technology Advanced Collaboratory), which was founded by a number of national humanities centers, supercomputing centers and other entities, lays out a vision for collaborative possibilities in e-humanities (http://www.hastac.org).

[63] Kaufmann (2005) describes the importance of video and television for education and envisions a future of open production.

[64] http://valley.vcdh.virginia.edu

[65] http://www.cvrlab.org, http://www.artstor.org/info/collections/mida.jsp, http://ecai.org

[66] See, for example, http://www.web2con.com

[67] http://www.myspace.com, http://www.facebook.com, http://www.wikipedia.com, http://del.icio.us, http://www.flickr.com

create and share social tags (keywords) on any and all web content without regard to rigid centralized categorical constraints (Flickr and del.icio.us being the most notable examples). Examples of podcasting of lectures and other audio, and the use of blogs and wikis in writing courses can be found in any publication focusing on technology in higher education. Wikipedia, as described on its website, is a "multi-lingual Web-based free-content encyclopedia. It is written collaboratively by volunteers, allowing articles to be added or changed by anyone with an Internet connection." It is of particular note because its distributed authoring model has been hailed by enthusiasts as the model for creating everything from electronic college textbooks to scholarly publications. The degree to which such a model can ensure high quality and avoid misinformation is very much under debate, however (Siegenthaler, 2005). Experimentation with these types of technologies in pedagogical contexts abounds and will surely increase.

There has also been significant attention focused on how games and simulations might be used for educational purposes (including MMORPGs, Massively Multiplayer Online Role-Playing Games). Proponents argue that games have the potential to teach higher order thinking skills as well as encourage adaptation to continuously changing environments (e.g., Kelly, 2005, and NESTA Futurelab, 2005). Kelly specifically suggests that while games cannot replace traditional forms of teaching or teachers, they can offer similar functions as one-on-one tutors without the drain on teacher time. John Seely Brown (2005) further argues that in specific interest communities, including online role-playing games, the range of "users" from novices to experts and the interactions that occur enable a kind of peer modeling or informal apprenticing that teaches not only actual skills but situational knowledge as well: the culture, sensibilities, and aesthetics—or epistemological framework—that make up that profession or role.[68] For educational games to be widely used in teaching, Kelly (2005) argues that significant funding for research and development of tools, standards, infrastructure for data collection, and evaluation of effectiveness is necessary, especially in the area of "serious games" or games that incorporate real educational skills in order for the player to advance. Gee (2005), however, suggests that many commercial games are already based on good theories of learning.

The new generation of students that higher education can expect to welcome is variously known as the Net Generation, ikids, and the "always on" generation. They depend upon and expect convenience and easy access to information, and often find linear learning unfamiliar and difficult (Ayers, 2003, Oblinger and Oblinger, 2005). A UC Berkeley and USC Annenberg Center project funded by the MacArthur Foundation has just begun an ethnographic study to investigate the broad outlines of how kids are using various types of new media in informal learning contexts [69]

It is expected that these students will be characterized by their facility with mobile devices and their willingness and interest in creating digital content through blogs, social tagging, remixing audio, etc. Many expect the emergence and evolution of new mobile devices such as phones and iPods (Lenhart and Madden, 2005; Ito *et al*., 2005), which allow access to unlimited information in a pocket and enable communication via text, video and audio, to have profound effects on learning. The recent ECAR report (Kvavik and Caruso, 2005), however, suggests that current college students may have fewer demands for technology on the higher education

[68] Also see http://www.johnseelybrown.com/learning_in_digital_age-aspen.pdf

[69] "Kids' Informal Learning with Digital Media."; http://groups.sims.berkeley.edu/digitalyouth;

landscape than previously expected. It is unclear whether the student desire for "moderate" technology in learning may change as the younger generation enters higher education.

In summary, we can continue to say with confidence that there has been no coordinated conversation about the "why" and "how" of user studies that could apply across the many types of digital resources and their sources. This is in large part related to (1) the relatively recent availability of multiple, well-developed digital resources, (2) the great diversity of digital resource types that has emerged, (3) the significant costs of well-designed user research, (4) the multitude of user types, potential educational contexts, and motivations for studying use, and (5) the evolving (moving target) nature of the digital resources themselves. The latter has required that evaluators focus both on "product testing" paradigms and on research that analyzes the "interactions of complex phenomena" (Marchionini, 2000).

C. Developing a typology—but from whose perspective?

Any attempt at describing the universe of faculty use of digital resources demands some common vocabulary. But there are challenges to the construction of such a vocabulary, not least of which is that digital resources of all kinds are proliferating in many different environments and are created by many different kinds of developers. The confusion can be seen in three areas:

- Defining any collection of digital resources is complicated by whose perspective you take.
- Different users may view and value the digital resources available to them differently from one another and differently from those who create and manage digital resources.
- The varied proprietors of digital resources have different views and roles, and may value resources and collections differently.

Based on discussion with a Site Owners Advisory Group, our faculty discussion groups, and interviews of and a meeting with digital resource providers, it is clear that the array of available digital resources may represent different things to different types of owners and users. Clearly, the perspective of users and owners is quite different both among them and between them. For example, what we might describe and label as a *collection* has little meaning to the typical user. Many users are not particularly interested in the word "collection" unless it represents a tightly focused collection around a specific topic or topics (e.g., the Jack London Collection[70]).

Therefore, the word *collection*, as used in the digital library world, may be problematic both in understanding users and in constructing a map of the universe of "stuff" users want to access. In our project's context, which has been to ascertain what people use and not to tell them what particular resources are valuable, the issue of how to define *digital collection* frequently arose. We concluded that, while collection owners may indeed care about *collections*, individual users probably do not. Users often have a different level of granularity that categorizes their definition (e.g., whether they can find on the web a format, a photo, a picture, or a passage). For users, the information needed is frequently a small slice of a larger digital collection. We discuss the issue of different perspectives in some detail below.

[70] http://sunsite.berkeley.edu/London

1. The user perspective

Faculty (and others) have various types of digital resources from which to choose for teaching, depending on their needs. As mentioned previously, the resources faculty draw from include their own resources, department resources, local library resource collections, licensed resource collections, and of course, what is available through Google and similar search engines.
To complicate matters futher, there is no single type of academic user, nor do users see the world in the categories constructed by researchers and librarians.[71] For example, users simply want the *right object at the right time.* That object might be mined from a traditional collection or it might be found in any number of spaces—not infrequently, as the result of a Google-type search. The types of users who access these resources are also diverse. They range from K–12 teachers and students to research scholars to undergraduate educators in vastly different types of institutions to the general public. Furthermore, these categories of users often comprise diverse individuals with varying and idiosyncratic needs, perceptions, and ways of finding and utilizing digital resources.

2. The site "owner" perspective

One attendee at the Site Owners' Advisory Meeting mentioned above aptly pointed out that the terms "owners" or "collection developers and owners" recurred as though they described a single group.[72] In reality, though, there is often a more complicated set of roles under the designation "owner," and the individuals in those roles ordinarily have different interests, values, and, especially, different levels of access to traces of user behavior. He suggested the following distinction between these roles:

- Aggregators, who select which digital resources are to be available in what combinations, and try to bring them to the attention of users (e.g., someone at Berkeley choosing which resources should be combined in a meta-search service, or someone assembling a portal, or RLG in their role of assembling the Cultural Materials service and promoting it, or Google)
- Developers of tools, who shape user interactions, export mechanisms, and access paths. This role includes both searching within stand-alone digital resources and making digital resources available for federation or crawling or other forms of discovery (e.g., developers at Luna in their role of developing Insight, or those developers involved in ARTstor in their role of developing a browser-based client and Offline Image Viewer, or Blackboard, or RLG in their role of defining and developing functionality and export for Cultural Materials, or Endeavor)[73]
- Content creators/owners, who conceive, assemble, describe, and digitize content (e.g., the site development team comprising a programmer at one institution and a content developer at another, who both contribute to site development).

[71] Results from our faculty survey and discussions.

[72] Arnold Arcolio of RLG contributed the ideas about multi-faceted owner roles at the May 17th, 2004, Site Owner Advisory Meeting.

[73] http://luna-imaging.com/insight, http://www.artstor.org/info/news/oiv_2point5.jsp, http://www.blackboard.com, http://www.endinfosys.com

3. Typology development

To describe the complex and diverse world of digital resources, we began by constructing a simple typology in spring 2004. We leveraged findings from our fall 2003 faculty discussion group sessions and drew from existing research (Brogan, 2003) to develop our initial framework. We began with one primary dimension based on *types* of resources that were mentioned by faculty and from our background research of existing resources (e.g., ancient manuscripts, image databases, online journals, etc.). The resulting classification is shown in Table 1.1, below. We knew before we started that there is often significant overlap among potential types. For example, what features distinguish a "digital archive" such as MOAC from a broader "non-library/non-museum" resource such as Perseus? How does a set of archived course videos differ from the online course materials being mounted in MIT OCW or the learning objects of MERLOT?

Table 1.1: Typology of digital resource landscape

Types of resources	**Sources of resources**
Images or visual materials (drawings, photographs, art, posters, etc.)	Search engines/directories (e.g., Google, Yahoo)
Maps	Personal collection of digital materials
Simulations or animations	Public (free) online image databases
Digital film or video	Commercial image databases (e.g., Saskia, AMICO[74])
Audio materials (speeches, interviews, music, oral histories, etc.)	Campus image databases from one's own institution (e.g., departmental digital slide library)
Digital facsimiles of ancient or historical manuscripts	"Portals" that provide links or URLs relevant to particular disciplinary topics
Online or digitized documents (including translations)	Online exhibits (e.g., from museums)
Government documents	Library resource collections (i.e., digital)
Data archives (numeric databases; e.g., census data)	Online journals (e.g., JSTOR)
News or other media sources and archives	Media sites (e.g., NPR, New York Times, CNN, PBS)
Online reference resources (e.g., dictionaries)	Other sources of digital resource
"Portals" that provide links or URLs relevant to particular disciplinary topics	
Personal online diaries (e.g., weblogs)	
Online class discussions (including archived discussions)	
Curricular materials and websites that are created by other faculty or other institutions (e.g., MIT OpenCourseWare, World Lecture Hall, Merlot)	
Digital readers or coursepacks	
Interactive Media (e.g., VR, games)	
Tutorials	
Other types of resources	

Further complicating a typology is the need to add functional dimensions to that which is purely descriptive. In Table 1.2, below, we added both (1) a dimension of "findability," or the *sources of resources* used to discover and locate digital resources (e.g., search engines, portals, online exhibits, etc.), and (2) a dimension of digital resource *characteristics,* or the underpinnings of digital resource origination, purpose, audience, and administration (e.g., the original

[74] http://www.saskia.com, http://www.amico.org

intended audience, primary or secondary integration into the classroom, university or public institution based, foundation funded, etc.).

Table 1.2: Digital resource characteristics/digital resource provider interview focus

Focus and goal of site	**Management and administration**
Scope (e.g., degree of specificity—Dime Novel Collection[75] vs. broad digital resource collections which may be a conglomeration of many individual sites, like Sunsite[76]) Diversity (how many subsites make up the main site?) Overall digital resource type (anthology, online exhibit, referratory, etc.) Overall size (small/large, number of pages, etc.) Intended audience (students, instructors, scholars, etc.) Media content (what types of media are included—images, maps, games, tutorials?) Digital formats (form of representation, e.g., jpegs, tiffs, etc.) Content evaluation (what percentage of content is evaluated, e.g., refereed?) User access (free and unrestricted vs. password protected, etc.) Integration intention (is the site intended to be integrated with other learning resources, CMS, bibliographies, etc.?) Reuse (to what extent can the content actually be reused and by whom; e.g., wrapped in lesson plan, jpeg downloaded, etc.?) Technical compliance (e.g., Z39.50) Metadata (LC subject headings, Dublin Core, none, etc.) Searchability (Google licensing, federated, homegrown search feature, browsing, none) Linking (external vs. internal vs. none)	Organizational affiliation of resource (public, private, consortium, etc.) Ownership (single owner, group, museum staff, multi-institutional) Staffing and roles (how many and in what roles, librarians, designers, scholars, etc.) Dissemination/Marketing (personal, institutional, registered) How long the has the site been up (persistence) Preservation and maintenance (how often the site is updated, expected lifespan) Funding (start up and maintenance costs) Funding sources for development and sustainability (foundations, institutional support, income, none) **Understanding use** Monitoring usage (what usage data are collected, e.g., TLA, anecdotal, surveys, etc.) How frequently usage is monitored (monthly, yearly, etc.) Percentage of budget, per year, spent monitoring use Percentage of staff, per year, dedicated to monitoring use Applying usage data (how are usage data applied to the operation?) Unknown information about use (e.g., what do you want to know that you haven't been able to collect, or why is understanding use important?)

4. Usefulness and limitations of a typology approach

Since our initial typology was based on actual discussion group data, it provides a useful map for describing digital resources from a faculty perspective. Together, using all three dimensions (type, source, and characteristics), the typology conceivably functions as a theoretical matrix for describing the variety and complexity of unrestricted digital resources in humanities and social science undergraduate education. But, as with most typologies, which are simplifications of complex phenomena, our typology has its limitations.

In May, 2004, we asked our Site Owner Advisory Group for critiques and revisions of our typology. While the group considered our typology a realistic start to describing the digital

[75] http://sulair.stanford.edu/depts/dp/pennies

[76] http://sunsite.berkeley.edu

resource landscape, they acknowledged existing gaps and limitations to our approach. They stated a need for adding resource characteristics to our typology, including: (1) a category for users' motivation for resource use, (2) a category for different forms of representation in resources (e.g., jpeg, tiff, and so on), (3) a category covering implications of reuse (licensed vs. unlicensed sites), and (4) a category covering the abilities of users to repurpose content from a digital resource collection for their own uses. Arnold Arcolio of RLG suggested that we modify and simplify our typology approach altogether, so that resource characteristics are gathered around "centers of value," which appear in Table 1.3. These centers of value can function as broad yet significant guiding principles, with considerable strengths in describing all kinds of unrestricted resources (whether the resource is MOAC, Sunsite[77], MIT OCW, or a homegrown site put together by an anthropology professor for classroom use).

Table 1.3: Digital resources and centers of value

- Content coverage (chronological, geographic, thematic, disciplinary, type of "original"— manuscripts, coins, maps, games)
- Form of representation (i.e., availability of digital formats and portability, e.g., jpeg, tiff, sid; proprietary or open, level of metadata: structured, standard, rich or thin; wrapper issues, e.g., HTML, XML, METS)
- Authority (e.g., source, maintenance, institutional affiliation)
- Permitted uses and digital rights of reuse
- Persistence (e.g., how long is the resource up, how often does updating occur?)
- Exposure for discovery (e.g., searching paths, browsing, availability for federated search, availability for Google crawling)

At the beginning of this study, we intended to map, through an online review, the interrelationship between the centers of value and the resource characteristics needed to fully describe them. The sites under study came from three sources: (1) those suggested to us by faculty through survey responses and discussions, (2) our own research, and (3) initiatives funded by the Mellon and Hewlett foundations. The list of sites can be found in Appendix A.

As we began to collect these data, however, two issues became apparent: 1) the sheer scope of data available made collection both time consuming and resource intensive, and 2) the data themselves were in different formats, making comparison difficult at best. We opted to forego this mapping process at the same time as it became apparent that our planned broad survey (described below) would not sufficiently answer the questions we posed.

Specifically, we thought it more valuable to tease out some of the complexities and richness of individual sites. Thus, we opted to conduct in-depth one-on-one telephone interviews with a small sample of sites in lieu of a broad survey that might only scratch the surface. Though not comprehensive of the entire digital resource universe, our interviews were able to explore the variety and the nuances of individual sites, and thus begin to raise important questions and identify areas for future investigation. Our findings are discussed in Goal 3A.

[77] http://sunsite.berkeley.edu

GOAL 2: HOW ARE DIGITAL RESOURCES BEING USED AMONG DIVERSE COMMUNITIES?

A major part of this project includes an analysis of how, how much, and even if unrestricted digital resources are being used in targeted H/SS teaching/learning contexts among diverse higher education communities. We are taking two approaches to this challenge: First, we talked with faculty directly through discussion groups and surveys (Goal 2A), and second, we tested transaction log analysis (TLA) and online site surveys to determine their efficacy and efficiency as methods for understanding users of specific sites (Goal 2B).

GOAL 2A: FACULTY DISCUSSION GROUPS AND FACULTY SURVEY

Principal authors: Diane Harley, Jonathan Henke, Irene Perciali , and David Nasatir, with Ian Miller and Shannon Lawrence

This section describes methods and results from conducting surveys and discussion groups with instructors (faculty, teaching assistants, and students) from UC Berkeley, other UCs, liberal arts colleges, and community colleges; the sample included both users and non-users of digital resources. Additionally, we conducted discussion groups with librarians, collection owners, and educational technology professionals.[78] We also relied on interviews, background research, and our own personal knowledge.

A. Discussion groups – methods

In October and November 2003, we hosted four discussion group sessions with thirty-one instructors from three institutions. Twenty-five faculty and six graduate student instructors participated. Transcripts of these discussion groups were analyzed.[79] The discussions formed the basis for the development and creation of the faculty survey instrument.

We asked variants of four basic questions in our discussions:

- What digital collections/resources do you use in undergraduate teaching?
- How do you use them in your teaching?
- What obstacles to use do you encounter?
- What would you like to do with digital collections/resources in a perfect world?

In summary, we found that instructors use a diverse array of online resources in their teaching. Those in our discussions generally agreed that there were many useful online resources available, but issues frequently arose about how to find, manage, maintain, and reuse them in new contexts. Resources mentioned run the gamut, and include the ubiquitous Google search, student-created "collections," archived news and other media sources, digital library collections, subject portals that link to other sites and resources, archived student discussions, blogs, and so on. Simply put, no two collections are alike, especially given the relevance and

[78] In April and May 2004 CSHE and the California Digital Library co-sponsored two meetings with educational technology professionals and librarians to discuss issues of use, available tools, and the potential for synergies among the multiple groups represented.

[79] The methodology and full discussion group analysis, plus the survey instrument, can be found at our project website: http://digitalresourcestudy.berkeley.edu.

value individual faculty apply to a particular digital collection and its potential use in the classroom.

Personal teaching style and philosophy influenced use significantly. We also found some intriguing differences among disciplines in their choice of and concerns about the digital resources they use. In some cases, faculty in disciplines that use texts extensively depend on different kinds of sources for different pedagogical goals than those who rely more heavily on images. Those instructors who used text in writing and composition courses sometimes turned to online texts as examples of good or bad writing or as exercises to teach students basic information literacy. Some faculty in fields dependent on visual analyses and/or current events (e.g., cultural studies, new media, art history, and anthropology) were heavy users of digital resources. Those faculty who teach subjects that require three-dimensional visualization and/or historical reconstruction used various pedagogies that require students to explore and evaluate sites and associated evidence in both time and space. These pedagogies use a significant "problem-based inquiry" approach, and often integrate distributed online resources and/or those hand-worked by the instructors.

The tasks that faculty report having to accomplish, and for which they frequently do not have help, include:

- Locating or searching for digital resources
- Assessing the technical quality of digital resources
- Assessing the credibility of digital resources
- Evaluating copyright and fair use
- Evaluating the appropriateness of resources for their teaching goals
- Creating their own websites
- Learning how to use learning management systems such as WebCT
- Importing resources into a course website or database
- Digitizing and posting resources to a webpage or database
- Assembling and building collections
- Curating or indexing the digital resources
- Preserving digital collections and keeping them relevant
- Finding short- and long-term storage for collections
- Guiding students in how to find and evaluate digital resources
- Securing resources such as servers and smart classrooms, which are often scarce.

B. Faculty survey – methods

Direct discussion with and feedback from faculty gave us a deeper understanding of why faculty do or do not use unrestricted resources in undergraduate teaching. Specifically, our analysis of the discussion groups identified four areas to inform our survey design and to explore in more detail with the survey responses and analyses:

- Digital collections vary in type, purpose, and perceived value.
- There is significant variation in faculty enthusiasm and involvement.

- Different disciplines have different needs.
- There is a wide range of obstacles to using digital collections.

Initially, we surveyed approximately 4,500 faculty from specific departments at a stratified random sample of community colleges, University of California campuses, and liberal arts colleges in California.[80] This survey was distributed in mid-March 2004, and had a closing date in June 2004.

We then conducted a second survey of a larger population, to expand our pool of respondents beyond the targeted institutions and geographical areas (e.g., international, non-UC research universities, state colleges, etc.); we targeted subscribers of H-Net lists and the Humanist discussion group for this second survey. (See page 4-13, below.)

1. Target population: Institutions and disciplines

The primary target population for the initial survey consisted of active teaching faculty and instructors in selected H/SS disciplines and institutions in California. There were pronounced differences of size, geographic distribution, mission, student body composition, and faculty background among the types of institutions and the various disciplines (below). The population included three types of California universities and colleges: campuses of the University of California (UC), community colleges, and private non-religious liberal arts colleges in California.

Out of necessity, we could not sample all possible disciplines for this initial scan of the universe. We surveyed well-established humanities and social science disciplines that, based on our research and general knowledge, were likely to have use for the types of unrestricted digital resources germane to this study.

The population consisted of all levels of undergraduate classroom instructors in the disciplines of visual arts, art history, archaeology, architecture, anthropology, political science, history, languages and literature, writing and composition, classics, and geography; it excluded English as a second language (ESL), remedial English, and American Sign Language (ASL).

Our research into individual schools and departments revealed that the chosen disciplines included faculty who were cross-listed in other programs (e.g., Medieval Studies). Also, unlike specialized programs or certain interdisciplinary studies (such as Near Eastern Studies), these disciplines could be found at all three types of institutions sampled for this project.

2. Sampling

For this survey, we drew a stratified random sample of institutions from each of the specified institution types in California: UCs, community colleges, and private non-religious liberal arts colleges. (Within the community college system, stratification was also based on size and geographic region.) This design permitted pooling of a large number of faculty responses and examination of variations in digital collection usage associated with qualities of departments, disciplines and institutions, and attributes of individual users (e.g., academic rank).

[80] Because this survey was only one piece of a larger project and because of time limitations, we chose to exclude other institution types, such as the California State University system and private universities, from our sample.

At each institution, all active instructors (full- and part-time) who were currently teaching in any of the selected disciplinary areas were asked to participate in the survey. In summary, institutions in the sample include:

a. University of California

Of the eight eligible UC campuses with undergraduate instruction, we randomly selected five: UC Berkeley, UC Davis, UC Los Angeles, UC Santa Barbara, and UC San Diego.

b. California community colleges

Given the geographic and size differences among the state's more than 100 community colleges, we stratified our sample for this group by size (small, medium, and large) and by the population density of the areas they serve (urban, suburban, and rural). Classification data were provided by the California Community Colleges Chancellor's Office (1999). We then randomly chose three of each type of small school, two of each type of medium school, and one of each type of large school. Based on this method, we chose:

Table 2.1: Community college sampling

Type of School	Small (< 10,000 students)	Medium (10,000 – 15,000 students)	Large (> 15,000 students)
Rural	(3): Mendocino College, Columbia College, and Porterville College	(2): Antelope Valley College, Monterey Peninsula College	(1): San Joaquin Delta College
Suburban	(3): Oxnard College, Marin College, and Santiago Canyon College	(2): Foothill College, Mission College	(1): Saddleback College
Urban	(3): LA Southwest College, College of the Alameda, LA Harbor College	(2): Golden West College, LA Trade-Tech	(1): East LA College

c. Liberal arts colleges

The Carnegie Classification defines liberal arts colleges as "primarily undergraduate colleges with major emphasis on baccalaureate programs, … which award at least half of their baccalaureate degrees in liberal arts fields." Carnegie lists fourteen liberal arts colleges in California—one public and thirteen private.[81] In consultation with the Mellon Foundation, we limited our sample to private institutions without an explicit religious or ethnic mission. The final list included eight colleges: Claremont McKenna College, Harvey Mudd College, Mills College, Occidental College, Pitzer College, Pomona College, Scripps College, and Whittier College. We included all in our sample.

[81] http://www.carnegiefoundation.org/Classification/CIHE2000/PartIfiles/BA-LA.htm

3. Identifying participants and finding contact information

A combination of public resources was employed to identify all current instructors within the selected disciplines at each sampled institution. We relied on university catalogs, online resources, and commercial databases to identify full- and part-time faculty as well as adjunct faculty and instructors. We also contracted with a marketing company to obtain an up-to-date database of faculty from our various institutions by discipline.

A total of 4,488 faculty members were identified for participation. We identified 3,277 participants from our own research into public domain sources; 3,249 were identified from the list provided by the marketing firm (with an overlap of 2,038 identified from both sources). After contacting potential participants, we found that a number of individuals were ineligible (retired, deceased, or not teaching undergraduates in the targeted disciplines). As a result, we had a total valid sample of 4,443 faculty members across all three institution types (Table 2.2, below).

The contact lists were extensively cross-checked and cleaned, and additional research was performed to fill in missing contact information, to verify contact information, and to verify subject eligibility. We compiled contact information for selected instructors using a variety of public sources. Specifically, we obtained participant email addresses and work mail addresses via public online or written sources (such as directories, departmental websites, etc.) and/or by requesting information that is publicly available but in a convenient, centralized format via department chairs or administrators and/or other university administrators. This latter process was necessary because (1) online sources are often out of date, incomplete, and/or disorganized, and (2) departments and universities often have public but centralized lists of faculty work contact information.

Valid email addresses were found for 3,596 participants; the remaining 892 were contacted by postal mail (Table 2.2). (After the initial recruitment email, 240 (6%) of the messages "bounced" because the email address was no longer valid.)

The process of identifying survey subjects from the thirty-one targeted institutions and finding their contact information was incredibly long and labor-intensive—much more than we would have predicted. We spent approximately 1,100 staff hours over five months compiling and cleaning our list of survey subjects and contact information. Comparing our list (generated from our own research) with the list obtained from the marketing company confirmed the value of using both methods: there was surprisingly little overlap between the two, and we would have missed fully one-fourth of our sample if we had relied on either method alone.

Our difficulty identifying current instructors was particularly acute in the community colleges. With a large number of part-time instructors and adjunct faculty, even the institutions themselves sometimes do not have a comprehensive list of their instructors. Even after identifying instructors' names, determining their email or postal addresses was no mean feat. Smaller and less well-funded institutions also seem less likely to have central email systems or good online directories. After investing considerable time and energy identifying and contacting our sample group of instructors and faculty members, we are convinced that there would be no simple, straightforward, reliable way of conducting a comprehensive survey of this population.

4. Delivery mode: Online vs. paper

One major question in planning the survey was whether to administer the survey online or on paper (by mail). It is worth noting that the literature around online vs. paper-based surveys is unclear. We consulted extensively with UC Berkeley's Survey Research Center (SRC) and took a number of factors into consideration when making this choice:

- Our research group had significant experience with online surveys, as well as other survey modes.
- Recruitment, data collection, and data entry would be much simplified (and more cost-effective) if responses were entered online.
- An online survey would likely bias responses toward those more comfortable with technology.
- Recruitment for an online survey would be further complicated by our difficulty finding valid email addresses for many of our subjects, especially in the community colleges.

We also considered what response rate we might expect with each of the two delivery methods. The SRC had recent experience with an institutional online survey of UC faculty that achieved a 50% response rate after three email reminders. On the other hand, a 2001 report from the RAND Corporation reviewed online surveys and concluded that response rates were higher on paper-based surveys (Schonlau *et al*., 2001).

Our own experience and discussion with others who have conducted online surveys suggest that other factors may determine response rate in academic settings. We see a number of issues which, in combination, may impact survey response rates:

- Survey fatigue—e.g., the multiple surveys faculty are exposed to (e.g., the recent Mellon Foundation survey, Schonfeld and Guthrie, 2004, and various local surveys)
- The source of the survey (institutional vs. outside surveys)
- Whether the source of the survey is in a position of authority (e.g., a vice chancellor)
- The use of incentives
- The motivation of respondents. Some individuals may simply like to answer surveys, leading to over-sampling of this group.

Because a major goal of the faculty survey is to explore the perspectives of people who do not use digital resources—including those faculty members who are less adept with computer technology—we decided not to administer the survey completely online. In order to achieve some of the benefits associated with online surveys, however, we decided to offer the survey online for instructors with valid email addresses available, and by mail for the remaining instructors. In addition, people who were initially recruited by email were given the option of requesting a paper version of the survey. This mixed-mode survey achieved some of the efficiencies associated with online surveys, while minimizing the potential response bias.

5. Design of survey instrument

We used the results of our faculty discussion groups (see above) to guide our design of the survey instrument. The questionnaire was also reviewed for refinement by experts at UC

Berkeley's Survey Research Center (SRC). The survey was designed to take fifteen to twenty minutes to complete, and focused on eight main topics:

- Teaching background
- Types and sources of digital resources used
- Personal digital collections
- How digital resources are used in teaching
- Motivations for using digital resources
- Motivations for not using digital resources
- Barriers and frustrations
- Support and assistance.

(The complete survey instrument can be found in Appendix D and is also linked from http://digitalresourcestudy.berkeley.edu/docs.html.)

6. Pilot testing

In the spring of 2004, we conducted formal pilot tests of the survey instrument. Pilot tests were conducted with five participants: faculty members and instructors from several different disciplines and two different institutions. The pilot tests provided valuable feedback about the questionnaire; the survey was modified to improve its clarity, understandability and validity.

7. Electronic survey system

After assessing commercial options and our own data management and analysis needs, we decided to build a custom online survey system in-house for this project. The system supports the entire survey process, including delivery of the survey online, online data and survey management, management of the list of survey subjects, sending and tracking recruitment emails, and preliminary data analysis. It is a secure system; all survey transactions are encrypted using Secure Socket Layers (SSL), and data are exported in an encrypted format. Additionally, all identifying information is stored separately from survey responses. The system allows auditing and verification of all survey responses. The system is written in Perl with a Postgres database, and can be used for any online, web-based survey.

8. Survey recruitment: Online and by mail

When possible, faculty were recruited via email solicitations. The email contained a URL link to the online survey with a unique random identifying code for each respondent. Participants without email addresses (and those who requested a paper version) were sent paper copies of the survey by regular postal mail, along with a pre-paid response envelope.

As an incentive to participate, all faculty members who completed the survey were entered into a prize drawing for a new Palm PDA, a $300 Amazon.com gift certificate, or one of five $100 Amazon.com gift certificates. In addition, we offered all contacted faculty the opportunity to receive a report detailing our research findings at the end of the project. In addition to showing our good will and legitimacy, we attempted to establish a sense of reciprocity that would encourage faculty to participate.

For people contacted by email, two follow-up efforts were made to increase the number of responses. For those contacted by mail, a reminder postcard was sent several weeks later.

We also conducted a short telephone survey of a sample of non-responders, to explore their reasons for not responding and to look for possible sources of response bias. (See page 4-11, below.)

9. Human subjects and confidentiality

This project was approved by all the relevant institutional review boards (IRBs), including the UC Berkeley Committee for the Protection of Human Subjects. All measures were used to protect any identifiable data (e.g., each participant has been assigned an identification code; all responses and code keys were stored separately in locked files or on secured computers). No participants will be identified in any reports of the research. All research staff with access to survey data successfully completed the NIH tutorial "Human Participant Protections: Education for Research Teams" to fulfill the obligation for education in the area of human participant protection.[82] The research team was also certified by the UC Santa Barbara Office of Human Research Protections.

Given the decentralization of the UC institutional review boards, we were also required to apply for human subjects' permission at UC Davis and UC Santa Barbara. UC Los Angeles accepted our UC Berkeley approval for an exemption and did not require a separate IRB review. UC San Diego does not require a separate IRB review if faculty information is obtained through public sources rather than university administrators, and if administrators are not involved in recruiting faculty. We obtained approval using an exempt protocol for UC Davis and a full protocol for UC Santa Barbara. Both institutions required a local principal investigator (PI). Barbara Sommer, UCD, and Richard Flacks, UCSB, joined us as PIs for their respective campuses.

10. Data cleaning and calculated variables

After compiling the complete response data set, we performed basic data cleaning. We began by validating respondents' identities, to be sure that respondents were actually part of the sample pool and to remove responses from people who were clearly ineligible for study participation (e.g., people who do not teach undergraduates or are not in our target disciplines or institutions). We also corrected obvious data-entry errors and validated responses of "other" (questions 1, 5, 6, 7, 10, 17, 18, 19, 22, 23, and 25) to see if they were better classified under one of the existing, closed-ended categories.

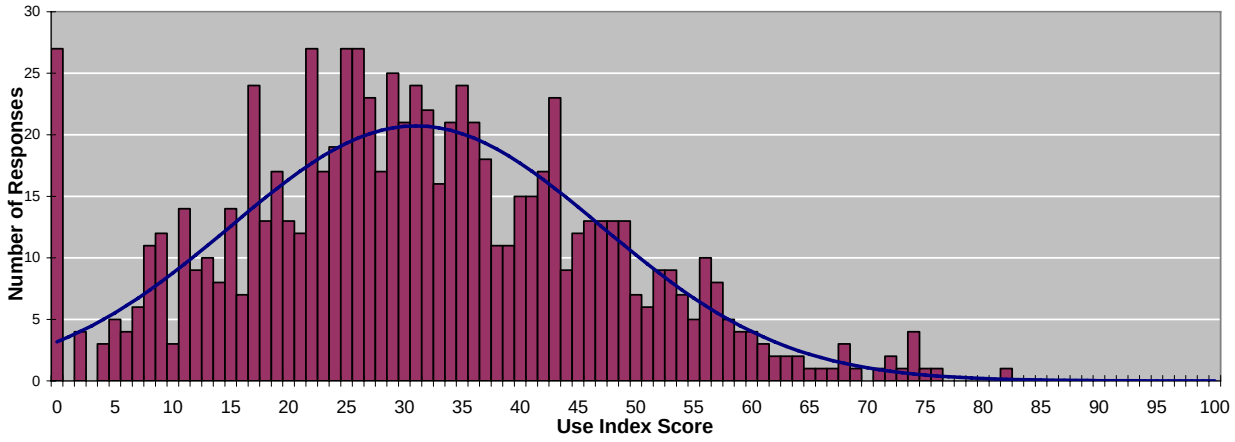
The survey question about disciplines (question 1, see Appendix D) asked respondents to "check all that apply"; 334 instructors (40%) selected more than one discipline. For analyses that required mutually exclusive disciplinary categories, we recoded respondents into eleven disciplinary categories based on their responses to question 1, their free-text descriptions of their disciplines in question 1, and the specific courses they taught (question 2). These disciplinary categories are shown in Table 2.3 below. (Twenty-four respondents could not be categorized, due to missing or ambiguous data.)

[82] http://cme.cancer.gov/c01/nih_intro_01.htm

We created binary recodes of most of the scaled response variables, to simplify some analyses. For frequency scales (five-point scale; questions 5, 6, 7, 9, 10, and 21), we coded responses of "sometimes" or greater as "yes"; for agreement scales (four-point scale; questions 12, 13, 14, 15, 16, 17), we used "somewhat agree" and "strongly agree"; for importance scales (five-point scale; question 18), we used "somewhat important" or greater; for satisfaction scales (four-point scale; question 19), we used "somewhat satisfied" or "extremely satisfied." Most tables and figures in the results section below use these binary recodes.

We also constructed a composite index reflecting each instructor's total use of digital resources in undergraduate teaching. The index was based on respondents' reports of the relative frequency with which they used seventeen individual types of resources (survey question 5; see Appendix D). The index was then scaled from zero to 100, with a score of zero indicating no usage of any resource type and a score of 100 indicating maximum usage of all seventeen resources. Among survey responders, the use index had a mean score of 31 and a standard deviation of 16. Figure 2.1 shows the distribution of index scores, with a normal distribution superimposed.

Figure 2.1: Index of total digital resource use, distribution



11. Response rates

We received 831 valid responses to the survey, of which 729 completed the entire survey and 102 began the survey but did not finish. (An additional 115 people viewed the online survey, but did not answer any questions.) Responses by institution type are shown in Table 2.2.

Table 2.2: Survey recruitment and response rates

	Total	University of California	Liberal arts colleges	Community colleges
Total:				
Eligible participants	4,443	2,416	428	1,582
Submitted surveys	831	522	88	209
Response rate	19%	22%	21%	13%
Online Survey:				
Participants contacted	3,553	2,240	397	900
Submitted surveys	771	509	85	165
Response rate	22%	23%	21%	18%
Paper survey:				
Participants contacted	889	176	31	682
Submitted surveys	60	13	3	44
Response rate	6.8%	7.4%	9.7%	6.5%

We note that people recruited by email responded at three times the rate of those recruited by postal mail. (This could be due to the email reminder messages.[83]) Within each delivery mode, the response rates were similar across the three institution types, with community colleges slightly trailing UCs and liberal arts colleges. However, because so many more community college instructors were recruited by postal mail, the overall response rate at those institutions was one-third lower than at UCs and liberal arts colleges.

Table2.3 presents a demographic description of the survey respondents.

[83] We observed a greater response volume following each reminder message than following the initial recruitment message.

Table 2.3: Demographics of faculty survey respondents

	Total	University of California	Liberal arts colleges	Community colleges
Full-time	78%	86%	88%	56%
Part-time	22%	14%	12%	44%
Highest Degree:				
AA	0.1%	0%	0%	0.6%
BA	2.4%	1.7%	1.2%	5.0%
MA	26%	11%	11%	71%
PhD	69%	86%	87%	19%
MD	0.5%	0.2%	1.2%	1.1%
JD	0.9%	0.8%	0%	1.7%
Other	0.4%	0.2%	0%	1.1%
Gender:				
Male	49%	55%	48%	34%
Female	51%	45%	52%	66%
Age (years):				
0 – 29	1.0%	0.9%	0%	1.7%
30 – 39	19%	18%	27%	16%
40 – 49	27%	29%	32%	19%
50 – 59	32%	33%	28%	32%
60 – 69	18%	17%	12%	25%
70 –	3.4%	2.8%	1.2%	6.3%
Discipline:				
Anthropology and archaeology	8%	8%	8%	5%
Art and architecture	12%	11%	12%	15%
History	12%	13%	18%	8%
Political science	11%	12%	19%	4%
Writing	4%	4%	3%	3%
Foreign language	11%	12%	10%	11%
Literature and English	28%	25%	24%	40%
Geography	2%	3%	0%	2%
Ethnic, gender, and cultural studies	3%	4%	2%	1%
Media studies & communications	2%	1%	2%	2%
Other	4%	4%	0%	5%

12. Non-response survey

To assess the degree to which faculty survey respondents were representative, we conducted a follow-up telephone survey of a random sample of survey non-respondents. The non-response sample was recruited and interviewed by UC Berkeley's Survey Research Center.

We successfully surveyed 128 non-respondents, distributed among the three institution types. The overall response rate on the follow-up survey was 76 percent (see Table 2.4).

The non-response survey instrument can be found in Appendix E. The survey required about five minutes and covered three main areas:

- Reasons for non-response (to estimate whether their reasons were likely to bias the primary findings of the survey)
- Demographic measures — age, gender, discipline, highest degree obtained, and length of time since highest degree (to look for demographic bias)

- Five sample questions from the main survey, which were closely correlated with overall use of digital resources (to compare the non-respondents with the respondents and look for potential bias).

In addition, we knew the gender and discipline of all eligible subjects.

Table 2.4: Non-response survey response rates

	University of California	Liberal arts colleges	Community colleges	Total
Total attempted	63	63	63	189
Ineligible	5 (7.9%)	6 (9.6%)	9 (14.3%)	20
Total eligible	58	57	54	169
Non-response				
Never located	7	6	2	15
Never home	7	5	7	19
Refused	3	3	1	7
Total non-response (% of eligible)	17 (29.3%)	14 (24.6%)	10 (18.5%)	41 (24.3%)
Response Rate (% of eligible) *(% of eligible successful contacts)*	41 (70.7%) *(93.2%)*	43 (75.4%) *(93.5%)*	44 (81.5%) *(97.8%)*	128 (75.7%) *(94.8%)*

a. Non-response survey results

Analysis of the demographics shows that respondents and non-respondents were fairly similar. Statistically significant findings are summarized in Table 2.5, and complete results can be found in Appendix F. Overall, there were no statistically significant differences between the two groups in age or education level, or gender, based on the non-response survey. The only statistically significant difference overall was the under-representation of art practice instructors.

We also analyzed response patterns separately for the three different institutional types.

University of California:

- Although most differences were not statistically significant, differences by discipline are notable: foreign language, art history, and political science were slightly overrepresented; architecture, art practice or applied arts, geography, and history were slightly underrepresented.
- Women were slightly overrepresented.
- There was no bias by age or education level achieved.

Liberal arts colleges:

- There was some bias by age: on average, respondents were five years younger than non-respondents.
- There was no bias by discipline, gender, or education.

Community colleges:

- There was some bias by gender, with women slightly overrepresented.
- There was no bias by discipline, age, or education.

Table 2.5: Non-response survey: Summary of differences
(Includes only differences that were statistically significant at the 0.05 level.)

	Institution type							
	All		University of California		Liberal arts colleges		Community colleges	
Demographic measure	over	under	over	under	over	under	over	under
Gender							Women	Men
Age					Younger	Older		
Education								
Discipline		Art practice		History		Literature, classics		Art practice
Usage level								
Enthusiasm								

Based on responses to the five key survey questions, overall usage of and enthusiasm about digital resources can be estimated for non-respondents and respondents. On these measures, the non-respondents seem very similar to the survey respondents, both overall and within each institution type, with overall means and standard deviations almost identical and no significant difference detected. This suggests that although there may be slight differences in the demographic characteristics of the respondents and non-respondents, these characteristics are unrelated to the key areas of interest of the study.

Reasons given by non-respondents for failing to complete the original survey might be expected to reveal sources of non-response bias. In fact, however, very few people indicated usage-related reasons that might suggest bias on the study's key topics.[84] Instead, the majority cited reasons such as not having received the initial invitation, forgetfulness, or lack of time.

Taken together, the small demographic differences, the similarity between the groups on the sample survey questions, and the reasons given for non-response suggest that the survey respondents may be considered reasonably representative of the population in the areas of primary concern to this study. We believe that the findings based on this survey may be cautiously applied to the whole population of instructors in the targeted disciplines at these three institution types in California.

13. H-Net survey

As a follow-up to the California faculty survey, we conducted a second, parallel survey of a broader population in fall 2004. This second survey was targeted at college and university

[84] Reasons such as lack of knowledge about digital resources, opposition to the use of digital resources in teaching, or inapplicability of digital resources to their discipline or teaching style.

instructors in the humanities and social sciences, both domestically and internationally; the survey was available on the Internet for any instructor to complete anonymously.

The survey instrument was largely identical to the instrument from the California faculty survey, with a few alterations to account for international audiences and instructors from a broader range of institutions and H/SS disciplines. We solicited participation by posting announcements on online discussion boards and email lists—primarily the various lists associated with H-Net, an online community of scholars and teachers in the humanities and social sciences. Announcements were also re-posted on other related online lists and forums, such as the Humanist discussion group.

Because the survey was not sampled from a defined population, there was no response rate as such and no way to determine if the respondents were representative. In fact, we fully anticipated that the responses would not be representative of instructors in general, but would reflect the greater awareness, use, and enthusiasm for digital resources that is typical of online communities.

a. H-Net respondent demographics

We received responses from 452 subjects for this second survey, of which 353 (78%) completed the survey and the remaining 99 (22%) discontinued participation before the end. The respondent demographics differed somewhat from the survey of California instructors, as shown in Table 2.6, below. Respondents were predominantly from four-year colleges and universities (with over half from research universities) in North America and Europe. We received a small number of responses from Australia, Asia, and the Middle East, and none from Latin America or Africa. As anticipated, respondents represented a broad range of disciplines, but a disproportionate number (40%) were history instructors—perhaps because of a high number of history instructors on the email lists used to publicize the survey. Respondents from this survey tended to be younger than those from the California faculty survey and had completed their education more recently.

Table 2.6: H-Net survey and faculty survey respondent demographics

	International (H-Net) survey		California faculty survey	
	N	Percent	N	Percent
Total	452	100%	831	100%
Discipline:				
Languages and literature				
English	--	--	182	22%
Languages	32	7.1%	149	18%
Literature	41	9.1%	182	22%
Speech/rhetoric	17	3.8%	--	--
Writing/composition	51	11%	165	20%
Humanities/social sciences				
Anthropology/sociology	53	12%	62	7.5%
Archaeology	20	4.4%	24	2.9%

	International (H-Net) survey		California faculty survey	
	N	Percent	N	Percent
Architecture	5	1.1%	20	2.4%
Classics	11	2.4%	19	2.3%
Communications (media/film studies)	22	4.9%	--	--
Cultural studies (ethnic/gender studies)	64	14%	--	--
Economics	9	2.0%	--	--
Geography	13	2.9%	24	2.9%
History	190	42%	128	15%
International studies	13	2.9%	--	--
Legal Studies/law	5	1.1%	--	--
Linguistics	5	1.1%	--	--
Philosophy	23	5.1%	--	--
Political science/public policy/government	47	10%	92	11%
Art history	43	9.5%	47	5.7%
Art practice/visual art/ other art	9	2.0%	63	7.6%
Performing arts (music, theater, dance)	9	2.0%	--	--
Psychology	6	1.3%	--	--
Religious studies	34	7.5%	--	--
Other	39	8.6%	157	19%
Geography:				
Africa	0	0%	--	--
Asia or Pacific Islands	5	1.4%	--	--
Australia	4	1.1%	--	--
Canada	16	4.5%	--	--
Central America	0	0%	--	--
Europe	30	8.4%	--	--
Mexico	0	0%	--	--
Middle East	3	0.8%	--	--
South America	0	0%	--	--
United States	300	84%	831	100%
Institution Type				
University of California	--	--	522	63%
Liberal arts college	--	--	90	11%
Community college	--	--	206	25%
Institution Type				
Research university, public or private (Ph.D. granting)	182	51%	--	--
Public (state) university or college (non-Ph.D.)	67	19%	--	--
Private university or college (non-Ph.D.)	77	22%	--	--
Community college (two-year, associates degree)	25	7%	--	--
Professional school/college (post-graduate only)	0	0%	--	--
Technical or vocational institution	2	0.6%	--	--
Secondary school (high school or middle school)	1	0.3%	--	--
Primary school	0	0%	--	--
Other	3	0.8%	13	1.6%
Institution Size				
0 - 1,000 students	15	4.2%	--	--
1,000 - 5,000 students	85	24%	--	--
5,000 - 10,000 students	68	19%	--	--
10,000 - 25,000 students	96	27%	--	--
more than 25,000 students	90	25%	--	--

	International (H-Net) survey		California faculty survey	
	N	Percent	N	Percent
Job Title				
Instructor	28	7.9%	64	8.6%
Lecturer	39	11%	124	17%
Adjunct professor	33	9.3%	59	7.9%
Assistant professor	82	23%	100	13%
Associate professor	57	16%	126	17%
Professor	57	16%	255	34%
Retired or emeritus professor	1	0.3%	10	1.3%
Graduate student as main instructor	25	7.1%	4	0.5%
Graduate student as teaching assistant	19	5.4%	--	--
Secondary school (middle/high school) teacher	1	0.3%	--	--
Primary (elementary) school teacher	0	0%	--	--
Other	12	3.4%	6	0.8%
Part-time	125	35%	161	22%
Full-time	228	65%	584	78%
Highest degree				
Associate's degree (two-year undergraduate degree)	0	0%	1	0.1%
Baccalaureate (bachelors) degree (four-year undergraduate degree)	10	2.8%	18	2.4%
Master's degree (post-baccalaureate)	107	30%	198	26%
Ph.D. (Doctor of Philosophy)	235	66%	519	69%
M.D. (Medical Doctor)	--	--	4	0.5%
J.D. (Doctor of Law)	0	0%	7	0.9%
Other doctoral degree	3	0.8%	--	--
Other degree	1	0.3%	3	0.4%
Age (years)				
00–35	98	28%	76	10%
36–44	94	27%	169	23%
45–53	84	24%	181	25%
54–61	49	14%	184	25%
62+	20	5.8%	120	16%
Mean age ± SD (years)	345	44 ± 11	730	50 ± 11
Mean years since degree ± SD (years)	348	10 ± 9.9	734	18 ± 12
Gender				
Male	--	--	362	49%
Female	--	--	379	51%

14. Principal component analysis

Principal component analysis is a tool for simplifying datasets with a large number of quantitative variables. Principal component analysis derives a small number of linear combinations, or principal components, from a set of variables while keeping as much information from the original variables as possible. When there are many variables, principal components are an appropriate way to reduce the number of variables for clustering. Component matrices may be rotated to any number of equivalent matrices, with equal explanatory power. If rotations result in different interpretations, all interpretations are valid ways of describing the same thing (Pearson, 1901; and Rao, 1964). Note that principal component analysis assumes the input variables are continuous or interval variables, are normally distributed, and have equal variance at each point in the distribution. We felt that some violations of these assumptions might be warranted, as the results were to be used primarily as a suggestion.

To simplify the faculty survey data and to identify a smaller number of underlying components, we performed principal component analysis on five sets of questions. For each of these components, we then calculated component scores for each survey respondent. For the five sets of questions (ninety-eight raw variables), we produced twenty-two principal components;. Components were calculated for the types of digital resources used (twenty-six variables and five components), ways digital resources are used (nine variables and four components), reasons for using or not using digital resources (thirty variables and eight components), barriers to digital resource use (twenty-one variables and five components), and activities for which support is required (twelve variables and two components).

Initially, we used the eigenvalue criterion to suggest the number of principal components to calculate; we adjusted these numbers upward or downward to produce components that were easier to interpret. We then performed an orthogonal varimax rotation, which maximizes the variance in the components. We assigned a name and description to each component, based on the individual variables with which each component was most strongly correlated. The component matrices can be found in Appendix G.

Because each component score is calculated as the linear combination of a larger set of raw variables, any missing values in the raw variables makes it impossible to calculate all related component scores. To accommodate the missing values in our dataset and still produce a usable number of component scores, in cases where a small fraction (about 15 percent) of the raw data elements necessary to calculate a component score were missing, we filled in the mean response values for those missing variables, for component scoring. (If more than about 15 percent of the data elements were missing, the component score remained missing.)

a. Factor descriptions

We calculated factor scores for five different sets of questions:

- What digital resources people use (five factors)
- How people use digital resources (four factors)
- Reasons for using or not using resources (eight factors)
- Barriers to digital resource use (five factors)
- Activities with which people need support (two factors)

What digital resources people use

(1) **General-purpose and reference materials –** Including portals, reference resources, materials from search engines, exhibits, digital libraries, journals, and media sites.
(2) **Images and audiovisual materials –** Including images, digital film or video, digital audio, simulations, and animations. Materials come from many sources, including commercial image databases, free image databases, and (occasionally) campus image databases.
(3) **Historical documents, maps, and primary sources –** Including maps, facsimiles of historical manuscripts, images, and (occasionally) other texts or documents. Less likely to use news and media resources, blogs, and curricular materials.
(4) **Data, news/media, and governmental resources –** Resources include datasets, governmental documents, and news resources (and occasionally maps).

(5) **Discussion and curricular materials –** Including blogs, class discussions, curricular materials, and digital readers/coursepacks.

How people use digital resources

(6) **Student assignments –** Assigned to students for projects, portfolios, or studying.
(7) **Web posting –** Made available to students online.
(8) **Online courses –** Presented in an online lecture or discussion.
(9) **In-class presentation –** Presented in the classroom.

Reasons for using or not using digital resources

(10) **Pedagogical reasons –** A variety of reasons relating to teaching and learning, including providing students context and getting them excited, helping students learn and enabling their creativity, and allowing them to do more and have access to materials otherwise unavailable.
(11) **Expectations & reputation –** Reasons relating to the expectations of students, colleagues, and administrators, and the instructor's associated professional reputation.
(12) **Inappropriateness –** Reasons related to the inappropriateness of digital materials for teaching in general, or for the instructor's discipline or teaching style (and the instructor's lack of time to integrate them).
(13) **Concerns about students' interpretation and information literacy –** Reasons related to students' lack of information literacy, and misuse (plagiarism) or decontextualization of digital materials.
(14) **Time, convenience, and access –** Reasons related to improved efficiency and convenience for the instructor and students.
(15) **Teaching information literacy and critical thinking –** Reasons related to the teaching of information literacy, critical thinking, and the evaluation of scholarship.
(16) **Making information publicly available –** Concerns about making information publicly available to students and the general public, including allowing students to preview the course, making course materials available to the world, and integrating the instructor's research interests into the course.
(17) **Using free and publicly available materials –** A dependence on resources that are freely or publicly available (and do not require passwords or registration).

Barriers to digital resource use

(18) **Finding resources –** Difficulty in finding appropriate resources, generally because there is *too much* relevant information available; includes a sense of being overwhelmed at the amount of material available, difficulty organizing materials, and the challenge of assessing documents' credibility and copyright status.
(19) **High-end multimedia equipment and software –** Lack of easily available high-end equipment and software (which might typically be provided by the institution), including appropriate software for presentation and management of audiovisual materials, as well as servers, scanners, learning management systems, and classroom technology.
(20) **Personal equipment –** Lack of easily available personal equipment for the *instructor*, including a computer, a high-speed connection, scanners, server space, and classroom technology.
(21) **Resource availability or existence –** A belief that the materials an instructor needs simply do not exist, or are of poor academic quality.

(22) **Student equipment –** Lack of easily available equipment for the *student*, including computers and high-speed connections.

Activities with which people need support

(23) **Technical activities –** Activities primarily concerned with the technical support infrastructure, including setting up web pages or learning management systems, importing content, digitizing and organizing materials, obtaining and setting up infrastructure, and training students.

(24) **Intellectual and content-based activities –** Activities primarily concerned with the digital materials themselves, including finding materials and assessing their appropriateness, credibility, and copyright status.

C. Faculty survey and discussion group results

In analyzing the faculty surveys and discussion groups, we focused on five overarching questions:

- What digital resources do you use in undergraduate teaching?
- How do you use them?
- What are your motivations for use (or non-use)?
- What obstacles do you encounter?
- In a perfect world, what would you do with digital resources?

It is important to note that we assiduously avoided judgments about the "value" of specific resources. Instead we simply asked instructors to tell us what resources they found more and less useful, why or why not, and for what purposes.

This section outlines in great detail the results and highlights of multiple analyses of the data sets. Our goal was to explore in as many ways as possible any emergent patterns in faculty use and attitudes. The results are presented in the following order:

- Faculty survey data presented in the aggregate and by institution type for each group of questions: what is used, where it is found, how it is used, why it is used or not used, inhibiting factors to use, and support needs and satisfaction
- Disciplinary variation based on principal component analyses
- Responses by age
- Variation among community colleges by size and population density
- Differences between heavy and light users
- Personal collections
- Highlights from the H-Net survey
- User profiling and cluster analysis.

We reference the discussion group findings throughout when appropriate.[85] An analysis of the community college data by size and geography of institution is presented in Appendix J. Selected tables and figures are included in this report; additional data tables can be found in Appendix H.[86]

1. Faculty survey results: Aggregate and by institution type

a. Types of resources faculty say they use

As illustrated in Table 2.7 and Figure 2.2, the digitized resources faculty report using are not just text and do not just emanate from libraries or any other single source. Digital resources take many forms, and are found in media sites such as that of *The New York Times*, and in

[85] A complete summary of discussion groups is available on our website at http://digitalresourcestudy.berkeley.edu/docs.html.

[86] A more complete set of data can be found online at http://digitalresourcestudy.berkeley.edu/surveyresults/.

collections assembled by independent organizations and by individual scholars. According to our survey, the most commonly used resources (in approximate order of frequency of use) are images and visual materials, news and other media sources, online reference resources, digital film or videos, and portals. Curricular materials, blogs, digital coursepacks, and simulations were low on the list of resources that faculty in our sample say they use frequently (Figure 2.2).

Media types encompass images, videos, audio recordings, news resources, digitized books, journal articles, data archives, maps, historical documents, curricular materials, and others. We were struck by how many faculty say they use video and audio, news, and other media sources.[87]

Among the three institution types, community colleges tend to be the heaviest users of digital resources, with the exception of digitized documents (where UCs and liberal arts colleges are higher), and government documents (where liberal arts colleges are higher). Liberal arts colleges use digital readers or coursepacks more than twice as heavily as UCs and community colleges. UC instructors are less likely to use simulations, audio, news and media resources, and online reference materials.

Specific resources used: Open-ended survey question 8 asked respondents to list the specific digital resources or collections that they found most valuable for their teaching. Six hundred twenty-four people answered this question; they listed 574 unique responses, of which 408 were specific identifiable online resources. (The remainder included more general descriptions such as "online grammar websites" or "news online.") Detailed results can be found in Appendix I. There was little unanimity in faculty responses. Only ten websites were listed by more than 2 percent of respondents (JSTOR, Google, Library of Congress American Memory Project, Library of Congress, Lexis Nexis, *The New York Times*, Modern Language Association, Perseus Digital Libraries, Oxford English Dictionary online, and Project Muse). We should note that three of these—Google, *The New York Times*, and JSTOR—were named in the survey instrument as examples; this fact may have artificially inflated their totals by bringing them to the respondents' attention (although these sites were heavily referenced in faculty discussion groups).

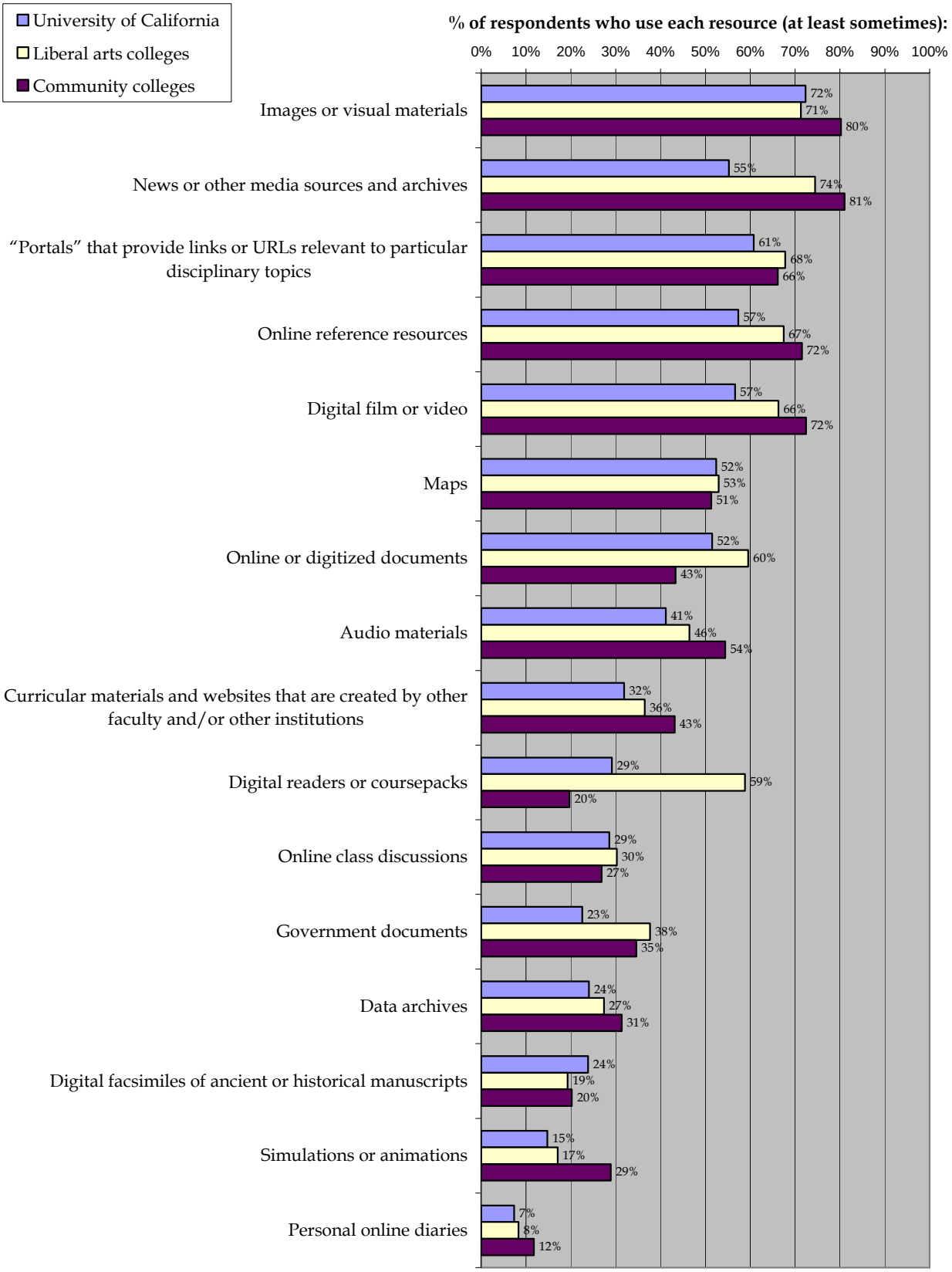
These findings underscore our sense of the broad array of digital resources available to and used by faculty, and of the great variation in faculty choice of material to use. We were also struck by the frequent use of sites not specifically designed for educational purposes (including a wide variety of news, current events, governmental, and reference resources). Clearly, no one site has a monopoly on the educational resource domain.

[87] It should be noted that at least thirty-six free-text responses indicated some ambiguity about the distinction between offline media (e.g., VHS videotapes, CDs, or DVDs) and online digital resources. Therefore it is possible that some respondents who reported using digital audio and video may actually using non-web-based audio and video media rather than online digital audio and video. Our data do not allow a more fine-grained analysis.

Table 2.7: Faculty survey responses: Types of digital resources used

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How often do you use the following types of digital resources in your undergraduate teaching:				
Images or visual materials	75%	72%	71%	80%
News or other media sources and archives	64%	55%	74%	81%
"Portals" that provide links or URLs relevant to particular disciplinary topics	63%	61%	68%	66%
Online reference resources	62%	57%	67%	72%
Digital film or video	62%	57%	66%	72%
Maps	53%	52%	53%	51%
Online or digitized documents	50%	52%	60%	43%
Audio materials	46%	41%	46%	54%
Curricular materials and websites that are created by other faculty and/or other institutions	35%	32%	36%	43%
Digital readers or coursepacks	30%	29%	59%	20%
Online class discussions	28%	29%	30%	27%
Government documents	27%	23%	38%	35%
Data archives	27%	24%	27%	31%
Digital facsimiles of ancient or historical manuscripts	23%	24%	19%	20%
Simulations or animations	19%	15%	17%	29%
Personal online diaries	9%	7%	8%	12%

Figure 2.2: Faculty survey responses by institution-type: What digital resources do you use?



b. Where people find resources

As Table 2.8 indicates, faculty in our sample, like students, say they most commonly use Google-type search engines to find resources, including images. Another prominent source is faculty's personal collections. Online journals and public/free image databases are also high on the list of preferred ways of locating desired resources. Commercial image databases are very low on the list of sources, despite the costs to institutions in supporting them. Of course, many respondents may not realize that what they use is indeed licensed and they therefore may have misunderstood this question.

Faculty at all three institution types were relatively heavy users of search engines, personal collections, public image databases, portals, library collections, and media sites, and they were all low users of commercial image databases, campus image databases, and online exhibits. Liberal arts college faculty were the heaviest users of online journals and library collections, while community college faculty were the heaviest users of media sites and the lightest users of online journals.

Table 2.8: Faculty survey responses: Where faculty find digital resources

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How often do you use digital resources in your undergraduate teaching from each of the following sources?				
Search engines/directories	81%	77%	88%	87%
My own personal collection of digital materials	69%	69%	64%	71%
Online journals	62%	65%	80%	46%
Public online image databases	62%	62%	60%	62%
Media sites	57%	52%	60%	69%
Library collections	57%	57%	70%	52%
"Portals" that provide links or URLs relevant to particular disciplinary topics	55%	53%	59%	58%
Online exhibits	37%	36%	43%	37%
Campus image databases from my own institution	24%	21%	31%	26%
Commercial image databases	9%	5%	10%	15%

c. Curricular materials

Given the open educational resource movement to post freely available online curricular materials (e.g., MIT OCW), we highlight here faculty responses to the curricular materials question: "Please indicate how often you use or have used … curricular materials and websites that are created by other faculty and/or other institutions (e.g., MIT OpenCourseWare, World Lecture Hall, Merlot)."

When viewed in aggregate (see Table 2.7, above), use of electronic curricular materials was relatively low (when compared to news, images, personal collections, etc.) at 35%. When broken out by institution type however, it appears that community college faculty are heavier users (43% vs. 32% at UCs). Among the various disciplines (see Table 2.9, below), foreign language, writing, art and architecture, and geography faculty are the heaviest users of curricular materials, and anthropology, literature and language, history, and political science faculty are the lowest. These findings suggest that the former disciplines may be more

amenable to adopting digital curricular materials, and the latter more interested in customized products.[88]

It should be noted this survey question may not have captured the full range of electronic curricular use available to and used by faculty. For example, nineteen faculty wrote that they used textbook electronic supplements, although we did not ask explicitly about those types of resources.

Table 2.9: Faculty survey responses: Use of curricular materials by discipline

	N	Percent
All	831	35%
Media studies & communications	13	50%
Foreign language	93	49%
Writing	33	47%
Art & Architecture	102	46%
Geography	18	44%
Anthropology & Archaeology	65	34%
Literature & English language	235	31%
Ethnic, gender, and cultural studies	26	29%
History	99	28%
Political science	90	21%

d. How are resources used in teaching?

Resources are used most frequently for presentation during class. The next most frequent uses were assigning resources to students for study or research projects and posting them on course websites. Very few instructors reported using digital materials for online courses or discussions, although this practice is more common at community colleges.

It also appears that community college faculty are less likely to have a course website from which to post and link resources, perhaps due to lower institutional support or funding.

Table 2.10: Faculty survey: How digital resources are used in teaching

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How often do you use digital resources in each of these ways?				
Presented during my lectures/class	71%	68%	72%	78%
Assigned to students for review and/or study	59%	56%	65%	64%
Assigned for student research projects or problem-based learning assignments	56%	50%	68%	65%
Posted directly on my course website	52%	57%	48%	38%
Linked from my course website	49%	53%	48%	39%
Used in tests and quizzes	25%	20%	24%	37%
Assigned to students to create their own digital portfolios and/or multimedia projects	20%	18%	27%	22%
Presented in the context of an online discussion	12%	9%	11%	21%
Presented in my online lectures	12%	9%	7%	21%

[88] Because the sample sizes for media studies and communication; geography; ethnic, gender, and cultural studies; and writing are so small, results for those disciplines should be interpreted particularly cautiously.

e. Motivations for using online resources

As illustrated in Table 2.11, instructors who use digital resources do so for a variety of reasons. The most frequently cited motivations were integrating primary source material into the course, improving students' learning, providing students a context for a topic, getting students excited about a topic, allowing faculty to do new things in the classroom, and obtaining resources not available at their institution. Other motivations included convenience and time savings (for themselves or their students), access to materials or teaching methods that would otherwise be unavailable, and pressure from students, colleagues, or administrators.

Several faculty explained their reasoning:

> *It makes my course fresh and allows me flexibility in my teaching and keeps me current on topics and resources. Students love it!*
>
> —English instructor, Monterey Peninsula College

> *The availability of primary sources has been crucial for the success of my teaching in history. Students have remarked what a difference it has made and I have noticed a big difference between this course with the availability of online primary sources to those I have taught before that were based on printed resources.*
>
> —History instructor, UC Berkeley

> *Classes held in immersive virtual reality projection settings such as 'portals' and 'caves' are especially useful for teaching students about architectural environments.*
>
> —Architecture instructor, UCLA

Teaching critical thinking was low on the list overall; this motivation was lowest at UCs (47%) and highest at community colleges (75%), as were the motivations to teach information literacy, to allow students more creativity, and to help faculty stay up to date with colleagues. Integrating research interests was relatively important across all institution types, perhaps as a corollary to the large number of faculty who maintain their own collections.

Very few instructors felt pressured by their administration to use digital resources, and even fewer felt that it would help them get promoted or get tenure. Participants in the faculty discussion groups agreed that there were few rewards (in the form of job security, promotions and/or status in their field) to be reaped from employing digital resources.

Table 2.11: Faculty survey: Motivations for using digital resources

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…				
Because it improves my students' learning.	78%	77%	70%	86%
To integrate primary source material into the course.	78%	76%	82%	82%
To provide students a context for a topic.	75%	72%	77%	81%
To get students excited about a topic.	73%	69%	75%	84%
Because it allows me to do things in the classroom that I could never do otherwise.	68%	67%	69%	68%
Because it provides access to resources that we don't have at our college.	61%	51%	80%	76%
Because it allows my students to be more creative.	56%	51%	52%	72%
To teach critical thinking skills.	56%	47%	61%	75%
To integrate my research interests into my course.	55%	53%	60%	59%
Because I like or feel very comfortable with the new technologies.	53%	49%	55%	63%
Because it is more convenient for my students and their schedules.	51%	50%	49%	55%
To teach information literacy (i.e., evaluating the online materials themselves).	43%	36%	54%	56%
Because it saves me time.	41%	41%	40%	41%
Because my students expect or ask for more technology.	38%	35%	38%	43%
Because it allows me to stay up to date with my colleagues.	37%	31%	36%	55%
To provide students with both good and bad examples of different kinds of scholarship.	32%	25%	35%	49%
Because it creates a sense of community for students enrolled in my course.	32%	29%	29%	40%
Because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	25%	22%	25%	31%
Because the administration encourages me to use digital resources more.	23%	18%	28%	32%
To provide students a preview of the course before they register.	22%	21%	13%	27%
Because it may help me get promoted or get tenure.	9%	8%	11%	12%

f. Reasons for non-use

We asked two sets of questions to assess reasons for non-use and barriers to use: one asked why they do **not** use resources, and the other asked specifically about barriers to use.

Table 2.12 illustrates that the foremost reason faculty have for not using digital resources is that they simply do not support an instructor's current teaching approaches. Several instructors elaborated:

> *Given a teaching style and materials that require one-on-one and/or group discussions regularly, … the computer is a poor substitute for being in a classroom where ideas bong off of each other and where we "talk" as people to people, where I can see body language, and where I can manage the flow.*
>
> —Literature instructor, UCLA

> *I think there is a real danger of students' becoming too computer literate and "connected" in ways that undermine, or at least compete with, other crucial skills: argumentative writing, careful and critical reading of long texts, and oral argument.*
>
> —Political science instructor, UCLA

> *My courses do not lend themselves readily to digital resources.… Any hope of conversation with the students about the material disappears; class becomes another television show for them.*
>
> —Foreign language and literature instructor, UC Davis

> *There is evidence that PowerPoint and those other displays with bells and whistles etc. rot the mind. My students need to learn how to THINK and to READ BOOKS and, in the case of foreign languages, talk to real people. Their attention span is being annihilated enough with the huge number of "technical events" on television.*
>
> —Foreign language and literature instructor, UC Davis

> *I find digital technology inherently alienating and a distraction from the sense of human community and interpersonal communication I try to create.*
>
> —Writing and art instructor, UC Santa Barbara

> *Frankly, I just don't really want to use digital resources. What's wrong with books anyway?*
>
> —History instructor, UC Berkeley

A simple lack of time was a constraint on everyone, regardless of institution.

> *I came across an adage that "email allows me to do in one hour what I never had to do before." So it goes with course WWW sites and digital instructional media too.*
>
> —Art history instructor, UC Berkeley

> *I am excited about the possibilities here to truly enhance teaching. For me the primary stumbling block is in having the time to explore and evaluate sources, not a lack of sources or a lack of belief that quality resources are out there.*
>
> —English and writing instructor, Mendocino Community College

> *I have not devoted enough time to finding out what is out there. I feel like I need a sabbatical just to learn to make efficient use of digital matter.*
>
> —History instructor, Pomona College

The reliability of digital content was a source of concern raised in the faculty discussion groups. Some participants felt a growing pressure to teach "web literacy" to undergraduates so students could better evaluate the credibility of digital resources. In addition to digital collections use, some faculty members had specific concerns about how students used search engines for course-related research, suggesting that web searching, in particular, ran the possibility of eroding "good" learning (e.g., search engine results decontextualize information by retrieving an orphaned page that lacks the context of the originating site). Two instructors expressed their concerns:

> *Plagiarism with online resources is a real problem. In addition, they all seem to believe that everything they find on the web is absolutely true, and they have no interest in, or ability to, determine the credibility of various sources found on the web.*
>
> —Political science instructor, UC Santa Barbara

> *Access to the web initially diminished my students' abilities as researchers — they substituted it for better print material — but this is slowly beginning to change. It remains an enormous issue, however in relation to plagiarism.*
>
> —Architecture instructor, UC Berkeley

Survey results, however, suggested that relatively fewer faculty have serious concerns about copying, plagiarism, and students' information literacy skills than we would have expected. Concerns about information literacy were somewhat more of a concern to community colleges than to UCs or liberal arts colleges, however (39% vs. 25%).

> *Most of my students appear not to have learned how to do a good job of basic library research. I feel that should be a skill to be developed before others.*
>
> —Anthropology instructor, East LA Community College

> *I must teach students about using digital resources responsibly.*
>
> —English instructor, Monterey Peninsula College

Discussion groups and survey respondents also suggested that many faculty were jaded about keeping up with the "new new" thing. They were apprehensive about investing time in learning how to use new tools (i.e., they did not want to be beta testers) and felt that valuable time was wasted on technical development projects that had limited functionality and usability. Several elaborated:

> *I once did a project on automating Dutch grammar drills and it turned into an ENORMOUS waste of time. It is hard enough to get my research done; I do not have the time to really work up new skills in this area.*
>
> — Foreign language and literature instructor, UC

> *The technological environment has changed so rapidly on campus that it is very difficult to reuse materials without a great deal of very tedious reformatting.*
>
> — Foreign language and literature instructor, UC Berkeley

Table 2.12: Faculty survey: Motivations for *not* using digital resources

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…				
They cannot substitute for the teaching approaches I use.	75%	78%	81%	66%
I don't have time to use digital resources.	66%	67%	72%	61%
Using them distracts from the core goals of my teaching.	47%	49%	59%	34%
I don't want my students to copy or plagiarize material from the web.	33%	35%	21%	34%
They are irrelevant to my field.	30%	30%	38%	28%
Students don't have the information literacy skills to assess the credibility of digital resources.	29%	25%	27%	39%
Digital material can be presented outside its original context.	25%	24%	19%	31%

g. Barriers to faculty use of resources

Faculty, including those active and enthusiastic in their use of digital resources, identified many obstacles to using these resources for teaching. They were unsatisfied both with their ability to find the resources they need and with the tools available to manage those digital resources in different contexts. One instructor felt particularly frustrated:

> *As an art historian, I'd love to use more digital resources in teaching – especially as more and more interactive digital reconstructions of ancient and medieval monuments become available. However, I cannot afford to upgrade my computer and equipment on my own. Moreover, the VRC in my department is very stingy about letting faculty use the scanning equipment, which means that I haven't been able to do the kind of experimenting with digital images I'd like to be able to do. My answers on this survey will probably look very strange; it's because I am totally gung-ho about using digital resources but have not had the opportunity to use them in the way I'd like to!*
>
> —Art history instructor, University of California

The most-cited obstacles to the effective use of digital resources were the availability, reliability, and expense of the necessary equipment in the classroom. One faculty member explains his/her reluctance to use technology in the classroom:

> *I find that the computer in class anchors me to a certain spot and at times to a certain order of presentation. I need freedom to improvise, change direction, and physically move around…Finally, I hate the tension that equipment introduces into the classroom, the fear of breakdown, the suspense, the frequent waste of time.…*
>
> —English instructor, UC Santa Barbara

> *The physical teaching facility is a big issue. I am currently carrying my laptop and projector from classroom to classroom and having to reconnect two or three times per teaching day. The rooms in which I teach have no online hook-ups, which is also a limitation. The physical burden of this technology can sometimes discourage me from using it.*
>
> —History instructor, LA Harbor Community College

In one discussion group, a graduate student described a labyrinthine process for accessing classroom technology; she knew that her department owned the equipment she needed, but nobody could tell her where it was, who was responsible for it, or how to obtain access. Community college instructors reported the most trouble with access to technology, including both students' and instructors' computers and Internet access as well as institutional technology. Our faculty discussion groups suggested that in community colleges, the relative rank of a faculty member may be important. For instance, it was reported that part-time faculty were given low priority for using resources such as wired classrooms.

In some cases, faculty were in a continual state of cobbling together internal and external funds to support innovative work (e.g., finding the funds for a systems administrator of new servers) because their institutions, although enthusiastic, could not provide the necessary resources.

> *My department's budget model dates back to the mimeograph; thus I must acquire my own computers, film scanner, flatbed scanner, printer, and software. Some devices come from my extramurally-funded projects, but much is purchased out of pocket.*
>
> —Art history instructor, UC Berkeley

> *Often we have money to buy gadgets, but no money for training or maintenance. That's the biggest problem.*
>
> —Literature and writing instructor, Porterville College

> *Keeping equipment up to date is not taken seriously by those with the funds.*
>
> —Anthropology instructor, UC Davis

Other major obstacles included difficulty locating high-quality, pedagogically relevant materials from credible sources, and the sheer volume of available materials. Academic quality of materials was a concern for more UC (45%) and liberal arts faculty (40%) than community college faculty (24%). Forty-three percent of all faculty stated they did not have time to assess the credibility of available resources.

Some faculty in specialized fields found too little material (or none at all) that met their needs or applied to their subject. One explained, "African materials are largely underrepresented in digital resources," and another said bluntly, "There are very few digital images available … for 'nonwestern' fields in general."

Even when the materials were available, organizing and archiving them remained a challenge. "Gathering sources and materials for my students and researching information to meet departmental needs are easy enough tasks but organizing it all is not," explained one instructor.

Survey results suggest that copyright concerns are not a major barrier for most faculty and are cited by only one-third of respondents.

Table 2.13: Faculty survey: Barriers to digital resource use

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...				
I don't have reliable access to physical resources in my classroom(s).	53%	52%	43%	63%
The digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	43%	56%	46%
There are too many resources out there for me to take advantage of—I am overwhelmed.	44%	42%	51%	47%
I don't have time to assess the credibility of the available resources.	43%	42%	48%	44%
The content I need or want is just not available online.	41%	47%	48%	25%
The academic quality of available materials is too poor to meet my needs.	39%	45%	40%	24%
I don't have reliable access to scanners.	39%	40%	34%	39%
I don't know how to locate the online materials I need.	36%	33%	43%	40%
I don't know how to save presentations to my computer so they can be run without a live connection.	35%	35%	35%	36%
Available software is unsuitable for integrating audio or video into my course.	34%	31%	40%	40%
Search engines provide irrelevant results for my needs.	34%	31%	35%	39%
I have difficulty understanding the issues surrounding copyright and digital collections.	33%	33%	33%	34%
My students don't have a high-speed connection.	32%	28%	13%	54%
Course management software packages are inadequate for my needs.	32%	32%	41%	29%
Websites I would use are unreliable, and I can't count on them being there when I need them.	32%	30%	39%	33%
Available software is unsuitable for viewing and displaying digital images.	31%	29%	39%	31%
My students don't have reliable access to computers.	30%	24%	10%	54%
Web formats allow me to link to whole documents, but not to specific excerpts within a text.	28%	28%	21%	32%
It is difficult to get server space or access to a server in order to store/host digital resources for teaching.	27%	23%	21%	38%
I don't have reliable access to a high-speed connection.	21%	19%	15%	32%
I don't have reliable access to a computer.	13%	10%	11%	21%

h. Activities for which support or assistance is important

The most striking conclusion from the responses to this questions may be that support is needed for almost everything at relatively high levels (>70%), with little variation. The exception is evaluating the appropriateness and credibility of resources, which are relatively unimportant for UCs and liberal arts colleges (although they remain important to about two-thirds of community college faculty).

Table 2.14: Faculty survey: Support and assistance

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How important is it for you to have support or assistance with each of the following activities for your teaching?				
Obtaining or setting up technical infrastructure.	82%	81%	89%	84%
Creating my own website.	82%	81%	87%	81%
Digitizing existing resources.	80%	79%	92%	78%
Learning how to use a learning management system.	79%	78%	85%	80%
Importing resources into a course website or a database.	79%	79%	81%	77%
Gathering, organizing, and maintaining digital materials.	78%	77%	86%	77%
Integrating resources into a learning management system.	78%	75%	83%	81%
Finding digital resources.	72%	69%	75%	78%
Training students to find or evaluate digital resources.	71%	67%	77%	79%
Interpreting copyright laws and/or securing copyright permission.	65%	62%	69%	70%
Assessing the credibility of digital resources.	50%	43%	50%	69%
Evaluating the appropriateness of resources for my teaching goals.	42%	35%	38%	60%
How satisfied or dissatisfied are you with the support you have received from the following sources?				
Campus librarians	84%	85%	83%	84%
Friends or family	83%	81%	76%	90%
Graduate students	80%	81%	64%	75%
Campus educational technology or IT support staff	73%	74%	76%	68%
Other faculty	71%	70%	72%	74%
Undergraduate students	70%	73%	65%	69%
My departmental or college staff	66%	68%	66%	63%
Workshops	60%	55%	59%	67%
Online help or guides	47%	44%	48%	53%

2. Personal collections

The importance of personal collections was evident from faculty survey responses to the question: "Where do you find digital resources?" As shown in Table 2.8, the large majority of faculty (69%) reported that they use resources from their own collection, and those personal collections were the second-leading source of such resources (behind only search engines).

In a separate question, we asked whether they (1) gather or maintain their own collection of digital resources, and (2) make their own digital resources available to others via the World-Wide Web. (See Table 2.15, below.) The responses were remarkably consistent. Nearly three-quarters (72%) said they maintain their own resources, while only 37% of those (or 27% of respondents overall) make their resources available to others online.

The use of personal collections is fairly heavy across all disciplines (see Table H.2 in Appendix H). Use of personal collections as sources for digital materials is particularly common in anthropology/archaeology (81%), art/architecture (81%), and history (74%); more than 58% of respondents in literature, writing, and political science say they rely on their own collections.

Table 2.15: Faculty survey: Personal collections

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
I gather or maintain my own collection of digital resources.	72%	71%	71%x	75%
(Of those who responded yes to the previous question) I make my own digital resources available to others via the World-Wide Web.	37%	37%	38%	37%

In discussion groups and open ended survey responses, faculty discussed a variety of reasons for maintaining their personal collections; the most important was the need to annotate, manipulate, and organize the various resources and to present them in context within the course. Keeping their own copy of a digital item made them more confident that they'd be able to find the correct object again, and that it would still be accessible when needed. These personal collections resided largely on individual personal computers—rarely in any sort of database or on a server. Based on the free responses, it seems that faculty stored the resources in the format that was most convenient and that didn't require learning a new, more complicated system.

It was not always easy to determine the original source of the items in these personal collections. Based on open ended survey responses and discussion group feedback, they appear to be a mixture of items collected from the Internet, those digitized from print sources (e.g., scanned from books), and those created by the individual faculty member (e.g., original documents written by the instructor or photographs taken by the instructor). Faculty tended to describe the whole collection as their own material, rather than focusing on the original sources of individual items. For faculty who rely heavily on primary sources, existing items culled from other sources may be the most valuable; even for these instructors, however, their individual annotations and organization may be the "added value" that makes the personal collection worthwhile.

One faculty member described his reasons for creating his own digital resources:

> *I personally create essentially all the digital materials that I use for my classes. I have not done much about integrating related materials created by others. I should probably do that, but time is short and I am lazy. It would probably take as much time to wade through others' work finding what is useful and how to adapt it than it is to make my own, which I know address my needs.*
>
> —Linguistics and foreign language instructor, UCLA

Faculty with substantial personal collections faced a variety of challenges in the online world. Some who had developed digital collections were frustrated by the demands of required collection maintenance and preservation. Often the resources (e.g., student assistance, funding, technical support staff) initially relied upon to build or digitize their collections had vanished when they were needed most.

Several explained the challenges of integrating personal resources into new media,

> *I own a personal collection of 40,000 35-mm slides, so to put it mildly, I am very invested in 20th century technology. I would need real help – both in machines and time – to convert teaching to PowerPoint, although I see some of its genuine advantages.*
>
> —Architecture and geography instructor, UC Berkeley

> *I would really need a full-time visual resources person to convert, label, and store in an accessible way the thousands of slides in my own teaching collection.*
>
> —Art history instructor, Whittier College

3. Use by discipline

Because of the complexity of the disciplinary analysis, we chose to summarize the results using principal component scores. As discussed above (page 4-16) principal component analysis is a method for simplifying a large number of quantitative variables into a smaller number of summary variables, based on patterns that emerge from the data themselves. Although some of the detail is lost by this simplification, the component scores provide a sense of respondents' characteristics on key dimensions. (See Figures 2.6–2.10, below; complete statistics can be found in Table H.2 in Appendix H.) Because the principal components are normalized to a mean of zero and a standard deviation of one, the scores do not tell us about individuals' absolute level of usage; rather, they measure usage relative to all survey respondents. (Negative scores indicate values lower than the survey average, and positive scores are greater than the survey average.)

Although some of the specifics of this analysis may not be surprising, the wide range of differences is important.[89]

a. Writing

Writing instructors are heavy users of general purpose and reference materials and of discussion and curricular materials, although they rarely use historical documents, maps, or primary source materials. They are more likely than average to use digital materials for online courses or student assignments, and less likely to present them in the classroom. As a discipline, writing instructors are the most interested in using digital resources to teach information literacy and critical thinking, and are the most heavily influenced by the expectations of their students and colleagues, although they also have a sense that the materials may not be appropriate for their discipline or teaching style. They are not overly concerned with whether materials are publicly and freely available.

b. Literature and English language

Instructors who teach literature and English tend to be near the survey average on most measures, with few extremes. They are slightly heavier users of general purpose and reference materials and lighter users of historical documents, maps, and primary sources and of data, news/media, and governmental resources. They are also less likely than average to post digital materials online or to present them in class. They have some sense that digital materials are not appropriate for their subjects or teaching styles, although they do use them to teach information literacy and critical thinking more than the average instructor. Their only appreciable barrier to use is difficulty finding appropriate resources.

[89] Because the sample sizes for media studies and communication; geography; ethnic, gender, and cultural studies; and writing are so small, results for those disciplines should be interpreted particularly cautiously.

c. Foreign languages

Foreign-language instructors are heavier-than-average users of images and audiovisual materials and light users of historical documents, maps, and primary sources, and of data, news/media, and governmental resources. They tend to be motivated by pedagogical concerns when using digital resources, but they tend not to use them for teaching information literacy or critical thinking. These instructors deal with more barriers than average, including difficulty finding appropriate resources, a lack of high-end multimedia equipment and software, and a lack of equipment for their own use.

d. Art and architecture

Art and architecture instructors are much-heavier-than-average users of images and audiovisual materials, and light users of data, news/media, and governmental resources. They are more likely than average to assign digital resources to students for projects, portfolios, or studying, and to present the materials in class. These instructors agree that digital resources are appropriate for their teaching, and believe that they save time and improve convenience and access.

e. Anthropology and archaeology

Anthropology and archaeology instructors are heavier-than-average users of historical documents, maps, and primary source materials. They are more likely to post materials online, somewhat more likely to present them in class, and less likely to assign them for student projects. These instructors are more motivated than average by the desire to publicize their course materials, and they do not feel that digital resources are inappropriate for teaching. They are more troubled than the average instructor by the lack of appropriate, high-quality materials for their teaching.

f. History

Not surprisingly, history instructors are the heaviest users of historical documents, maps, and primary source materials; they also use more data, news/media, and governmental resources than the survey average. They are more likely than average to present digital resources in the classroom. They are more motivated than average by pedagogical concerns, and less by their reputation and the expectations of others, or by concerns about time, convenience, and access. They feel somewhat more need for technical assistance than the average instructor.

g. Political science

Political science instructors use far more data, news/media, and governmental resources than average and use fewer images and audiovisual materials. They tend to use digital materials for posting on the web, and are less likely to assign them for student projects, homework, or studying. They are not particularly motivated to use digital resources by the expectations of and pressure from students, colleagues ,or administrators, and they don't particularly need outside help with intellectual and content-based activities, such as finding digital materials and assessing their appropriateness and credibility.

h. Geography

Although our sample of geography instructors was small (N=18), the results suggested a few interesting trends. Geography faculty were far-heavier-than-average users of data, news/media, and governmental resources, and were also heavier users of historical documents, maps, and primary source materials. They presented digital materials in the classroom much more than average. They felt strongly that digital materials were appropriate for teaching, although they were not particularly influenced by pressure from their students, colleagues, or administrators. They also needed less help than average with the technical tasks related to digital resource use.

i. Ethnic, gender, and cultural studies

Although the survey N was small (26), some trends were suggested for instructors of ethnic, gender, and cultural studies. They were heavier-than-usual users of data, news/media, and governmental resources and of historical documents, maps, and primary source materials, but lighter users of general purpose and reference materials. They were less likely to assign digital materials to their students. They were concerned about their students' misinterpretation of digital resources and lack of information literacy; they were not motivated by concerns for time, convenience and access, but were interested in publicizing information about their course or their work. These instructors had greater-than-average concerns about their own and their students' access to computers and high-speed connections; they needed more support than average with both technical and content-based activities.

j. Media studies and communications

Because the sample of instructors of media studies and communications was so small (N=13), caution is warranted in interpreting the results. These instructors were heavy users of images and audiovisual materials and of discussion and curricular resources, but relatively light users of historical documents, maps, and primary source materials; they use these materials in the context of online courses more often than average. These instructors do not find digital materials inappropriate for their teaching; they want to publicize their resources to others, but aren't particularly concerned about using materials that are already free or publicly available. They need less support than average with technical activities.

Figure 2.3: Faculty survey responses by discipline: What digital resources do you use? (part 1)

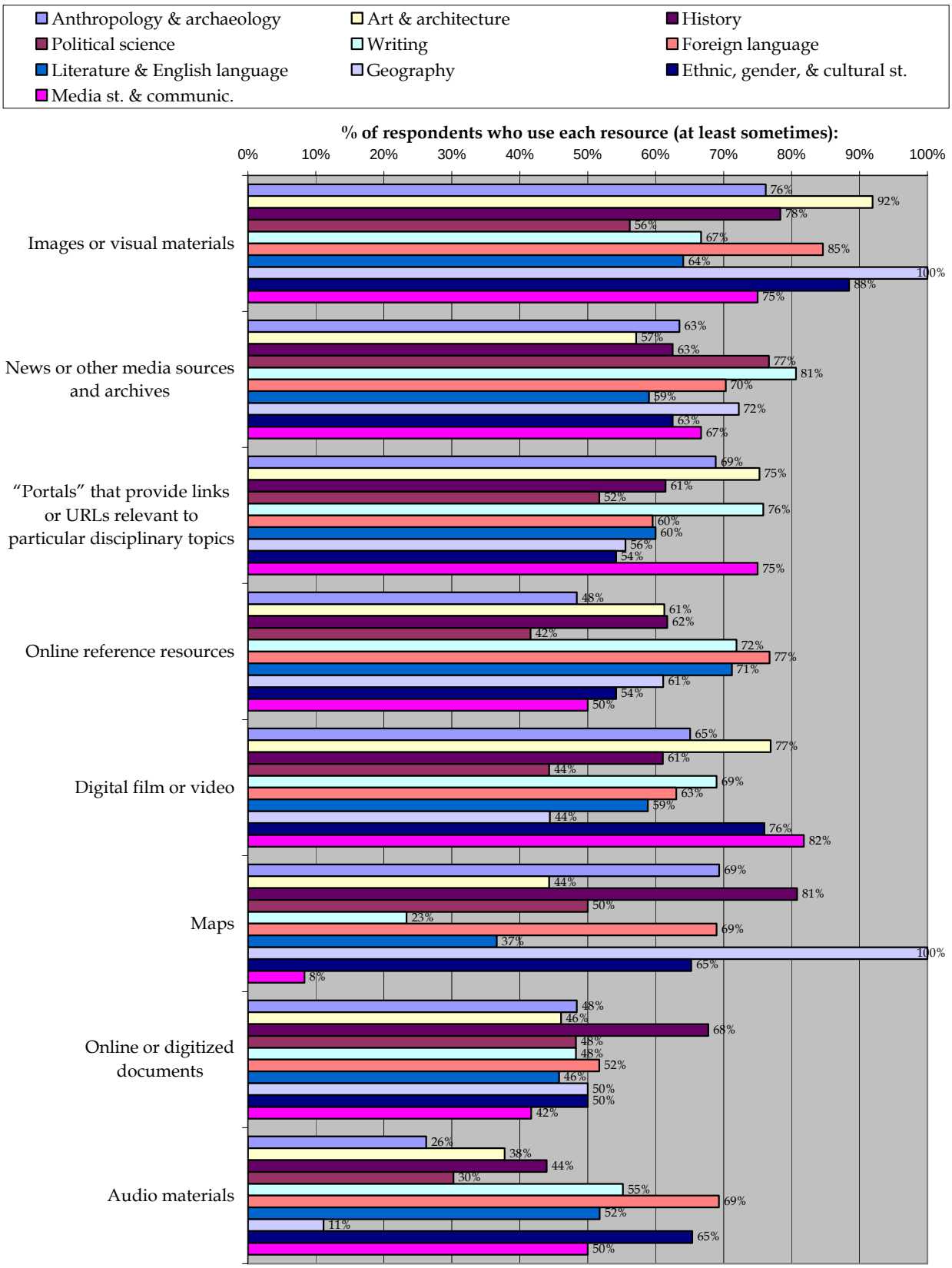


Figure 2.4: Faculty survey responses by discipline: What digital resources do you use? (part 2)

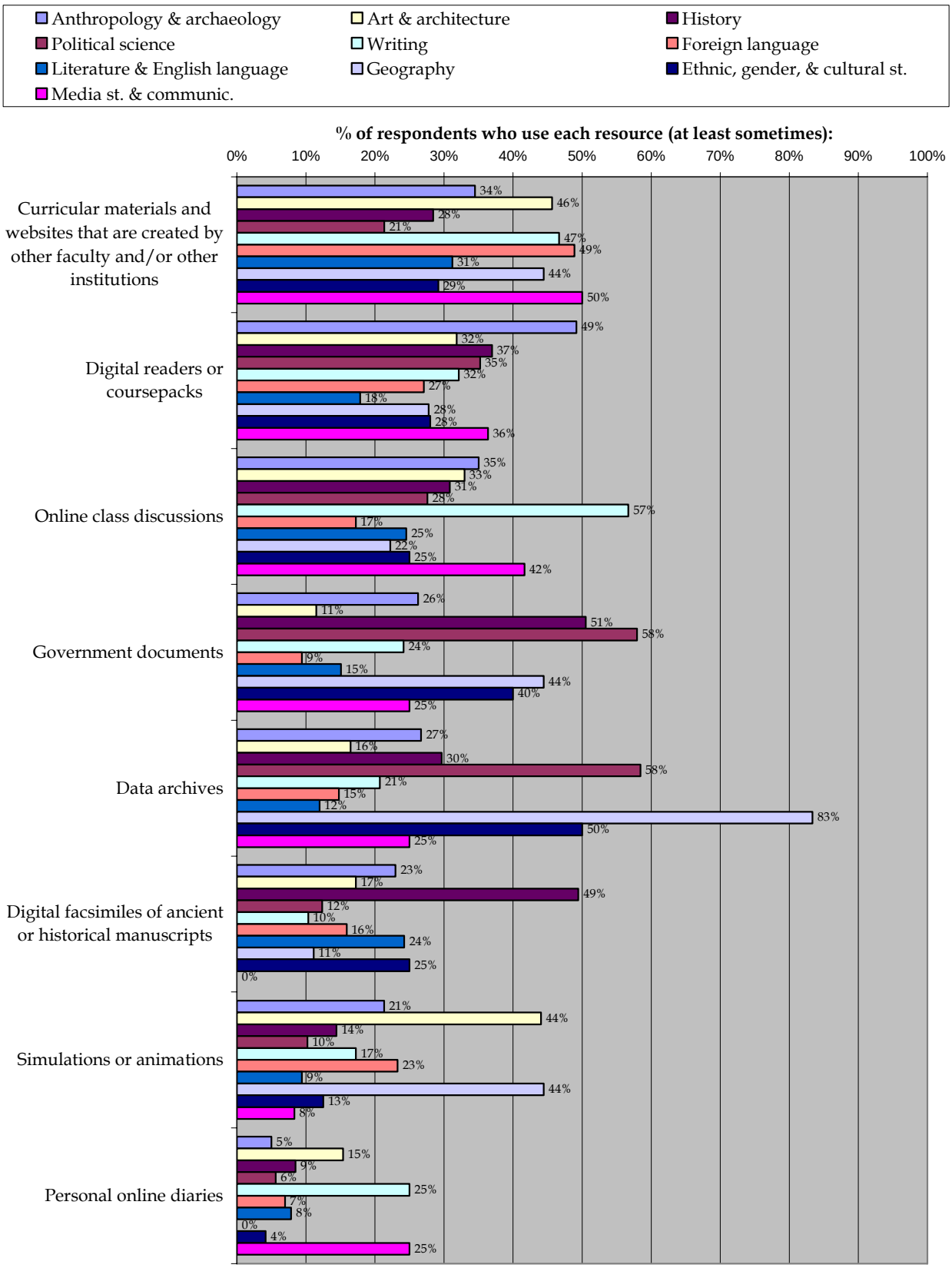


Figure 2.5: Faculty survey responses by discipline: How do you use digital resources in your teaching?

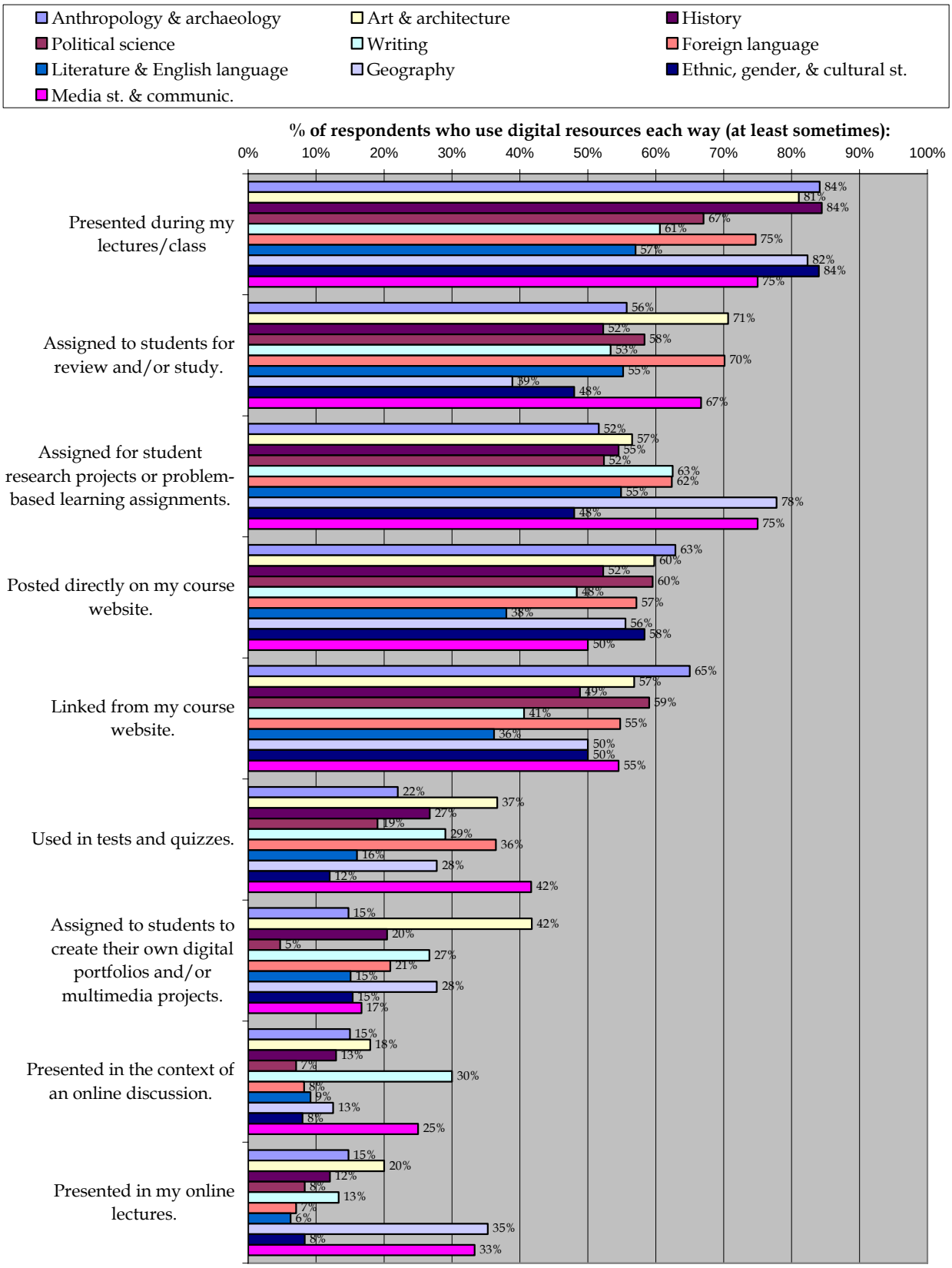


Figure 2.6: Faculty survey responses by discipline: What resources people use (principal components)

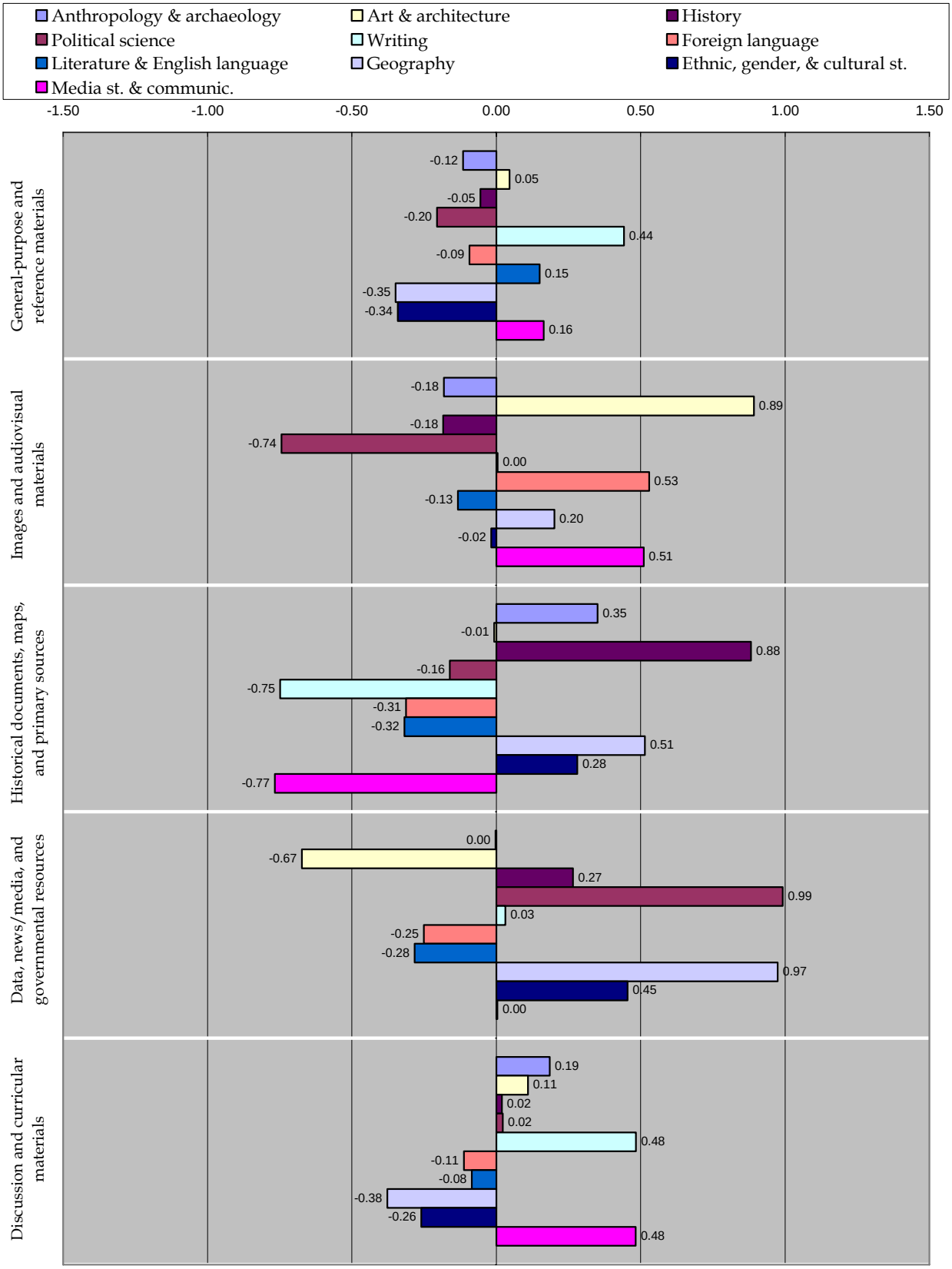


Figure 2.7: Faculty survey responses by discipline: How people use digital resources (principal components)

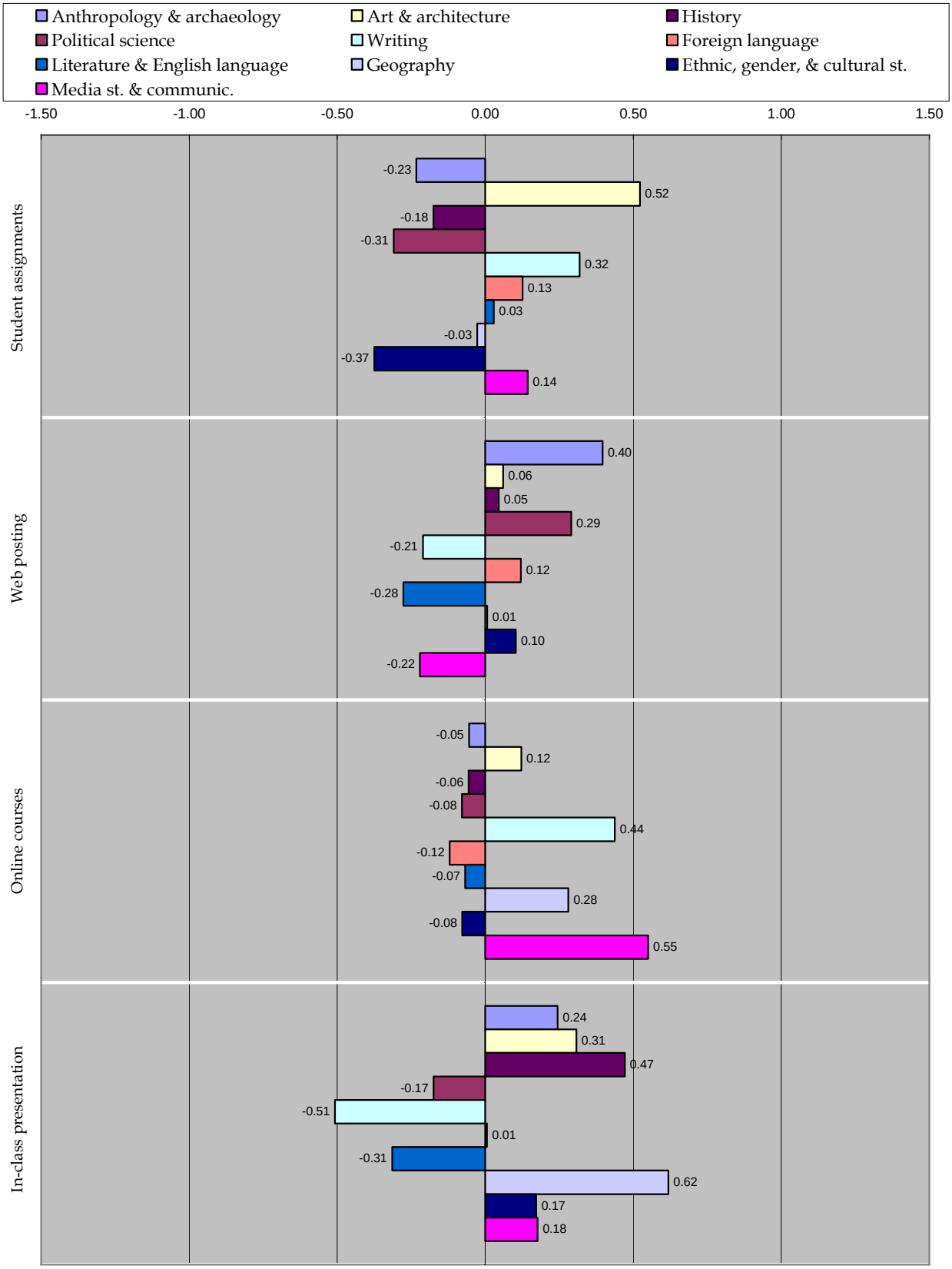


Figure 2.8: Faculty survey responses by discipline: Reasons for use and non-use (principal components)

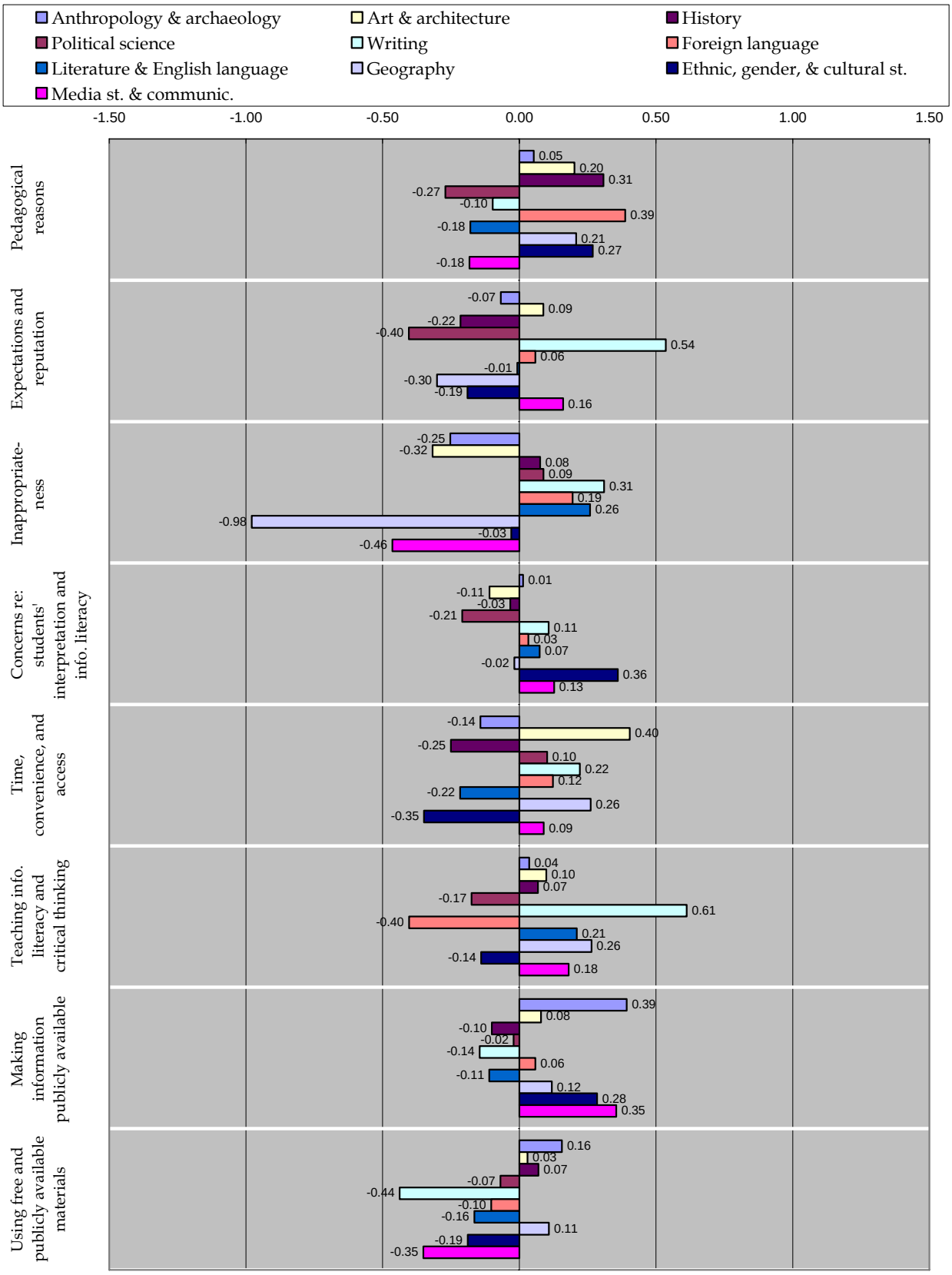


Figure 2.9: Faculty survey responses by discipline: Barriers to use (principal components)

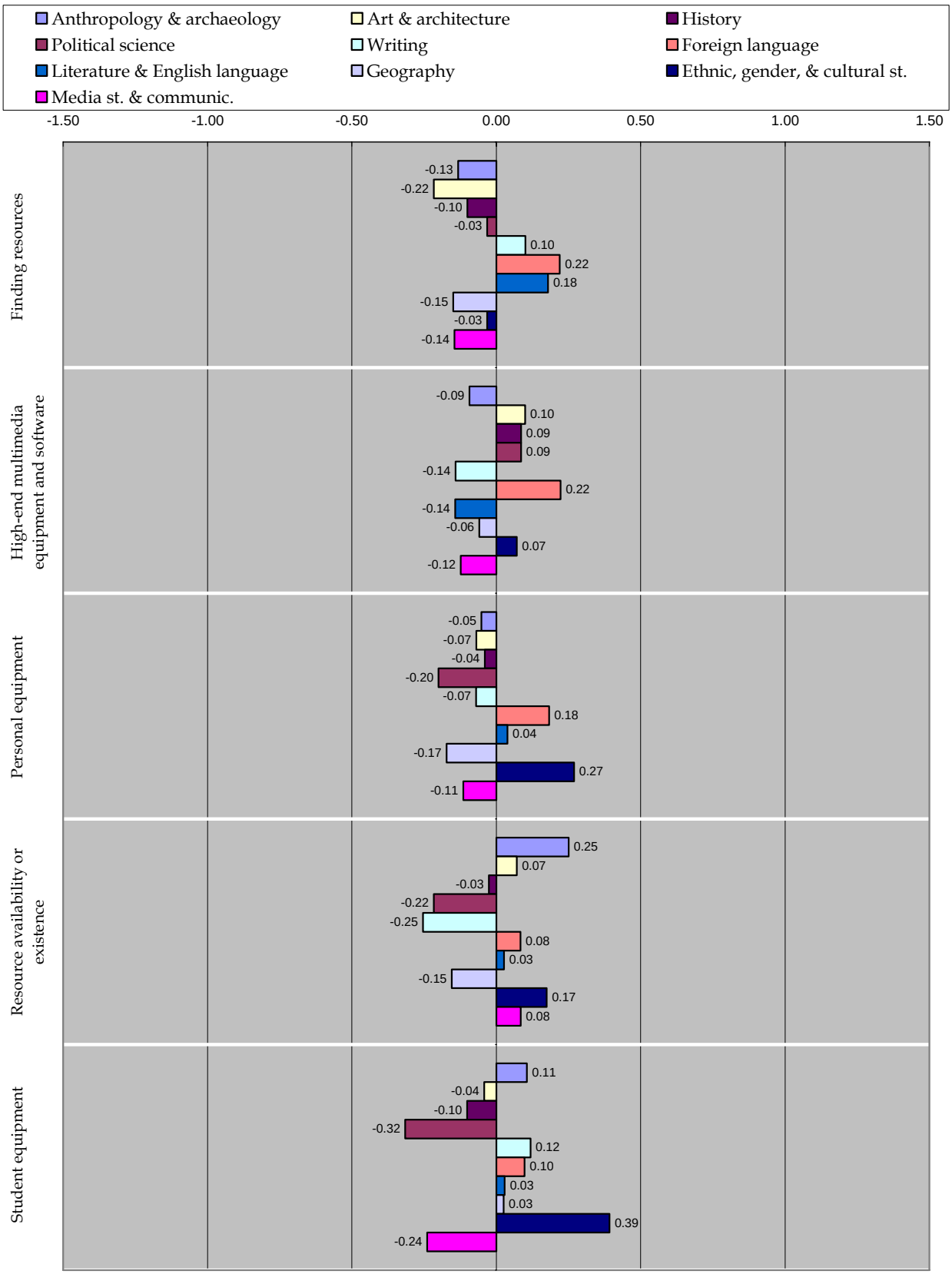
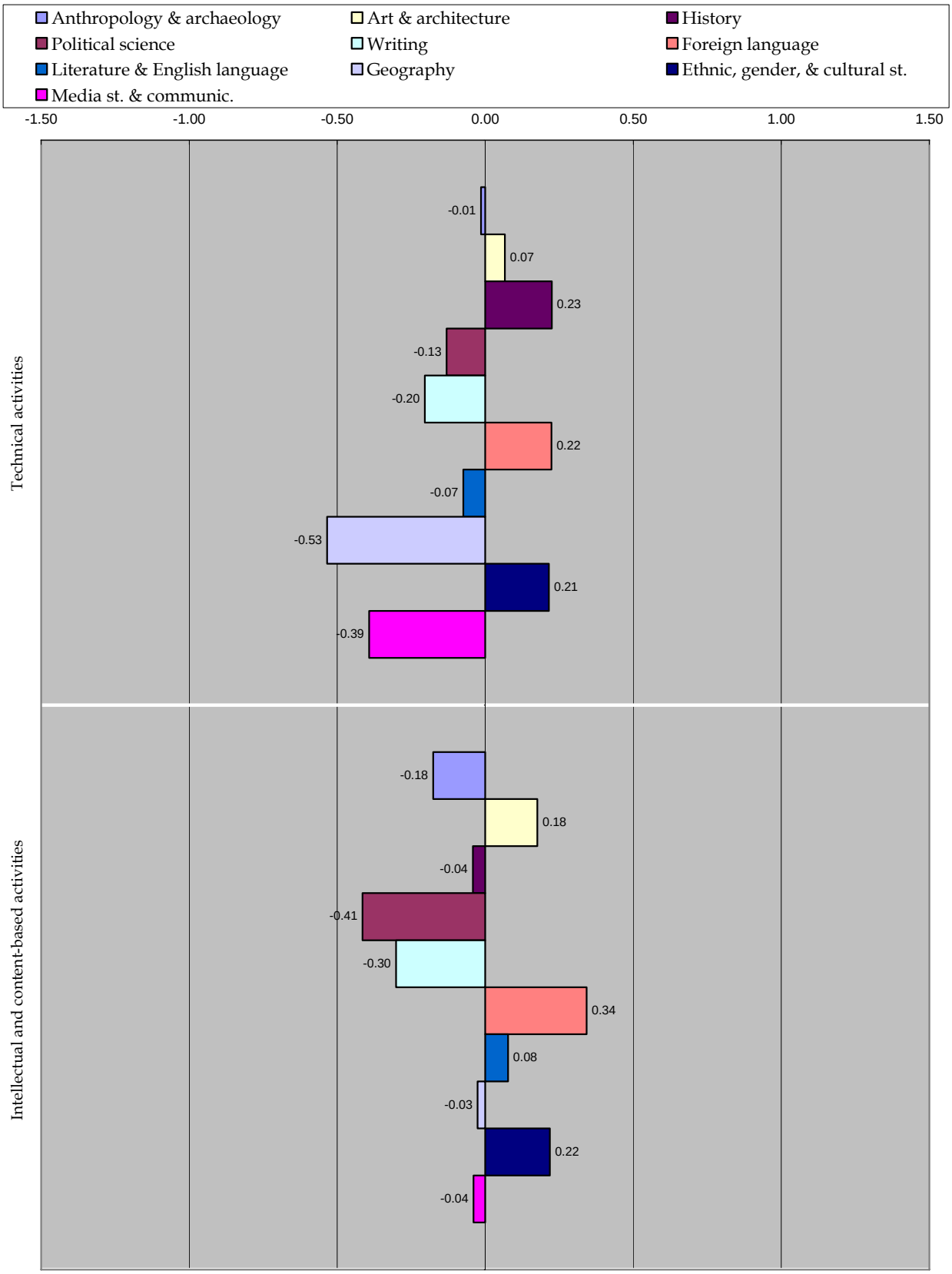


Figure 2.10: Faculty survey responses by discipline: Activities with which people need support (principal components)



4. The role of age in resource use

Conventional wisdom suggests that digital resources are primarily the domain of younger instructors and that older faculty simply do not use them very much. Survey results support this theory to a limited extent: for almost all types of digital resources and all use scenarios, the oldest instructors (age sixty-two and up) were the lightest users (See Figure 2.11 and Table 2.16, below). We should note that although there seem to be real differences in level of digital resource use by age, as discussed below, an instructor's age alone is a weak predictor of digital resource use; other factors have a much greater effect on a person's use level (see "Regression and Path Analysis", page 4-55 below.)

Beyond this statement, however, the results get more complicated. Many types of resources, such as news and media, digital film and video, digitized documents, data archives, and online journals are used more heavily by younger instructors. Other resources are much less influenced by age; images and visual materials and disciplinary portals, for example, are used heavily by instructors in all age groups (except the very oldest). Although very few instructors use personal online diaries ("blogs") in their teaching, the youngest instructors do so at a higher rate.

As shown in Table 2.16, there are some differences in motivations for using digital resources among different age groups. Younger instructors are more likely to use digital resources for pedagogical reasons, believing that they will improve students' learning, help teach critical thinking skills or information literacy, and get students excited about a topic. Younger instructors also feel more comfortable with new technologies. Concerns about time, convenience, the availability of appropriate materials, and students' ability to deal with the materials, on the other hand, cut across the different age groups.

It is also interesting that the oldest instructors reported the least need for support in almost all areas. It appears that they do not need help with the various digital activities because they are less interested in these activities, with or without support. When they did need support, though, the different age groups turned to different sources. Younger instructors were more likely to seek help from friends and family, workshops, or online sources, while older instructors were more likely to go to graduate students or campus librarians.

Figure 2.11: Faculty survey responses by age group: What digital resources do you use?

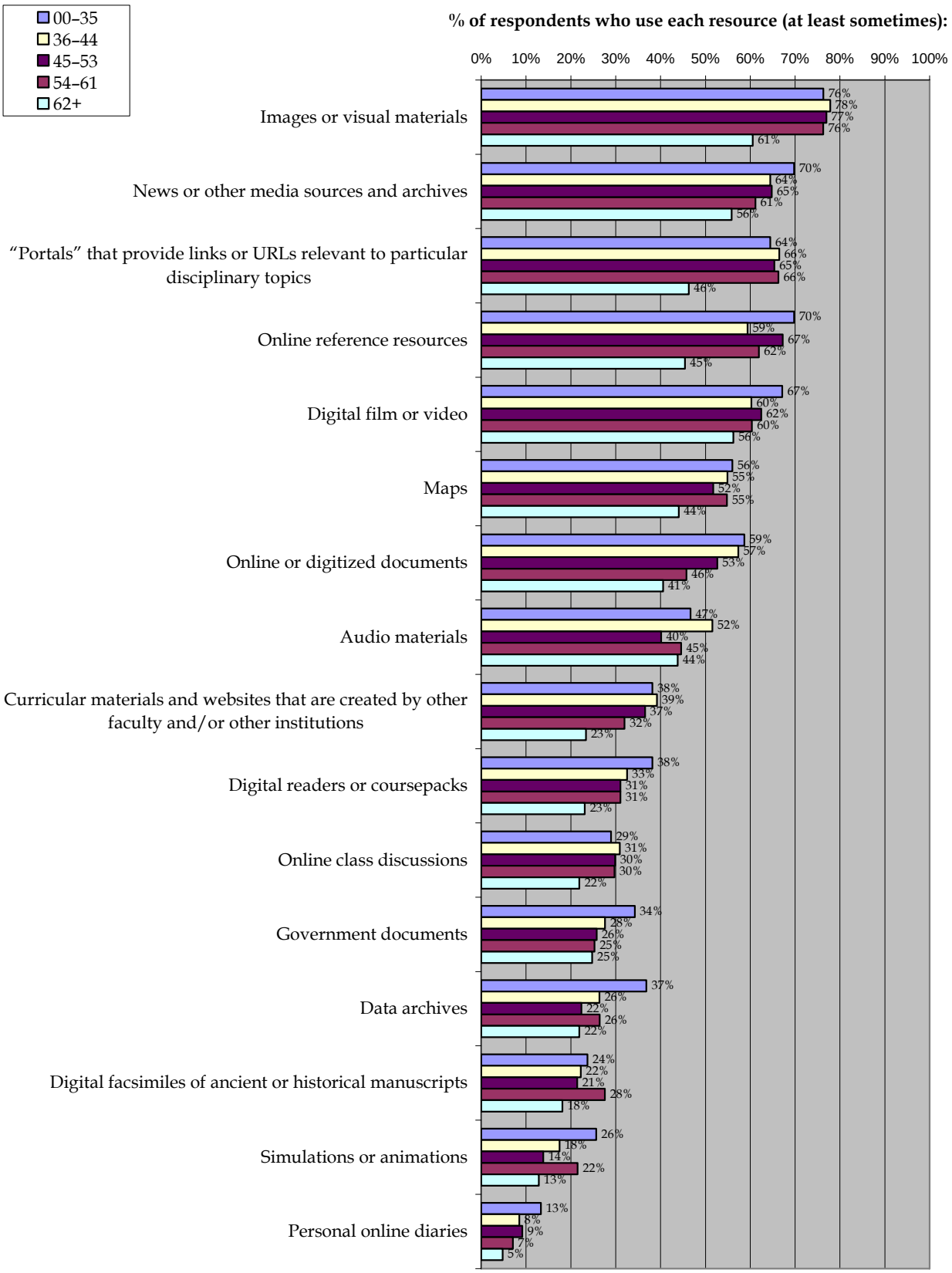


Table 2.16: Survey responses by age group (selected questions)

	All	00–35	36–44	45–53	54–61	62+
N	831	76	169	181	184	120
How often do you use the following types of digital resources in your undergraduate teaching:						
Images or visual materials	75%	76%	78%	77%	76%	61%
News or other media sources and archives	64%	70%	64%	65%	61%	56%
"Portals" that provide links or URLs relevant to particular disciplinary topics	63%	64%	66%	65%	66%	46%
Online reference resources	62%	70%	59%	67%	62%	45%
Digital film or video	62%	67%	60%	62%	60%	56%
Online or digitized documents	50%	59%	57%	53%	46%	41%
Data archives	27%	37%	26%	22%	26%	22%
Personal online diaries	9%	13%	8%	9%	7%	5%
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…						
Because it improves my students' learning.	78%	85%	78%	82%	75%	75%
To get students excited about a topic.	73%	84%	77%	77%	73%	56%
Because it provides access to resources that we don't have at our college.	61%	58%	59%	63%	66%	51%
To teach critical thinking skills.	56%	70%	56%	59%	55%	41%
Because I like or feel very comfortable with the new technologies.	53%	70%	53%	54%	53%	43%
Because it is more convenient for my students and their schedules.	51%	60%	51%	51%	53%	44%
To teach information literacy (i.e., evaluating the online materials themselves).	43%	51%	52%	41%	41%	29%
Because it saves me time.	41%	51%	41%	41%	40%	41%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…						
I don't have time to use digital resources.	66%	59%	74%	69%	66%	58%
I don't want my students to copy or plagiarize material from the web.	33%	36%	34%	30%	34%	30%
Students don't have the information literacy skills to assess the credibility of digital resources.	29%	24%	31%	28%	33%	25%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...						
The digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	50%	46%	43%	43%	47%
I don't have time to assess the credibility of the available resources.	43%	37%	44%	45%	43%	44%
The content I need or want is just not available online.	41%	39%	43%	43%	38%	39%
The academic quality of available materials is too poor to meet my needs.	39%	38%	36%	45%	39%	34%
How important is it for you to have support or assistance with each of the following activities for your teaching?						
Obtaining or setting up technical infrastructure.	82%	84%	88%	82%	85%	67%
Creating my own website.	82%	85%	86%	84%	77%	78%
Digitizing existing resources.	80%	84%	81%	83%	80%	72%
Learning how to use a learning management system.	79%	84%	82%	80%	79%	69%
Importing resources into a course website or a database.	79%	80%	81%	84%	78%	69%
Gathering, organizing, and maintaining digital materials.	78%	84%	79%	80%	76%	74%
Integrating resources into a learning management system.	78%	84%	83%	79%	77%	63%
How satisfied or dissatisfied are you with the support you have received from the following sources?						
Campus librarians	84%	77%	82%	83%	84%	94%
Friends or family	83%	100%	84%	85%	79%	71%
Graduate students	80%	75%	79%	77%	78%	91%
Workshops	60%	66%	60%	62%	56%	55%
Online help or guides	47%	65%	50%	50%	35%	41%

5. Heavy users, light users, and non-users

Survey responses reveal a wide range of levels of use of digital resources, but the differences between light and heavy users are more complex than might initially be suspected. Figure 2.12 and 2.13 show survey responses by the instructors' level of use of digital resources. (See also Table H.4 in Appendix H.) Using our composite index of site usage (see page 4-9, above), we divided respondents into four groups based on usage level:

- Non-users to light users (usage index = 0–13, N=113),
- Light to medium users (14–29, N=306),
- Medium to heavy users (30–44, N=259), and
- Heavy users (45–100, N=153).

It is interesting to note that both light and heavy users face challenges and need support—but their needs differ.

Light users complain primarily about their difficulty finding, managing, and assessing digital materials; they feel overwhelmed and unable to locate useful resources. Light users are also less likely to have reliable access to a computer or a high-speed connection. Medium to heavy users, on the other hand, are more likely to be concerned about their students' lack of computers or high-speed connections. The lack of high-end multimedia equipment and software is also more likely to be a barrier for medium to heavy users—things like server space, scanners, appropriate classroom technology, and more advanced, reliable software for integrating audio and video into their courses.

Light users and non-users report that they need somewhat less support related to digital resources, presumably because they're not even attempting to use them to any significant degree. There is, however, a difference in the support needed by intermediate-level users and the heaviest users. The heaviest users need assistance obtaining and setting up technical infrastructure, creating websites, and dealing with copyright issues. Intermediate users are more likely to need help finding and managing digital content, including digitizing existing materials and importing them into databases or learning management systems.

When they do need support, light and heavy users turn to different sources. Light users seek help from librarians, graduate students, and other faculty, but are unlikely to go to their campus' educational technology or IT staff. In addition to technology experts, heavy users also seek help from their family and friends and from online help or guides.

Figure 2.12: Faculty survey responses by use-level: Barriers and frustrations

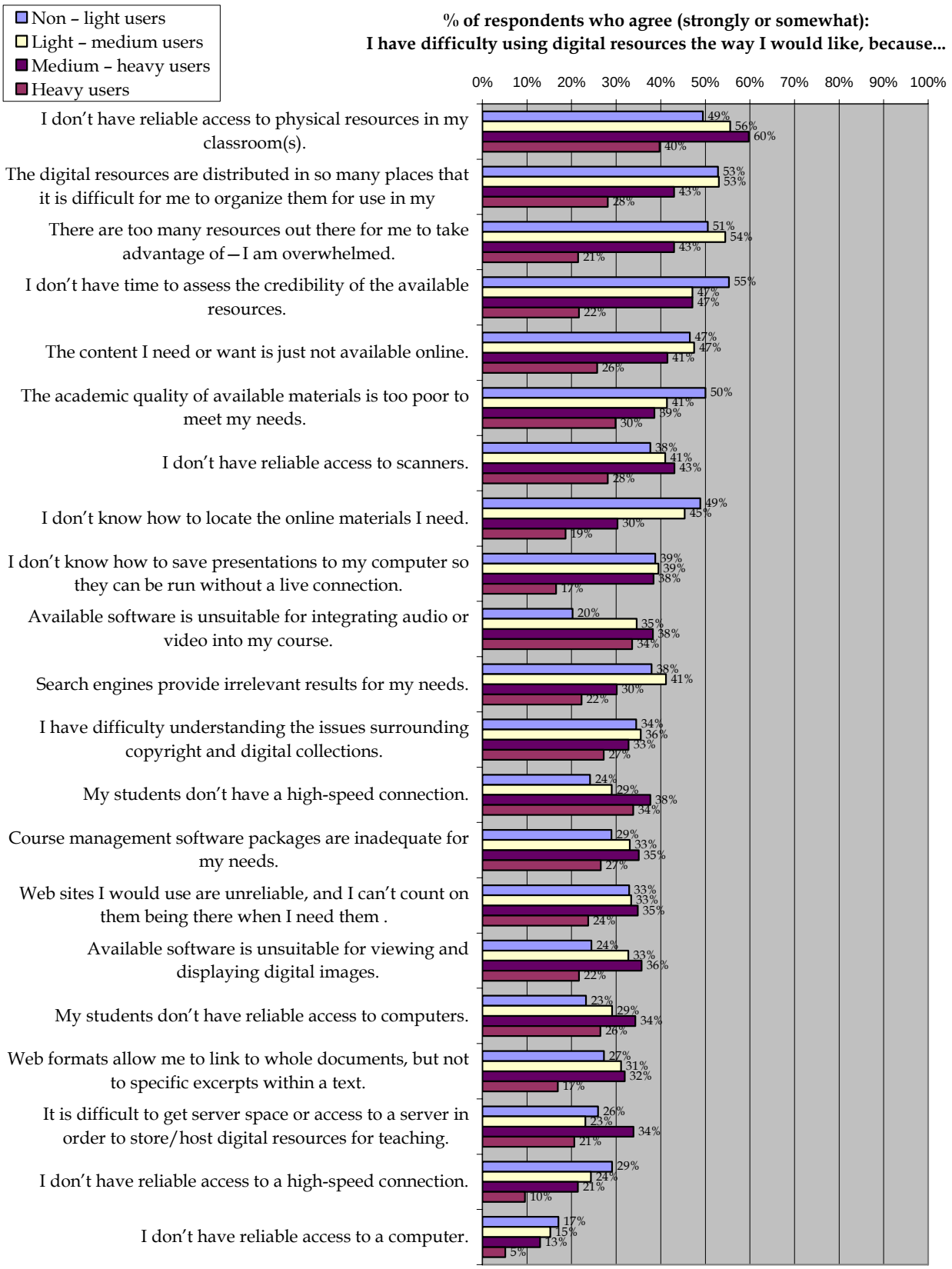
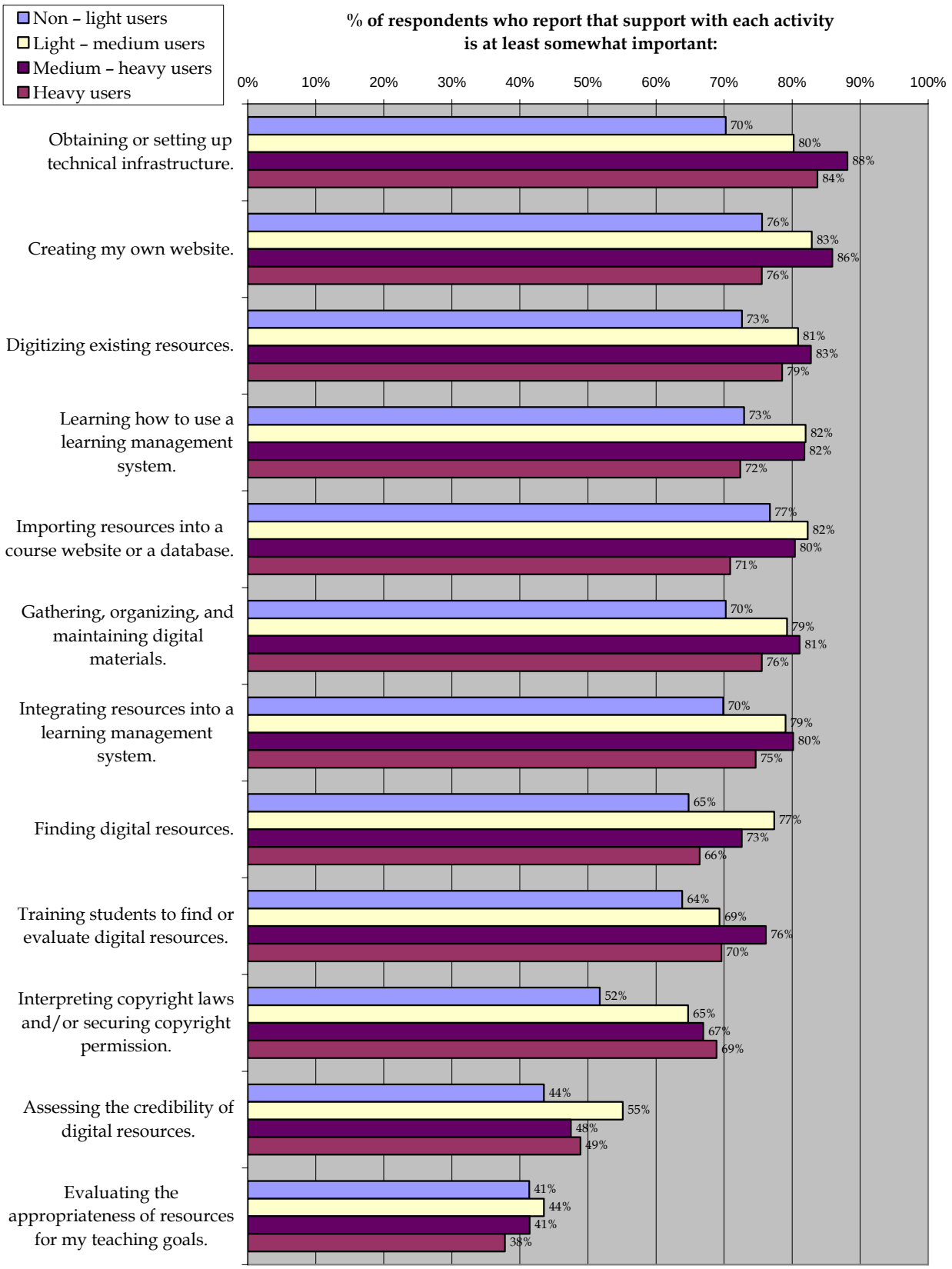


Figure 2.13: Faculty survey responses by use-level: Support and assistance



6. Highlights from the H-Net survey

Overall, the results of the H-Net survey were strikingly similar to the California faculty survey. (See Figures 2.14 and 2.15, below, and Table H.7 in Appendix H.) The various types and sources of resources used were ranked in nearly the same order, as were methods and motivations for use. Where the two populations differed, the H-Net respondents seemed characteristic of heavier users, as might be expected among people recruited from an online community like H-Net. Also, the disproportionate number of history instructors among the respondents affected the H-Net results somewhat (the use of digitized documents and historical facsimiles was somewhat elevated, corresponding to the behavior of historians from the California faculty survey). H-Net respondents were also more likely to report hearing about digital resources from "professional societies or discussion lists," just as one would expect. Unfortunately, the low response from non-U.S. institutions made it difficult to examine the effects of national or cultural differences. In general, the correspondence between results of the two surveys reinforces the findings of the California faculty survey.

Figure 2.14: What digital resources do people use? (Faculty survey vs. H-Net survey)

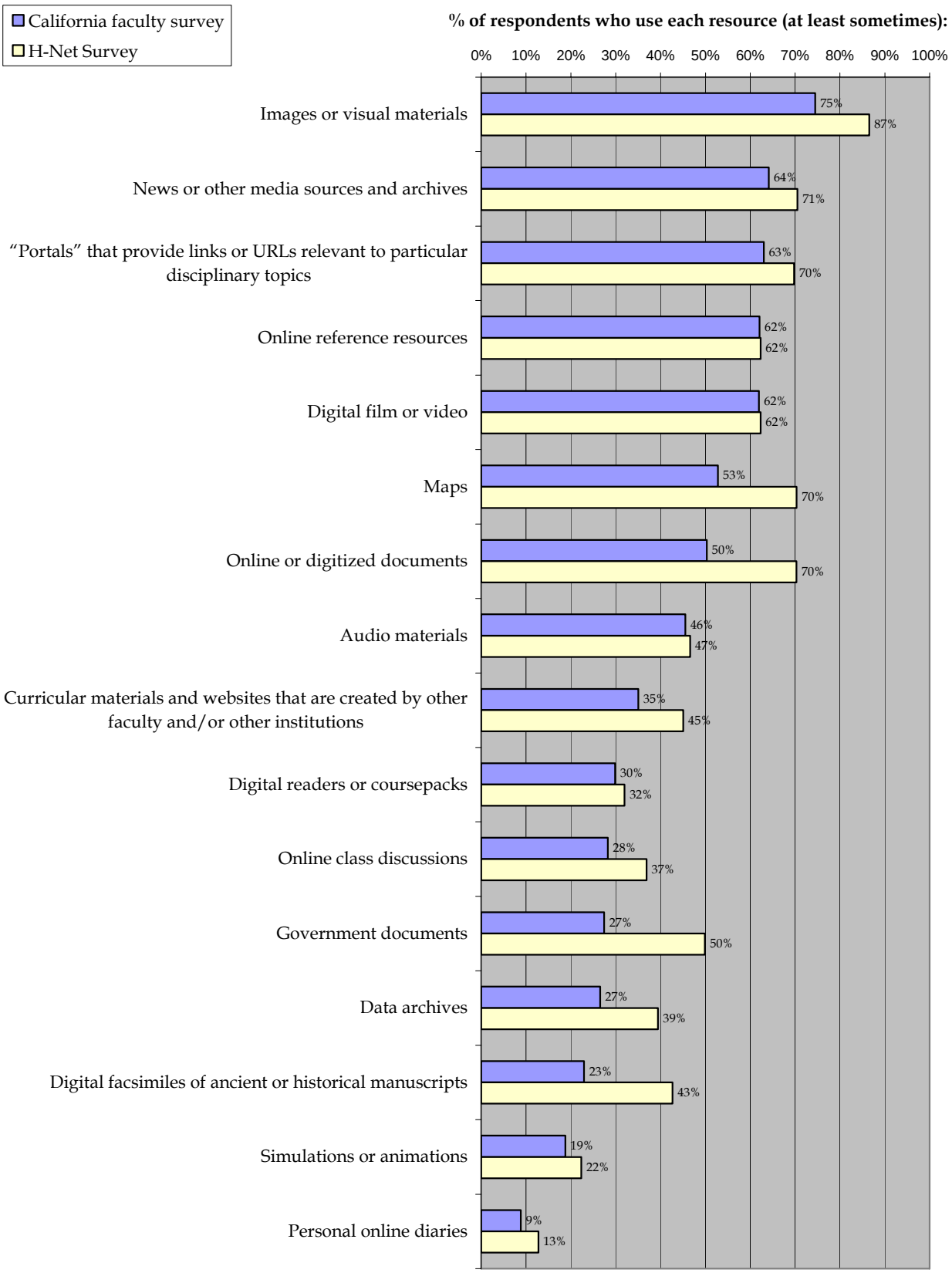
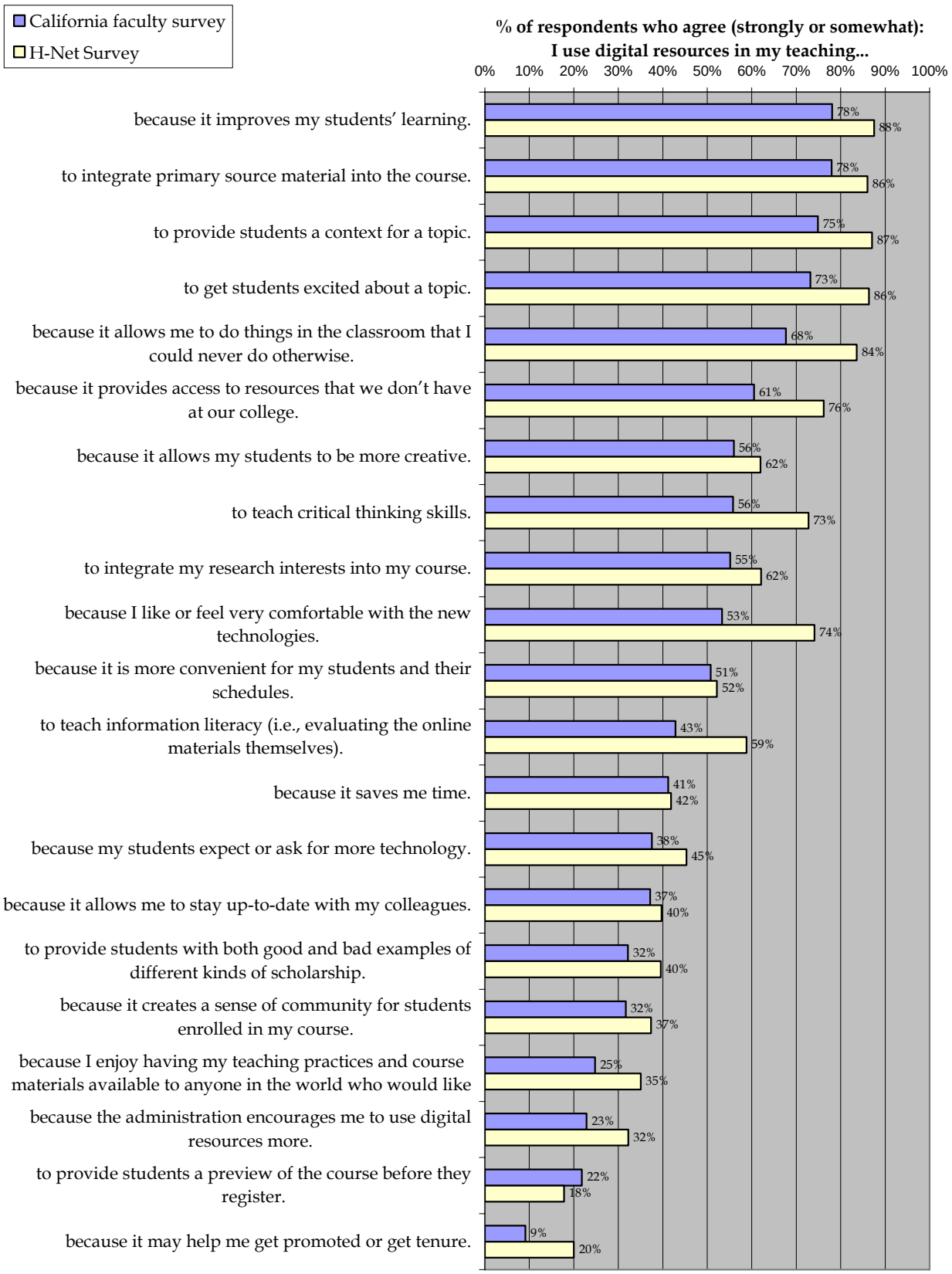


Figure 2.15: Motivations for using digital resources (Faculty survey vs. H-Net survey)



7. Regression and path analysis

As the above results show, the use of digital resources is a complex phenomenon, influenced by a wide range of institutional, disciplinary, and individual factors. To gain a better understanding of digital resource use, we used regression and path analysis to explore the interrelationships between these multiple variables in predicting an instructor's level of use. Regression is a statistical technique for exploring the relationship between a set of predictor variables and a particular outcome, such as use of digital resources.

Based on the literature and conventional wisdom, we identified twenty-one variables that might be expected to predict an instructor's digital resource use (see Table 2.17, below). These variables included characteristics of the individual respondent (age, gender, education, time since highest degree) and characteristics of respondent's teaching environment (institution type and discipline). Binary dummy variables were used for community college and UC teaching contexts, and liberal arts colleges were omitted, to avoid over-specifying the model. We also included respondents' level of enthusiasm about using digital resources and a measure of total use of computer technology, based on reports of the frequency with which respondents used computers, email, the worldwide web, and online library catalogs. We used our composite index of digital resource use as the dependent variable. (See page 4-9, above.)

We performed a series of regressions, looking at each predictor's effect on digital resource use in isolation. Next we performed a multivariate regression, looking at the additive effect of all twenty-one variables, assuming each was acting independently and concurrent with all the others. The multiple linear regression model details the effects of each predictor variable on respondents' level of usage of digital resources, assuming a simple, linear relationship.[90]

The notion of simultaneous independent effect is strained when attempting to model what we know, from practical experience, to be a complex web of interactive causality. To address this issue, we created a somewhat more complex model by using path analysis to explore the total effect of each variable, including both direct and indirect effects. This approach provides a somewhat clearer picture of what is certainly a complex phenomenon.

a. Regression and path analysis results

Table 2.17 shows the results of individual regressions, looking at each predictor in isolation. Eleven of the twenty-one initial variables show statistically significant relationships with total usage.[91] Older instructors, for example, tend to use fewer digital resources or use them less frequently. It is important to note, however, that although this relationship is statistically significant, the effect size is very small: each additional year of age predicts a usage score that is 0.23 points lower (out of 100). The total predictive power of this linear regression model (measured by the adjusted R^2) is also very weak: age alone accounts for only 2.5 percent of the total variation in use.

[90] It is important to keep in mind the combined assumptions of linearity and additivity when assessing the adequacy of the multiple linear regression model as a way of describing the relationships among the predictor variables and the distribution of actual usage as measured by the index.

[91] For this and all subsequent analyses, we examined statistical significance at the 0.05 level. Statistical significance in a linear regression model indicates that the regression coefficient differs from zero by an amount unlikely to have occurred by chance alone (due to the sampling process).

In fact, the linear model is not a very good one for any of the variables, as none has an adjusted R^2 of more than 10 percent, with the singular exception of respondents' enthusiasm about digital resources, which accounts for one-third of the total variation in our usage index.

Overall, instructors who teach languages, architecture, geography, and history use more digital resources (or use them more frequently), while those who teach classics and those who teach at UC use fewer. Instructors who are more enthusiastic about digital resources are also heavier users, as are younger instructors, females, those who finished school more recently, and those who use computer technologies more frequently.

It is worth noting that although these eleven variables are statistically significant, most of their effects are so small, and they account for such a small portion of the total variance in usage, they have essentially no predictive utility. Despite expectations to the contrary, a person's age, for example, provides almost no indication of whether the person will be a heavy user, light user, or non-user of digital resources.

Table 2.17: Individual bivariate regressions: Predicting overall use of digital resources in teaching

Variable		Model adj. R^2	Parameter estimate (β)	p-value	Significant? (95% CI)
Age	*(Per year of age)*	0.025	-0.23	0.00	*
Years since degree	*(Per year)*	0.029	-0.23	0.00	*
Education level	*Four-point scale*	0.0005	-1.25	0.25	
Gender (female)	*Yes/no*	0.0045	2.33	0.04	*
Institution type	*Yes/no*	0.01			
UC			-4.59	0.01	*
Community college			-1.76	0.35	
Discipline	*Yes/no*	0.06			
English			-2.32	0.12	
Languages			3.81	0.01	*
Literature			-2.64	0.06	
Writing			2.51	0.10	
Anthropology			2.61	0.24	
Archaeology			1.01	0.76	
Architecture			10.41	0.00	*
Art history			0.9	0.70	
Art practice			3.57	0.09	
Classics			-10.22	0.01	*
Geography			12.34	0.00	*
History			6.51	0.00	*
Political science			-0.31	0.87	
Enthusiasm	*1 – 7 scale*	0.33	4.92	0.00	*
Total tech use	*0 – 16 scale*	0.07	2.16	0.00	*

Table 2.18 shows the results of the multivariate regression, using the same variables identified in Table 2.17. The total model has an R^2 of 0.39— a trivial improvement over the bivariate model containing only enthusiasm. Figure 2.16 offers a graphical representation of the statistically significant relationships; the line width is proportional to each predictor's

standardized partial regression coefficient (the parameter estimate, standardized by the variables' standard deviations).

While eleven of these variables had a statistically significant bivariate correlation with the usage index, only seven do when all twenty-one predictors are taken into account simultaneously: teaching at UC; teaching architecture, classics, geography, or history; enthusiasm about digital resources; and greater use of computer technology.

Other variables that were statistically significant when considered individually, such as age, have no significant direct effect. Thus age, for example, has only minimal direct impact on usage: although older people may use fewer digital resources, this can be best explained by their lower enthusiasm and lower exposure to computer technology.

Table 2.18: Multiple regression: Predicting overall use of digital resources in teaching (Model adjusted $R^2 = 0.39$)

Variable		Parameter estimate (β)	p-value	Significant? (95% CI)
Age	*(Per year of age)*	-0.05	0.56	
Years since degree	*(Per year)*	-0.005	0.95	
Education level	*Four-point scale*	0.17	0.90	
Gender (female)	*Yes/no*	0.99	0.32	
Institution type	*Yes/no*			
UC		-4.59	0.0013	*
Community College		-0.86	0.64	
Discipline	*Yes/no*			
English		-0.87	0.53	
Languages		1.68	0.22	
Literature		-0.82	0.51	
Writing		1.33	0.34	
Anthropology		1.43	0.46	
Archaeology		-1.02	0.72	
Architecture		6.70	0.02	*
Art history		0.64	0.77	
Art practice		2.78	0.19	
Classics		-7.07	0.02	*
Geography		10.53	<0.0001	*
History		5.75	<0.0001	*
Political science		0.38	0.82	
Enthusiasm about digital resources in teaching	*1 – 7 scale*	4.47	<0.0001	*
Total technology Use	*0 – 20 scale*	1.03	0.001	*

We can improve this model by using path analysis, a technique that examines both the indirect and direct effects of a set of variables. Enthusiasm, for example, is a major predictor of digital resource use, while several other variables are statistically significant predictors of enthusiasm: technology use, teaching in a community college setting, teaching English, or teaching art practice. Figure 2.17 shows a path analysis diagram for this model. All predictive relationships shown in this model are significant at the 95 percent confidence level; arrows for non-significant relationships are not shown. For each relationship, the standardized partial regression

coefficient is noted next to the arrow. (Negative coefficients indicate negative relationships; for example, teaching English predicts a *lower* enthusiasm about digital resource use.)

For each variable, the paths trace both direct and indirect effects on a respondent's total usage of digital resources. We can see, for example, that while education level has no direct effect on digital resource usage, it has indirect effects via technology usage and via disciplines such as art practice. While art practice has an impact only via enthusiasm, technology use exerts both a direct and an indirect effect on digital resource usage.

b. Example: The effect of computer technology use

The combined effects of technology use are highlighted in Figure 2.18. The direct effect of a respondent's level of technology use on digital resource use has a standardized partial regression coefficient of 0.12. This indicates that an increase of one standard deviation in technology use tends to result in an increase of 0.12 of a standard deviation of digital resource use.

Technology use also exerts an indirect effect on digital resource use by predicting a person's enthusiasm level. The total coefficient of this indirect relationship can be calculated by multiplying the partial coefficients along the predictive path, resulting in a standardized regression coefficient of $0.25 \times 0.51 = 0.13$ for the indirect relationship. Combining the indirect and direct relationships, the total effect of technology use on digital resource use has a coefficient of $0.12 + 0.13 = 0.25$. Thus the *total* impact (direct plus indirect effects) of technology use, according to this model, results in a predicted 0.25 standard deviation increase in digital resource use for an increase of one standard deviation in technology use. This is twice the magnitude of the effect estimated when considering only the direct effect.

c. Summary

This analysis reinforces the importance of a person's individual attitudes about digital resources. It seems obvious, but the instructors who use more digital resources in teaching are, by and large, those who are most enthusiastic about it. There are a few small exceptions to this rule: to a small degree, instructors in geography and history use more digital resources than one might expect based on their enthusiasm levels alone, while those who teach at UC use fewer. Perhaps in these disciplines, established work practices and scholarly expectations may reduce the importance of individual enthusiasm. Institutional characteristics of UC, on the other hand, may inhibit some faculty from using digital resources the way they would like.

Why people feel positively about digital resources is itself a complicated phenomenon. Instructors from community colleges and from art practice tend to report higher levels of enthusiasm, as do those who are heavier users of computers in their day-to-day non-teaching activities. These findings may underscore a substantial difference in mindset between the community colleges and other institution types. Perhaps community college faculty, faced with less-well-prepared students, are excited by the prospect of using digital resources as a "hook" for student engagement; perhaps they are generally more open to pedagogical change or experimentation.

English instructors, on the other hand, tend to be less enthusiastic about the role of digital resources in their teaching, perhaps because of their reliance on texts, or perhaps because of

their sense that digital resources cannot be easily integrated into their teaching style. Even among English instructors, however, there is a range of attitudes, and those who are more enthusiastic about digital resources use them more.

Age, education level, and gender seem to have no significant impact on a person's enthusiasm about digital resources or on their level of use of those resources.

The path analysis diagram (Figure 2.17) highlights the importance of individual opinions; it also lays out the complicated set of relationships between those opinions, an instructor's demographic characteristics, and the institutional and disciplinary settings in which they teach.

Figure 2.16: Multiple regression: Predicting overall use of digital resources in teaching (Model adjusted $R^2 = 0.39$)

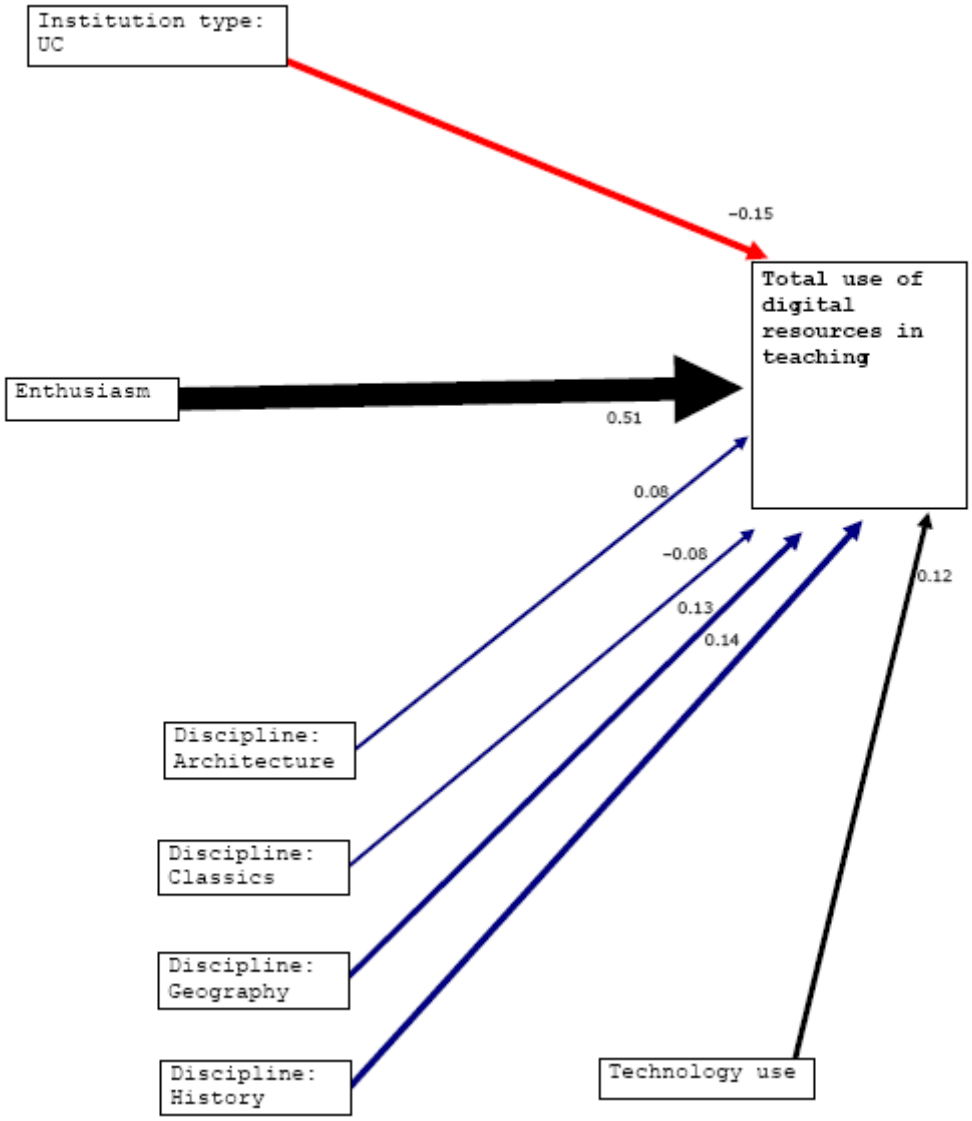


Figure 2.17: Path analysis: Predicting overall use of digital resources in teaching

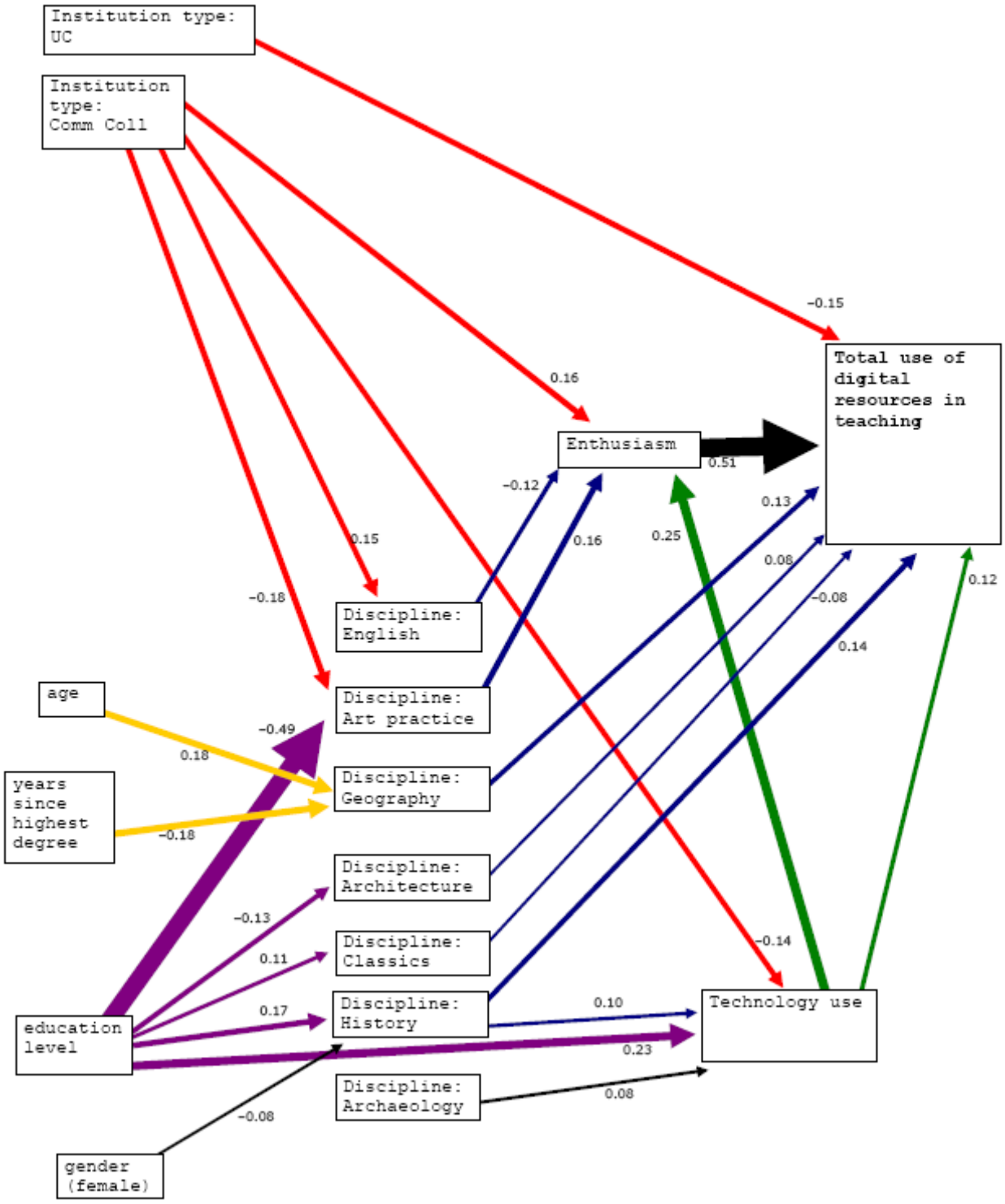
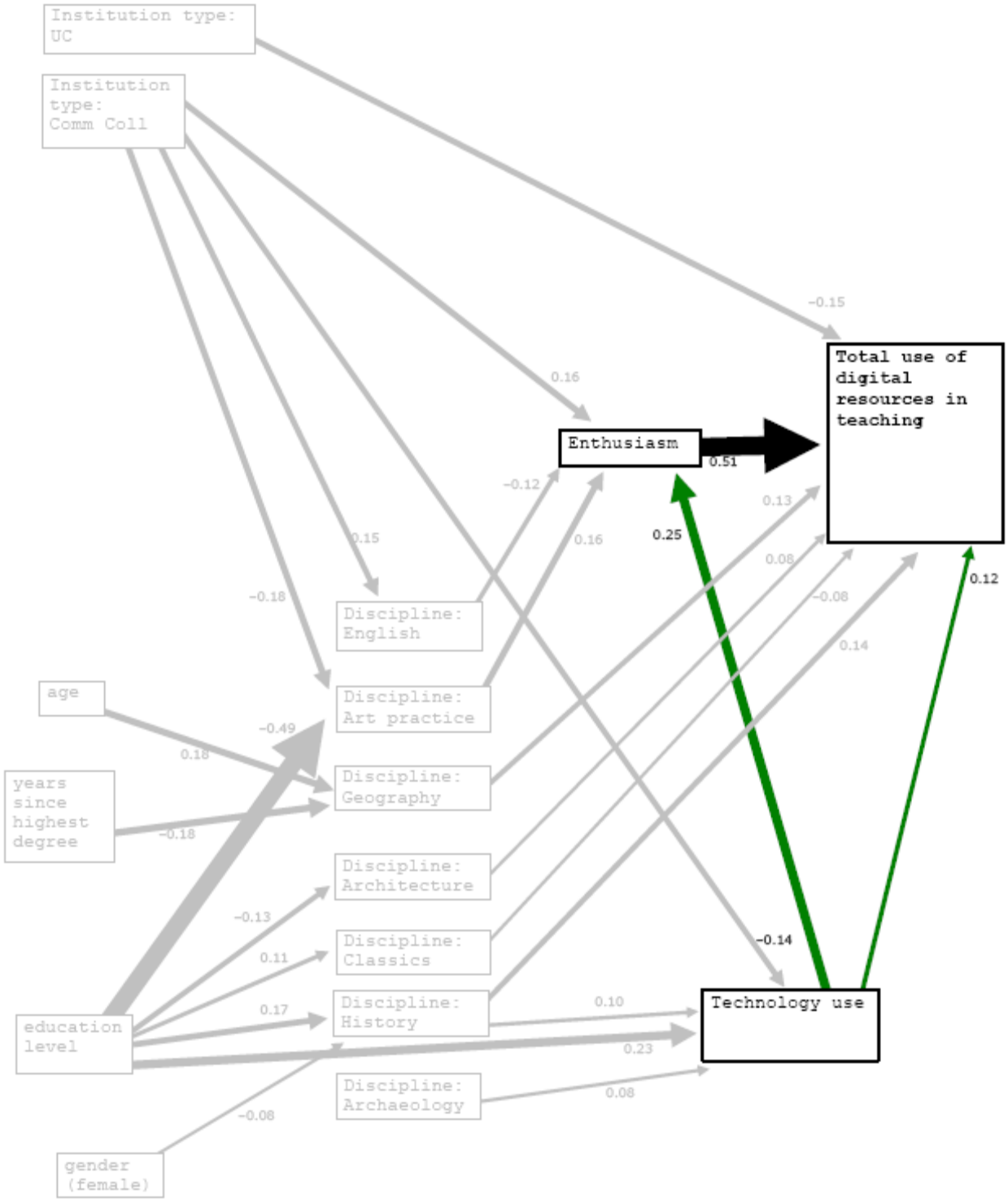


Figure 2.18: Path Analysis: Predicting overall use of digital resources in teaching (Effects of technology use highlighted)



8. Clustering and user profiling

a. Background

Cluster analysis is a method for assigning objects to groups suggested by the data rather than by *a priori* assumptions. Objects that cluster together are more similar to each other than to objects in a different cluster.

We employed cluster analysis in an attempt to simplify the organization of our data about faculty users and non-users of digital resources into meaningful and descriptive categories. We identified a preliminary and limited cast of user and non-user types from the academic community based on their patterns of use of digital resources as well as their motivations and frustrations. We also hoped that cluster analysis might uncover any hidden or latent clusters of faculty that were not immediately obvious from the summary data due to the complexity of multiple variables.

b. Methods

We generated data-based clusters, based on a large number of variables simultaneously. After assigning each observation to a cluster, we described the general characteristics shared by the members of each cluster.

A variety of clustering techniques are available, which may produce many different sets of clusters from the same observations. In addition, we could have assigned clusters based on many different combinations of variables; the number of clusters defined is also somewhat arbitrary; we could have defined more or fewer. These alternate clustering methods could have produced results that, though vastly different, would still be equally valid.

We created disjoint clusters of faculty survey respondents, with each respondent as a member of only one cluster, using hierarchical "tree clustering" based on Ward's minimum variance method (Ward 1963). We defined the clusters based on instructors' individual attitudes and behaviors and not on their institutional, disciplinary, or demographic characteristics; we defined ten clusters.

We generated clusters based on the following variables. (See page 4-16 for a more detailed description of the principal components.) We normalized variable values before clustering, to eliminate the effect of varying scales.

1) **Total amount of digital resource use**
2) **Enthusiasm about digital resources**
3) Use of personal collections –
4) What Resources People Use (5 principal component scores)
5) How People Use Digital Resources (4 principal component scores)
6) Reasons For Using or Not Using Digital Resources (8 principal component scores)
7) Barriers to Use (2 principal component scores) (We omitted barriers related to the availability of instructors' equipment, students' equipment, and high-end multimedia equipment, since they seem to be more related to the instructor's institutional setting than to individual characteristics.)
8) Activities With Which People Need Support (2 principal component scores)

We also experimented with several alternate criteria for clustering; we developed clusters based on institutional and disciplinary affiliation, individual demographics such as age, gender, and education level, amount and type of digital resource use, and other behavioral and attitudinal measures, to see whether these different clustering criteria produced similar clusters.

When disciplines or institution types group together in this clustering model, it suggests that they really do have similar needs, attitudes, or behaviors. Note that hierarchical clustering methods are not designed to provide any statistical significance measures (such as p-values). (For a more thorough introduction to cluster analysis, see Everitt, 1980).

c. Results

Our ten clusters comprised a total of 608 survey respondents. (The remaining 223 survey respondents could not be included in the model due to missing values.) A complete statistical summary of the ten clusters can be found in Appendix K.

The resultant clusters still display a great deal of intra-cluster variance. In addition, very few variables for each cluster are far from the population mean. Table 2.19 lists the characteristics of each cluster that are more than one standard deviation from the population mean; only the one characteristic that is marked with an asterisk is more than two standard deviations from the mean.

Table 2.19: Cluster analysis highlights

Cluster	Demographics, institution, and discipline	Overall use and enthusiasm	Principal components: what & how; personal collection use	Principal components: reasons, barriers, and support
1 (N=60)		Low total use; low enthusiasm	Low use of general-purpose/reference resources, of images/audiovisual resources, and of historical/primary-source materials. Low use for student projects, in-class, and web posting. Low use of personal collections	Unlikely to believe to believe that digital resources improve student learning.
2 (N=106)				
3A (N=48)	Unlikely to be from community colleges	Low total use	Low use of images and audiovisual material; low in-class use	
3B (N=95)				High need for technical support
3C (N=63)			High use for web posting	
4A (N=62)			High use of historical and primary-source materials; high use for in-class presentation	Above-average belief that that digital resources improve student learning; below-average concern for time, convenience and access
4B (N=36)	High proportion of people with bachelor's degrees or less.		Low concern about making information freely available	Few problems finding digital resources; low need for intellectual support
4C (N=68)		High total use; high enthusiasm	High use of images and audiovisual materials; high use in class and for student projects; high use of personal collections	
5A (N=48)	Predominantly female		High use of discussion and curricular materials; high use for online courses.	
5B (N=22)	High proportion from community colleges; low proportion from UC.	High total use; high enthusiasm	High use of images and audiovisual materials and of discussion and curricular materials; high use for web posting and for online courses*; high use of personal collections	Above-average belief that digital resources improve student learning; below-average concern that digital resources are not appropriate for their teaching.

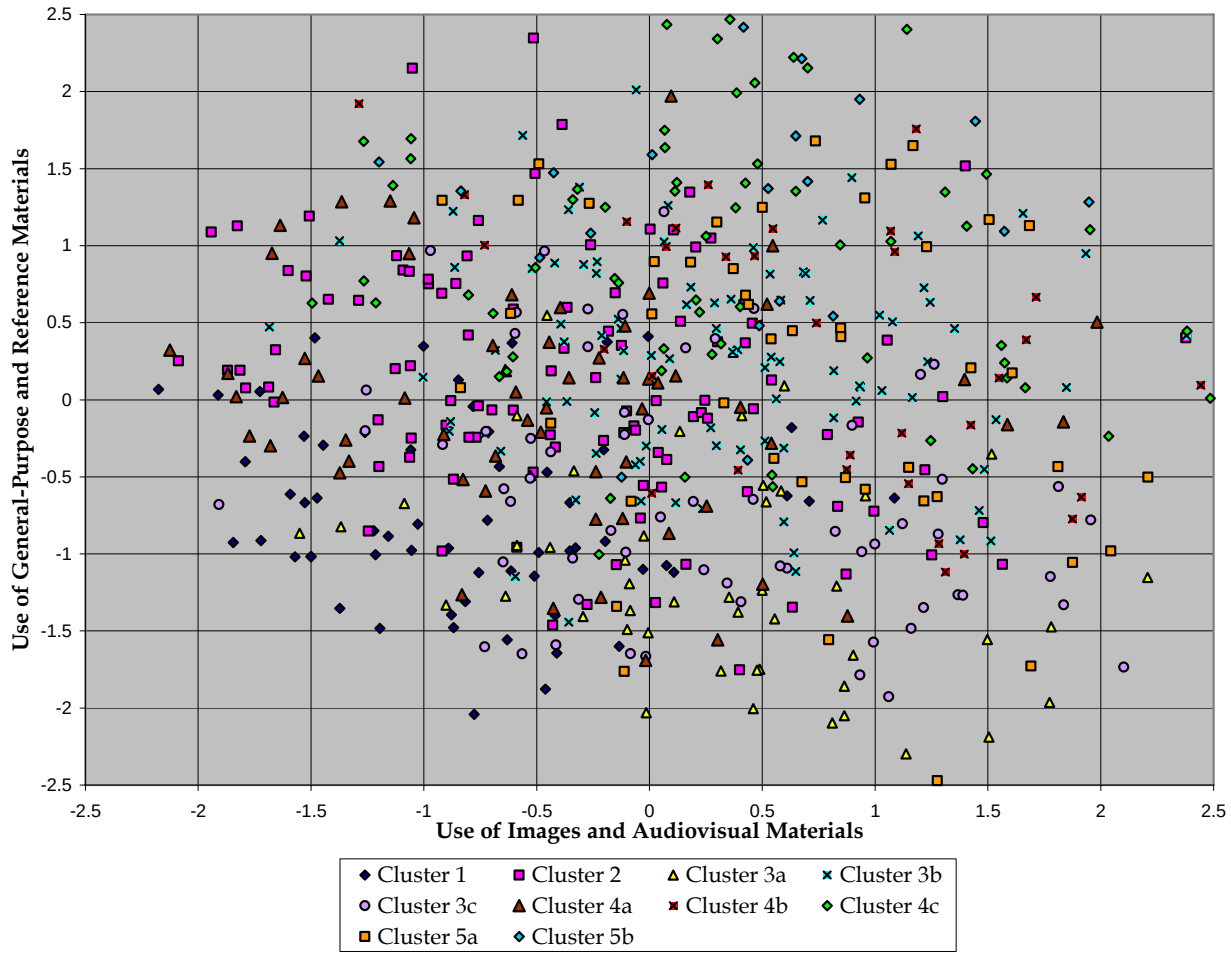
* Only the item marked with an asterisk is more than two standard deviations from the population mean.

d. Discussion

The clusters presented above may provide an alternative way to parse the survey responses. By identifying particular user groups according to multiple dimensions, we can ask, What are a particular group's needs and concerns? What group does a particular service or system best assist? How can services be tailored to the needs of particular user types?

This array of clusters is still fairly complex; because of the high degree of intra-cluster variation and scarcity of extreme values, it is difficult to pinpoint or summarize most of the clusters. As an example, Figure 2.19 displays a scatterplot of two of the principal component scores used in clustering: the use of general-purpose and reference materials and the use of images and audiovisual materials. Different clusters are marked by different colors and shapes of data points.

Figure 2.19: Scatterplot: Use of general-purpose and reference materials vs. use of images and audiovisual materials



Overall, the groups seem not to be very tightly clustered. It appears that our survey population has few natural or latent clusters, and does not naturally divide into clear and distinct "types". We observed a wide range of faculty characteristics, and these characteristics occurred in a wide variety of combinations. People in the same institution or discipline may approach digital resources with very different perspectives; those who use the same types of resources may do so in different ways or for divergent reasons; and those who are driven by similar motivations may use the resources in different ways and experience different barriers and frustrations.

When we attempted to define clusters using alternate sets of criteria, we also found groups that were only loosely clustered. Slightly different methods and criteria produced largely different groupings, with only a weak connection between the clusters defined here and those defined using different sets of criteria. This variation again suggests the lack of strong natural clusters in this sample.

In our main model, we found only a few clusters with any notable correlation to institutions or disciplines; this suggests that these particular patterns of behaviors and attitudes are more common among certain institutional or disciplinary environments. Most of the behavioral and attitudinal patterns, however, seem to be found in a wide variety of institutions and disciplines.

e. User profiling

One possible use for a cluster analysis like that presented here would be to develop user profiles or personas, which could then be used as a tool for digital resource planning or design.

By way of background, user profiling defines and categorizes a set of generalized user types (including non-users), as a method for characterizing the target population of a given digital resource or set of digital resources. Types may be derived from theoretical or policy goals that identify dimensions of interest, such as institution type, organizational context, disciplinary focus, or age of respondent. Types may also be derived from the statistical grouping of responses into clusters of relative similarity with respect to individual attributes, access requirements, information needs, tasks, and working environments. User profiling can enable developers to create resources that meet the needs of a target audience and to isolate representative user types for conferring and testing during stages of development. With the ubiquity of digital development projects, user profiling of both potential users and non-users may become a standard practice for describing use.[92]

Based on the cluster statistics above, one could describe a semi-fictional composite person who is typical of each cluster. Alternately, one could select an actual person, near the center point of each cluster, on which to base the persona. If one is planning to develop user profiles based on actual survey data, cluster analysis can help ensure that the profiles are well distributed across the range of actual user characteristics.

9. Summary of findings: Faculty survey

The complexity of the faculty survey results points to the many interacting variables that impact use. These variables include institution type, discipline, age, and faculty idiosyncrasy. In general, however, we can say that digital resources vary widely in type, purpose, and perceived value. Instructors use a dizzying range of objects, including personal collections and a mix of free and commercial resources, for a wide range of educational purposes and goals.

We see a broad spectrum of user types, ranging from the non-user, to the inexperienced, novice user, to the highly proficient and advanced user of digital resources. Non-users are themselves diverse. Often pejoratively referred to as "Luddites" by those more enamored of technology, non-users in fact include those who are passionately opposed to the use of technologies in their classroom for a variety of valid pedagogical reasons (e.g., they cannot substitute for preferred teaching approaches). Non-users also include self-described enthusiasts frustrated by technical and non-technical barriers, and those simply without enough time to think about, let alone use, technology in teaching.

[92] In Grant's study of digital cultural content evaluation publications, for example, she reports that 78 percent of her sample employed user profiling as a method for summarizing audience characteristics of a given resource (Alice Grant Consulting, 2003). Bischoff and Allen (2004) note that museums, because of their need to understand tend to break down their "visitors" into several categories when compared to libraries.

Highlights of our analyses are discussed below.

What people use and where they find resources. Our findings underscore the broad array of digital resources available to and used by faculty. Clearly, no one site has a monopoly on the educational resource domain. We were struck by the frequent use of sites not specifically designed for educational purposes (including a wide variety of news, current events, governmental, and reference resources). Faculty in our sample, like students, say they most commonly use Google-type search engines to find resources, including images. Faculty's personal collections were the second most common source of resources. Online journals and public/free image databases are also high on the list of preferred ways of locating desired resources.

Curricular materials. In light of the significant activity around the open courseware movement, we were particularly interested in what faculty said about the use of online curricular materials. Among institutions, the community colleges were slightly heavier users than other institutions (although overall use of curricular material relative to other resources was low). Among the various disciplines, foreign language, writing, art and architecture, and geography faculty are the heaviest users of curricular materials, and anthropology, literature and language, history, and political science faculty are the lowest. These findings suggest that the former disciplines may be more amenable to adopting digital curricular materials, and the latter more interested in customized products.

How resources are used. Faculty responses to questions about how resources are used suggest that resources are predominantly used in classroom presentations and assigned to students for review and research projects. Very few instructors reported using digital materials for online courses or discussions, although the former practice is more common at community colleges, and more common in a few specific disciplines (e.g., writing).

Motivations for using online resources. The most frequently cited motivations were integrating primary source material into the course, improving students' learning, providing students a context for a topic, getting students excited about a topic, allowing faculty to do new things in the classroom, and obtaining resources not available at their institution. Teaching critical thinking was lower on the list overall but highest at community colleges, as was the motivation to teach information literacy. Integrating faculty research interests was relatively important across all institution types, perhaps as a corollary to the large number of faculty who maintain their own collections.

Very few instructors felt pressured by their administration to use digital resources, and even fewer felt that it would help them get promoted or get tenure. Participants in the faculty discussion groups agreed that there were few rewards (in the form of job security, promotions and/or status in their field) to be reaped from employing digital resources.

Reasons for non use. The foremost reason faculty have for not using digital resources is that the materials simply do not support an instructor's current teaching approaches. This is an important message to those who develop tools and content and those who provide campus infrastructure to faculty. It also points to the importance of assessing faculty needs, goals, and pedagogies first, and then adapting technology to fit those needs.

A simple lack of time was a constraint on everyone, regardless of institution. Fewer faculty have serious concerns about copying (33%), plagiarism, and students' information literacy skills than we would have expected from talking with librarians and other administrators who saw these as perhaps the biggest hurdles for faculty. Information literacy was somewhat more of a concern to community colleges (39%) than to UCs or liberal arts colleges, however (27% and 25% respectively). Discussion groups and survey respondents also suggested that many faculty were jaded about keeping up with fast changing technologies.

Barriers to faculty use of resources. Overall, we can say that it is not at all easy for most of our respondents to use the mass of digital resources available to them. Faculty, including those active and enthusiastic in their use of digital resources, identified many obstacles to using these resources for teaching. They were unsatisfied both with their ability to find the resources they need and with the tools available to manage those digital resources in different contexts. The most-cited obstacles to the effective use of digital resources were the availability, reliability, and expense of the necessary equipment in the classroom. Community college instructors reported that both students and instructors had trouble with access to computers, Internet connections, and other technology.

Other major obstacles included difficulty locating high-quality, pedagogically-relevant materials from credible sources, and the sheer volume of available materials. Even when the materials were available, organizing and archiving them remained a challenge. In some cases, faculty were in a continual state of cobbling together internal and external funds to support innovative work (e.g., finding the funds for a systems administrator of new servers) because their institutions, although enthusiastic, could not provide the necessary resources.

Survey results suggest that copyright concerns are not a major barrier for most faculty—perhaps because they have given up trying to understand or comply with the law, and are going about their business the best they can. In our discussion groups, nuances of copyright and fair use eluded many faculty, irrespective of institution type; few faculty members had a clear understanding of how copyright laws applied to their use of digital collections in the classroom, despite voicing concern. Individuals (confidentially) admitted to using material and ignoring copyright issues, due to time pressure and convenience. Because of new laws and ongoing legal issues (e.g., downloading music from the web) many faculty looked to their administration for clearer guidance about their legal rights and an easy way to obtain copyright permission, although few campuses had clear policies in place.

Activities for which support or assistance is important. The most striking conclusion from the responses to this question may be that support is needed for almost everything at relatively high levels with little variation. The exception is evaluating the appropriateness and credibility of resources, which are relatively unimportant for UCs and liberal arts colleges (although they remain important to about two-thirds of community college faculty). The finding for UCs is somewhat unexpected, as we have heard from administrators that this is among the most important areas for which faculty need support.

Personal collections. Nearly three-quarters of faculty reported that they gather or maintain their own collection of digital resources. Those personal collections were the second-leading source of such resources (behind only search engines). We suspect in many cases that scholarly practice is linked tightly to pedagogical approach in various sectors of humanities and social

science teaching, leading many faculty to place a high value on integrating their own resources and research into their teaching practice.

As Borgman (2003) has suggested, the ability to create personal digital libraries, which allow the integration of resources from diverse sources for reuse, is a need that most users will have at one time or another. This finding corresponds with Penn State's *Visual Image User Study* (Pisciotta *et al.*, 2002), the work of UC's California Digital Library (Farley, 2004), and ARTstor's research (Roger Schonfeld, personal communication), all of which found extensive use of personal digital collections among their institutions' faculty as well as a desire to have tools that allow easy integration of those resources with other software and systems.

Beagrie (2005) sees the use of personal collections increasing and discusses the challenges of managing these growing collections. A variety of tools are being developed to assist faculty with organizing and maintaining their collections, and institutions are experimenting with ways to assist in this endeavor. Additionally, a number of institutions are beginning to grapple with how their faculty can share their personal collections with colleagues (Farley, 2004), perhaps by reaggregating these collections into institutional repositories. Our work suggests that the feasibility of such sharing is an open question (Harley *et al.*, 2003). Although many faculty members in our survey expressed an interest in sharing their materials with others, somewhat fewer seemed interested in using others' collections.[93] (On the H-Net survey, where we asked more detailed questions, more than three-quarters of instructors used their own personal digital collections while fewer than one-third used a colleague's.)

The centrality of personal collections represents a significant challenge in the design of online resources. For example, many online databases, repositories, and content-management systems assume that users will store or manipulate digital resources online within the context of that particular system; our research suggests that in fact this is not how faculty typically work. That is, faculty have an aversion to learning new systems, and identify "easy" as the most important quality in a digital resource or tool. Proprietary systems that keep the content "locked up" in various ways for intellectual property reasons also pose a barrier to faculty work practices, making it difficult for users to reaggregate, manipulate, and organize the materials. Difficulty tracking down the original source of these personal materials, and ascertaining their copyright status, is a nontrivial challenge for institutions.

Disciplinary differences: The variation in responses among disciplines demonstrates again that the humanities and social sciences are not a monolith regarding how different resources are valued and what motivates faculty to use them. The findings suggest some caution is warranted when generalizing about the importance of any one type of resource for the higher education community. For example, faculty who use texts extensively may depend on different kinds of sources, for different pedagogical goals, than those in more traditionally "image-centric" disciplines. Political scientists, contrary to the aggregate, are not heavy users of images. Maps, historical documents, and primary source materials are heavily used by historians, anthropologists and archaeologists, as well as by geographers, but less so by writing instructors and those in English and foreign languages.

As reinforced in our discussion groups, those in art and architecture appear to have different profiles than their colleagues in other disciplines, including a tendency to use resources for

[93] Approximately 72 percent of faculty said they maintained a personal collection but only 27 percent said they make their material available to others online.

student assignments and as a way to save time. Those who teach subjects that require three-dimensional visualization and/or historical reconstruction may need particularly sophisticated resources and tools, and the support that such applications demand.

Even instructors who use similar resources may use them in very different ways and have different needs and concerns. Use of images is widespread across a variety of disciplines; however there remains variation in the types and quality of images needed, how they are used, and an instructor's specific needs in selecting them. The result is that an image database designed to serve art history instructors may not meet the needs of historians or language instructors. The latter have lower expectations regarding resolution and detail, and may not want to be bothered with high levels of complexity that often accompany sophisticated image databases.

Heavy users, light users, and non-users. When analyzed by level of use, our data suggest that both light and heavy users face challenges and need support—but their needs differ. The difference in barriers and support among light and heavy users' needs suggests a model of "sequential hurdles." Advanced or heavy users are not as bothered by the issues that trouble beginners (finding, organizing, and assessing content), but *not* because these issues don't apply to them; rather, the advanced users have already successfully dealt with these issues and surmounted these barriers to reach their current level of usage. Only after they've solved these more basic problems do the more advanced issues become relevant.

Finally, the survey data suggest that what people (university administrators or technical support staff) think they know about faculty will depend on whom they talk to. Needs, opinions, and behavior vary in crucial ways by age, discipline, and institution; the needs expressed by one group of faculty are unlikely to match those from a different discipline, age group, or experience level. Such variation in user needs may make one-size-fits-all programs or resources unlikely to serve the wide range of potential users. If institutional educational-technology or library-support programs are geared to either the "mean" or the most extreme outliers (or the most vocal constituencies), it is likely that many users and potential users will be dissatisfied or underserved.

GOAL 2B: TRANSACTION LOG ANALYSIS AND WEBSITE SURVEYS

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A. Introduction

This analysis focuses on evaluating methods for tracking actual site usage. Specifically, we conducted a pilot test on two local sites, using a combination of server transaction log analysis (TLA) and online surveys to determine if and how these methods can elucidate patterns of use of digital resources. Our charge was *not* to generalize our findings about users of targeted sites. We only analyzed the efficacy and efficiency of TLA and online site surveys as methods for understanding use generally.

Transaction log analysis is a widely used (or at least widely discussed) method for studying the usage of particular websites. It is a particularly valuable method because the usage data are collected automatically and passively; the method records actual behavior rather than relying on self-reports. Many sites also use web-based surveys, either alone or in combination with transaction log analysis, to learn more about their users. Surveys can be used to create a richer profile of the site's visitors and their attitudes, behavior, and motivations.

Although these two methods are widely used, there seems to be little consensus about the best way to implement them and to report the results (Troll Covey, 2002; Mento and Rapple, 2003). This lack of consensus makes it difficult to interpret statistics for different sites and to compare one site with another. Both TLA and online surveys can be time-consuming and labor-intensive and unless research and analysis methods are sound, the results may be ambiguous or even misleading. Our goal is to explore methods that are effective, efficient, and yield high-quality, reliable results that assist site owners in practical decision making.

Because TLA and online surveys explore slightly different aspects of a site's use and users, they can be complementary tools, and the combination of the two may allow a deeper understanding of a site's use than either alone. In this study, we set out to explore the benefits and challenges of these two user research methods by pilot testing their efficacy on two specific websites.

By way of providing context, we first provide an overview of these two methods, including their key challenges and limitations, such as the inability of TLA to identify individual users, and the difficulty in obtaining adequate response rates to online surveys. Some challenges, such as respect for users' privacy and confidentiality, are a particular concern for educational and non-profit organizations.

We then describe a pilot implementation of TLA and online surveys in combination on two local sites, and the results of that pilot test. From that pilot test, we draw conclusions about the utility of these two methods, and which particular analysitic methods may provide the most valuable and efficient results.

1. Studying the users of specific online resources

As discussed above, studying a website's users can provide information to help a content provider improve an online service or create new resources to meet emerging needs. Interviews

with site owners suggest a significant (and often unsatisfied) desire for a richer and more complete understanding of the site's users and potential users. This knowledge can be a useful tool for a site owner or developer's strategic decision-making, by helping them make optimal use of scarce resources.

Studying a particular site's users may provide insight into the following:

- User demographics
- User needs and motivations
- User preferences
- Resource utilization levels within a particular timeframe
- Changes in usage over time
- Details of user interaction with existing materials
- Levels of repeat use
- Users' assessment of site usefulness.

B. Background

1. Transaction log analysis

Transaction log analysis (TLA) takes advantage of the computerized log files that automatically record online access to any website (see sidebar). By analyzing these logs, one can determine a number of characteristics of the site's users and summarize total site use. TLA is rare among research methods in that it allows the researcher to measure the actual online behavior of a site's users, rather than relying solely on self-reports.

Our research has employed available expertise and related projects to explore a set of practical methods for TLA that are compatible with different types of library and non-library collections. According to a recent CLIR publication, there are significant challenges to assessing the use and usability of digital collections through transaction log analysis (Troll Covey, 2002).

- Because the logs identify only the client computer, it is usually not possible to identify individual users or track them over time. It can be difficult to determine which log records are associated with the same user. The user's IP address is often used as a proxy for a user identifier, but the IP address is not a perfect identifier in all cases:
    - The same user may visit a site from several IP addresses. People with dial-up connections or on other types of networks will have dynamically assigned IP addresses that vary from session to session, or even within a session.

  - Several users may share one IP address. A public library or campus terminal may be used by many users to access a site. Also, small networks frequently share one IP address, so different users on different computers may still appear to originate from a single IP address.
- Each IP address can be associated with a particular hostname, but the IP address (or even the hostname) may not reveal anything of interest about the actual person.
- Analyses may attempt to use hostnames to identify characteristics of individual users, such as their country of origin, educational status, or institutional affiliation. However, these analyses can be unreliable or even misleading:
  - Researchers may attempt to identify users from colleges and universities by looking for hits from .edu domains. However, many educational users rely on commercial dialup for home access, where the commercial IP address has no bearing on the user's educational status.
  - Hostnames can be used to attempt to locate users geographically, particularly for hits from international (country code) domains. However, most users still originate from generic top-level domains (without country codes), which are difficult or impossible to pinpoint geographically based on the hostname or IP address alone.
  - In addition, hostname lookup may not be 100 percent reliable, due to incomplete or out-of-date DNS records; these records may be less reliable for international domains.
- Other, more advanced geolocation techniques exist and have improved dramatically since the 1990s, but they can be quite expensive and are still not 100 percent accurate. MIT's OpenCourseWare analysis used the Akamai service to help locate its users geographically (Carson, 2004).

What is a web transaction log?

Web transaction logs (or access logs) are recorded automatically by web server software every time a file is requested. A separate entry is made for every file request, including HTML pages, images, style sheets, script files, PDF documents, and other types of files. Each log entry will typically include the following items:

- The IP address or hostname of the computer requesting the file (the user's computer)
- The username, if authentication is required (if the user had to enter a login and password to access the file)
- The date and time of the request
- The method (GET or POST)
- The filename requested
- The version of HTTP used by the client's browser
- HTTP response code (indicating whether the file was successfully retrieved, and if not, what error message was returned)
- The number of bytes transferred
- The referrer (the URL from which the file was requested; e.g., the page from which the user clicked on a link to reach the requested page)
- The client's user agent (which identifies the user's browser and operating system and also identifies if the file was requested by a robot or automatic web crawler)
- Cookies included with the request, if applicable.

A web server will also generally be configured to create an error log, which records every time an error message is returned; other software, such as Internet search engines, may have their own specialized logging system (e.g., recording which searches were performed). We analyzed only standard user access web logs, because they are so consistent from site to site, and because they contain important information about site usage.

- Proxy servers limit the reliability of server logs: if the requested page is in the proxy server's cache, the web server will not be contacted, and will have no record of that access.
- Not all web browser events are logged by the web server. For example, the web server is generally oblivious to the user pressing the back button, because the page will be reloaded from the web browser's cache. Even though hours may pass, when a user re-visits a site later, that site may still be loaded from the browser cache instead of the website, effectively evading logging. Other events such as scrolling the window, switching applications, and periods of computer inactivity are also not logged.
- Cookies can serve as a better user identifier than an IP address, but while every Internet user has a relatively inflexible IP address, users can control the cookies you place on their system (and many users block cookies). For example, a cookie can be copied to other computers, deleted, or systematically modified by users for their own purposes, all of which will impact logging.
- More advanced TLA techniques (using some high-end analysis tools) may require extensive site modifications. Many commercial packages require the placement of a special HTML tag on each page to facilitate the software's best features. Other techniques require JavaScript code embedded in the site's pages or invisible Macromedia Flash files which set Flash "cookies." These modifications require considerable expertise and place an additional burden on the site designer or manager, particularly for small or understaffed organizations.

Sample web server transaction log

```
169.229.132.204 - - [10/Feb/2004:12:20:48 -
0800]  GET / HTTP/1.1  304 -  -   Mozilla/5.0
(Windows; U; Windows NT 5.1; en-US; rv:1.0.2)
Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:10 -
0800]  GET / HTTP/1.1  200 4991  -
Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US;
rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:15 -
0800]  GET /site_styles.css HTTP/1.1  200 3318
http://digitalresourcestudy.berkeley.edu/
Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US;
rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:15 -
0800]  GET /title-text-only.gif HTTP/1.1  200
2586  http://digitalresourcestudy.berkeley.edu/
Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US;
rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:16 -
0800]  GET /title-bg2_r1_c1.gif HTTP/1.1  200
6534  http://digitalresourcestudy.berkeley.edu/
Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US;
rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:16 -
0800]  GET /title-bg2_r1_c2.gif HTTP/1.1  200
25119
http://digitalresourcestudy.berkeley.edu/
Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US;
rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:26 -
0800]  GET /index.html HTTP/1.1  200 4991
http://digitalresourcestudy.berkeley.edu/
Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US;
rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:28 -
0800]  GET /about.html HTTP/1.1  200 6051
http://digitalresourcestudy.berkeley.edu/index.
html   Mozilla/5.0 (Windows; U; Windows NT 5.1;
en-US; rv:1.0.2) Gecko/20030208 Netscape/7.02

169.229.132.204 - - [10/Feb/2004:12:32:29 -
0800]  GET /docs.html HTTP/1.1  200 3172
http://digitalresourcestudy.berkeley.edu/about.
html   Mozilla/5.0 (Windows; U; Windows NT 5.1;
en-US; rv:1.0.2) Gecko/20030208 Netscape/7.02
```

(NCSA Combined Log Format, generated by the Apache 2.0.x web server. Other log formats exist, including the W3C Extended Log Format used my Microsoft IIS. The two formats contain similar information, formatted differently.)

Despite all of these challenges and limitations, transaction log analysis still has two major advantages over most other user research methods. First, it captures the actual behavior of real users in their own real-use environments; it does not rely on biased self-reports or artificial, laboratory-based use scenarios. Second, because TLA records behavior passively without requiring users' active participation, it can capture a much broader spectrum of uses and users than can surveys, focus groups, or other methods. These advantages make TLA a worthwhile user research methodology, in spite of the challenges.

2. Privacy and confidentiality

Issues relating to privacy and confidentiality can be a concern when performing TLA; these concerns may be better defined at educational or non-profit institutions than in the private sector. Colleges and universities have traditionally had much higher standards for protecting individual privacy than have commercial institutions. Libraries in particular tend to have strict policies protecting their patrons' privacy, both on and offline. While commercial websites may be specifically designed to track individual browsing behavior (by requiring registration and login, or by using cookies), academic websites will rarely use these same techniques. Even anonymous log data may be more tightly controlled because of privacy concerns.

For a variety of reasons (including unease with provisions of the USA PATRIOT Act that particularly target libraries), such institutions often have well-developed policies for protecting (or destroying) any identifying information about their patrons. Unfortunately, there is very little clarity about how these policies apply to online transactions or to user logs. At the most basic level, it is unclear whether transaction logs (and IP addresses in particular) should be considered "identifying information." (An IP address is not necessarily associated with an individual; even when it is, it is rarely possible to determine who the person is.) At some institutions, transaction log data can be used for internal analyses but not shared with external research partners.

3. Online surveys

In the past decade, web-based surveys have become more widespread, for a variety of reasons (Fricker and Schonlau, 2002; Gunn, 2002). Online surveys provide some cost and convenience advantages over other survey modes, but they also raise some problems that warrant careful consideration.

Online surveys can take a variety of forms. Surveys can be administered online as part of a traditional, well-developed survey methodology involving a defined population of interest, an explicit sampling method for generating a representative sample, a well-thought-out recruitment strategy, carefully calculated response rates, and statistical estimates of the likelihood of response bias.

Increasingly, however, online surveys are posted on a website and made available to anyone who happens upon them. These surveys rarely have a defined population or sampling method; with no way of tracking those who do or don't complete the survey, it is often impossible to report a response rate or estimate response bias.

When one designs a survey instrument for online administration, a variety of new options are available for question structure, layout, and design (Gunn, 2002; Schonlau *et al.,* 2002; Faas, 2004). Important issues in instrument design include question wording, survey navigation and flow, skip patterns, survey length, and the graphical layout of the instrument. Computerization allows the design of more complicated skip patterns and question randomization. Additionally, it is possible to program automatic data checks and verification to disallow the entry of inconsistent responses.

The automation of data collection and analysis can result in an economy of scale, making web-based surveys much more cost efficient, especially for large sample sizes. Automation can also

mean that data (and basic analyses) are available in a much shorter timeframe—even instantaneously.

An online survey can be a valuable complement to transaction log analysis for studying the use and users of a website; while TLA can reveal users' actual online behavior and usage patterns, surveys can reveal users' motivations, goals, attitudes, and satisfaction levels.

A more detailed exploration of techniques for survey design, administration, and analysis can be found in Rossi, Wright, and Anderson (1983) and Fowler (2002).

a. Survey response rates

Survey response rates are an important concern, as rates for all types of surveys have been on the decline since the 1990s (Johnson and Owens, 2003; Baruch, 1999). Evidence suggests that response rates for online surveys are lower than for other media and continue to shrink (Fricker and Schonlau, 2002).

Measuring response rates is a particular challenge for web-based surveys, partly because of the tricky definition of "response." Bosnjak and Tuten (2001) identify seven distinct response types, including lurkers (who view a survey without responding), drop-outs (who complete the beginning of a survey without continuing), item non-responders (who omit individual questions), and complete non-responders.

To boost response rates, various rewards can be offered to increase participant motivation. The use of rewards and incentives can introduce response bias, however, as the people who are motivated to respond by a specific reward may not be representative of the whole study population.

In traditional social science survey research, sampling methods are designed to ensure that the survey respondents are representative of the population of interest. If the sample is representative and the response rate is high, the survey results can shed light on the characteristics of the population. If, on the other hand, response rates are low or the sample is known to be non-representative, it is possible—even likely—that the survey results will be misleading. (Note that a large response rate alone is no guarantee that the respondents are representative.)

However, sampling techniques and the measurement of response rates are a particular challenge when a survey is posted online and made available to any web user anonymously, without active recruitment or sampling. In such an environment, the population of users and the characteristics of the respondents are essentially unknown, making it difficult to report response rates and even more difficult to estimate the survey's response bias. The lack of knowledge of the complete population also makes it difficult to design appropriate sampling frames.

Most basic statistics texts and guides to survey practice devote considerable space to a discussion of sampling. Minimizing sampling bias requires the use of proper sampling techniques—decisions made by the researcher about the subset of the population to whom the survey will be administered. Discussions of sampling techniques and analyses typically assume that the sample will be a small subset of the population and that the survey response rate will

be quite high—two assumptions that are becoming less justified. In the world of online surveys, it may be economically feasible to offer the survey to most or all of the population of interest. (In our pilot tests, we presented the surveys to 100 percent of the relevant populations.) At the same time, response rates within that sample are often vanishingly small.

In this increasingly common scenario, sampling bias (the effect of the researchers' decisions about survey targets) has become less important, and non-response bias (the effects of individuals' decisions about whether to respond to the survey) is paramount. Unfortunately, the statistical literature (at least that accessible to the non-specialist) has provided very little guidance about how to deal with these challenges. Even the language and terminology of sampling can be unhelpful; the term "sample" sometimes refers to the people who are presented with the survey and sometimes to those who actually respond. In online settings, low response rates and self-selection bias may be unavoidable, since researchers may have no way to follow up with prospective subjects and no way to encourage their participation. Below, we propose a methodology for assessing response rates and response bias using the combination of online surveys and analysis of server transaction logs. (See page 5-20.)

C. Pilot testing

We conducted a pilot test on two local sites, using a combination of TLA and online surveys to determine if and how these methods can elucidate patterns of use among different types of institutions.

Through the pilot tests, we explored the ease and efficiency of implementing these two methods on specific sites; we also attempted to identify the specific questions, analyses, and techniques that would provide the most useful information for understanding and comparing the usage of the sites.

Given the enormous amounts of data that can be gleaned from transaction logs, we limited the range of possible TLA data to collect. We focused on a few key usage measures, including overall volume of site usage, domain name/IP address of users, user geography (based on hostnames), analysis of originating pages, and tracking of visitor persistence based on IP addresses. We believe that these measures may provide a relatively robust picture of actual collection usage using a straightforward, repeatable methodology.

We selected two sites for our analysis:

SPIRO[94]: The SPIRO website provides online access to the UC Berkeley Architecture Department slide library and comprises over 63,000 images (about 20% of the library's physical holdings). Images are cataloged by historical period, geographic location, object name, personal name, and subject using a variety of controlled vocabularies, including the Getty Trust's Art and Architecture Thesaurus. (The site includes lists of the metadata used for cataloging.) SPIRO's web interface supports advanced searching on any or all of these access points, but it does not support easy browsing of individual database items. (A side effect of the absence of a browsing interface is that the individual images and their metadata are not indexed by the major search engines.) This interface seems well suited to reference librarians and others who

[94] http://www.mip.berkeley.edu/spiro

know precisely the data they seek; it may be less helpful for a person who is less familiar with the subject area or with the collection.

The Jack London Collection[95]: The Jack London Collection features a wide variety of resources about the early-twentieth-century American author. The site includes the full text of nearly all of London's novels, short stories, and other writings; 113 images; a variety of biographical materials; facsimiles of his original correspondence; a range of curricular materials for teachers and students, mostly at the high school level; and links to related sites with further information. The collection can be accessed by browsing (and therefore can be indexed by search engines) as well as by searching. The user interface seems accessible and understandable to both novices and experts and seems designed with high school and college students in mind.

We placed short surveys on the homepages of both sites and analyzed the survey results in combination with the transaction logs from the same period. The survey instrument can be found in Appendix N.

D. Software comparison and selection

One major goal of this project was to evaluate the appropriateness of different software tools for performing TLA on digital resource collections. In addition to examining existing software options, we examined whether it would be more efficient and effective to develop our own analysis software tools and methods.

Our requirements were that the system be able to (1) handle the large volume of log data generated by our targeted digital collections, and (2) provide the detail and flexibility required by our analysis plan (below).

A number of software packages exist for performing TLA. We evaluated several free and commercial packages for use on our pilot tests and for their suitability for TLA in other situations. We compared six widely used tools: three free packages (AWStats , Analog, and Webalizer) and three commercial packages (Wusage, Urchin, and WebTrends) that range from inexpensive to high-end enterprise-level systems. Details about the various features of the different packages are available in Appendix M. In general, greater power and flexibility come at the cost of increased complexity, decreased ease-of-use, and higher price.

Because our methodology entailed experimenting with a variety of non-standard analyses—including the combination of survey and log data—we were unable to find any packages with the power and flexibility that we required. Many commercial analysis packages assume an established methodology and are not as flexible and customizable as we required.

Instead, we developed our own customizable transaction-log-analysis package. We used a series of Perl scripts to clean and transform the raw logs; the logs were then imported into a normalized database in a standard RDBMS system; a series of database queries were then used to produce the analyses of interest. We also evaluated the strengths and weaknesses of this custom-developed system, compared with the more widely available options.

[95] http://sunsite.berkeley.edu/London

E. Data processing

We performed initial data processing to prepare the transaction logs for analysis. First, we performed DNS reverse resolution to convert each logged IP address (e.g., "169.229.132.204") to a hostname (e.g., "csse11.berkeley.edu"). For a variety of reasons, some IP addresses could not be resolved to a hostname (perhaps due to a misconfiguration of the user's ISP); these IP addresses were still uniquely identified, but we were unable to analyze their hostname information. From the pilot sites' logs, about one-fourth of IP addresses were unresolved.

We then identified browsing sessions, which we defined as a series of page requests from the same IP address and user agent, without thirty consecutive minutes of inactivity.[96] For analysis purposes, we divided the files accessed into "pages" (HTML files) and "non-pages" (images, stylesheets, scripts, PDF files, etc.). We retained records for unsuccessful requests (errors such as "page not found"), but did not include these in our analyses. We also excluded from our analysis hits from known "spiders" or "robots" (automated programs which "crawl" the web to create search engine indexes).

For each of the pilot sites, we combined the site transaction logs with the survey response database, linking each survey response with the respondent's session in the transaction log. Finally, we converted the log and survey data into a relational database (PostgreSQL), which we accessed with a statistical analysis package (SAS) to perform our analyses. Table 3.1 shows the file size and processing time required for each pilot site.

For one of our pilot test sites, the data processing procedure was complicated by the organization's privacy and confidentiality concerns. In response to these concerns, we developed a method for "anonymizing" the transaction logs; this "anonymization" may have had a small effect on the reliability of the results.[97]

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[96] The combination of IP address and user agent is able to disambiguate some situations where multiple users share a single IP address.

[97] Privacy and confidentiality issues had a direct effect on our pilot tests. Reluctance to share raw user logs for fear of identifying individual users and the evolving and fluid nature of specific policies for such sharing created considerable challenges for us as third-party researchers. We settled on a compromise methodology for one site: we developed a method for "anonymizing" the user logs by partially randomizing the IP address. The modified logs allowed us to identify each user's Class C address (the first three numbers of the IP address) but not the exact computer. The pilot site's manager performed the "anonymization" before providing us with the logs. We believe that in most cases this didn't affect our identification of the user's domain.

This "anonymization" process had several implications on our TLA results for this site. The "anonymization" probably decreased the accuracy of the IP-address-to-hostname conversion, resulting in some misidentified hostnames. To estimate the number of misidentified hostnames, we ran the anonymization process twice more to see how often the results agreed. Based on this simulation, we estimate that anonymization resulted in an incorrect hostname approximately 6 percent of the time.

A mid-study policy shift interfered with matching survey responses to log data. We were forced to use timestamps to reconstruct the mapping. The global DNS database, which we relied on for hostname resolution, is a bit of a "moving target," as IP addresses and hostnames are changed over time. Because of the lag time as a solution developed, the DNS database had experienced several months of changes; as a result, we had more unresolved addresses (and presumably more misidentifications) than we would have if we had performed the lookup more promptly. To estimate the speed at which DNS changes, we resolved the same IP addresses again approximately six months later; we found that for both sites the number of IP addresses which could not be resolved to a hostname increased by 20 percent over the time period. Many of these issues would have been moot if we had been analyzing our own data, rather than obtaining logs from a partner organization.

Table 3.1: TLA data processing summary

	SPIRO	Jack London
Raw log file size	214 MB	315 MB
Number of lines	885,173	1,425,273
Running time[98]	~1 hour	~3 hours

F. Pilot test results

In this section, we present the combined results of the online surveys and the transaction log analysis conducted on both pilot test sites. For each major set of research questions, we detail the specific metrics and analysis strategies that seem to provide the best insight into the sites' users and usage.

Table 3.2 summarizes the analysis of the two sets of transaction logs.

[98] Postgres 7.3.x on 1x1.8GHz P4 Xeon, 1GB RAM, 10K RPM SCSI storage.

Table 3.2: Transaction log analysis results summary

	SPIRO	Jack London
Logging period	April 1, 2004 – May 31, 2004 (61 days)	March 27, 2004 – May 28, 2004 (63 days)
Number of sessions	54,375	145,956
Number of unique IP addresses	38,962	97,284
Number of sessions per IP address (mean ± SD)	1.4 ± 4.45	1.5 ± 2.71
Session length:		
Minimum	0 sec	0 sec
Q1	0 sec	0 sec
Median	1 sec	2 sec
Q3	30 sec	113 sec
Maximum	4,837 sec	5,320 sec
Session entry-points:		
Home page	30%	23%
Internal page ("deep linking")	70%	77%
User persistence (by session):		
First-time users	89%	83%
Repeat users	11%	17%
User hostnames:		
.com	18%	19%
.net	25%	24%
.org	1%	1%
.edu	9%	2%
International TLDs	22%	11%
Unknown/unresolved	25%	43%
Referrers		
Search engines	26%	31%
berkeley.edu pages	30%	29%
Other .edu pages	2%	5%
Other	25%	10%
Not provided	18%	24%

Table 3.3: Survey responses

	SPIRO	Jack London
Which title best describes you?	**N=106**	**N=433**
University/college instructor/professor	26 (25%)	32 (7%)
Undergraduate student	14 (13%)	76 (18%)
Graduate student	15 (14%)	31 (7%)
Independent researcher/scholar	11 (10%)	49 (11%)
Librarian	15 (14%)	10 (2%)
K–12 instructor	5 (5%)	22 (5%)
K–12 student	5 (5%)	154 (36%)
Other	15 (14%)	59 (14%)
For what purposes do you use the Jack London site? (Check all that apply.) [99]	**N=58**	**N=235**
Conducting research	19 (33%)	113 (48%)
Creating presentations, including lectures	10 (17%)	31 (13%)
Developing teaching materials	15 (26%)	23 (10%)
Making my own collection of digital resources	6 (10%)	15 (6%)
Other	8 (14%)	53 (23%)
How often do you use the Jack London site?	**N=45**	**N=196**
Today is my first time	30 (67%)	145 (74%)
Daily	2 (4%)	5 (3%)
Weekly	6 (13%)	5 (3%)
Monthly	3 (7%)	15 (8%)
Every six months	2 (4%)	7 (4%)
Once a year	0 (0%)	1 (1%)
Less than once a year	1 (2%)	3 (2%)
Other	1 (2%)	15 (8%)
Where are you accessing the site from now?	**N=45**	**N=192**
Home	21 (47%)	121 (63%)
Dormitory	0 (0%)	5 (3%)
On campus office/lab	7 (16%)	17 (9%)
Library	6 (13%)	12 (6%)
Office/lab	7 (16%)	21 (11%)
Other	4 (9%)	16 (8%)

[99] Percentages may not total 100% due to multiple selections; respondents were allowed to check multiple checkboxes.

	SPIRO	Jack London
How often do you do the following activities on the Jack London site? (check all that apply) [100]	**N=47**	**N=203**
Find text	7 (15%)	89 (44%)
Download text	3 (6%)	53 (26%)
Find images	19 (40%)	55 (27%)
Download images[101]	20 (43%)	34 (17%)
Find images to license	3 (6%)	19 (9%)
Browse to see what's available	18 (38%)	85 (42%)
Use the site as a reference tool to verify citations	10 (21%)	58 (29%)
Other	2 (4%)	12 (6%)
What is your affiliation?	**N=40**	**N=167**
Research university	25 (63%)	11 (7%)
4-year college	4 (10%)	25 (15%)
Community college	0 (0%)	6 (4%)
High School	1 (3%)	49 (29%)
Elementary or middle school	4 (10%)	30 (18%)
Library	2 (5%)	2 (1%)
Museum	0 (0%)	0 (0%)
Governmental agency	0 (0%)	6 (4%)
Business	0 (0%)	6 (4%)
Other	4 (10%)	32 (19%)

1. Who are the users?

Tables 3.2 and 3.3 give some indication of who is using each site. Survey respondents from the Jack London site were primarily K–12 students and teachers; those from SPIRO were primarily affiliated with colleges and universities.

The survey responses also suggest that the overwhelming majority of site users consists of irregular or occasional users rather than regular users. This corresponds with the TLA results from Table 3.2, which indicate that the majority of users are first-time rather that repeat visitors (at least during the logging time period).

2. Usage over time

Figures 3.1 and 3.2 show site traffic over time for both pilot sites. Note the dips in usage during week 1 (which corresponded to spring break for UC Berkeley and many other colleges) and during week 3 (spring break for many local primary and secondary schools). The two sites follow similar trends, but Jack London usage is more affected by the high school spring break. Figure 3.3 shows files per session for each week of the study, which may give us a sense of the intensity or qualitative type of use of each site over time. Files-per-session holds fairly constant

[100] Percentages may not total 100% due to multiple selections; respondents were allowed to check multiple checkboxes.

[101] This question was made more specific for SPIRO to distinguish between thumbnails and full-size images. The frequency reported for SPIRO has been aggregated.

for the Jack London site; at SPIRO, on the other hand, sessions during weeks 7 and 8 included a notably greater number of files. This time period roughly corresponds to UC Berkeley's final exams. The parallels between SPIRO's usage and UC Berkeley's academic calendar suggest that Berkeley coursework accounts for a large portion of SPIRO's usage. The elevated number of files per session during final exams (Figure 3.3) suggests that usage during this period is not just greater, it is also qualitatively different. The typical usage session during exams is more intensive, involving more files and covering a broader range of material.

Figure 3.1: Jack London traffic (site visitors per week)

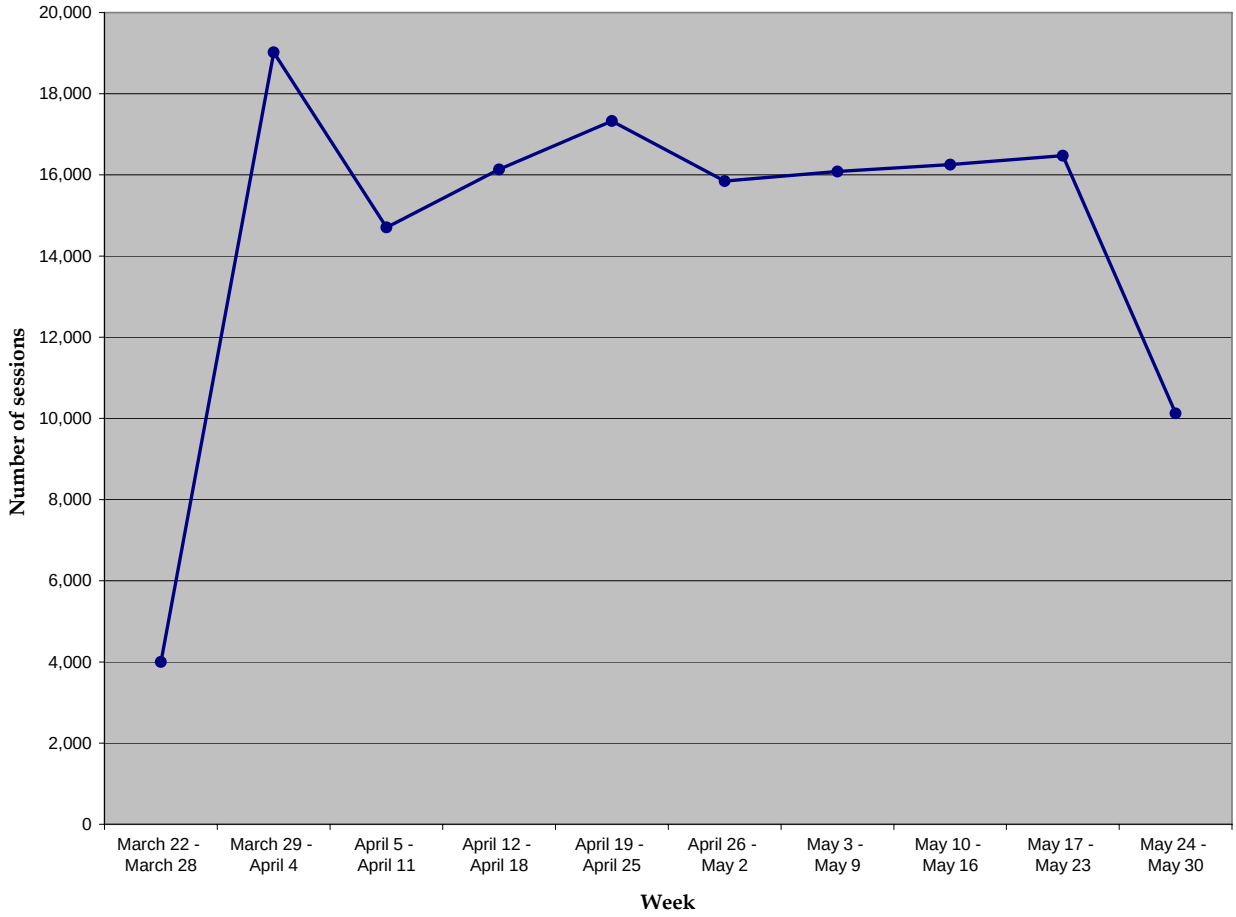


Figure 3.2: SPIRO traffic

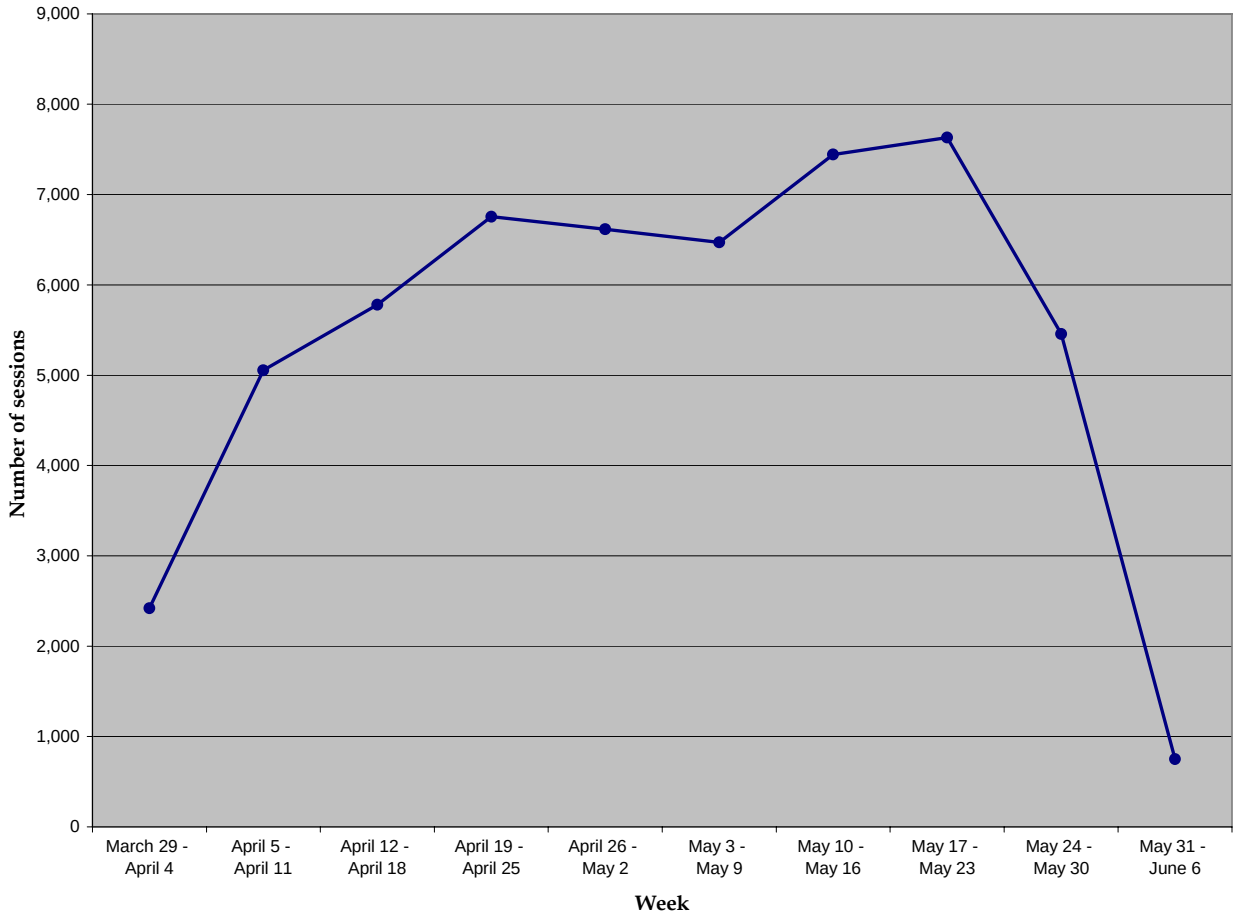
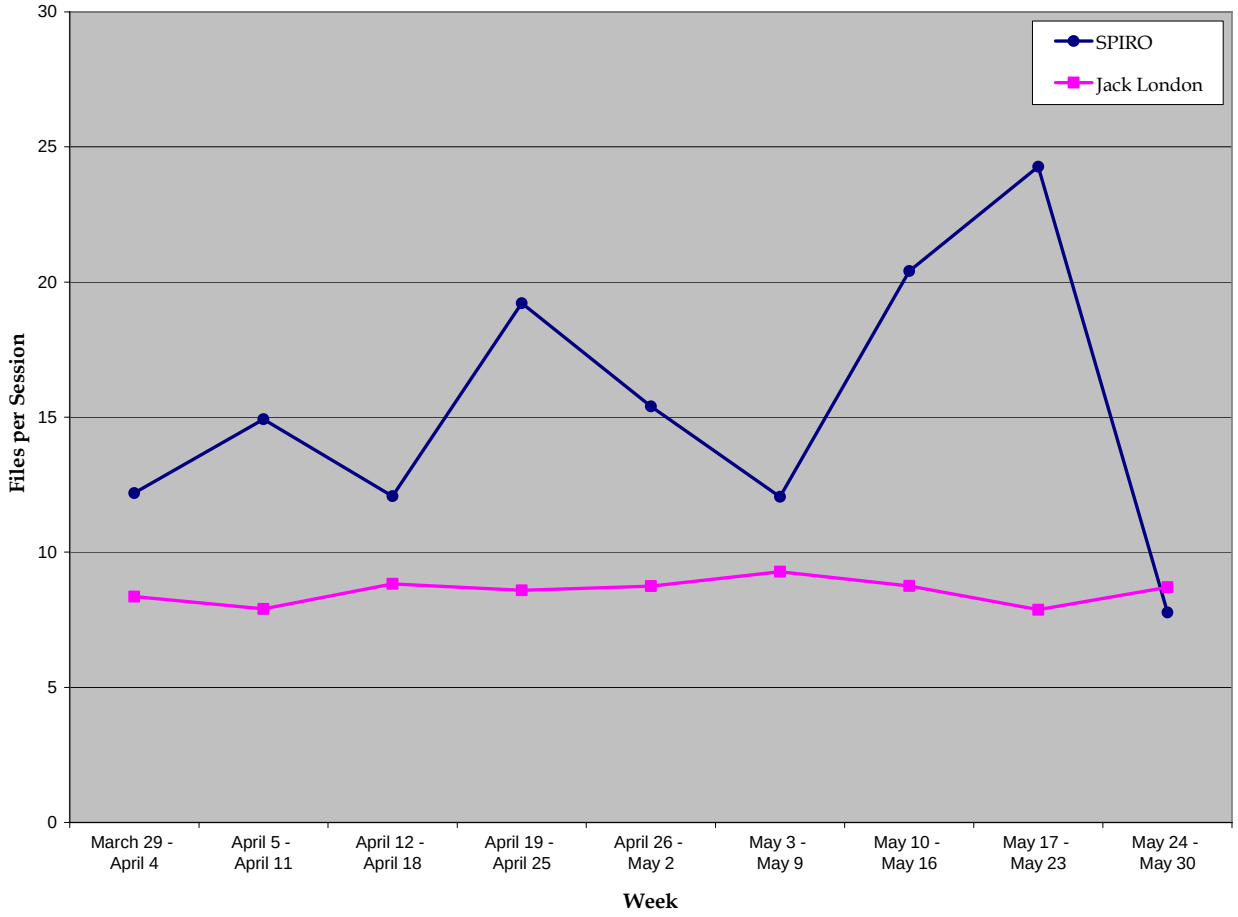


Figure 3.3: Files per session (comparison)



3. User domains and referrers

Figures 4 and 5 show the top-level domains of users' hostnames, with .edu domains broken down by individual institution. We observe that SPIRO has a much higher portion of use from .edu domains, which corresponds to the survey results. SPIRO also has a higher percentage of its use from international domains.

Note that we cannot conclude from this chart the actual fraction of users who are from colleges and universities, since many college and university users access the site via non-.edu hosts. (Most home access is from a private ISP.) However, the difference between the two sites is suggestive, especially in combination with the survey responses.

Figures 6 and 7 show a similar breakdown of the domain of referring sites—the pages from which people clicked on a link to reach each of the pilot sites. The sites show similar patterns, with 7 percent of users reaching the site from an international site and 32 percent from another .edu site (most often another berkeley.edu site). Thirty-one percent of Jack London traffic and 26 percent of SPIRO traffic was referred by search engines.

Figure 3.4: Domains of users, Jack London

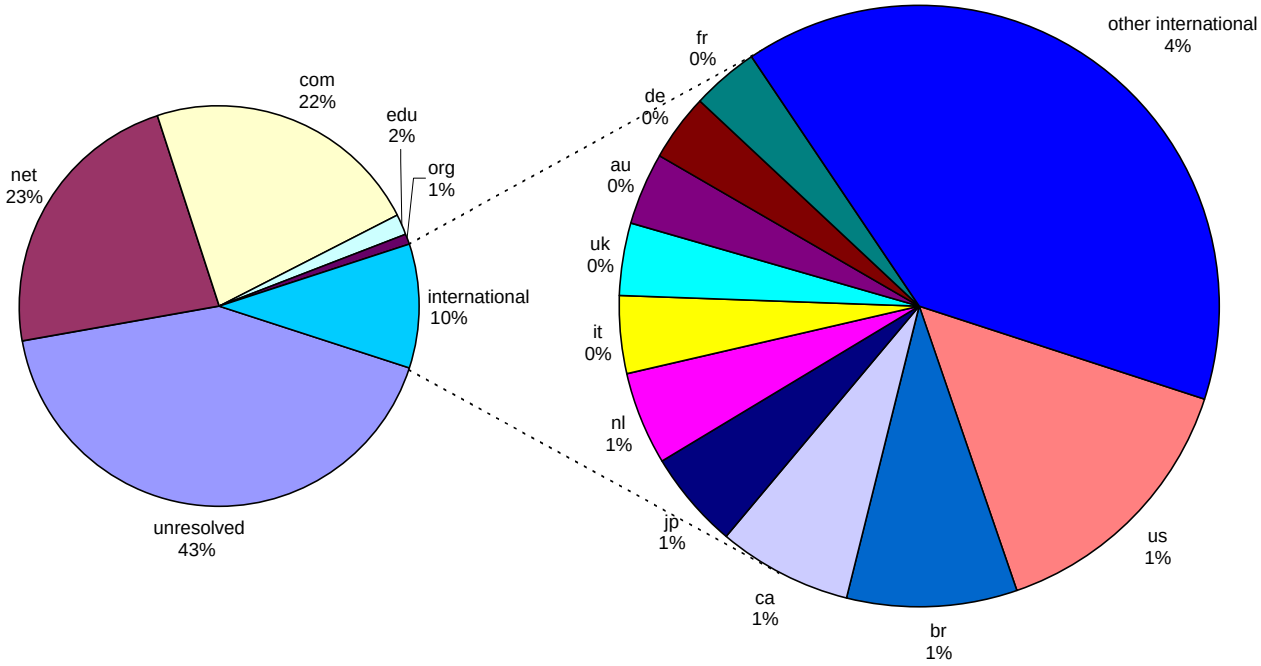


Figure 3.5: Domains of users, SPIRO

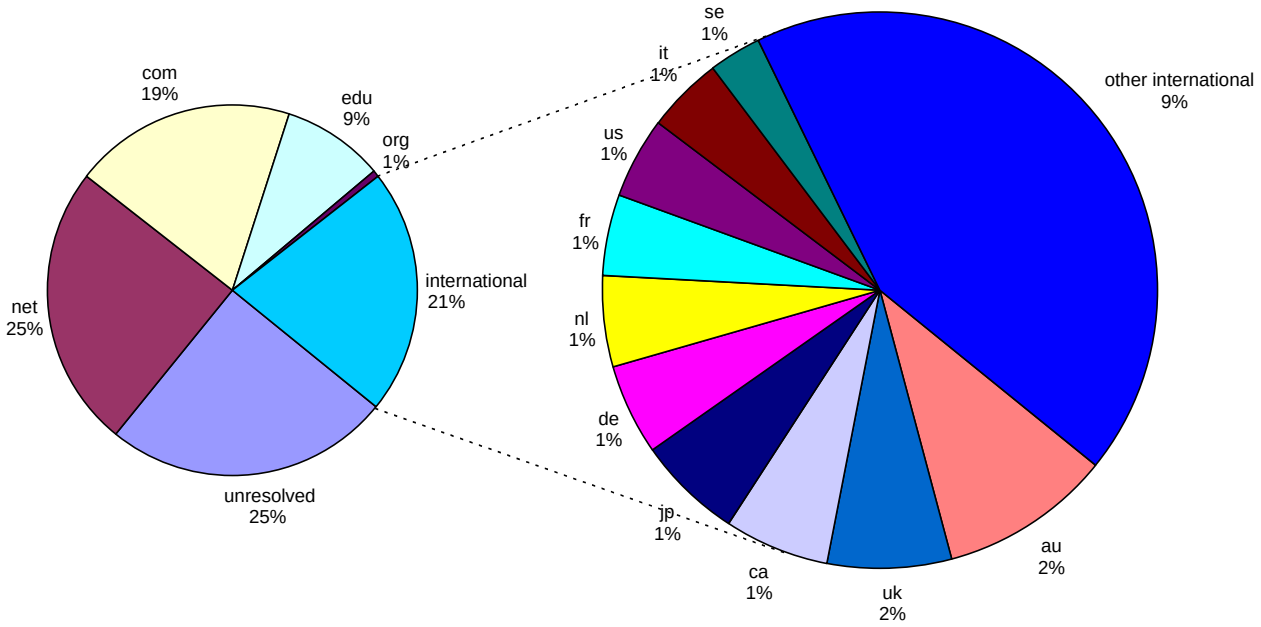


Figure 3.6: Referrers, Jack London

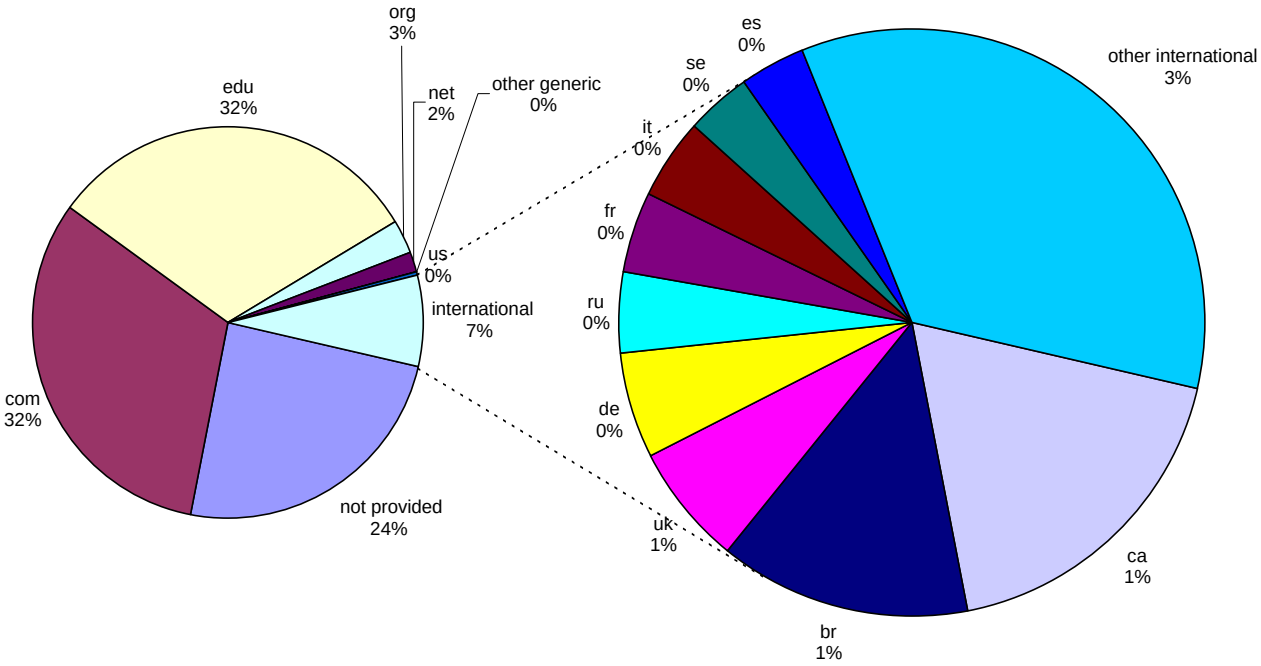
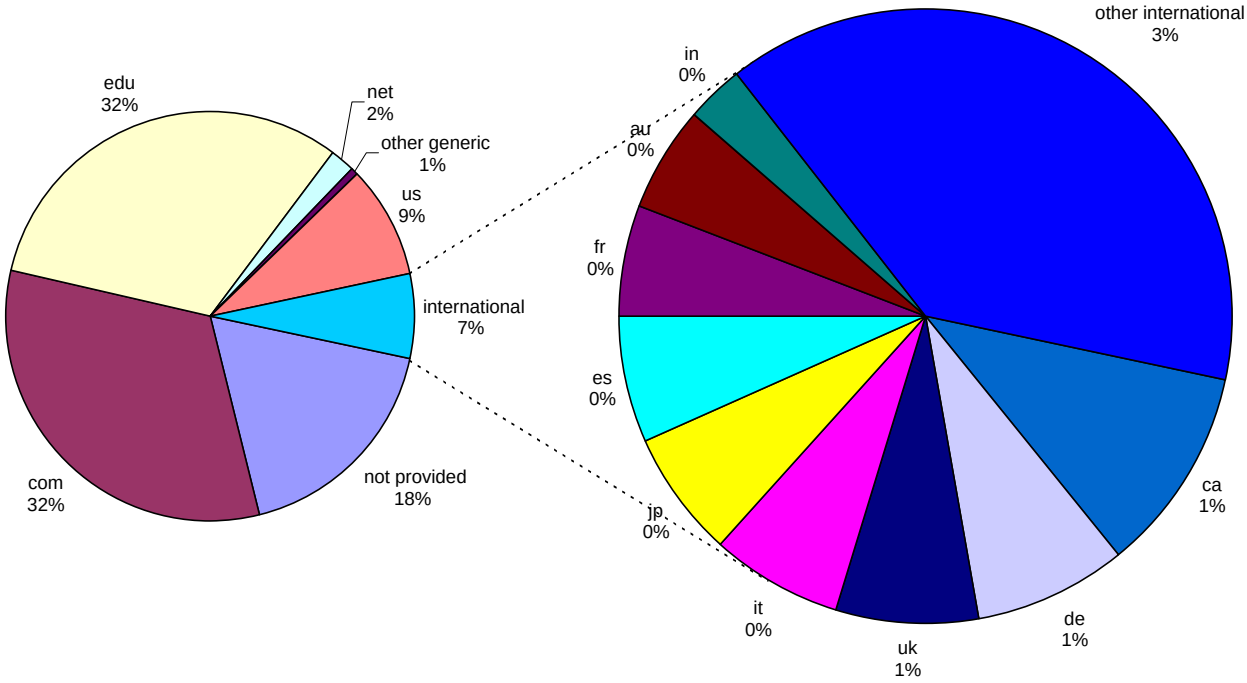


Figure 3.7: Referrers, SPIRO



4. Search engine queries

Tables 3.4 and 3.5, below, list the specific search engine queries that led people to each pilot site. Note that the queries which led people to the Jack London site include a variety of specific pieces of content (specific literary works, "Jack London biography," etc.) that probably directed people to specific internal pages. The top queries that directed people to the SPIRO site, on the other hand, tended to be general terms that referred to the whole site. This is undoubtedly

because the individual items within the SPIRO collection are not indexed by the major search engines. It is unclear from this analysis if people are simply not searching for things like "Frank Lloyd Wright building photographs," or if (more likely) those searches are not directing people to SPIRO's materials.

It is also interesting that several search terms that rank highly on SPIRO are probably "false positives"—cases where SPIRO is probably not what they were looking for. For example, 219 people found SPIRO by searching for "group names," a search which led them to a page from SPIRO's controlled vocabulary listing (a list of the metadata used to catalog the collection). It is unclear exactly what these searchers were hoping to find, but it was probably not the controlled vocabulary page.

Table 3.4: SPIRO: Search terms used to locate site

Search Term	Frequency
spiro	339
group names	219
architecture	184
slide	177
architectural images	155
california architecture	54
database architecture	47
architecture image	32
architecture images	30
berkeley architecture	29
great architecture	24
slide library	23
image database	23
image library	22
architecture database	21
image id	20
[unknown Japanese characters]	18
photos of architecture	14
p	13
[unknown Japanese characters]	13

Table 3.5: Jack London: Search terms used to locate site

Search Term	Frequency
jack london	11,177
call of the wild	2,749
the call of the wild	2,703
white fang	1,401
to build a fire	573
martin eden	568
jack	508
jack london biography	356
the sea wolf	266
sea wolf	237
london	205
the call of the wild by jack london	200
call of the wild by jack london	194
london images	167
jack london books	158
john barleycorn	150
biography of jack london	145
jack london short stories	143
jack london call of the wild	126
moon face	116

G. Online survey representativeness

We obtain a richer picture of site usage by analyzing surveys and transaction logs concurrently for the same site during the same time period. However, a new level of analyses is made possible by actually merging the two datasets, person-by-person. In particular, combining online surveys with transaction log analysis of the same site during the same time period allows new techniques for measuring the survey's response rate and for estimating response bias. The transaction logs allow us to measure the full population of site users during the study period—every user who viewed the site's homepage and therefore had the opportunity to take the survey. The transaction logs also allow us to describe everyone in the target population according to a few behavioral measures, based on their actual browsing patterns on the site. (Additional analyses would be required to see if site usage during the study period was typical of site usage at other times.)

To assess whether the survey respondents were representative, we looked at the following behavioral measures from the transaction logs: the number of browsing sessions each person had during the logging period, the number of files per session, and the average session time length. We compared these measures for the survey responders and the survey non-responders.

1. Analysis – Version 1: t-tests

To assess the likelihood and magnitude of response bias, we performed a series of t-tests, comparing the two groups on the three behavioral measures above. The t-test focuses on the observed means and provides an estimate of the likelihood that the difference between the means of the respondents and the non-respondents is due to chance (Steel and Torrie, 1980). In this case, a low p-value indicates that the survey responders are unlikely to be a representative sample of the population. We performed this analysis for both pilot test sites.

Table 3.6: Representativeness t-tests

	Jack London			SPIRO		
	Responders†	All users	p-value††	Responders†	All users	p-value††
N	161	97,284		45	38,962	
Number of sessions (mean ± SD)	2.2 ± 2.1	1.5 ± 2.7	0.003	5 ± 17	1.4 ± 4.6	<0.0001
Number of sessions (median)	1	1		1	1	
Number of files per session (mean ± SD)	553 ± 408	143 ± 306	<0.0001	242 ± 309	68 ± 210	<0.0001
Number of files per session (median)	460	5		93.5	1	
Session length (seconds) (mean ± SD)	24 ± 24	9 ± 23	<0.0001	63 ± 99	11 ± 46	<0.0001
Session length (seconds) (median)	16	5		21.5	2	

† Survey responders for whom log data are also available
†† Likelihood that the responders' observed mean would have been obtained from a random sample (from t-test)

For both sites, these results indicate that the users who responded to the survey were noticeably different from the typical site user—they used each site more frequently, and each session was longer and more in-depth. The p-values indicate that this difference is much greater than might have been expected due to randomness. The survey clearly suffers from response bias, and the respondents are a non-representative sample on the three measures we compared; based on these results, we should not generalize from the survey results to the whole population of site users.

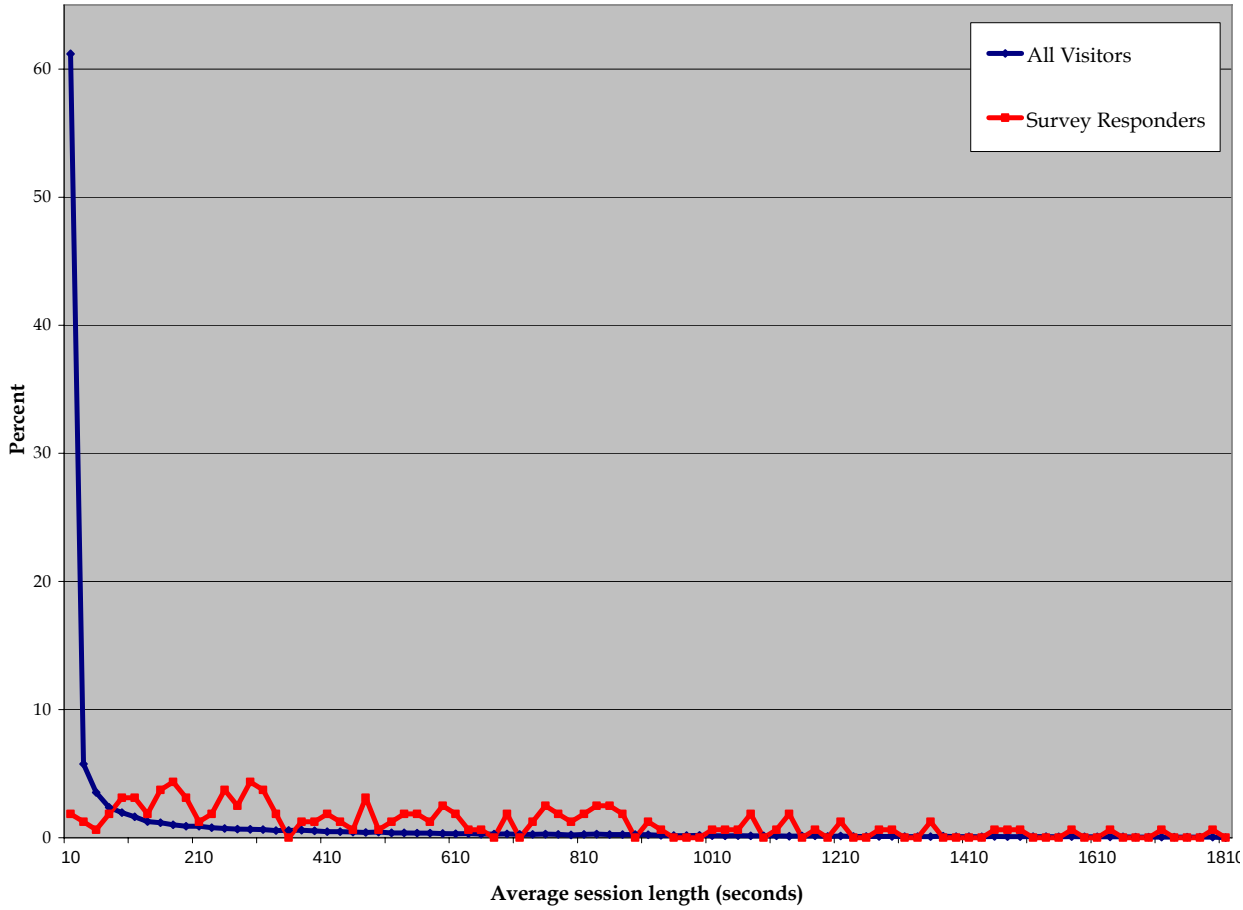
2. Analysis – Version 2: KL divergence measure

While the t-test focuses specifically on the means of the two distributions, it is possible to compare the survey responders and non-responders by examining the overall distribution of the behavioral measures. (It is possible for two distributions to have similar means with very different distribution shapes.)

Figure 3.8 shows the distribution of average session length for all Jack London site visitors and for survey responders. The distribution of site visitors is "right-tailed," with the majority of visitors having an average session length of thirty seconds or less. A small number have much longer sessions, up to 1800 seconds (thirty minutes). The shape of the curve for survey

responders is noticeably different, with disproportionately high response rates among heavy users—visitors with longer average sessions. Visitors with short average sessions (under one minute), on the other hand, were less likely to respond to the survey.

Figure 3.8: Jack London Collection: Average session length (Histogram: all site visitors vs. survey responders)



For this second measure of response bias, we used the Kullback-Leibler (KL) divergence measure (Kullback and Leibler, 1951) to quantify the difference between the total distribution and the distribution of the survey respondents on the same three empirical measures (number of sessions, files per session, and average session length).

We performed a permutation test (50,000 bootstrap samples of the same size as the actual sample) to estimate two statistics. First, we calculated the likelihood of obtaining a "good" sample of the size observed (defined as a sample with a KL divergence < 0.5) at random from the population distribution. (A lower value indicates that, because of the shape of the population distribution or the low sample size, it would be difficult to obtain a representative sample of that size.) Second, we calculated the likelihood of obtaining a sample as good or better (with a lower KL divergence) than the observed sample. In this case, a low p-value indicates that the actual observed sample distribution is unlikely to have been obtained through random sampling. The results are shown in Table 3.7.

Table 3.7: Representativeness: KL-divergence permutation tests

	Jack London				SPIRO			
	Responders† (mean±SD)	All users (mean±SD)	Probability of "good sample" ††	p-value (probability) †††	Responders† (mean±SD)	All users (mean±SD)	Probability of "good sample" ††	p-value†††
N	166	97,284			50	38,962		
Number of sessions	2.2 ± 2.1	1.5 ± 2.7	0.003	0.997	5 ± 17	1.4 ± 4.6	0.000	0.973
Number of files per session	553 ± 408	143 ± 306	0.000	0.002	242 ± 309	68 ± 210	0.000	0.001
Session length (seconds)	24 ± 24	9 ± 23	0.011	0.248	63 ± 99	11 ± 46	0.329	0.417

† Survey responders for whom log data are also available.
†† Probability of "good sample" = the likelihood of getting a representative sample (KL < 0.5) when selecting a random sample of the given size from the overall distribution.
††† p-value = the likelihood that a random sample of the given size from the overall distribution will be at least as representative (i.e., will have as low a KL divergence) as the actual sample of survey responders.

The results of this analysis are somewhat mixed. For both sites, this analysis indicates that the survey respondents are unlikely to be a random sample in terms of the number of files per session, because respondents' sessions involved significantly more files. The differences in session length and number of sessions, on the other hand, are not statistically significant. In fact, the p-values for number of sessions suggest that the sample of respondents is a better match to the overall distribution than might be expected at random.

The two representativeness analyses appear to give somewhat different results, with the t-tests indicating that survey respondents are non-random and the KL divergence measure suggesting that the sample is random. One explanation for this apparent discrepancy is that the two analyses are testing for different things. The KL divergence focuses on the overall shape of the response distribution; because the population distribution is so strongly right-tailed, a small sample is unlikely to be a close match. The t-test analysis, on the other hand, focuses on the difference between the means, rather than the whole distribution.

Both the t-tests and the KL Divergence permutation tests suggest that the survey respondents are not representative of all site visitors, based on the specific behavioral metrics available for comparison. Since we know the sample is non-representative on these measures, it is unwise for us to draw any conclusions from the survey results about the characteristics of the site visitors overall.

H. Discussion and Conclusions

In this section, we have endeavored to explore the strengths and weaknesses of two widely used user research methods—online surveys and transaction log analysis—through a pilot test on two local sites. Based on these pilot tests, we attempt to recommend a set of efficient, effective methods that can provide useful information for the owners of educational resource

sites. The pilot tests helped clarify the specific techniques and metrics that provide the most useful insights into site usage; the tests also provided a vivid demonstration of some of the challenges and pitfalls in performing user research.

These two methods encompass a variety of challenges:

- Balancing user research goals with concerns about the privacy and confidentiality of user information is a challenge, particularly in educational and non-profit institutions.
- Although website surveys are theoretically a powerful tool for understanding users' needs, motivations, attitudes, and satisfaction, low response rates make it difficult to obtain a representative sample of users.
- Unless statistics are calculated and interpreted carefully, it is easy to misinterpret the results of surveys or TLA—particularly if the survey sample is non-representative. Misinterpretation can be counter-productive, lending credence to unwise decision-making.
- Although TLA can be a useful tool for describing users' online behavior, it is of limited utility in describing who the users are, their goals, their offline behavior, and the outcomes of their site use.
- Both web-based surveys and TLA are prone to overlook the universe of non-users. However, an understanding of non-users and their motivations can be extremely valuable for planning and development, and it can be misleading to ignore these concerns.

1. Conclusions

Understanding the usage and users of an educational website can provide valuable insights to facilitate better decision-making, improve site design, and support the site's target users in making better use of the available materials. Online surveys and TLA, when properly implemented, can be good, reliable methods for understanding site use. Both methods can be performed simply and efficiently, and the two methods offer complementary views of users and usage; TLA is valuable for describing the actual usage of the site, while surveys can reveal users' needs, motivations, attitudes, and satisfaction levels.

After experimenting with a variety of different survey and TLA tools and analyses and evaluating their complexity and their usefulness, we have reached the following conclusions regarding the use of these tools.

a. Surveys

Website owners have much to gain by surveying their users. A survey of site users can be very revealing and provide insights into users' thoughts and feelings that are unavailable through other methods. Online surveys can be performed very simply, using a variety of inexpensive or freely available tools and websites (such as Survey Monkey or Zoomerang[102]).

It is important to be aware, however, that survey responses will probably not be representative of all site users. Think of survey results as suggestive, rather than authoritative.

[102] http://www.surveymonkey.com, http://info.zoomerang.com

When developing a survey, it is important to plan the analyses first, and design the questions to support the specific analytic goals. It is also a good idea to pilot test the survey, either online or in person, with a small number of known users; pilot testing is incredibly valuable for fine-tuning the survey questionnaire. Presser (2004) provides a helpful analysis of evaluation methods to use during questionnaire pilot testing.

When designing the survey, it is important that the questions apply to first-time visitors; our research suggest that they are the vast majority of users. For example, avoid questions about what users "usually" do on the site. Also, avoid questions about results or satisfaction with the site, since first-time site visitors will have no experience from which to answer. Questions about user identity, demographics, and intentions or goals are valuable and apply equally well to new and return visitors.

b. Transaction log analysis

Transaction log analysis helps in evaluating actual site usage. A variety of software packages are available for TLA (see Appendix M). If the organization has the time and expertise, high-end packages can provide the flexibility and power to perform almost any analysis imaginable; however, even the free packages provide a wealth of valuable information and are much easier to install and run. Many of the basic analyses can be fully automated, with reports generated every month, for example. Other analyses may require a greater time investment from the researcher.

c. Who are the users?

Understanding the types and characteristics of a site's users is of interest to many site owners; sites designed for a particular target population may be interested to see if their target users are their actual users. Unfortunately, this most basic question can be difficult to answer with any confidence.

A website survey can ask respondents to describe themselves; however, because the response pool tends to be small and non-representative, survey responses can be misleading. (It is still worth including some basic questions about respondents' identity, to provide a sense of who is responding to the survey.)

Transaction logs can provide a few clues to users' characteristics. The number of unique IP addresses can provide an approximation of the number of individual users over a time period; this number is useful for comparison with other sites, or to track changes over time. As a first step toward describing these users, one can examine users' hostnames for the breakdown of top-level domains, paying particular attention to .edu domains and international domains. Although these statistics cannot tell you the actual number of education users or international users, they are still useful for comparative purposes: tracking changes over time or drawing comparisons with other sites.

For sites affiliated with a college or university (or targeted at college and university users), it may also be valuable to look at the hostnames of specific schools (the second-level domain names). The relative proportion of traffic from different institutional domains provides only an approximation of the distribution of educational users; however, it may be particularly useful in

estimating the proportion of local use from the hosting institution, relative to use from other institutions.

TLA can also be used to estimate the proportion of first-time users versus repeat users, and the percentage of total traffic attributable to each. Understanding the proportion of first-time users can guide design decisions and inform assumptions about a user's knowledge of or familiarity with the site.

d. Characteristics of usage

TLA can be useful for providing an overall sense of how a site is used. To understand the intensity and depth of site usage, one can calculate the average length of each session (viewing time or number of pages viewed). It can also be interesting to examine the distribution of times across the range of users (for example, see Figure 3.8, above).

A site's total number of file hits and the breakdown of file types tend *not* to be useful pieces of information, since these numbers are heavily driven by the design of the site, rather than primarily by the site usage. The number of page views, rather than file hits, is a more meaningful statistic.

For sites with a variety of resource types, it can be particularly useful to track the relative usage of different resource types or of materials from different sections of the website. Some resources may be used more heavily than others, or by a greater diversity of people. This information can guide decisions about the site's design and about adding to or developing the site's content. To facilitate this type of analysis, however, it is best that the site be designed with TLA in mind. For instance, the file structure could divide resources according to their content type, and navigational and decorative elements could be separated from content elements. Dynamic, database-driven websites should design a system for analyzing which database elements fall into different categories of interest.

e. Users' goals and objectives

The most accurate way of determining a user's goals and objectives is to ask the user, presumably via an online survey. Because of surveys' typically low response rates, however, it can be valuable to supplement the survey results with information from transaction logs. One way of understanding users' goals is to examine the list of referring sites, focusing on specific pages that link to the site and generate a lot of traffic. These pages can provide a sense of the mindset and intentions of users.

Search engine referrals are particularly interesting. It is valuable to look at the full search queries that led people to the site (rather than a list of individual keywords), to get an overall sense of what users are looking for. Search queries can help answer a variety of questions about users' intentions: Do search queries suggest that users are looking for resources with an explicitly educational or instructional focus? Are users looking for specific individual resources, for broad packages of information, or for the site itself? Which searches lead to which site pages? Are there any "false positives"—pages found by users that are probably not what they want? What site resources are not being found by search engine queries?

f. Linking TLA with online surveys

In our pilot testing, we linked survey responses to transaction log data from the same usage session. We found that this process required a high level of expertise and a great deal of time. In general, linking the two datasets is probably more trouble than it is worth for the typical website. For sites that have the time and expertise, this high-level analysis can provide some interesting insights by drawing connections between actual site usage and individual self-reported attitudes, objectives, and satisfaction levels. In addition, this combination can allow the calculation of survey response rates and estimation of survey response bias (see page 5-20, above).

If one is planning to link survey responses with transaction logs, it is important to design the site and the survey to support the linking, with unique identifiers that will show up in both the usage logs and in the survey results. The data manipulations should certainly be part of the survey pilot test, before the full-scale survey is launched.

GOAL 3: WHY STUDY USERS?

GOAL 3A: INTERVIEWS WITH DIGITAL RESOURCE PROVIDERS

Principal author: Shannon Lawrence

A. Purpose and goals

Our goal in talking to digital resource providers was to better understand the role of user studies and usage research in daily practice and decision-making. As such, our goals for the one-on-one interviews were: (1) to test our initial sort of digital resource characteristics, (2) to collect opinions on the importance of user research to digital resource providers, and (3) to determine if certain factors and their attendant digital resource characteristics (e.g., histories, funding models, architectures, etc.) are associated with successful strategies for integrating an understanding of users into development and maintenance activities. Where possible, data on cost and collaborative development strategies were collected. These interviews addressed the following specific areas:

- Background and original purpose of a given site, including the design of a site for teaching, and its integration with other external resources such as course packs, bibliographies, etc.
- Knowledge about site use and what methods digital resource providers use to measure and evaluate use
- Funds digital resource providers have allocated to assessing use or need for assessing use
- Results digital resource providers have collected about users and usage
- Remaining questions digital resource providers have about usage, but for which they have not collected data
- How digital resource providers incorporate knowledge about use with planning and development activities to both improve integration of their site into undergraduate education environments and to sustain development and maintenance activities.

The questions we addressed to digital resource providers included:

- Who are your intended audiences?
- What are the educational goals of your site?
- How do you measure use, and what is most successful?
- What do you know about demographics, behavior, and motivations of your users?
- Do you distinguish among various educational audiences and contexts (e.g., community college, R1s, AP courses, fully online vs. on-campus hybrid, international markets, liberal arts, vocational, etc.)? Between random users and more cohesive communities? Between those willing or unwilling to pay for use of online resources?
- Where are the gaps in your current data about users, and how might those gaps be filled?
- What is the relationship, if any, between your understanding of current and potential users, and questions of user demand and sustainability?

1. Terminology

In our attempt to find a common language to describe the digital resource landscape and the place of user studies within that landscape, the interview process with digital resource providers identified a number of complexities, described in detail below.

For the purposes of this summary, we will opt for simple terms. When describing electronic resources (e.g., learning objects, modules/units, self-contained courses, images, texts, etc.) we will use the term "*digital resource*" to keep our definition as broad as possible. When we refer to a specific collection of digital resources, however, we will use the term "*site.*" Some interviewees pointed out that the term "website" did not aptly describe the complexity of their collection or service, especially those that were subscription based. While we recognize the limitations of the term, most digital resources are (or can be) accessed through a specific URL and, for this summary, the term "site" provides a convenient shorthand.

As noted above, there are at least three general categories of individuals involved with creating and providing digital resources: aggregators, who select and promote resources; developers, who shape user interactions, export mechanisms, and access paths; and content creators and owners, who conceive, assemble, describe, and digitize content, and may include teams across institutions. Because our interview participants fell into different, and often overlapping, categories, we use the term "*digital resource provider*" to describe the wide array of individuals interviewed.

B. Methodology

Between April and September 2005 we conducted thirteen telephone interviews with digital resource providers and two interviews with other stakeholders in this field.[103] Additionally, many of the interview participants, as well as other stakeholders in the digital resource arena, attended a meeting in May 2005 at which we were able to get critiques on our initial findings. Conversations that flowed from that meeting have influenced how the issues presented here are framed and prioritized. A detailed summary of that meeting can be found in Goal 3B.

All interviews followed a structured protocol (see Appendix O) and were conducted by a single researcher to ensure consistency. In addition to questions about the measurement of usage data and user studies, the protocol covered various topics ranging from history and development to issues of financing and sustainability. The tables below are an attempt to make comparisons across various types of sites, though they do not wholly reflect the richness of the data. We did include several open-ended questions to accommodate the unique nature of individual sites at various stages of development. Thus some of the information reported here may not be generalizable to the larger digital resource landscape.

1. Subjects

Our subjects were not randomly selected. We built our sample of sites based on previous research, including the faculty survey. We initially identified sites that were robust in size, had

[103] Initial interviews were conducted with eight digital resource providers in April and May 2005. Follow-up interviews with five of those sites, and three additional interviews, were conducted between April and September 2005.

a depth of potential user data available, and had potential classroom applications. Nine of the sites included in our sample are initiatives that have been funded by the Andrew W. Mellon Foundation and the William and Flora Hewlett Foundation, who also funded our research. The remaining four projects were not funded by these foundations to the best of our knowledge. Although the sample is small, it provides a snapshot of the diversity of free and open educational content available on the web. The following thirteen sites participated:

Table 4.1: Sites interviewed

Project	Description	Website
Connexions (Rice University)	Learning modules, units, and courses	http://cnx.rice.edu
Harvard University Open Collections Program: Women Working 1800–1930	Online archive (digitized historical materials)	http://ocp.hul.harvard.edu/ww
History Matters: The U.S. Survey on the Web (Center for History and New Media, George Mason University and American Social History Project, City University of New York)	Primary documents, web gateway, teaching materials, and forums	http://historymatters.gmu.edu
Humbul Humanities Hub	Cataloged and annotated humanities resources	http://www.humbul.ac.uk/
Labyrinth	Medieval studies resources	http://labyrinth.georgetown.edu
MIT OpenCourseWare (OCW)	Course materials	http://ocw.mit.edu
MERLOT	Referratory for individual learning objects	http://www.merlot.org
Museum Online Archive of California (MOAC, California Digital Library)	Finding aid and infrastructure for digital images and documents	http://www.bampfa.berkeley.edu/moac
Open Learning Initiative (Carnegie Mellon University)	Stand-alone courses in modular form	http://www.cmu.edu/oli
Purdue Online Writing Laboratory (OWL)	Language resources and interactive support	http://owl.english.purdue.edu
RLG Cultural Materials	Multimedia primary source materials	http://culturalmaterials.rlg.org
Sharing Open and Free Intellectual Assets (SOFIA)	Community college-level courses	http://sofia.fhda.edu/
Utah State University OpenCourseWare (USU OCW)	Course materials	http://ocw.usu.edu

C. Findings

1. Testing our initial sort of digital resource characteristics

Interviews with digital resource providers further underscored our Year 1 findings that digital resources are complex and difficult to compare. Our interviews began to unravel some of the

richness within three functional categories: 1) Site Purpose and Goals, 2) Management and Administration, and 3) Measuring and Understanding Site Use.

a. Site purpose and goals

All thirteen sites offer some degree of free and open access. In order to ensure easy access and remove potential barriers, all sites have a no-registration option, or no registration altogether. Some sites (e.g., OLI, Connexions, and MERLOT) require registration and login for members or subscribers to access special services (e.g., to add or manipulate materials). Registration is optional for History Matters and Humbul. RLG Cultural Materials, as a subscriber service, requires authentication for site access, but also has a spin-off resource, Trove.net, a commercial licensing service that provides free search capabilities for a subset of these same resources. Harvard Women Working, Labyrinth, MIT OCW, MOAC, OWL, and USU OCW do not have a registration option.

Table 4.2: Intended audience

	K–12 students	K–12 teachers	College/ university students	College/ university teachers	Scholars	General public	Other
Connexions	x	x	X	X	x	x	
Harvard Women Working	x	X	x	X	X	x	Librarians
History Matters	x	X	X	X	X		
Humbul			x	X	X	x	
Labyrinth		x	X	X	X	x	*
MIT OCW	x	x	x	X	x	x	
MERLOT	x	x	x	X			
MOAC/OAC		X	X	X	x	x	**
OLI	x	x	X	X	x	X	
Purdue OWL	x	x	X	X		x	
RLG Cultural Materials			X	X	x	x	X
SOFIA			X	X		x	
USU OCW	x	x	x	X	x	x	

X = primary, or target, audience(s); x = secondary, or additional, audiences
* Anyone with academic training
** Museum professionals

All thirteen sites were developed for educational purposes, though specific goals varied. Most digital resource providers also had broad intentions, e.g., to provide supplementary materials for students, to assist instructors in teaching, or to provide general course materials to support any type of learning. OLI, however, also has the additional intention of providing the enactment of instruction.

All sites target postsecondary instructors as one of their primary audiences (see Table 4.2), although History Matters considers the K–12 audience equally important. Even those sites with broad outreach missions (e.g., OCW sites) recognize that their materials are often most useful for faculty preparing new courses. Several sites have some idea of how materials are used as a result of user surveys, Google link searches, and anecdotal evidence through email feedback.

Most interviewees also claimed that their resources intend to or do reach a broad audience regardless of their intentions. It is possible to assume that, if resources are freely available online, anyone can find and access those resources using a search engine. Thus, it is likely that all types of users listed in Table 4.2 have accessed or will access each of the sites interviewed for this study, making a comparison of intended and actual users unlikely.[104] We attempted to collect usage data to make some comparison between intended and actual use. Unfortunately, because most digital resource providers interviewed do not require user registration on their sites, a categorical breakdown of use is not possible at this time, excepting MIT OCW and MERLOT, as illustrated in Table 4.3, which further illustrates the challenge that researchers face in understanding use.

What digital resource providers could tell us from anecdotal evidence suggested that the actual audience varied significantly from the target audience in only a few cases. Connexions, for instance, focuses primarily on college and university instructors, but has found that, increasingly, some materials created on the site are being used by K–12 teachers and students. Interestingly, these materials receive the most hits. MERLOT reports a growing K–12 audience as well as education undergraduates preparing to be K–12 teachers, and other undergraduate students. Excepting these two cases, most sites welcomed unanticipated users but did not perceive the need to alter their goals or services to accommodate these new audiences, either because these unintended audiences were successfully using the materials as available, or because support services built-in as a function of the overall site (e.g., online help desks) represent only minor indirect costs. As the aforementioned sites both encourage or rely upon users to contribute content to the site, it may be reasonable to assume that the role of unexpected users may be more important to these types of sites. For instance, sites whose users produce or contribute their own content may have differing obligations to their users.

Nonetheless, these anecdotes suggest that the divide between intended and actual audience is one that requires further exploration. How such unanticipated use affects a site's required resources, and whether or not a site should—or could—adapt to new audiences, especially among freely accessible sites whose funders desire support for specific target audiences, was a topic of discussion in some detail among digital resource providers at our May 2005 OER Meeting (see Goal 3B).

[104] Some freely available resources may not necessarily be findable via a search engine if they are part of the "deep web."

Table 4.3: Percentage of use, by actual audience

	K–12 students	K–12 teachers	College/ university students	College/ university teachers	Scholars	General public	Other
Connexions[1]							
Harvard Women Working[2]							
History Matters[3]							
Humbul[4]							
Labyrinth[5]							
MIT OCW	0.8	1.0	28.0	13.3	*	48.2	8.7
MERLOT[6]	n/a	n/a	21.0	55.0	n/a	8.0	16.0[6]
MOAC/OAC[7]							
OLI							
Purdue OWL[8]							
RLG Cultural Materials[9]							
SOFIA							
USU OCW[10]							

* MIT does not distinguish between teachers and scholars

[1] Connexions reported 16 million hits, 1.2 million page views, and 493,000 unique visitors during October 2005.

[2] At Harvard Women Working, no consistent or predictable pattern has been established at this relatively nascent site; however, the total "average" per month in 2005 was 19,859 visits by 8,288 visitors. Women Working cannot distinguish between students, teachers and researchers. Some distinction, however, can be made between K–12 visits and college/university visits: .com, etc. (general public, and likely some education traffic)—82.08% of visitor domains, 91.86% of visits; .edu (primarily colleges/universities, may include some K–12 private schools)—15.62% of visitor domains or 7.37% of visits; K–12 domains—.92% of visitor domains or .59% of visits; .gov (including non-U.S. .govs)—1.38% of visitor domains or .17% of visits

[3] History Matters reported 1.2 million hits during the past twelve months

[4] Humbul serves 680,000 pages per month to around 180,000 visitors

[5] Labyrinth has no raw data as they are currently in the process of updating their servers.

[6] MERLOT does not normally report usage statistics by month. From January 1 – November 30, 2005, MERLOT reported a total of 30,232 registered users and 758,754 visits (an average of 2,273 visits per day, with an average of 10 pages per visit).

[7] MOAC is preparing to install a new statistical package in February 2006 and will be able to collect data by domain at that time

[8] OWL's 1.8 million visits by 1.2 million computers resulted in an average of more than 4 million page views per month, over September and October 2005.

[9] RLG Cultural Materials reported 3661 sessions and 5148 searches per month. (Trove.net reported 20,391 unique visitors and 24,650 visits per month.)

[10] USU has reported 7300 visits (not hits) per month since its September 2005 launch date.

b. Management and administration

Management and funding

Operating budgets among sites varied, ranging from modest funding in the hundreds of thousands to several million dollars per year. Given the collaborative nature of most sites, often involving the time of individuals not directly funded by the site (e.g., faculty, institutional liaisons, etc.), it was difficult to extrapolate definitive numbers for budget or staff, limiting any further breakdown of evaluation activities as a percentage of overall activities. Therefore, the

information that was provided represents rough estimates. There were no obvious similarities between staffing models among the sites.

Given the challenge of estimating staff, providing an approximate percentage of time/resources dedicated to measuring use was even more difficult. Of the four institutions with similar budgets, answers ranged from "nothing" to a "part" of a staff member to 1 FTE to a rough estimate of 20 percent of time. Others estimated approximately 25 percent. Two institutions (MIT OCW and OLI) reported outsourcing use analysis to outside consultants. RLG Cultural Materials was unable to estimate staff time since tasks are distributed across individuals and departments. Several interviewees noted that more intensive use data were collected at particular points in the evolution of their site and thus the corresponding resources were equally sporadic in their distribution.

Table 4.4: Funding sources

	Self-supporting (registration or licensing)	Self-supporting (advertising)	Institutional funding	Private funding	Grants – foundation	Grants – government	Other
Connexions			X	X	X	X	Trustees
Harvard Women Working			X		X		
History Matters			X		X	X	
Humbul			X			X	
Labyrinth			X				
MIT OCW			X	X	X		
MERLOT	X*		X			X	**
MOAC/OAC***			X		X		
OLI	X		X		X	X	Service income
Purdue OWL			X				
RLG Cultural Materials	X		X		X		
SOFIA			X		X		
USU OCW			X		X	X	

* Income from partnership/membership fees
** Corporate partnerships
*** May include funding for OAC or CDL in general. Difficult to disaggregate MOAC funding from other projects within CDL.

Nearly all digital resource providers interviewed currently operate their sites with a combination of institutional funding and grants, either from foundations or government (Table 4.4); some smaller projects depend solely on the time of volunteers. MIT OCW, USU OCW, and Connexions all reported some sort of private funding. RLG Cultural Materials reported that they receive support from membership or subscriptions, MERLOT receives fees from higher education and corporate partners (individual membership, however, is free to anyone who registers), and OLI reported modest income from for-profit efforts. Though most

sites in the sample were Hewlett and/or Mellon grantees, nearly all also received other funding. NSF and other grants received were often related to specific content development or received by partners or authors. Some development work for RLG Cultural Materials was funded through an anonymous foundation grant. Humbul was an exception in that it was primarily funded through JISC and AHRC as well as institutional funding, but did not receive any foundation funding.[105]

Expansion and sustainability

Questions around "markets" elicited various responses. Though all sites expressed interest in expansion, few had formal marketing goals. Most digital resource providers mentioned that they paid attention to what other institutions or sites were doing. Distinct budgets for marketing and promotion were rare, though Harvard Women Working had placed targeted advertisements, Cultural Materials outsourced research for Trove.net, Humbul has a small budget for printing and distributing flyers and booklets, and MERLOT has a director of strategic development. Notably, MIT OCW has an enormous communications effort with several staff dedicated to outreach and awareness, including two full-time dedicated staff as well as the part-time efforts of two other high-level staff. Because of the scope of its mission, MIT OCW has a communications manager responsible for interacting with internal stakeholders, conferences, and media; an external outreach liaison who works with institutional partners that focus on MIT OCW (e.g., translation efforts, mirror sites, etc.); and two other staff responsible for managing relationships with other OCW efforts and communicating to high-level administrators.[106] USU OCW reported that they are working closely with other emerging OCW sites so that each site will focus first on specialty fields, then expand to general course offerings. The Center for History and New Media (the umbrella organization for History Matters) is exploring the possibility of providing their materials on mobile devices. Only Connexions reported being currently engaged in research for the purpose of reaching an identified target market. Since the time of our interviews, OLI has engaged in a market research project with Kevin Guthrie of the Mellon-funded Ithaka project.

All digital resource providers relied mainly on personal contacts through academic channels as the primary method of reaching new markets, and many reported success. These contacts range from personal communication to listserv notices to the presentation and publication of papers about the collection. MERLOT, RLG Cultural Materials, and Connexions work with other sites that link to theirs. MIT has a full-time communications manager to handle public relations. OLI has a co-marketing agreement with McGraw-Hill for a particular course, but they were generally disappointed with the arrangement. MERLOT, RLG Cultural Materials, and OLI participate in trade shows (and Harvard Women Working did attend the American Library Association mid-winter meeting when the site was initially launched). MERLOT worked closely with course management systems, e.g., Blackboard and WebCT, to develop build-ins for searching MERLOT through the course management system, and a similar effort is underway with Labyrinth.

[105] JISC (Joint Information Systems Committee) is the U.K.'s equivalent to the NSF. AHRC (Arts and Humanities Research Council) is the U.K.'s equivalent to a combination of NEA and NEH.

[106] One of MIT's explicit goals set in the original OCW plan is to help other institutions, both domestically and internationally, develop open-access projects of their own. In fact, most OER projects funded by the William and Flora Hewlett Foundation, such as the Developmental Gateway (a community site specifically for developing countries, see: http://www.developmentgateway.org) and David Wiley's eduCommons project (which provides OCW management software, see: http://sourceforge.net/projects/educommons), are working in cooperation to share best practices and coordinate marketing efforts.

About half the sites reported that their current funding models were not sustainable and that they were exploring alternative economic models. History Matters, Labyrinth, MERLOT, MOAC, and OWL indicated that while they could function on an existing base of support, budgetary volatility encouraged them to continuously watch for new funding opportunities. Nearly all digital resource providers envisioned a blended funding model involving a degree of institutional, foundation, and endowment support coupled with some for-profit activities. Particularly established sites such as Labyrinth and OWL, however, expected to rely almost exclusively on institutional support. RLG Cultural Materials anticipated self-sustainability through subscription and licensing income.

None of the digital resource providers interviewed could point to a formal agreement with their funders that guaranteed permanent sustainability on any level (funding, technology, content), though those sites embedded within universities with already-strong university support believed that their sites were secure. The question of sustainability is particularly problematic for smaller sites that are primarily maintained by the creator, with little or no institutional support (especially technology support). Therefore, building communities of stakeholders within and outside the institution becomes important for smaller sites.

Most interviewees agreed that the success of their site was dependent not solely upon the level of use, but upon a variety of factors. Most digital resource providers based at educational institutions felt that their site—intentionally or not—provided a value to their institution, either through increased public awareness or credibility, and often served unrelated needs such as recruitment, class enrollment, and other unexpected functions. Several interviewees described scenarios in which institutional administrators recognized the increased value of the site as it developed, resulting in increased (or secured) institutional funding. Thus digital resource providers at newer sites believe that institutional support would likely follow initial success and they plan accordingly. Membership sites, such as RLG and MERLOT, rely more on usage, perceived value, and scholarship support needs.

c. Measuring and understanding site use

Measuring use: Data collection

We were interested in finding out what digital resource providers know about users, how they know what they do, and why they collect these data in the first place.

Most digital resource providers reported that they collected various types of data on use and users.[107] There was concordance among all sites (except SOFIA) in the collection of web traffic logs, although depth of analysis varied. Additionally, most resource providers collected some combination of online surveys, email feedback, user search strategies, interviews, focus groups, anecdotal research, and/or usability tests. Several sites conducted user studies (e.g., interviews, focus groups, surveys) as specific, limited-time, grant-funded projects (in some cases, these studies were outsourced to third-party organizations). There were no data collection methods on our list wholly rejected by any digital resource provider. In all cases, the level and

[107] Labyrinth, however, collected little or no data at this time due to the fact that the site is fully established (no or minimal new content), maintained through campus services, and otherwise unfunded. Likewise, SOFIA has not conducted any type of user evaluation to date. Their plan for conducting user research was part of Phase II of their project, which did not receive funding.

sophistication of both data collection and analysis depended on the choice of methods as well as time and budget constraints.

Table 4.5: Ways of measuring use

	User registration	Web traffic logs	Online surveys	Help questions	Email feedback	User search strategies	Anecdotal research	Interviews	Focus groups	Usability tests	Other
Connexions	X	X	X	X	X	X	X	X	X	X	X
Harvard Women Working		X		X	X	X	X	X	X	X	X
History Matters	X	X	X	X	X	X	X	X	X	X	
Humbul	X	X	X	X	X	X	X			X	X
Labyrinth		X			X						
MIT OCW		X	X		X	X	X	X		X	X
MERLOT	X	X	X	X	X	X	X	X	X	X	X*
MOAC		X	X	X		X	X			X	X
OLI	X	X	X	X	X	X	X	X	P	X	X
Purdue OWL		X			X					P	
RLG Cultural Materials		X		X	X	X	X		X		X
SOFIA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
USU OCW		X	P	P	X	P	X		X	X	

X = data currently or previously collected
P = data to be collected in the future
* = MERLOT has completed a content analysis of personal collections, comments, etc. These "surrogate" measures, while not direct, do give a sense of how users are using the items.

All interviewees reported collecting data about users and usage for the general purpose of improving the site, especially to amend content, change the design (see Tables 4.5 and 4.6), or to develop the site (e.g., expansion). Some sites reported, however, that this was not necessarily an ongoing data collection process but may have been part of usability studies during initial development or site restructuring. Only about half the sites interviewed depended upon these data to demonstrate robust usage to current or potential funders, although for at least one site (OLI), this is not a primary motivator. MIT OCW collects data specifically to maintain buy-in from internal stakeholders. They report regularly both to individual faculty with feedback from individual course use and from user email comments, and to higher-level administrators (deans, etc.) with overall usage data. This data reporting is especially important as MIT OCW transitions from foundation to institutional support. Few sites collected data for curiosity's sake alone, primarily because of the extensive resources required. Interestingly, four sites (Labyrinth, Harvard Women Working, OWL, and MOAC) do not collect data for development (e.g., assessing server size). This may be because they are institutionally supported with more or less static content and thus are not as concerned as other sites with expansion.

These varied reasons for collecting user data raise additional questions about digital resource providers' motivations. Conversations at our May 2005 OER Meeting (see Goal 3B) addressed many of this issues, such as the potential motivations for user research and especially questions of measuring site value and success.

Table 4.6: Reasons for studying use and users

	Curiosity	Defend site funding	Appeal for funding	Growth/ develop-ment	Target marketing efforts	Amend content	Change design	Other
Connexions		X	X	X	X	X	X	
Harvard Women Working	X	X	X		X		X	
History Matters			X	X	X	X	X	
Humbul		X	X	X	X	X	X	
Labyrinth				X				
MIT OCW		X	X	X	X	X		*
MERLOT	X	X	X	X	X	X	X	**
MOAC							X	
OLI	X	X		X	X	X	X	***
Purdue OWL	X	X	X			X	X	
RLG Cultural Materials				X	X	X	X	
SOFIA								
USU OCW		X		X	X		X	

* Internal community
** Part of mission
*** Learning science research

We also asked interviewees what additional information they desired about users, and their responses varied. One common interest among digital resource providers was to find a way to measure how and for what purpose materials were being used once accessed. At least two sites/services wanted to know more about learning outcomes while others were interested in user satisfaction. RLG Cultural Materials felt that the type of classroom (or other educational) use was perhaps the biggest marker of value. Other desired information, however, varied by institution and ranged from site effectiveness (e.g., especially for non-western users) to who non-users were and why they did not use the resource.

Understanding use: Data analysis and interpretation

Sites varied on their level of knowledge about users. All interviewees except SOFIA reported that they did analyze (or at some point had regularly analyzed) web traffic logs in particular, though depth of analyses varied by site. Most sites sought information about general demographics (hits from types of institution, e.g., .com, .edu, etc.), but did not collect or analyze data at the individual level. Most described their knowledge about use as a general sense of

overall traffic, including hits, frequency, and origin (by country or by educational vs. other type of institution). Some sites were also able to track patterns of use. Several interviewees noted that log data are relative and provide a limited picture of use (e.g., no access to demographic data except from registered users). [108]

Those interviewees who had completed online surveys or interviews/focus groups believed they had expanded knowledge of user satisfaction and other self-reported behaviors. Some interviewees were aware of how materials were being used, though the level of specificity varied depending on the source of the data informing this knowledge. Among those with anecdotal data, there was a good sense that materials were being used in the classroom, but they did not know the specific purpose of those materials. Other interviewees knew that teachers were using information in presentations or distributing information to students as reference materials. MIT, in particular, found that users, especially faculty, are idiosyncratic about how they use information.

Most digital resource providers were generally satisfied with the current level of use of their site or service, but clearly wanted to expand use. At least four interviewees felt their sites were underutilized (Harvard Women Working, Humbul, MERLOT, and USU OCW), although Harvard Working Women was still a relatively new site and USU OCW had not yet officially launched the site at the time of the interview.

Though most sites collect a wide array of data, several digital resource providers had difficulty identifying what information or method is most helpful. Sites had varied perspectives depending on the site content, goals, or stage of development. Some sites in early stages of either development or evaluation were unable to make any determination of priorities (USU OCW, MOAC, SOFIA). Of those with data already collected, Connexions felt that all data collected were useful. MIT OCW collects immense amounts of data and finds it important to apply external (user) data to site improvements that serve the end user. For instance, they now offer entire courses as zip files for easier download and are in the process of simplifying an underused calendar feature.

While all sites depended heavily on web traffic log analysis, several of the interviewees pointed out the problematic nature of these data. History Matters and MERLOT both noted that web traffic logs are helpful in creating a general picture of use, but analysis is limited and can easily be misleading (the number of hits, for example, may or may not correlate with the repeat users and/or the usefulness of the site). The biggest struggle for MERLOT has been the limitation of data collected by IP address. Like RLG Cultural Materials, MERLOT provides use information to their partners at the institutional level; when faculty access MERLOT from home, however, these data are not collected. RLG Cultural Materials is unique among interviewees because of their subscription service. While they roughly analyze usage data for subscribers, they were one step removed from end users. Thus, it was most useful for them to talk directly with end users (faculty) and with their instructional technology advisory group, because they were able to tease out issues and concerns not addressed by other data collection methods (e.g., logs). In fact, most interviewees noted that anecdotal evidence was often most helpful in making design and/or content decisions.

[108] MIT OCW is a special case in which more data about user demographics appears to be possible because of technical infrastructure and special arrangements with server owners.

While most interviewees agreed that all collected data were useful or perceived to be useful in the long run, not all data were analyzed rigorously. In such cases, time constraints, especially deadlines, prevent staff from incorporating all data back into the process. Most interviewees reported that the scarcity of general resources (time, staff, funding) prevented them from extensive data analysis. MIT OCW reported that the global range of their audience results in logistical challenges (due to diversity in language, culture, etc.); they are inviting education students to conduct further research with international users so that they can be served more effectively. MERLOT reported that stakeholders did not demand usage data, though ongoing evaluation was built into their mission.

Overall, there was no clear consensus about which types of data were most valuable, or about which research methodologies are best for answering particular questions. A pertinent question, given limited resources, is how much, and which, information about users is enough? This is an important area for further exploration and conversation.

2. Digital resource providers and the importance of user research

One area for inquiry is the degree to which specific methods are robustly matched with research questions. For example, our own research suggests that online surveys are frequently interpreted as providing high-quality user data about satisfaction and context of use, although we know that such surveys can be highly biased toward a small and self-selected sample, with response rates rarely above the low single digits (when matched against overall traffic). At both the May meeting and follow-up interviews, it became clear that the majority of digital resource providers in our small sample had no clearly defined evaluation plan that laid out the essential questions, the necessary metrics, and the methods by which to collect those data.[109]

In the case of log analyses, available data about user geography and institutional affiliation are usually quite fragmentary because of the large number of users who access via commercial ISPs or are otherwise of unknown origin. Such gaps in data make generalizations about the demographics of "users" speculative at best.

Finally, we have found that it is not uncommon for some types of user studies (e.g., needs assessments, use cases, scenarios, etc.) to draw heavily on biased samples, sometime as the result of convenience. How the samples are chosen, sample size, and the mix of populations will determine the degree to which extrapolation to a larger population(s) is possible. We think that there is value in distinguishing between questions of user demand and usability; both are valid ways of thinking about users, but are quite different in terms of motivations, goals, and outcomes. Drawing this distinction begs the question: Is it worth thinking about whether there are costs to interpreting user data incorrectly or applying specific types of user data to the wrong question or the wrong planning stage? One common obstacle to understanding use that was mentioned in several interviews was the lack of consistent data, terminology, and methods that might enable comparison. Sharing methods, data, and evaluation technology is one possibility for addressing this concern (Khoo, 2005), though the complexity of coordinating such efforts may prove impossible. The development of a common typology and benchmarks is a first step in this effort that might provide substantial benefit.

[109] OLI and MIT OCW did have well-defined evaluation plans and both used third party researchers.

Overall, user research beyond basic needs analysis and usability testing fell into a loose category of peripheral and expendable activities. Motivation to engage in this type of research often resulted from the external funding to do so, or funders who required it. Thus, among our small sample, we surmise that rigorous user research is not an ongoing primary activity for most sites.[110]

3. The role of user research in strategic planning

One area for further exploration is the extent to which site/resource development should be predicated on any initial needs assessment or marketing study. We were not aware that this is an established activity among most digital resource providers, and some sites (especially archive/library sites) plainly stated that it was not necessary as the transition to online access was simply the natural evolution of their services (see Goal 3B for further discussion of this topic).

While some level of usability testing and user search strategies is evident in overall site design and/or redesign, ongoing user research (and usage in general) seems to play a rather ambiguous role in long-term strategic planning. The extent to which user data informs the decision-making process was not clear, though we suspect that this factor may vary depending upon the scope and purpose of each individual site.

D. Next steps

The data from these interviews represent important areas for follow-up and further investigation. The questions of value and success have emerged as most pressing and were discussed in more depth at our Online Education Resources (OER) Meeting (see Goal 3B). Additionally, we think that the issue of sharing usage data across various projects has not been addressed. The variety of methods used, for varied purposes and goals, makes such sharing of results close to impossible. The need to make data more transparent is especially important for understanding use, given the varied measurements among sites that offer different resources in different ways. How more sharing can be achieved among projects is a topic that needs further exploration.

Finally, similar in-depth conversations would be fruitful with digital resource providers at sites that extend beyond our sample. As OER transform within higher education, the need for ongoing conversation is apparent.

[110] Again, OLI's user-driven design strategy for ongoing research and MIT OCW's extensive data collection and evaluation are the exceptions to this statement.

GOAL 3B: SITE OWNERS AND USER RESEARCHERS MEETING

Summary of Proceedings: May 23–24, 2005
Principal author: Diane Harley. With Shannon Lawrence and Irene Perciali

Introduction and Overview

On May 23–24, 2005, the Center for Studies in Higher Education convened a meeting of seventeen experts for a discussion entitled "Online Educational Resources: Why Study Users?" The meeting was part of the UC Berkeley "Use of Digital Resources in Undergraduate Education" study. A complete agenda for the meeting and a list of participants can be found in Appendices N and O.

The format of the meeting was relatively informal and flexible to maximize discussion. Our discussions covered four broad topics:

- Codifying content and contexts
- What do we want to know about users? How do we find out?
- Users, user demand, and sustainability
- What are the larger research questions and agendas that need to be addressed?

The participants represented a variety of perspectives in the field of online educational resources. Their collective expertise included production and delivery of online educational resources, delivery of continuing education, user research, and foundation funding. The following organizations were represented:

- Curricula: CMU OLI, Connexions, MERLOT, UC Irvine, MIT
- Digital Libraries: JSTOR/ARTstor, NSDL
- Tools and Reuse: Carnegie Foundation, MIT, IKSME
- Foundation and Society perspectives: ACLS, Hewlett Foundation

The meeting, organized by Diane Harley, Vijay Kumar, and Gary Matkin, was born out of our collective interest in how we might clarify communication about users within the somewhat amorphous field of online education resources. Our purpose was to explore a number of questions. Most broadly, what do we know about users of online educational resources (OER)? What more do we need to know, and how do we find out? What, exactly, do we mean by online educational resources? Is it content, a course, or a certification? Is it open or restricted, and do users even know the difference? We asked from the start what we mean by users. The meeting also served as an opportunity to present for critique preliminary findings from the CSHE faculty survey (see page 4-20) and interviews of OER site providers (see page 6-3).

Regarding terminology, we intentionally focused on *Online Educational Resources* (OER) broadly defined, because we know from our work that most users, and even some producers, do not actually make the distinction in practice between open-access and proprietary, restricted, or licensed sources (e.g. proprietary textbooks and databases that are licensed are used in combination with free resources found on the Web through Google). But because so many of

the participants are specifically involved with *"open" online education resources* (OOER), there is potential for confusion. We attempt to maintain the distinction throughout this summary.

Proceedings were recorded and transcribed. The following report represents our attempt to summarize our rich discussions. It is not meant to be verbatim, nor presumptive of any one perspective or position, but rather a synthesis of the main ideas and disagreements that emerged, and the areas that were noted to be worthy of further exploration. It is a merging of many voices.

Section One: The challenge of creating common frameworks for studying users

A. Finding a common framework: codifying content and contexts

The meeting began with these fundamental questions:

- What do developers know about the demographics, behavior, and motivations of users and non-users of online educational resources? How do they find out? What do they want to know?
- How does the variety of online educational content available (canned curricula, digital libraries, media sites, electronic textbooks, learning object repositories, etc.) and the infinite number of ways users can combine resources (e.g., individual digital objects and canned curricula; mixture of free and proprietary content; comprehensive and niche resources) influence our ability to make sense of the current and future landscape of user behavior and motivation?
- Is it important for content providers to distinguish among various educational audiences and contexts (e.g., community college, R1s, AP courses, fully online versus on-campus hybrid, international markets, liberal arts, vocational, etc.)?
- How are localization and translation of open content to be handled? Who are the mediators? How can we help users access and share pedagogical knowledge and innovations to better use OER?

Questions about user behavior are tightly linked to questions of policy and planning. Descriptions provided by various initiatives about what they know or don't know about their users clarified that both information about users and key terms and methods for studying use vary greatly from one OER project to the next. Some projects have in-depth knowledge about some of their users but not about others (e.g. Carnegie Mellon University's Online Learning Initiative and MIT OCW), while other projects have little systematic knowledge about any of their users. The lack of a clear approach to studying users makes it difficult to coordinate knowledge about audiences, uses, sustainability models, or strategic planning among OER projects. To answer such questions and make OER useful to varied users and communities, we need a common framework for talking about and studying OER users.

1. Barriers to systematic understanding of users: More attention has been paid to supply than to demand for OER

A common assumption among participants representing open OER (OOER) initiatives is that a large quantity of OOER production and dissemination has been driven by the excitement of the mission—characterized by several participants as a "vision" or "campaign" with, perhaps, an

"evangelistic" bent. The site owners who participated in the meeting also acknowledged that they often have limited knowledge about who is using the content and why, and some are coming to realize that many OER, whether open or not, are not being used as widely as anticipated. The "build it and they will come" approach of OER initiatives, especially those born in academic institutions, has in many ways precluded systematic investigations of user behavior and demand.

2. Codifying categories of content and users

A major challenge identified by the meeting was creating a common framework to talk about various users and various kinds of OER. As one participant put it, "The trouble we have in defining our market or defining the need or defining our users is that we don't even have a common semantic about what we mean." Based on general agreement that we should be more precise about the categories of user study, the meeting posed the question of how to go about codifying the content and context of OER as a first step in coordinating among projects.

Participants all underlined the importance of having clear categories to break down large terms like "digital resource" and "user." For instance, before deciding to study "faculty use," a researcher needs to decide what sort of OER to ask about and what sort of faculty to study—from what departments and institutions, and with what educational aims. Only with a precise vocabulary and a shared understanding can user studies be applied effectively in diverse contexts. As one participant put it, "Just to be able to qualify and inform what should be the kinds of questions that you'd ask of large initiatives I think is a worthwhile purpose." Participants hoped that such a codified framework could help make sense of the OER endeavor as a whole: "Some sort of structure or analytical framework through which research could be judged, research agendas can be formed, proposals can be evaluated, individual business plans could be assessed, and so forth."

a. Differentiate among types of OER content

The category of OER needs to be refined. Are we talking about sophisticated, carefully crafted curricula such as CMU OLI, syllabi and associated materials such as MIT's OCW, modular learning objects such as MERLOT, a repository that can be added to in chunks as with Connexions at Rice, or a digital library such as MOAC or RLG Cultural Materials?

Participants began to elucidate the differences among OER products and sites. Some sites are significantly larger and broader in scope than others. Some sites offer referratory or portal services on top of content, and one participant reminded us to differentiate between "product" and "service," where the former is the online content, and the latter is the repository or portal. Then there are multiple sites that provide "online courses." While some of these course sites offer online instruction that stands alone, others offer online materials to supplement a course that takes place in a traditional classroom. Resources need to be differentiated according to "the extent to which the enactment of instruction is embedded in the resource itself," as one participant suggested. Curricular sites need to be distinguished from the multitude of digital library and archival collections that house massive amounts of "raw" digital resources, as well as from commercial media sites that offer a variety of media types from news stories to digital video. Aware of these and many other differences among OER sites, participants agreed that we should not over-generalize from a high-profile OOER site like MIT's OCW. OCW's success

does offer a powerful vision of possibilities, but their precise profile is not necessarily what every user wants and what every OER site should duplicate.

b. Differentiate among OER users and the contexts in which OER can be potentially used

Students vs. faculty vs. self-learners

Participants throughout emphasized the importance of distinguishing among student users, faculty users, and unaffiliated independent users, or self-learners. Because these groups use OER materials in very different ways, developing unique strategies for site and content design to meet those user needs may be essential for success. CMU OLI, for instance, designs materials that can, in principle, be used by everyone, but they often present the content in different forums that suit each unique target audience. (See page 7-17 for a more in-depth discussion about informal users.)

Moreover, many, if not most, open-access OER sites are used by learners in other countries. Participants with global audiences explained that working with other countries involves adapting to a diversity of learning styles and objectives, as well as navigating the complexities of cultural and linguistic barriers. As one participant put it, adaptation means more than just translation, or even making relevant examples available. It also means that we have to understand the preconceptions, misconceptions, and previous learning foundations of the students in those countries.

Type of institution

Participants noted that formal academic users (students or faculty) differ based on the type of institution in which they work or study. Users from R1 universities, liberal arts colleges, community colleges, vocational schools, or high schools are likely to have differing objectives and access to technology. For instance, community college students (who may rely on computer labs more than a personal computer) often do not have the same level of access to technology as would students from a liberal arts college (who may have a personal laptop included in their tuition). Other types of users may not be in formal educational settings at all, but in workplaces, or learning from home.

Users with different skill levels and learning objectives

It is fruitful to differentiate the reasons that people use OER. Some seek a particular digital object for a specific purpose; some seek a completely stand-alone course; some seek supplemental material for a research project, assignment, or their own course; some seek to create their own online course or resource site; and others may just be engaged in lifelong learning.

Different types of users also have different skill levels and technological sophistication. If technological sophistication corresponds to age, participants suggested that the fraction of sophisticated users will only increase. Indeed, younger students may be comfortable with technologies, like instant messaging, that university instructors and OER sites have barely begun to incorporate in their teaching methods. But the difference in skill level and technical sophistication is not as simple as age and can also be attributed to factors such as discipline, industry, and socioeconomic status. Not knowing that a resource exists is just as much of a barrier as not being sufficiently skilled to use it. This CSHE study, for instance, found that

many UC faculty simply do not know about the wide variety of restricted digital resources available to them through institutional licenses.

Non-users

One key group to study is individuals who do not currently use OER, especially if one aims to increase OER's audience. Why don't certain faculty, for instance, incorporate OER into their teaching? This research project was particularly interested in why resources weren't being used, and Diane Harley suggested that understanding non-users presents an opportunity. If we better understood the myriad reasons for non-use, including social and economic barriers, perhaps we could redesign OER in ways that would be useful (and that would potentially counteract existing disincentives and barriers).

Category overlaps

Finally, it is important to remember that user categories will inevitably overlap. Some users are also producers who create and contribute OER material of their own to existing sites. Self-learners encompass a vast and demographically diverse population who embark on varied types of independent research. Some users from one institution (for instance, a graduate school of education) may seek OER to be used in a different institutional context (K–12 classrooms). How do site producers define the user or user community, and classify users into categories, when communities can be so fluid and difficult to define?

B. Codify terms and methods for studying users

This session, which provided an overview of CSHE interviews with site owners on OER user studies, referenced the following questions:

- Where are the gaps in current data about users, and how might those gaps be filled? What are the best methods to employ for strategic planning purposes? Should/can OER projects be thinking about common questions, metrics, and approaches to understanding users?
- What are consequences, if any, of poor sampling and of application of user results to the wrong questions? Are there consequences to not doing user demand/market analyses before building content?
- What are the best ways to leverage activities across multiple projects?

Shannon Lawrence presented her work interviewing OER site owners (see Goal 3A). Her interviews, and the ensuing discussion, highlighted the problem with the current state of user studies: while many OER sites may use similar tools for collecting data (weblogs, online surveys, focus groups/interviews), the questions asked and the precise metrics used are unclear and inconsistent.

There was some concern expressed that sites may not even know about the range of possible evaluation tools they could use, and how to use them. At the National Science Digital Library (NSDL),[111] Flora McMartin found that the six digital collections under study used almost completely different metrics to describe themselves and their use. Similarly, Shannon Lawrence,

[111] http://nsdl.org

during her initial discussions with site providers for this study, found widely differing notions of what it means to "interview" users—it can mean conducting a focus group, a survey, an informal conversation, or a usability test.

In addition to codifying the categories of OER content and OER users, participants concluded that it is also important to agree upon some common questions and methods for conducting user studies. A discussion of research design followed: some of the better-funded sites have hired specialists to collect and analyze their user data, but few others can afford to follow suit, and are left to analyze their own data without necessarily having the professional expertise to do so rigorously.

Participants did not all agree that a professional-level study and analysis is always warranted. As Diane Harley asked, "Do we really do anything with this high-end, expensive evaluation work that is any better than what we would do with the informal kind of studies?" Informal conversations with users, it was argued, may be useful, depending on the site's objectives and constraints. Several of the site providers interviewed found that in-depth feedback from individual users was more valuable than large, comprehensive surveys. This type of informal user study may be especially useful during the early stages of development, when a site is determining direction, and later when usability issues of existing tools might be needed. It may be less useful if decisions are being made about investments in new and expensive initiatives. Participants concurred that it would be helpful to clarify which different types of studies—degree of formality, scale, rigor of data analysis—were best suited to particular objectives and particular contexts.

1. Clarify the purpose and objectives of user studies

Throughout the discussion of distinctions among types of content, types of users, and types of study, participants returned to an important consideration: a site first needs to understand its objectives to best select the categories it wishes to study. One participant noted:

> *In order to get a handle on the impact of use and whether outcomes are being achieved, we need to describe the problem we're trying to solve. Because actually, how I measure success, and even how I continue to do product development and dissemination, has everything to do with "what's the problem I'm trying to solve?"*

While there are no hard and fast rules about which methods should be used, there was significant discussion about the need to identify the objective of the OER project and to design studies to improve the probability of meeting that objective. The metric a site chooses for "the atomic unit of the user"—institutional affiliation, desired learning outcome, skill level—depends on what that site wishes to learn from its findings. Conversations among different site producers revealed that different studies are appropriate for different OER projects. For example, it is important to consider whether a project is under pressure to adapt to user demand or has the financial resources to create content regardless of user demand or needs. Sites that follow a subscription model may choose to study only visitors that use the materials regularly and frequently, while a site such as Connexions tries to understand and serve every visitor.

In her interviews with site producers, Shannon Lawrence found that many sites collect data without knowing what they want to learn from it. That is, site producers had difficulty

expressing the connection between the data collected and its usefulness, and they often lacked a framework for analyzing data. This fact seemed to highlight the crux of the issue: the problem may be not only in collecting the data but in analyzing it. In fact, several site providers openly admitted to collecting data with no intention of immediately analyzing it, either because they did not have the resources/funding, or because they were unclear about what possible questions it could answer. Some debate ensued in the discussion following her presentation and throughout the meeting. Some shared the concern that few sites have thought through what data they really value and why, while others felt that it was desirable to collect as much data as possible even lacking a clear objective.[112]

2. Why study users? Illustrative cases and goals

Participants stated a wide variety of goals for user studies, ranging from improving producers' decision-making process, to increasing the value of the broader OER endeavor. The following three site producers went into some detail about the particular ways in which their user study impacted OER project design.

Example 1: Carnegie Mellon University Open Learning Initiative (Candace Thille)
User studies can improve academic value, pedagogic quality, and educational outcomes.

OLI is driven by a mission to improve educational pedagogy through cutting-edge computerized learning. Because OLI's goal is to improve pedagogy rather than, for instance, to reach as many people as possible or to encourage learning communities, their studies focus on learning outcomes and especially on professional development for instructors. They differentiate between two types of users: students/self-learners who do not otherwise have access to high-quality post-secondary education, and smaller institutions of higher learning that wish to incorporate OLI's course content and teaching methods. OLI designs their offerings differently for these two distinct audiences; for instance, for the latter they offer coaching and professional mentoring. They also study these two groups of users differently. While they communicate with their faculty and institutional partners through informal conversation, they study learners by gathering data about individual usage practices, learning styles, and performance, and improve their materials accordingly. They do not, however, collect data about user identities such as age, field of study, or institutional affiliation. They do try to understand the CMU faculty who contribute to the project: what keeps them motivated and how to encourage them to continue contributing high-quality material. In sum, OLI's efforts at user study are geared to maintaining a high-quality model curriculum. Some of that curriculum has spun into a commercial venture, Carnegie Learning, but the business side does not affect the ongoing research and development within OLI itself.

[112] It was suggested by one participant that a better approach in talking to site producers about user studies would be to ask which metrics best answer their most pressing questions. Follow-up interviews in which this new set of questions was posed resulted in an equal amount of confusion. Making the connection between important questions in user studies and the metrics that answer those questions is beyond the capacity of most evaluations at this stage in OER development. The exception to this experience may be those sites that have clear objectives tied to *measurable* goals. Also, those sites that invest in professional evaluation are more likely to have a comprehensive evaluation plan.

Example 2: Ithaka/JSTOR/ARTstor (Roger Schonfeld)
User studies can improve usefulness to specific, known users and can inform choices about content and tools.

ARTstor faced some choices about how to design their offerings and where to invest their limited resources: in improving the quality of an individual image, in offering more images, or in providing robust subject indexing and metadata. So they turned to a needs analysis to address these issues and developed a formal survey that asked "what do users want?" Because ARTstor aims to appeal to a broad range of faculty, the survey was administered to a wide variety of disciplines. And indeed, although art historians preferred a higher image quality, the survey found that the majority of other faculty were more interested in having a very good cataloging and search system. The formal market study confirmed a critical issue that ARTstor staff had long suspected. Having these results in hand helped to give ARTstor the confidence to devote further resources to its metadata, including the creation of robust "crosswalks" across collections allowing for the best possible user experience.

Example 3: University of California, Irvine, Distance Learning Center (Gary Matkin)
User studies can improve economic sustainability.

The Distance Learning Center studies its users to create a product that will draw partners to commercialize it. They engage in market research and product development primarily by trying different prototypes. In Gary Matkin's words, "One of the things we do is we build a prototype product and test it on an audience, and see if they like it." Rather than engage in a formal needs analysis, they rely on professionals and experts who understand the field or industry to identify areas of need. Thus, the Distance Learning Center puts resources into product development first, and lets the market tell them whether the product is viable and attractive. Gary finds this approach more cost-effective in their case, but, as another participant noted, such an approach depends on the cost per unit of production. Gary acknowledged that other types of OER products would likely require too much initial investment, and hence would warrant greater initial study.

Based on these and other conversations, three goals for user studies emerged:

a. Goal: Improve OER content and functionality

As all three examples show in their own way, one key goal of any user study is to enable an OER to be responsive to various audiences' needs. Steps to this goal can include changing content, adding software functionality, refining the learning experience, and/or fixing any back-end problems.

b. Goal: Assess OER value

Value came up repeatedly in discussions about the goal of user studies: participants hoped that understanding use would help assess the true value of OER. To answer looming questions such as, "Do we keep going…do we keep putting money into this…is there value?," site producers need to know if people are using OER. A more precise understanding of users helps move considerations of value from the abstract to the tangible. Participants cited instances where an OER that seemed valuable because of its high-quality curriculum ends up having very little value for an audience, whether for lack of interest in the content as packaged, access to basic technology/usability, or similarity to existing OER. User studies, thus, can provide a

perspective on how much a particular OER realizes its value for its users. (The value of user studies and their relationship to sustainability is discussed in more detail in Section 2.)

c. Goal: Strategic planning

Another key purpose of studying users is to inform strategic planning. Is there an audience? And who is the audience for whom a particular product is most valuable? By realistically assessing a site's value to users, user studies can help producers gauge whether their vision of the site is on the right track, what improvements they need to make to further their objectives, and whether they should adjust those objectives. User studies can also create a feedback loop between funders and site producers by giving funders a way to know whether a particular grant is meeting its objective.

While few OER sites currently engage in the sort of strategic planning that Roger Schonfeld described above for ARTstor, participants imagined various scenarios where user studies could productively inform strategic decisions about future development and resource investment. For instance, if a site realizes it is primarily used by self-learners, it could design new tools that would be of interest to that audience. User studies could also help OER producers make difficult strategic choices: a site may choose to narrow its profile to serve only the key audience that most frequently visits it. Finally, strategic planning can help a site think about the lifecycle of its offerings and how to respond to trends in technology and usage patterns. Aware of the rapid nature of technological change, participants were concerned about how to continue to produce content that is useful for varying communities whose needs and skills change over time.

Not all participants were equally convinced that user studies would actually help OER be more responsive to its users. OER suppliers may be so content-driven that, as one participant put it, "It doesn't matter what we say about user studies, and what information, they're still going to be producing these repositories just willy nilly…." Another participant pointed out that because OER use is such a moving target, the conclusions from today's studies may be very poor strategic guides for the future.

Similarly, not all participants were equally convinced that strategic planning should be the main objective for user study in the first place. Instead, OER sites could conceive their user studies as academic rather than marketing endeavors. After all, as one participant phrased it, educational projects such as OER have never been the sort to tailor themselves to "well-targeted, well-defined user demands."

3. What methods are best, in what contexts?

The discussion then addressed some practicalities of studying users: what are the obstacles, technical and conceptual, facing user studies? And what are some potential solutions and directions for future research?

Obstacles to research quality and rigor: bias, the unknowable, and lack of replicability

Bias

Good social science research demands time and professional expertise, and most organizations do not have the resources or skilled personnel to conduct rigorous research (or even more casual research in some cases). As a result, studies can be poorly designed and executed (e.g., ubiquitous lack of random sampling, lack of assessing impact of small response rates, lack of knowledge of existing research). In particular, participants pointed out that user studies are prone to bias if conducted by the site's own staff, who are very invested in the success of their particular site. Several participants discussed the ways in which user study risks becoming a "self-fulfilling prophecy" that serves to validate the producers' pre-existing sense of the site's value. Another participant pointed out that user studies tend to favor relationships and products that already exist: it is much easier to ask a site's existing users about the content they already use than to research non-users and explore what other content users would use if it existed. Techniques for measuring site usage also may have bias; for example, it would be misleading to measure hits right after a site has launched a new advertising campaign. Being aware of these potential biases, however, participants could imagine finding ways to correct for them, or at least acknowledge them, and still produce informative studies.

The fuzzy unknown

A major stumbling block to collecting good data is the difficulty of understanding the full range of an OER site's users. As participants shared their actual knowledge and conjectured about who uses their site and why, it became clear that most sites freely available on the Web get hits from a phenomenal range of users with very different goals and motivations. Participants cited the international community and K–12 teachers and students as examples. It is especially difficult to study users who do not register and who do not log in from recognizable institutions. Many open-access OER sites, in particular, do not even have a registration option, leaving few avenues open for understanding users at all. Sites such as OLI do not collect IP addresses and can rely only on anecdotal and random email messages. A site such as MERLOT is able to track usage only from IP addresses provided by their campus partners and is thus unable to learn about the larger fraction of off-campus use. (The challenges presented by anonymous, unaffiliated visitors are explored in greater depth below, in the section dealing with unintended use and users.)

Even when it comes to known users, identifying what to measure is sometimes problematic. How much use qualifies a site visitor as a "user?" How do we define an "active" user? As one participant inquired, "Is 'active' somebody who comes on once a year and spends two or three hours looking for materials? Is it somebody who is there once a week?"

Participants also noted technical and cultural barriers to studying users, especially via log analysis studies, which can be fraught with problems (e.g., see Goal 2B, page 5-2), and when studying international users. When it comes to formal and informal surveys, some participants suspect that what users claim in surveys is not always what they do or need in practice. This suspicion compounds the significant difficulty of working with exceptionally low response rates and biased samples when interpreting survey data culled from an on-site survey.

Replicability

Finally, many participants were concerned about the fact that even a well-designed study may be difficult to apply to other sites or types of users due to the variation in producers, institutions, and users. Indeed, comparing use among projects is one of the greatest challenges facing user studies. Can a study about faculty at the University of Wisconsin tell us anything about faculty in California community colleges? A very broad study may not shed light on the day-to-day decisions of a particular OER site, while a very specific study may not be applicable to other contexts. Other participants felt, more optimistically, that any user study is a building block that contributes knowledge about the big picture. For example, one participant described several ways in which the divergence among studies still teaches us a great deal about segmentation among user groups.

4. Recommendations

a. Gather more and better user data

Participants brainstormed ways to collect more useful information from both registered and non-registered users. MERLOT, for instance, will soon begin asking registered users questions that differentiate them according to the categories outlined above, such as institutional affiliation. Users could also be asked to describe what they have done with the OER material they found, and to provide greater detail about their needs and interests. Ideas were exchanged about new technologies that could track a single user throughout the site, combining his or her registration information, feedback, and transactions into one profile. A cookie is one solution, or perhaps an identifying passport that tracks a user across multiple OER sites. Participants did agree, however, that all such data-gathering must be voluntary, to respect users' privacy, especially in cases where there is fear of politically motivated surveillance.

b. Share knowledge

Participants underscored the importance of being more aware of one another's projects. Understanding the existing array of OER projects can help producers eliminate duplication, position a site to address unmet needs, and identify potential partners with complementary offerings. Knowing about other projects would also help producers expand their sense of what is possible and what is valuable.

Additionally, participants would like to see usage statistics shared across projects, so that user data can be combined and analyzed more broadly. Some conceded, however, that projects which compete for funds may not be willing to share their user data freely, especially data that was expensive to collect and is considered proprietary.

A different discussion underscored the importance of knowing about existing studies: while trying to rectify the lack of sufficient user information, we should not overlook the fact that a great deal of research has been done on many of the relevant topics. Some time spent researching existing literature and other user studies would ensure that new studies do not just reinvent the wheel. As one participant put it, "An hour in the library is worth twenty in the lab." Similarly, some participants noted that foundations already provide a sort of "marketing" study when they articulate their funding priorities—they have already done the work of speaking to relevant constituencies to assess and prioritize needs.

c. Create a feedback loop

In response to concerns about whether it is possible to generalize from user studies, many participants pointed out that the most effective general categories and questions are those that emerge gradually over the course of many studies, in a continual back-and-forth between the micro- and macro-level. All relevant variables of study—mission, users, producers, sustainability—are interwoven and need to be put together piece by piece, which is best accomplished by an iterative analysis.

d. Develop a community approach—methods, questions, categories

The importance of convergence was underscored by several discussions. Developing a common approach to user studies would further the ability to approach OOER as a collective movement rather than as a series of isolated projects. A valuable goal, according to many participants, is to articulate general principles and standards as a community. Indeed, when asked how they would go about designing a research agenda for user studies of OER in general, many participants suggested that future studies should take place under an umbrella framework that ensures consistency and the capacity to generalize. A coordinated effort would then ensure that at the end of the study period, we would be able to draw definitive conclusions about "the general world of users."

Section Two: Users, user demand, and sustainability

A. Value and sustainability in context

Although we devoted an afternoon specifically to the topic of sustainability, it was in fact a recurrent subtext woven throughout the two days of discussion. The formal discussion focused on the following questions:

- What do we mean by sustainability and what are its dimensions?
- What is the relationship, if any, between understanding current and potential users, and questions of user demand and sustainability of open online educational resources?
- How important is it to distinguish between those willing and unwilling to pay for use of online resources (e.g., undergraduate contexts versus informal learners, etc.)? Between intentional users who have specific educational goals and broad-spectrum users?
- What are the financial implications of subsidizing informal users?

Concerns about sustainability were introduced early in the meeting during Phoenix Wang's discussion of the Hewlett Foundation's OER value chain. She explained that the foundation has moved away from the creation of content and toward considerations of access and the authentic use of resources in real educational contexts.

Vijay Kumar began our focused discussion by asking us to think about value and distinguish among the multiple aspects of sustainability: technical, financial, and organizational. He pointed out that technology and infrastructure are inherently transient and variable, and that ultimately content needs to be designed to enable choices in complex contexts. Value, as a measure of sustainability, is ultimately determined by heterogeneous communities and needs to

be understood in each community's local context. Technological innovation should not be considered a value for its own sake. The questions to address include: What are local priorities? How do usability and complexity interact to define value in specific contexts? How do costs and support service needs affect value? How do various sectors (e.g., publishers, faculty, students, etc.) value the same resources? Finally, he suggested that the organizational structure within which the OER is embedded should enable the participation of different sectors. This need is especially true for "open" OER (OOER). As Kumar put it, "Value is determined by people being able to get to the value." Kumar pointed out that even expensive technologies can be discarded if they do not fill needs in local contexts or local cultures.

Definitions of value and approaches to sustainability also vary according to each OER's context and goals, or the specific problems that an OER is trying to solve. It was argued that the only way to understand the value of OER—for individuals, communities, and institutions—is to measure its impact and its outcomes. Does OER improve educational and societal outcomes? And how can those outcomes be measured rigorously when so many users are "informal" and difficult to track?

Following this introduction, the group spent considerable time debating the components of sustainability and value. It was agreed that codifying the ingredients of sustainability and the types of value would be necessary to answer recurring questions such as, "How do you measure success?" and "What makes a good OER?" A number of schemes emerged for breaking out these dynamic aspects of sustainability and value. We unanimously agreed on four key components of sustainability:

- Curricular
- Technical/Infrastructural
- Organizational
- Financial

B. Curricular sustainability

1. Assuring quality—who vets?

In the world of open-access educational resources that were represented at the meeting, quality and value are central concerns. Users have to trust the quality of OER content to value and therefore use it. Real concerns about propagating misinformation and poor quality educational materials are common, but there are also costs to high quality. For example, quality is determined to a large extent by accurate, timely, and updated information. But these very requirements can be a significant obstacle to sustaining OER financially.

Who, if anyone, is responsible for assuring OER quality? Two primary answers were provided: the content producers should survey and control the quality of their content, or it can be left up to the user community to vet the material, either through peer review or some kind of ranking based on social tagging mechanisms. The ensuing conversation explored the contents, purposes, and audiences associated with each of these models.

Producers can vet

There are a number of issues that relate to quality in OER. Users often rightly associate OER content from prestigious institutions like MIT with higher quality. Such universities already vet the faculty and other staff who create OER; in these cases, it is the institution that guarantees quality. In other cases, however, OER is not the product of an accredited higher education institution but rather an aggregator, referrer, or independent OER publisher. As new providers of OER emerge, it may not always be easy for users to sort the good from the bad.

Some producers choose to actively control quality by strictly enforcing their own pedagogical and production standards, sometimes linked to highly specific course or certification requirements. In these cases, scope and sequence is relatively fixed. This tight linkage may result in such highly structured and linear content that it becomes difficult to reuse the material outside of the context originally envisioned by the producers. There was some discussion that the more independent and inexperienced the learner, the more structured the material needs to be, which itself creates tension between quality and reusability.

Other sites, such as the referratory MERLOT, have established a peer review process, which benefits from carefully chosen content experts and a clearly defined set of criteria. In both cases, the OER are "branded," and that branding confers quality at a relatively high level. When branding is important, it also becomes paramount to avoid brand dilution. As a result, some contributors and content are turned away, which is seen by some as antithetical to the idea of "open" content. Such perceptions of elitism create additional tensions within the OOER movement.

The community can vet

At the far extreme of OER being produced by a prestigious research university such as MIT are sites where anyone can contribute to a corpus of information and no one will be turned away (e.g., the Wikipedia model). In marked contrast to the MIT OCW model, the user community itself takes the place of institutional or individual authority over quality. In a totally user- and learner-centered model, quality is a function of whether users get what they need from the material. Quality in this scenario is simply relative. However much work an institution puts in to producing high-quality OER, it is ultimately up to each user to make the final decision about whether the material meets his or her standards and will be useful. Connexions and Google are two online examples where quality is vetted by a grassroots community process: a voluntary peer-rating system in the former, and a mechanized system in the latter.

Alan Wolf, meanwhile, provided a different perspective.[113] The science faculty that he studies claim to trust neither peer review nor community vetting; instead, they simply rely on their own personal judgment in every case of using an OER, or they consult with a trusted colleague. Similarly, the responsibility of quality could also rest with the individual faculty member who guides student users to the best OER for his or her purposes. In this model, though, the vast

[113] Alan Wolf described the National Science Digital Library's (NSDL) user study he and others are conducting. NSDL noticed that, despite the high quality of their digital collections, their collections were not being used as much as anticipated. In designing the study of faculty, Wolf and his colleagues followed the CSHE model. They are collecting existing research on this topic, and also plan to design a toolkit that would make their study replicable and perhaps useful to others.

emerging universe of unaffiliated informal users remains without the benefit of such a guide, and users are left on their own to make sense of the information.

The role of (active) user communities in sustainability

A community can be made up of users who are studying the same material or who are interested in the same knowledge clusters. Once connected to an OER community, users are more committed and likely to contribute to the site. The types of communities discussed ranged from students who take a course together, to self-learners who meet while studying the same material, to faculty in a similar discipline who might share and develop course content.

The type of content, or the degree to which it is "cooked," may determine to some degree the role of the user community. The more easily the content can be manipulated, the more likely a user community may be given free reign over adapting materials both for their own needs and for the user community at large. Of course, the downside is that the independent learner is left with a diminished learning "roadmap" to follow.

One model, illustrated by Connexions, encourages a user community to actively contribute to OER, ensuring curricular sustainability in two ways. By taking an active role in developing content, users help the site offer continuously growing and improving content. Simultaneously, an active user community can ensure that the site makes an impact: users develop the content that is useful to them in their local context and that takes into account their (or their students') learning styles and objectives, rather than what the institution or producer would unilaterally choose. By building user communities in this manner, OER can develop a feedback loop between users and site producers (or developers), but only if there is a mechanism to document the products and processes created by the communities in question. In the case of Connexions, each time a user makes changes to a set of materials, a unique version is published to the corpus.

Participants recognized ongoing problems and risks when it comes to community reuse. Much of the time, repurposing occurs outside of the OER and does not return to its site of origin (unlike Connexions), and hence does not increase the overall corpus of knowledge. Some participants felt that reuse puts quality at risk: curricular value may get lost when pieces are taken out of context, and the repackaged resources that a user contributes back to the site may not be of high quality. Connexions has found that the pieces contributed by some users have no copyright clearance and/or are not in keeping with the site producers' specifications (e.g., images, syllabi, course details, office hours). Additionally, including such items would reduce the reusability of content by others.

Creating and maintaining community

Though many sites find it desirable to have a critical mass of users constantly creating, using, reusing, and adapting content, how a site can encourage and support such vibrant growth remains a question. Community is dynamic and hard to predict, and it may have much more to do with users themselves than with anything that an institution can author. As one participant suggested,

> *Community doesn't just happen by making content available. You really need to have some sort of an infrastructure, and it's not simple to do, to allow the community conversations to happen, and to really have leaders that get people in a subject area or*

> *interest area together. They have to have some sense of belonging to that subject before they're ready to start giving back and improving.*

Learning communities are, as one participant put it, transient by nature: as soon as the material is learned or the course completed, there may be little reason to keep participating. On the other hand, while a particular course has an end-point, many users are ongoing learners who need to keep up with their field (such as tax law), and these learners benefit greatly from being in touch with others in that field. Communities may be easier to create around a subject area with multiple courses than around one course. The resulting challenge for OERs is how to support these various communities.

Currently there is no common set of standard tools or practices to help achieve interactive community on a large scale, though emerging social computing models such as Wikipedia, individual "play lists," and social tagging (e.g. del.icio.us) were hailed by some as a possible way to merge individual needs with resource sustainability.

Several initiatives are developing techniques for encouraging community and reuse. Lisa Petrides and Toru Iiyoshi described their emergent projects that are being designed to facilitate such communities. With Hewlett Foundation support, Petrides at ISKME[114] is creating an open-content portal that would act as a layer to open content resources and will point users to open content, particularly educational materials. The project intends to have both a top-down and bottom-up process, so that it will be organically driven (through tagging, etc.) and will contain some measure of quality vetting. The portal will point users to other people's repositories, but will not be a repository itself. The portal will initially be seeded with pointers to particular content, especially courses, from specific fields (not yet identified). Toru Iiyoshi demonstrated the Knowledge Media Laboratory developed at the Carnegie Foundation. The KEEP toolkit[115] is an open technology being deployed and tested that allows instructors to gather and use OER, and also to reflect upon and share best practices in the use of OER.[116]

While it is far from evident that spontaneous talking and sharing among users creates real educational value, a substantial knowledge community could be encouraged by an appropriate OER site design. One conversation explored how open-source software encourages community to develop organically. People in open-source software participate because they enjoy the prestige of being part of a community that creates create software and that improves with iteration. The degree to which the open software movement is analogous to open content creation is questionable, however. In the former, bad code simply doesn't work and cannot endure, whereas with academic content, misinformation can propagate uncontrollably, especially in non-technical, non-scientific fields.[117]

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[114] http://www.iskme.org

[115] http://www.carnegiefoundation.org/kml/keep/

[116] http://www.carnegiefoundation.org/kml/keep. Similar sites and toolkits are being developed, such as COSL's eduCommons software (http://sourceforge.net/projects/educommons) and the Development Gateway's community site, which targets developing countries.

[117] At the suggestion that machine translation could offer a mechanized way to make OER more readily available to different cultures, it was pointed out that this could be particularly dangerous in well-crafted curricula where accuracy is paramount.

Intended vs. unintended users

The unintended or informal user community, as opposed to those university faculty or matriculated students for whom the OER may have been initially produced, clearly has to be considered to enable understanding of the value of a resource. For many OER initiatives, the informal learner is an exceptionally important metric of value, even though matriculated students, and the faculty who teach them, are the primary targets. One question that arose time and again was whether the OER could or should adapt their content or services to unintended users. How and if these informal users should be subsidized is a problem in search of a solution. Significant discussion around the following questions followed:

- How does unintended use impact a site's mission?
- How can unintended use add value and contribute to sustainability, or is it simply to be viewed as a pleasant by-product of targeting a core audience of paying matriculated students?
- What happens when the tables turn, and OER sites are transformed by informal users in ways that site producers never predicted?
- To what extent does a site subsidize the cost of redesign to accommodate all of its users, including those who are unintended?

Participants answered these questions in different ways based on their unique missions, primary value propositions, funding models, and institutional obligations. Some sites, such as MERLOT, remain committed to their original target audience and do not intend to change their mission or customize content for unintended users. Other sites, such as MIT OCW, view unintended international users as a new strategic opportunity and have aggressively adjusted development efforts and resources to meeting the needs of these new audiences.

To some participants, unintended use is an opportunity for creative reuse. The pedagogical innovations that occur around some materials often result in uses that the original author had not intended. To other participants, unintended use represents a possible revenue opportunity, signaling to the site producer a new market that may be larger and/or more lucrative than the site's original target audience.

Participants discussed reasons that an OER site should not or could not change course to serve an unintended audience. During a discussion exploring the pros and cons of expanding to serve the K–12 audience, particularly the lower grades, it became clear from Geneva Henry's description of Connexions that the support costs of accommodating a new audience could be potentially very large. Costs might include the necessary staff to develop new content and support educational goals and standards that are out of a producers' original domain in higher education. Some participants also worried about inevitable trade-offs: by shifting resources toward a new audience, a site could find itself under-serving its intended users. Finally, funders may not wish to support a target audience that differs from the audience they originally envisioned. And as one participant asked, given the nature of OOER, is it possible to limit how a site is used? How a site accommodates unintended use requires a complicated calculus that must account for the site's mission, scope, financial model, desired impact, quality control, and targeted constituencies.

Finally, if content can be used with other technologies and other tools, it might be reasonable to assume that there is another category of unintended users—commercial entities. For example, one question raised was how the commercial publishing community could add value to an open-access resource. Will the OER community resist use by such a proprietary commercial entity? It was suggested that we think of OER as part of a large ecosystem that includes various players who want to contribute value, and in doing so, help to sustain it on multiple levels. This notion introduces yet another tension between the values of the producer (who may want to give it all away) and potential users who want to integrate it into a commercial venture.

C. Technical/infrastructural sustainability

1. Centralized repositories, aggregation, and metasearch

It was argued that OERs, and especially OOERs, need a common place where they can be reliably housed, organized, searched, and preserved, perhaps in one or more centralized OER repositories. And other institutions or individuals must be able to easily contribute material. The benefits of centralized repositories include a high level of quality across the board, coordinated promotion as part of national outreach, and an organization for relatively easy search. How a centralized repository would be organized was open to debate. Several types of repositories currently exist or are in development (e.g., Connexions, NROC[118]), but they are still disparate and idiosyncratic in their character, technical requirements, target audiences, and learning objectives. To overcome this problem, one participant suggested that materials could be initially concentrated into a reliable repository and then later broken up into relevant communities such as science or humanities.

Aggregation of resources into "super" repositories is a supply-driven solution that may make it easier to maintain OER but often does not take into account what works best for users. For example, a centralized repository may not change the incentives and barriers of using and producing OER in the first place (e.g., time budgets, promotion and tenure, intellectual property, trust in brand). Users, perhaps especially those in academia, may want to innovate and use their own "collections" rather than download those that are pre-existing. Similarly, contributors, especially institutional contributors, may be less willing to go through the process of adapting and donating their content for centralized aggregation unless they feel that the repository is sufficiently developed and of equally high quality.

Several participants agreed that federating searching among all OER sites would be desirable, though it may be technically far off, and would likely require a high level of standardization and collaboration among all OERs. From the users' perspective, an aggregated repository, where learning objects are consistently configured may more easily enable them to reuse with their learning management or other systems.

2. Will Google become the master repository?

There is plenty of evidence, including the data presented in this study, that many, if not most, users already treat Google as their portal to OER. There was concern expressed about the sheer volume of Google results, which places the impetus for sorting on the end user. As Google expands and digitizes more content, will it become the default gatekeeper? Yet, according to

[118] http://www.montereyinstitute.org/nroc.html

the this study's findings, faculty will probably not rely exclusively on Google or the books that Google is digitizing, but often on a vast array of free and proprietary online content, including their own personal collections. One participant nonetheless speculated that Google's efforts to allow users to store their own content may make them the one (already very large and well-funded) centralized OER repository. As the gatekeeper of OER, Google could not only become the distributor for OER resources, but likely the space where content is repurposed by new communities.

3. Supporting reuse/tools

Finally, beyond the question of where OER are housed, where would users find the tools that make use and reuse of the materials possible? Without such tools to easily integrate digital "stuff" into local contexts like a classroom, a PowerPoint presentation, a research project, or into different platforms, the content will likely be underutilized. Although this topic ran through some of our discussions as simply understood, it was not a main focus, as we were not concentrating on technology *per se*. Some technical and cultural considerations arose:

- Faculty are particularly careful where they invest their creative energy; when they do, the resources they choose must be not only easily accessible but adaptable to their local environment.
- One of the primary goals of OOER is to increase the corpus of overall knowledge and to use, not simply amplify, original materials.
- Users may want access to a one-stop shop where they find, adapt, reuse, and integrate materials into their own practice, and perhaps contribute back. This process may require technology on all levels: a CMS on the front end, an archive on the back end, and a content repository at the center.
- Well-developed products have a whole set of variables that contributed to their original design and therefore it may not be a good idea to make these types of products available for reuse.

D. Organizational sustainability

Sustainability is inextricably linked to organizational value, which treats the question of how OER fits into the organization that supports it. To what degree does the host institution value the OER site, and to what degree does the site's value drive institutional support?

As discussed above, a basic concern of sustainability is an OER's physical existence: hardware, servers, and staff maintenance need to be continuously available. In many cases, and in contrast to MIT OCW, there is an *ad hoc* approach in which a faculty member cobbles together local support, be it hardware or technical support staff. If he/she leaves the institution or runs out of funding, the OER can potentially be compromised.

Long-term commitment for OER is generally unclear. Saul Fisher pointed out that "unlike print resources, many online or open educational resources are unmoored from a given learned society, or publisher. Typically, they are instead attached to an individual scholar or to a center that produces them, or to the host college or university for such scholars or centers." Institutional or organizational commitment can take many forms and can be garnered on several levels.

Depending on the OER, institutional commitment can overlap with all forms of sustainability; content, servers, and software may all require regular updates, and there is a cost for that. Further, the question of buy-in arose: at what level is institutional support sustainable? At the individual faculty level? By discipline or department? By school or college? Or at the highest level through commitment by a president or chancellor? There was general agreement that the success of MIT OCW is very much a product of leadership from the top and that it primarily serves the institutional mission, but has secondarily resulted in many positive unintended consequences.

It was suggested that, at minimum, some formal agreement should be made between the institution and the site developer indicating the level of the institution's commitment. This agreement should include a definitive time commitment, whether fixed or *in perpetuum*. Similarly, a faculty member who oversees an OER should clarify that its intellectual property can be used by the institution even in his or her absence. Thus, organizational sustainability requires a two-way commitment between the site producer and the institution.

E. Financial sustainability

How do you fund a product that you give away? At this stage, many OERs depend on a mix of institutional, foundation, and corporate funding, and have few concrete plans for financial sustainability. Foundation, government, and institutional funding cannot be presumed to be reliable, so producers need to look for revenue streams from the market or other sources.

Determining when educational content and associated technology is cost effective is not an easy task. Saul Fisher provided background on some early Mellon Foundation educational technology experiments that were unable to clearly demonstrate cost-effectiveness. His description follows:

> *The Mellon CEUTT studies (Fisher and Nygren, 2000) showed that in various contexts the use of educational technologies does not appear to be cost-effective. While the findings were diverse, one general lesson from the economic side of the studies was that there is no reason to believe that deployment of such resources is more likely to be cost-effective than not, for colleges and universities. One obstacle to cost-effectiveness is the moving target. Instructional technologies – as well as the curricular modalities they support – have been in flux for over a decade, and show no signs of attaining the level of stasis we associate with, say, teaching in front of a classroom with chalk in hand. A further challenge is identifying those core qualities of such technological and curricular innovations that merit support as near- and mid-term innovations, independent of their immediate cost-effectiveness (or lack thereof).*
>
> *The use of open educational resources has stabilized, overall, in that every college and university now offers or makes use of OER to some degree. Students expect it, and faculty are coming to terms with it – or have done so already. And the general scheme for production, deployment, and use is more or less well understood. Many questions remain, though, not the least of which involve technological and fiscal sustainability. These are generally questions of how, rather than whether. Indeed, whether or not using open educational resources is a good idea pedagogically or cost-wise, it is clearly an unquestionable, even largely unquestioned, element of the higher education instructional landscape. This use is here and we have to accept it and deal with it in what fashion we*

may. What remains unclear is how such resources will be sustained financially as their use grows larger and larger.

1. "Business plans" in an educational context

The conversation moved to the topic of "business" models for OER. There was no pretense within our small group that we had the necessary expertise to provide a thorough inventory or an answer in an afternoon. The general conclusion was that the models that exist all fall short in some way, or are very specific to particular initiatives.

There was agreement that any business model has to first determine the production costs, followed by costs for delivery and sustainability. It would be necessary to identify interested stakeholders willing to support the project, whether users, foundations, home institutions, or some combination of all. All of these concerns must then be tied to the desired outcome of the project.

Some sites described their current efforts to develop "business plans" to supplement or, in some cases replace, foundation and public funding. CMU OLI, for instance, described the dilemma posed in anticipation of foundation funding ending. In an effort to continuously improve and augment their courses, both in terms of content and technology, they have collaborated with Ithaka to launch a formal project investigating potential business models.

Connexions has brought in revenue by self-publishing some of their courses as textbooks; in the big picture, however, neither that nor any other existing business model earns enough to keep them fully sustainable. They considered developing some sort of consortium or exploring other options. After presenting the business school faculty with their ideas, they have embarked upon some basic market research to better explore who their stakeholders are and to identify the key value in their service.

The business model that best fits the needs of a project will, of course, depend on what is being sustained, whether curriculum, modules, learning objects, or other types of content. A range of possibilities arose, and the following models were suggested as worthy of exploration.

MERLOT, a referratory with peer-reviewed learning objects, is based on a modified, more open subscription model. While its content is entirely open and free to any user, institutions can pay to become partners. Paying a subscription allows access to services such as faculty development, and subscribed institutions are also invited to become part of MERLOT's decision-making process. These partners are responsible for "wrapping" learning materials with information about how people use them, including peer review, assignments, user comments, and the newest feature, called Snapshots, where the authors include information about why the learning materials were created, how they used it, and how others might use it. Registered users, of which there are currently more than 22,000, also have a means to create personal collections, where they can create a compilation of materials that they use for a particular class or purpose, and then annotate these materials. Other participants noted, however, that at this time the benefits of partnership remain too intangible to offer significant value over the site's free contents.

The Stanford Encyclopedia of Philosophy (SEP),[119] an online open-access philosophy reference resource, was discussed as an interesting case. As described by a participant, the SEP has developed a funding model styled in part after those embraced by public radio (typically, NPR affiliates), where site visitors are asked to contribute voluntarily to keep the site going. This "public radio" component is intended to fill in the gap ($1.125 million) for their overall fundraising effort ($4.125 million) to establish an endowment fund.[120] The SEP's larger effort depends upon a partnership with the global library community to raise funds through one-time contributions and membership dues in exchange for continuing to offer free and open content.[121]

Endowment model

There was some discussion about endowment being a successful model because raising endowment funds is a common practice in academia. Successfully raising such funds would require that the donor perceive great value in the project and that the project can demonstrate longevity. Whether or not such a fundraising strategy could be broadly implemented in OER at large remains a question due to the possibility of donor fatigue, among other things. In any case, soliciting donations works better when it is clear which program the donor is supporting and when that donor is convinced of its quality, which could be a challenge for OER sites that do not have an established brand or a clear and loyal user community.

The Digital Promise (Digital Opportunity Investment Trust—DO IT),[122] is perhaps the most ambitious model mentioned. DO IT is a nonprofit, nongovernmental agency dedicated to funding innovative use of advanced information technologies in libraries, archives, museums, school systems, community colleges, universities, arts and cultural centers, and public broadcasting stations, to allow them to continue to serve their essential public purposes. The proposed trust will be financed by revenues earned from investing $18 billion from the mandated FCC auctions of the radio spectrum.

Society subscription model

In particular scholarly communities, such as professional societies, a move to a subscription model could meet with some degree of success because it builds on existing sustainable infrastructure. For example, those who subscribe to print journals can more easily shift to using that same journal online. This model becomes problematic, however, because it prevents access to anyone who isn't a member of that society (and pays dues), an aspect that is obviously antithetical to the OOER mission.

Commercial curriculum model

It was discussed that a centralized OER repository such as Connexions could offer raw curricular materials to commercial vendors who would repackage and sell them. Another

[119] http://plato.stanford.edu

[120] The NEH has offered a $500,000 matching grant ($1 for every $3 raised) for library partners. See: http://plato.stanford.edu/fundraising.

[121] The Joint Information Systems Committee (JISC) is now contributing to the operating fund on behalf of the U.K. education community, after establishing that the SEP was a first port of call and valuable tool for the U.K. community.

[122] http://www.digitalpromise.org

possibility would be to redirect the textbook revenue stream to curricular OER. The National Repository of Online Courses (NROC) at the Monterey Institute for Technology and Education (MITE) is exploring a variation of this model.[123] MITE's business model earns revenue from low licensing fees similar to open-source software, but also encourages "barter"—trading access to existing courses in exchange for new contributions to their digital resource collection.

OER sites could offer free content with fee-based services and tools such as course management. This might be a way in which OER sites could explore corporate partnerships. But for these or any other ideas to be profitable, OER sites need to significantly increase users. As several participants put it, a "critical mass" of users is essential, and currently many companies do not see the educational market for OER as large enough.

Commercial education model

The University of Phoenix[124] was discussed as an example of user-centered commercialized education that has reached critical mass. What can we learn from how the University of Phoenix does business?

- It keeps costs low by outsourcing to teachers and tutors around the world, who are paid by their output.
- It keeps customer satisfaction high by offering rapid turnaround and services to students.
- It appeals to demographics that have not been well served by existing higher education, and students who need results-oriented rather than prestige-oriented education.
- It uses a traditional instruction model: education is organized by degrees and courses with teachers and grades, with a hybrid of online and face-to-face instruction.
- It spends 30 percent of its budget on marketing.
- The degrees it offers are desirable and convenient, and it ensures high quality by being very responsive to student needs and tailoring materials to student performance.
- Its success comes from being totally user-based: it helps students achieve their objectives, and the prestige of the faculty/institution doesn't matter.

2. Commercialization vs. public good

Is commercialization desirable, or even appropriate, for OER? There is much hesitation in academic circles to endorse the concepts of market research, strategic planning, and commercial sustainability. Academic institutions do not operate in the same way as commercial enterprises, and, some say, we should not necessarily expect them to. Indeed, commercialization conflicts with OER's central mission of free access for the public good. From this perspective, OER should be treated as an educational resource within a tradition of formal education, one that is subsidized by the institution's core mission of research, teaching, and outreach, and should not be translated into business terms. Students and faculty are not customers, and curricular materials and the faculty who use them are not products.

[123] http://www.montereyinstitute.org/nroc.html

[124] http://www.phoenix.edu

Discussing a commercial side of OER often raises general anxiety about ways in which higher education is being transformed into a commodity. Students' learning objectives are driven by convenience and by the pragmatic value of a completed course or degree, rather than by education for its own sake.

The discussion concluded that the traditional teaching role of higher education institutions is to certify knowledge and educational quality. Perhaps by focusing on this role even in a commercial context, universities and OER can be financially sustainable without abandoning their mission. As Gary Matkin put it,

> *There is an issue that unrecognized, it's captured in this phrase. It's an advertising phrase for a continuing education organization. 'Take this course before you enroll.' Take this course before you enroll. Here it is, it's up, it's open. That makes a lot of sense to a lot of people in the world because potential students may want to find out whether they can get a good grade on it, or they want to find out whether you can handle it, or whether you have time to do it and so forth. The dirty little secret of many independent study operations is that there's a huge dropout rate. And people actually build financial models around the fact that 50 percent of the people that are enrolling in courses are never going to finish.*
>
> *In this type of convenience market, there are implications for how we create the course. It has implications for the financial model, it has implications for the user, for the user group, and the marketing. It also has huge implications for education and now. If there's an exam that certifies your knowledge, then you can take this course, but you never have to enroll, and you can take this exam and get what you want, then you cut out the higher education middleman – the teacher, the registrar, etc. What I'm suggesting is that we have a business model in which we have all this stuff up online, and this is click here to enroll. What we found is that people go halfway through it and they say, "I want to enroll in this course, sure, I can do this," click here, and they enroll. And so it's that sort of business model that I think…might be a new one to try out in the realm of OER.*

3. Limits and parameters to funding by foundations, institutions

For those OER sites that wish to remain non-commercial entities, a combination of foundation, institutional, and/or corporate funding nonetheless remains the only source of financial sustainability. While some foundations will continue to fund innovative OER projects that have high curricular value, foundations increasingly ask grantees to demonstrate that their OER has meaningful impact among users and that it will remain sustainable after the life of the grant. They say upfront, "Show me the other players. I don't want to fund a single institution. I want to see the other players, because by virtue of hiring a collective, the likelihood of success is increased."

Foundation funding today is increasingly tied to OER value. During Shannon Lawrence's interviews with site providers, as well as in the discussions above, well-established OER sites agreed that, as their sites evolved, they were better able to demonstrate value (in various forms) to their institution and funders, which better enabled them to receive core budgetary funding and grants. Many emerging OER sites agreed that they would soon have to prove their worth to their primary constituents to receive sustainable institutional support and funding. If an OER makes a significant impact on matriculated students and other key constituencies, it is more likely to be funded and sustained.

F. Measuring and establishing a user base

In sum, understanding users, differentiating among users, responding to users, are all key to making OER sustainable, in any financial model. As one participant put it, "Where is the user base? What value do users find in this? And how do they form communities to have something that will sustain long-term? And until you know that, you don't know how you can keep it alive." Any discussion of sustainability models—how to design the OER and how to pay for it—rapidly turns into a discussion about users. A sustainability model has to seriously attend to its potential customers: will enough people use the service to make it profitable, sustainable, and/or meaningful in such a way that the user will pay for it or that a funder or institution will subsidize it?

The question of how to do market research brings us back to a set of methodological issues: what parameters and categories do we use to study and talk about OER's various audiences? There are some methodological concerns that come up when we approach the question of user studies with financial sustainability in mind.

How do you define and measure "critical mass?" If it is the number of users that makes the OER commercially practicable, how do you determine that number? If it is market share, of which market is it the share? User base can be measured against all Internet users, against the textbook and education market, or only against the online textbook and education market. Who are the potential users who need to be captured to succeed commercially? The market for OER needs to be defined so that it is quantifiable. For instance, if one wants to define the OER market as faculty, the market size can be calculated by determining the total number of universities and faculty affiliated. Finally, what metrics are most meaningful in commercial ventures? None of the readily available metrics—number of hits, unique visitors—really capture an OER site's potential profitability.

How do you measure success with foundation funders? One participant suggested that foundations should clarify their parameters: is it more important to reach new users, to improve education for existing users, or just to garner a large volume of users? What if you succeed at impacting a population that the foundation does not care about? There was general agreement that each OER needs to define its own mission first, then align its goals and activities with that mission and focus on a targeted set of funding opportunities. Any source of funding will ask for some measure of value based on the OER sites' actual impact and use.

Section Three: Imagining a research agenda

Gary Matkin concluded the meeting by inviting participants to imagine a hypothetical scenario: if you had five million dollars to spend on OER research, what research projects would you prioritize? Participants agreed that all studies should be coordinated to use a similar set of terms and techniques, so that findings can be shared effectively and made generally applicable. Multiple research topics were suggested, but they converged on one primary and one secondary research priority: faculty and self-learners, respectively.

A. Study faculty

After some debate, participants agreed that studying faculty would yield the highest return for coordinating knowledge about users across projects. Faculty use is the most common channel by which OER has an impact, since in most cases students use OER at the behest of their faculty instructor, who by definition is qualified to make decisions about curriculum. As Diane Harley put it, there is a long tradition of certain systems (namely, higher education) being set up to move students through to get some kind of certification of knowledge. "It's an economic issue, it's a quality of life issue, it's a social-good issue." Generally faculty have been good at being the mediators in knowledge acquisition and creation in higher education environments. They are the ones with the knowledge, they (and librarians) are the ones with the abilities to find relevant resources, they organize knowledge in packages and pathways, and they have experience in teaching subjects. By focusing on them as a domain of users, we have a high probability of understanding a large segment of OER use.

Several approaches to studying faculty were proposed. We can study the ways in which existing faculty OER use furthers "excellence in education," as one participant put it. How do faculty integrate OER to improve educational outcomes? Other participants felt that studies should focus on faculty practices and beliefs about OER rather than on learning outcomes. Why do so few faculty create materials and put them online to share? Why would they not give their knowledge away?

Many participants felt that the key point of study should be why so few faculty use OER. What are the barriers to use? Are they technical, or are they related to more difficult issues? How can those barriers be overcome? One participant referred to claims in Robert Zemsky's 2004 report "Thwarted Innovation" that startlingly few faculty have adopted OER in their teaching, which is of great concern to OER providers. Non-users may be harder to find and harder to study, but they are the most important group to understand. To study what it would take to increase faculty use, participants recommended designing a controlled experiment of incentives and rewards, or studying the motivations of faculty who have just begun using OER.

In any case, all studies of faculty use need to take into account different faculty categories, by institution, location, discipline, and other considerations.

B. Study students and self-learners

Studying "students" was also seen as a priority, but it was agreed that it presents a different set of methodological problems, especially when students may not have affiliations or clear learning objectives. Participants were very interested in learning more about self-learners, because they are the group about which least is known and who are possibly the most heavily subsidized. At the same time, participants recognize them as the best opportunity to fulfill OER's mission of universal free and open-access education. Indeed, attending to this potentially large user group might lead OER to expand its mission beyond the traditional institutional structure of higher education. But it was agreed that designing a rigorous study of this population would be exceptionally challenging for whoever undertook it.

CONCLUSIONS

Why study users? This question is at the heart of our work. There are myriad reasons cited for undertaking and conducting user studies. They range from improving product design and usability, to policing sites, to facilitating policy planning and investment decisions.

As we think about users and potential users of online educational resources, Martin Trow's (1997) exhortation to "disaggregate, disaggregate, disaggregate" is particularly relevant. To understand their diffusion and uptake, it will be crucial to understand how "the distinctions between elite, mass, and universal access to higher education point to different forms of teaching and learning, to differences in their contexts and uses." We believe that acknowledging the many diverse, complex, and overlapping "ecosystems" within which open and other educational resources will or will not be integrated is an essential first step to understanding users and non-users of the many high quality digital resources available.

For our purposes there were three interrelated questions we sought to answer.

- How do we begin to assess whether the unique modes of scholarship and pedagogy that characterize the humanities and social sciences require different educational technology solutions than those employed in science, technical, and vocational fields?
- How do we determine if a given resource is sustainable in a given context?
- How can we leverage the knowledge that providers and researchers have about users so that it can be shared?

Empirical comparative data on use and users are essential to addressing these and related questions. To that end we rigorously collected data on what targeted H/SS faculty are using or not using, and how the social, economic, academic, and technical factors that faculty cite as barriers to employing available digital tools and resources in teaching vary by discipline, institution type, and/or other dimensions. We also spent considerable time assessing the perspectives of digital resource providers and others interested in user behavior in order to gauge how to make the sharing of knowledge easier.

How do we begin to assess whether the unique modes of scholarship and pedagogy that characterize the humanities and social sciences require different educational technology solutions than those employed in science, technical, and vocational fields?

By focusing our work on faculty in the humanities and social sciences, we have begun to develop a baseline understanding of their needs, and how disciplines vary in those needs. Such a baseline will facilitate future comparisons with the needs of faculty in scientific, vocational, and technical fields. Until comparable work is undertaken in these fields, however, direct comparisons will not be possible. We are delighted that a project recently funded by the NSDL, and run by Alan Wolf and Flora McMartin, is using much of our research design to address issues of use in science, technology, engineering, and mathematics (STEM) disciplines. The comparable research design and protocols will move us closer to understanding how solutions can be targeted more precisely to the varying needs of the full array of disciplines represented in higher education.

What have we learned from the faculty we talked with? They use almost every conceivable type of resource, many of which fall outside of what are formally called "collections" or "educational." Faculty from different disciplines often have different needs with regard to the types of resources they want, and how they ultimately use resources in educational contexts. In addition to these disciplinary differences, where a faculty member teaches and what their personal needs and experiences are influences their specific choices and challenges.

The fact that the most cited reasons for *not* using digital resources was that they simply do not mesh with faculty members pedagogies is a very important finding, and has implications for those who wish to increase technology adoption by faculty. We should not expect faculty, who we can assume know more about teaching their subject than non-specialists, to shoehorn their approaches into a technical developer's ideas of what is valuable or the correct pedagogical approach. Tools and resources need to be developed to support what faculty do.

Our work indicates that faculty use a variety of strategies for negotiating the digital morass. For most, the path of least resistance is the one usually taken—a Google search, a walk down the hall or an email to a colleague, a visit to the website of a trusted archive, or often one's own eclectic "collection" of digital stuff. What is deemed "good enough" for users will depend on the immediate problem; a single individual may have different standards and strategies that are determined by the immediate objective, time, budgets, personal and institutional equipment, and support staff, among other variables. Related to this issue is the large majority of faculty who maintain their own personal digital "collections" for teaching. Where does this material originate? What formats is it in? How is it stored and preserved? This wealth of material is simply off the radar of most institutional or commercial support providers, but it apparently represents a large percentage of what faculty value.

Many faculty want to build their own reaggregated resources, using their own materials and mixing them with resources they have collected along the way. They are concerned about the significant inadequacy of the classroom technologies available to them. How to first manage the array of available resources, and then integrate them into teaching practice is a concern for those who are involved in supporting faculty pedagogies and developing useful technical tools. For faculty, there may be an array of tools available for collecting, developing, managing, and actually using resources, but the efficacy and interoperability of these tools for the immediate tasks that faculty need supported are questionable.

A related challenge, for those directly providing support to faculty, is the integration of learning management systems (LMSs) with library resources and other course content. Current LMSs appear to have limited overall functionality, especially since they may not allow easy integration with the diversity of digital resources that faculty use.

The challenges faced by those charged with building the future tools to reaggregate varied resources for easier use include:

- The difficulty, if not current impossibility, of reaggregating objects that are bundled and "locked" into fixed, often proprietary resources.
- Managing and interpreting digital rights, which may include pulling data from one resource for integration into another.
- The unevenness of interface usability and aesthetics. (In some disciplines, such as art history, faculty may care a lot about resolution quality. Yet in other disciplines, faculty

may create "hodgepodge" resources, often not caring about varying resolution quality from one record to the next.)

- The growing demand from users for granularity (e.g., the ability to search and find the one particular image or piece of text they need within an entire resource).
- The issue of knowing about and finding digital objects. Simply put, many faculty have no idea about the existence of local and non-local resources, especially licensed resources, that may be available to them.

As Borgman (2003) suggested, most users will at one time or another need to create personal digital libraries, which allow the integration of resources from diverse sources for reuse. The possibility of a tool with these capabilities in the near future is not clear, however, despite efforts to construct prototypes of such spaces. Although there are many development efforts in the pipeline, we have been struck by the fact that most faculty may be adrift until these technical promises can be fulfilled.

Are investments in digital resource production, management, and maintenance worth it?

The short answer of course is "yes," simply because we now live in a world where these resources are expected to be there, and many expect them to be there free for the taking. At this stage, however, many academic and other noncommercial providers depend on a mix of institutional, foundation, and corporate funding, and few have concrete plans for financial sustainability, nor are they completely clear on the current or prospective use of their resources in undergraduate educational settings. How does the vast universe and diversity of resources defined by users, the great variety of users, and the ubiquity of faculty personal collections, influence thinking about sustainability and economics of educational resources in the H/SS?

Talking to digital resource providers, we came to understand that what they provide, and for whom, may represent different things to different types of users in different contexts. If we are to begin a productive conversation around users and use in varied educational environments, and about whether specific resources can be sustained in those environments, distinctions need to be made among types of digital resources and among types of users. A user's institutional affiliation, skill level, and educational goals are among the variables that need to be codified.

Definitions of value and approaches to sustainability of resources vary according to each provider's context and goals. The only way to understand the value of a digital resource—for individuals, communities, and institutions—is to measure its impact and its outcomes. When we convened a group of experts interested in use and users, we all agreed that focusing on financial sustainability alone is overly simplistic. Sustainability needs to broken down further, so that curricular, technical/infrastructural, and organizational sustainability can be factored into any calculus for assessing value to institutions or individuals.

The development of user communities around open digital resources is a hot topic, with some suggesting that sustainability can be approached when communities contribute to and organize content, primarily through new social software tools and associated practices. But can this vision be realized while ensuring high quality (which is itself achieved only at considerable cost)? If providers actively control quality by strictly enforcing their own pedagogical and production standards, it may become more difficult to reuse the material outside the educational context originally envisioned. But reuse introduces its own set of tensions, most

notably real concerns about user communities propagating misinformation and poor-quality educational materials. A related issue is how or if developers can afford the costs of customizing their resources for audiences ranging from scholars to school children, many of whom are simply impossible to study because of the informal way in which they access resources on the web.

No discussion about investments can ignore how the growing mass of "educational" digitized rich media objects meshes with established scholarly research publication models. These objects range from personal collections to commercial image services to traditional library collections and beyond. Where do personal faculty digital "collections," which cross the boundaries between the teaching and research realms, fit into traditional ideas about scholarly communication? Smith (2003) describes some of the challenges to preserving new media scholarship and the related economic and sustainability issues. We suspect that scholarly practice may be linked inextricably to pedagogical approaches in various sectors of H/SS teaching, and that many faculty indeed place high value on integrating their own resources and research into their teaching practice. If this is so, what are the implications for the learning object repository movement and reuse of digital resources, especially curricular materials that are developed for specific pedagogical goals and carry the weight of the developers' preconceived ideas of value?

All of these issues become more complex when the fast pace of technological change, and the unpredictable introduction of new products, presentation modes, and licensing agreements, among other things, are factored in. Understanding users, differentiating among users, and responding to user communities are all key to making digital resources sustainable.

How can we leverage the knowledge that providers and researchers have about users so that it can be shared effectively?

Comparing data among digital resource projects is a significant challenge facing those who conduct and/or rely on user studies for decision-making. Communication among resource providers is the key to leveraging results and knowledge. In addition to gathering more and better user data, the data should be widely disseminated to help producers expand their sense of what is possible and what is valuable. Developing a common approach to user studies would allow the articulation of general principles and standards as a community.

But before user statistics can be shared, they have to be transparent. Comparison requires some approximation of standardization, which is now almost nonexistent in user studies. How does one compare a transaction log analysis from a digital library site with a curricular materials site? How do we assess if visitors to a site are finding any value in the materials, and compare that to other sites? We suggest that we can't do these comparisons effectively until the categories of OER content and OER users are codified so common questions and protocols are agreed on. All relevant variables of study—mission, users, producers, and sustainability—are pertinent to such comparisons.

The unanswered question is how or if such analyses can help those involved in resource and tool development build more useful systems and supportive environments. We and our colleagues underscore the importance of sharing usage statistics and user results openly and the importance of the digital resource community articulating general principles and standards around user studies.

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APPENDICES

Appendix A: Digital Resources – A Snapshot

This list of sites is gathered from faculty survey responses, focus groups, initiatives funded by the Mellon Foundation and the Hewlett Foundation, and our own research.

Africa Research Program
http://africa.gov.harvard.edu

American Presidency Project
http://www.presidency.ucsb.edu

American South.org
http://www.americansouth.org

American Women
http://memory.loc.gov/ammem/awhhtml

AP Photo Archive
http://ap.accuweather.com/apphoto

Archnet (Archeology Net)
http://archnet.asu.edu

Artcyclopedia
http://www.artcyclopedia.com

Arts & Letters Daily
http://www.aldaily.com

Associated Press
http://www.ap.org

Atlantic Monthly
http://www.theatlantic.com

Avalon Project
http://www.yale.edu/lawweb/avalon/avalon.htm

Bartleby
http://www.bartleby.com

Beazley
http://www.beazley.ox.ac.uk/

British Pathe
http://www.britishpathe.com

Cal Poly Land
http://polyland.calpoly.edu

California Ballot Initiatives Database
http://holmes.uchastings.edu/cgi-bin/starfinder/?path=calinits.txt&id=webber&pass=webber

California Digital Library (CDL)
http://www.cdlib.org/

California Heritage Collection
http://sunsite.berkeley.edu/CalHeritage

California History Center Foundation
http://www.calhistory.org

California Newspaper Project
http://www.cbsr.ucr.edu/cnp

Catalonian Manuscripts
http://sunsite.berkeley.edu/catalan

Center for American Women and Politics
http://www.cawp.rutgers.edu

Center for History and New Media, George Mason University
http://chnm.gmu.edu

Center for Land Use Information
http://clui.org

Christian Science Monitor
http://csmonitor.com

CIAO: Columbia International Affairs Online
http://www.ciaonet.org

Classroom Electric: Dickinson, Whitman, and American Culture
http://www.classroomelectric.org

Conversations with History
http://globetrotter.berkeley.edu/conversations

Cultura
http://web.mit.edu/french/culturaNEH

Dartmouth Jewish Sound Archive
http://www.dartmouth.edu/~djsa

David Rumsey Historical Map Collection
http://www.davidrumsey.com

Die Deutsche Bibliothek Database
http://www.ddb.de

Digital Archive: Popular American Music
http://digital.library.ucla.edu/apam

Dime Novel Collection
http://www-sul.stanford.edu/depts/dp/pennies

Early English Books Online (EEBO)
http://eebo.chadwyck.com

Early English Prose Fiction
http://collections.chadwyck.com

EBSCO
http://www.ebsco.com

ECAI Iraq
http://ecai.org/iraq

Education Resources Information Center (ERIC)
http://eric.ed.gov

Encyclopedia Britannica
http://www.britannica.com

Exploratorium
http://www.exploratorium.edu

Faulkner site
http://www.mcsr.olemiss.edu/~egjbp/faulkner/faulkner.html

Financial Times
http://ft.com

Foundation for the Advancement of Mesoamerican Studies, Inc.
http://www.famsi.org

French National Library
http://www.bnf.fr

GALE Eighteenth Century Collections Online
http://www.gale.com/EighteenthCentury

Galileo Project
http://galileo.rice.edu

General Sourcebook for Medieval Economic Life
http://www.fordham.edu/halsall/sbook1j.html

Geo-Images Project
http://geoimages.berkeley.edu

Getty Images
http://www.gettyimages.com

Harry Stephen Keeler Society
http://staff.xu.edu/~polt/keeler

Healy's Literature Online
http://lion.chadwyck.co.uk

Heritage Image Partnership
http://www.heritage-images.com

History Matters
http://historymatters.gmu.edu

Humbul Humanities Hub
http://www.humbul.ac.uk

Instituto Cervantes
http://www.cervantes.es

JSTOR: The Scholarly Journal Archive
http://www.jstor.org

Kairos Rhetoric
http://english.ttu.edu/kairos

Kite Aerial Photography
http://arch.ced.berkeley.edu/kap

Labyrinth
http://www.georgetown.edu/labyrinth

Latin American Network Information Center
http://lanic.utexas.edu

Leuven Database of Ancient Books
http://ldab.arts.kuleuven.ac.be

Lexis Nexis
http://www.lexisnexis.com

Library of Congress American Memory Project
http://memory.loc.gov

Library of Congress Century of Lawmaking
http://memory.loc.gov/ammem/amlaw

LUCI: Library of the University of California Images
http://vrc.ucr.edu/luci

Mark Harden's Artchive
http://www.artchive.com

MERLOT (Multimedia Educational Resource for Learning and Online Teaching)
http://www.merlot.org

Miguel de Cervantes Digital Library / Biblioteca Virtual Miguel de Cervantes
http://www.cervantesvirtual.com

MIT Free Open Souce Research Community
http://opensource.mit.edu

MIT OpenCourseWare
http://ocw.mit.edu

MITHologies
http://www.mith.umd.edu/mithologies

National Election Studies
http://www.umich.edu/~nes

New Deal Library
http://newdeal.feri.org

New York Times
http://www.nytimes.com

OAC: Online Archive of California
http://www.oac.cdlib.org

Online Reference Book for Medieval Studies
http://www.the-orb.net

Open Collections Program
http://ocp.hul.harvard.edu

Oyez
http://www.oyez.org

Patrologia Latina
http://pld.chadwyck.com

Perseus Digital Library
http://www.perseus.tufts.edu

Personal website of authors and literary movements
http://www.wsu.edu/~campbelld/amlit/aufram.html

Places Online
http://www.placesonline.org

Project Gutenberg
http://www.gutenberg.org

Project Muse
http://muse.jhu.edu

ProQuest
http://proquest.com

Quia
http://www.quia.com/

Rhizome
http://rhizome.org/

RiverWeb
http://www.riverweb.uiuc.edu

RLG Cultural Materials
http://culturalmaterials.rlg.org

San Jose State's Image Repository
http://worldart.sjsu.edu

Saskia Ltd
http://www.saskia.com

Science
http://www.science.com

ScienceDirect
http://www.sciencedirect.com

Smithsonian
http://www.si.edu

Sor Juana Inez de la Cruz Project
http://www.dartmouth.edu/~sorjuana

SPIDER
http://eee.uci.edu/programs/spider

SPIRO
http://www.mip.berkeley.edu/spiro

Stanford Encyclopedia of Philosophy
http://plato.stanford.edu

Statewide Database
http://swdb.berkeley.edu

Strindberg Museum
http://www.strindbergsmuseet.se/index_eng.html

Strunk and White First Original Edition
http://www.bartleby.com/141

The Art Museum Image Consortium (AMICO)
http://www.amico.org

The British Museum
http://www.thebritishmuseum.ac.uk

The Connexions Project
http://cnx.rice.edu

The English Poetry Full-Text Database
http://etext.lib.virginia.edu/epd

The Getty Collections
http://www.getty.edu/art/collections

The Jack London Collection
http://london.sonoma.edu/

The Library of Congress
http://www.loc.gov

The Martin Luther King Jr., Paper Project
http://www.stanford.edu/group/King

The Museum of Unworkable Devices
http://www.lhup.edu/~dsimanek/museum/unwork.htm

The Nation
http://www.thenation.com

The Online Medieval and Classical Library
http://omacl.org

The Open Video Project
http://www.open-video.org

The Quiz Center
http://school.discovery.com/quizcenter

The Society for Political Methodology
http://polmeth.wustl.edu

The Teaching Resources Center Online Writing Project
http://cai.ucdavis.edu/trc/trcdefault.html

The Valley of Shadow
http://valley.vcdh.virginia.edu

Thesaurus Linguae Graecae
http://www.tlg.uci.edu

THOMAS
http://thomas.loc.gov/

UBU Web
http://www.ubu.com

UCSB library
http://www.library.ucsb.edu

USGS
http://www.usgs.gov

Virtual Data Center
http://thedata.org

Visual Sourcebook for Chinese Civilization
http://depts.washington.edu/chinaciv

Voice of the Shuttle
http://vos.ucsb.edu

Wall Street Journal
http://online.wsj.com

Warner Brothers
http://www.warnerbros.com

Web Gallery of Art
http://www.wga.hu

Will Connell Collection Online
http://photo.ucr.edu/photographers/connell

Women and Social Movements
http://womhist.binghamton.edu

World Lecture Hall
http://www.utexas.edu/world/lecture

Appendix B: Site Owner Advisory Group

Meeting held at the Center for Studies in Higher Education, UC Berkeley, May 17, 2004

Arnold Arcolio, Research Libraries Group, Red/Green Light Project (Information Architect)

Laine Farley, California Digital Library, Digital Library Services (Director)

Diane Harley, UCB, Center for Studies in Higher Education, Higher Education in the Digital Age (Director), Digital Resource Study (Principle Investigator)

Alison Head, UCB, Center for Studies in Higher Education, Digital Resource Study (Research Analyst)

Jonathan Henke, UCB, Center for Studies in Higher Education, Digital Resource Study (Research Analyst)

Elizabeth Losh, UCI, Humanities Core Course (Writing Course Director), SPIDER – Shared Pedagogical Initiative: A Database of Electronic Resources for the University of California Community

Flora McMartin, MERLOT, Membership Services and Evaluation (Director)

Rick Rinehart, UCB, Art Practice, Art, Technology and Culture (Online Curator), Berkeley Art Museum & Pacific Film Archive, Digital Media (Director)

Clarice Stasz, Sonoma State University (History Professor), the Jack London Collection (Content Developer)

Roy Tennant, California Digital Library (User Service Architect), the Jack London Collection (Site Developer)

Glen Worthey, Stanford University, Humanities Digital Information Services (Project Director)

Appendix C: CSHE/CDL Educational Technology & Librarian Meeting Participants

Meetings held at UC Berkeley, March 22, 2004, and May 10, 2004

Peter Brantley, California Digital Library, Digital Library Technologies (Director)

Barbara Davis, UCB, Undergraduate Education (Assistant Vice-Provost)

Elizabeth Dupuis, UCB Library, Instructional Services (Head)

Victor E. Edmonds, UCB, Educational Technology Services (Director)

Janice L. Eklund, UCB, Visual Resources History of Art Department (Principal Museum Scientist, Curator)

Mara Hancock, UCB, Educational Technology Services, Learning Systems (Associate Director)

Gary Handman, UCB, Moffitt Library, Media Resource Center (Head)

Michael T. Hardie, UCB, Educational Technology Services (Grants Coordinator)

Diane Harley, UCB, Center for Studies in Higher Education, Higher Education in the Digital Age (Director), Digital Resource Study (Principle Investigator)

Alison Head, UCB, Center for Studies in Higher Education, Digital Resource Study (Research Analyst)

Jonathan Henke, UCB, Center for Studies in Higher Education, Digital Resource Study (Research Analyst)

Oliver Heyer, UCB, Educational Technology Services (Programmer, Analyst II)

Patricia Iannuzzi, UCB Library (Associate University Librarian)

Rosalie Lack, California Digital Library (Evaluation and Instruction Analyst)

Pat Maughan, UCB Library (Librarian)

Flora McMartin, MERLOT (Membership Services and Evaluation Director)

Ian Miller, UCB, Center for Studies in Higher Education, Digital Resource Study (Programmer/Analyst)

Merrilee Proffitt, Research Libraries Group (Program Officer)

Jeff Rusch, UCB, Educational Technology Services (Programmer, Analyst III)

Maryly A. Snow, UCB, Architecture Slide Library (Librarian)

Roy Tennant, California Digital Library, Jack London Collection (User Services Architect)

Günter Waibel, Research Libraries Group (Program Officer)

Appendix D: Faculty Survey – Instrument

Digital Resources Survey

Thank you for participating in this important study. This survey asks a variety of simple questions about your use of digital resources in teaching undergraduates. There are no right or wrong answers; we are simply interested in your opinion and your experiences.

To thank you for completing the survey, we will enter you in a drawing to win one of seven prizes, including a new Palm Pilot, a $300 gift certificate from Amazon.com, or one of five $100 gift certificates from Amazon.com. Your odds of winning depend on the number of responses received and are approximately one in 75.

Please be assured of complete confidentiality. (We ask that you do not mention your name on the survey so your identity remains confidential.) The survey should take about 15–20 minutes to complete. Completion of this survey is voluntary, and you can skip any questions or withdraw at any time. There are no direct risks or benefits for you in doing this study; however, there is the possibility of a great benefit to undergraduate teaching.

This research project is funded by the Andrew W. Mellon Foundation and the William & Flora Hewlett Foundation, and is based at the Center for Studies in Higher Education at the University of California, Berkeley. This research is overseen by the appropriate institutional review boards for the protection of human subjects. For more information about this project, please see http://digitalresourcestudy.berkeley.edu or contact Diane Harley, Ph.D., at the Center for Studies in Higher Education, (510) 642-5040, heda@uclink.berkeley.edu.

Teaching Background

1. In what academic discipline(s) do you teach undergraduates?

(Check all that apply.)

- ❑ None: I never teach undergraduate courses

Languages & Literature:

- ❑ English
- ❑ Languages
  Please specify: _____
- ❑ Literature
  Please specify: _____
- ❑ Writing or composition
- ❑ Other:

- ❑ Anthropology
- ❑ Archaeology
- ❑ Architecture
- ❑ Art history
- ❑ Art practice, visual art, other art
  Please specify: _____
- ❑ Classics
- ❑ Geography
- ❑ History
- ❑ Political science
- ❑ Other
  Please specify: _____

2. What specific courses do you teach on a regular basis?

3. What type of course do you typically teach?

(Check all that apply.)

- ❑ Seminars / small discussions
- ❑ Labs / studio courses
- ❑ Small lectures (fewer than 25 students)
- ❑ Medium lectures (25-50 students)
- ❑ Large lectures (50-100 students)
- ❑ Very large lectures (> 100 students)

4. Some courses are offered completely or partially online. In what course formats do you typically teach?

(Check all that apply.)

- ❑ Online courses (where students do not have to come to class, but do all of their assignments online)
- ❑ Hybrid courses (where students still come to class, but do many of their assignments online)
- ❑ Traditional courses (where none of the work is completed online)

What do we mean by digital resources?

Our definition of digital resources is intentionally broad. Digital resources...

- may include audio, photos, maps, text, manuscripts, graphs, slides, charts, video, curricular support materials, or primary source materials.
- may be either your own or others' online resources.
- may be from library and museum collections.
- may be from your own personal collection.
- may be materials you, colleagues, or others have made available in an online format.

What Digital Resources Do You Use?

5. **Please indicate how often you use or have used the following types of digital resources in your undergraduate teaching:**

Types of resources:	Almost all the time	Often	Sometimes	Rarely	Never
Images or visual materials (drawings, photographs, art, posters, etc.)	❑	❑	❑	❑	❑
Maps	❑	❑	❑	❑	❑
Simulations or animations	❑	❑	❑	❑	❑
Digital film or video	❑	❑	❑	❑	❑
Audio materials (speeches, interviews, music, oral histories, etc.)	❑	❑	❑	❑	❑
Digital facsimiles of ancient or historical manuscripts	❑	❑	❑	❑	❑
Online or digitized documents (including translations)	❑	❑	❑	❑	❑
Government documents	❑	❑	❑	❑	❑
Data archives (numeric databases; e.g., census data)	❑	❑	❑	❑	❑
News or other media sources and archives	❑	❑	❑	❑	❑
Online reference resources (e.g., dictionaries)	❑	❑	❑	❑	❑
"Portals" that provide links or URL's relevant to particular disciplinary topics	❑	❑	❑	❑	❑
Personal online diaries (e.g., blogs)	❑	❑	❑	❑	❑
Online class discussions (including archived discussions)	❑	❑	❑	❑	❑
Curricular materials and websites that are created by other faculty and/or other institutions (e.g., MIT OpenCourseWare, World Lecture Hall, Merlot)	❑	❑	❑	❑	❑
Digital readers or coursepacks	❑	❑	❑	❑	❑
Other types of resources. *Please specify:* _____	❑	❑	❑	❑	❑

Where You Find Digital Resources

6. **How often do you use digital resources in your undergraduate teaching from each of the following sources?**

Sources of resources	Almost all the time	Often	Sometimes	Rarely	Never
Search engines/directories (e.g., Google, Yahoo)	❑	❑	❑	❑	❑
My own personal collection of digital materials	❑	❑	❑	❑	❑
Public (free) online image databases	❑	❑	❑	❑	❑
Commercial image databases (e.g., Saskia, AMICO)	❑	❑	❑	❑	❑
Campus image databases from my own institution (e.g., departmental digital slide library)	❑	❑	❑	❑	❑
"Portals" that provide links or URL's relevant to particular disciplinary topics	❑	❑	❑	❑	❑
Online exhibits (e.g., from museums)	❑	❑	❑	❑	❑
Library collections (digital)	❑	❑	❑	❑	❑
Online journals (e.g., JSTOR)	❑	❑	❑	❑	❑
Media sites (e.g., NPR, New York Times, CNN, PBS)	❑	❑	❑	❑	❑
Other sources of digital resources. *Please specify:* _____	❑	❑	❑	❑	❑

7. **How often have you heard about sources of digital resources from each of the following?**

	Almost all the time	Often	Sometimes	Rarely	Never
Professional societies or discussion lists (e.g., H-Net, Humanist Discussion list, etc.)	❑	❑	❑	❑	❑
Recommendation from a campus librarian	❑	❑	❑	❑	❑
Word of mouth from colleagues	❑	❑	❑	❑	❑
Word of mouth from students	❑	❑	❑	❑	❑
A campus department devoted to instructional technology (e.g., media or teaching and learning center)	❑	❑	❑	❑	❑
Other. . *Please specify:* _____	❑	❑	❑	❑	❑

What Specific Digital Resources Do You Use?

8. **Please name the specific digital resources or collections that you find most valuable to your teaching:**

Your Own Digital Collections

9. **How often do you do each of the following activities with digital resources?**

	Almost all the time	Often	Sometimes	Rarely	Never	
I gather or maintain my own collection of digital resources.	❑	❑	❑	❑	❑	
If yes…	Almost all the time	Often	Sometimes	Rarely	Never	Does not apply to me
I make my own digital resources available to others via the World-Wide Web.	❑	❑	❑	❑	❑	❑

How Do You Use Digital Resources in Your Teaching?

10. **How often do you use digital resources in each of these ways?**

	Almost all the time	Often	Sometimes	Rarely	Never
Presented during my lectures/class (e.g., images, audio, etc.).	❑	❑	❑	❑	❑
Posted directly on my course website.	❑	❑	❑	❑	❑
Linked from my course website.	❑	❑	❑	❑	❑

	Almost all the time	Often	Sometimes	Rarely	Never
Assigned for student research projects or problem-based learning assignments.	❑	❑	❑	❑	❑
Assigned to students to create their own digital portfolios and/or multimedia projects.	❑	❑	❑	❑	❑
Assigned to students for review and/or study.	❑	❑	❑	❑	❑
Used in tests and quizzes.	❑	❑	❑	❑	❑
Presented in my online lectures.	❑	❑	❑	❑	❑
Presented in the context of an online discussion.	❑	❑	❑	❑	❑
Other. . *Please specify:* _____	❑	❑	❑	❑	❑

Motivations for Using Digital Resources

11. How would you rate your enthusiasm about using digital resources?

Low 1	2	3	4	5	6	High 7
❑	❑	❑	❑	❑	❑	❑

12. How much do you agree or disagree with the following statements about your reasons for using digital resources?

	Strongly agree that this is a reason for me	**Somewhat agree** that this is a reason for me	**Somewhat disagree** that this is a reason for me	**Strongly disagree** that this is a reason for me
I use digital resources in my teaching to provide students a context for a topic.	❑	❑	❑	❑
I use digital resources in my teaching to get students excited about a topic.	❑	❑	❑	❑
I use digital resources in my teaching to integrate primary source material into the course.	❑	❑	❑	❑
I use digital resources in my teaching to integrate my research interests into my course.	❑	❑	❑	❑
I use digital resources in my teaching to provide students with both good and bad examples of different kinds of scholarship.	❑	❑	❑	❑
I use digital resources in my teaching to teach information literacy (i.e., evaluating the online materials themselves).	❑	❑	❑	❑
I use digital resources in my teaching to teach critical thinking skills.	❑	❑	❑	❑
I use digital resources in my teaching to provide students a preview of the course before they register.	❑	❑	❑	❑

Motivations for Using Digital Resources

13. How much do you agree or disagree with the following statements about your reasons for using digital resources?

	Strongly agree that this is a reason for me	Somewhat agree that this is a reason for me	Somewhat disagree that this is a reason for me	Strongly disagree that this is a reason for me
I use digital resources in my teaching because it improves my students' learning.	❑	❑	❑	❑
I use digital resources in my teaching because it allows my students to be more creative.	❑	❑	❑	❑
I use digital resources in my teaching because it saves me time.	❑	❑	❑	❑
I use digital resources in my teaching because it is more convenient for my students and their schedules.	❑	❑	❑	❑
I use digital resources in my teaching because it creates a sense of community for students enrolled in my course.	❑	❑	❑	❑
I use digital resources in my teaching because it allows me to do things in the classroom that I could never do otherwise.	❑	❑	❑	❑
I use digital resources in my teaching because it provides access to resources that we don't have at our college.	❑	❑	❑	❑
I use digital resources in my teaching because my students expect or ask for more technology.	❑	❑	❑	❑
I use digital resources in my teaching because it allows me to stay up-to-date with my colleagues.	❑	❑	❑	❑
I use digital resources in my teaching because the administration (deans, chairs, provost) encourages me to use digital resources more.	❑	❑	❑	❑
I use digital resources in my teaching because it may help me get promoted or get tenure.	❑	❑	❑	❑
I use digital resources in my teaching because I like or feel very comfortable with the new technologies.	❑	❑	❑	❑
I use digital resources in my teaching because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	❑	❑	❑	❑

Motivations for NOT Using Digital Resources

These next questions ask about teaching situations where you have decided not to use digital resources.

14. How much do you agree or disagree with the following statements about your reasons for NOT using digital resources in certain situations?

	Strongly agree that this is a reason for me	Somewhat agree that this is a reason for me	Somewhat disagree that this is a reason for me	Strongly disagree that this is a reason for me
I don't use digital resources in certain teaching situations, because I don't have time to use digital resources.	❑	❑	❑	❑
I don't use digital resources in certain teaching situations, because they cannot substitute for the teaching approaches I use.	❑	❑	❑	❑
I don't use digital resources in certain teaching situations, because using them distracts from the core goals of my teaching.	❑	❑	❑	❑
I don't use digital resources in certain teaching situations, because they are irrelevant to my field.	❑	❑	❑	❑
I don't use digital resources in certain teaching situations, because students don't have the information literacy skills to assess the credibility of digital resources.	❑	❑	❑	❑
I don't use digital resources in certain teaching situations, because digital material can be presented outside its original context.	❑	❑	❑	❑
I don't use digital resources in certain teaching situations, because I don't want my students to copy or plagiarize material from the web.	❑	❑	❑	❑

15. How strongly do you agree or disagree with the following statements?

	Strongly agree that this is a reason for me	Somewhat agree that this is a reason for me	Somewhat disagree that this is a reason for me	Strongly disagree that this is a reason for me
My use of digital resources is very dependent on whether they are available to me for free.	❑	❑	❑	❑
My use of digital resources is very dependent on whether they require registration or a password.	❑	❑	❑	❑

Barriers and Frustrations

This next section deals with barriers or obstacles that make it difficult for you to use digital resources the way you would like.

16. How much do you agree or disagree with the following statements?

	Strongly agree that it is a barrier for me	Somewhat agree that it is a barrier for me	Somewhat disagree that it is a barrier for me	Strongly disagree that it is a barrier for me
I have difficulty using digital resources the way I would like, because there are too many resources out there for me to take advantage of — I am overwhelmed.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't know how to locate the online materials I need.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because search engines provide irrelevant results for my needs.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because the content I need or want is just not available online.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because the academic quality of available materials is too poor to meet my needs.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because web sites I would use are unreliable, and I can't count on them being there when I need them.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't have time to assess the credibility of the available resources.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I have difficulty understanding the issues surrounding copyright and digital collections.	❑	❑	❑	❑

This section deals with technological obstacles that make it difficult for you to use digital resources the way you would like.

17. How much do you agree or disagree with the following statements?

	Strongly agree that it is a barrier for me	Somewhat agree that it is a barrier for me	Somewhat disagree that it is a barrier for me	Strongly disagree that it is a barrier for me
I have difficulty using digital resources the way I would like, because available software is unsuitable for viewing and displaying digital images.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because available software is unsuitable for integrating audio or video into my course.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because my students don't have reliable access to computers.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because my students don't have a high-speed connection.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't have reliable access to a computer.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't have reliable access to a high-speed connection.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't have reliable access to physical resources in my classroom(s) (e.g., projectors, high-speed connections, etc.).	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't have reliable access to scanners.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because course management software packages (e.g., WebCT, Blackboard) are inadequate for my needs.	❑	❑	❑	❑
I have difficulty using digital resources the way I would like, because I don't know how to save presentations to my computer so they can be run without a live connection.	❑	❑	❑	❑

	Strongly agree that it is a barrier for me	Somewhat agree that it is a barrier for me	Somewhat disagree that it is a barrier for me	Strongly disagree that it is a barrier for me
I have difficulty using digital resources the way I would like, because web formats (e.g., html or pdf) allow me to link to whole documents, but not to specific excerpts within a text.	❑	❑	❑	❑
Other obstacles. *Please specify:* _____	❑	❑	❑	❑

Support and Assistance

18. How important is it for you to have support or assistance with each of the following activities for your teaching?

	Support is extremely important	Support is very important	Support is somewhat important	Support is a little important	Support is not at all important
Support with finding digital resources.	❑	❑	❑	❑	❑
Support with assessing the credibility of digital resources.	❑	❑	❑	❑	❑
Support with evaluating the appropriateness of resources for my teaching goals.	❑	❑	❑	❑	❑
Support with interpreting copyright laws and/or securing copyright permission.	❑	❑	❑	❑	❑
Support with creating my own website.	❑	❑	❑	❑	❑
Support with importing resources into a course website or a database.	❑	❑	❑	❑	❑
Support with learning how to use a learning management system (e.g., WebCT, Blackboard).	❑	❑	❑	❑	❑
Support with integrating resources into a learning management system (e.g., WebCT, Blackboard).	❑	❑	❑	❑	❑
Support with digitizing existing resources.	❑	❑	❑	❑	❑
Support with gathering, organizing, and maintaining digital materials.	❑	❑	❑	❑	❑
Support with training students to find or evaluate digital resources.	❑	❑	❑	❑	❑
Support with obtaining or setting up technical infrastructure (servers, computers, smart classrooms, etc.).	❑	❑	❑	❑	❑
Support with other activities. *Please specify:* _____	❑	❑	❑	❑	❑

19. How satisfied or dissatisfied are you with the support you have received from the following sources?

	Extremely satisfied with this source of support	Somewhat satisfied with this source of support	Somewhat dissatisfied with this source of support	Extremely dissatisfied with this source of support	I have not sought support from this source
Campus educational technology or IT support staff	❑	❑	❑	❑	❑
Campus librarians	❑	❑	❑	❑	❑
My departmental or college staff	❑	❑	❑	❑	❑
Graduate students	❑	❑	❑	❑	❑
Undergraduate students	❑	❑	❑	❑	❑
Other faculty	❑	❑	❑	❑	❑
Friends or family	❑	❑	❑	❑	❑
Online help or guides	❑	❑	❑	❑	❑
Workshops	❑	❑	❑	❑	❑
Other sources. *Please specify:* _____	❑	❑	❑	❑	❑

Other Comments

20. Is there anything else you would like to tell us about your experience with using digital resources in undergraduate teaching?

Personal Information

21. How often do you use each of the tools listed below, for any reason?

	Almost all the time	Often	Sometimes	Rarely	Never
A personal computer	❑	❑	❑	❑	❑
The World-Wide Web	❑	❑	❑	❑	❑
Email	❑	❑	❑	❑	❑
PowerPoint	❑	❑	❑	❑	❑
An online library catalog	❑	❑	❑	❑	❑
A traditional library card catalog	❑	❑	❑	❑	❑
Abstracting and indexing databases	❑	❑	❑	❑	❑

22. At what institution(s) do you teach?

(Check all that apply)

- ❑ Antelope Valley College
- ❑ Claremont McKenna College
- ❑ College of Marin
- ❑ College of the Alameda
- ❑ Columbia College
- ❑ East LA College
- ❑ Foothill College
- ❑ Golden West College
- ❑ Harvey Mudd College
- ❑ LA Harbor College
- ❑ LA Southwest College
- ❑ LA Trade Tech College
- ❑ Mendocino College
- ❑ Mills College
- ❑ Mission College
- ❑ Monterey Peninsula College
- ❑ Occidental College
- ❑ Oxnard College
- ❑ Pitzer College
- ❑ Pomona College
- ❑ Porterville College
- ❑ Saddleback College
- ❑ San Joaquin Delta College
- ❑ Santiago Canyon College
- ❑ Scripps College
- ❑ UC Berkeley
- ❑ UC Davis
- ❑ UC Los Angeles
- ❑ UC San Diego
- ❑ UC Santa Barbara
- ❑ Whittier College
- ❑ Other

Please specify: _____

23. What is your job title?

- ❑ Instructor
- ❑ Lecturer
- ❑ Adjunct Professor
- ❑ Assistant Professor
- ❑ Associate Professor
- ❑ Professor
- ❑ Retired or Emeritus Professor
- ❑ Graduate student as main instructor
- ❑ Other. *Please specify:* _____

24. Do you teach part or full-time?

- ❑ Part-time
- ❑ Full-time

25. What is the highest degree that you have obtained?

- ❑ Associate's degree
- ❑ Undergraduate (bachelor's) degree
- ❑ Master's degree
- ❑ Ph.D.
- ❑ M.D.
- ❑ J.D.
- ❑ Other degree. *Please specify:* _____

26. In what year did you receive this degree? ☐

27. What is your gender?

- ❑ Male
- ❑ Female

28. In what year were you born? ☐

Thank you very much for your participation in this research study.

Please return the completed survey in the envelope provided. No postage is necessary, if mailed in the United States.

If you would like to receive a copy of the study's final report or any other information, please fill out the enclosed postcard and return it with this survey.

Mail to:

University of California, Berkeley
Center for Studies in Higher Education
Digital Collections Research Project
South Hall Annex, #4650
Berkeley CA 94720

Appendix E: Faculty Survey – Non-response Interview Protocol

Introduction

> I'm calling for the Center for Studies in Higher Education, UCB, for a study about the use of digital resources in college and university teaching. Several months ago, we sent you an email inviting you to participate in an online survey about your use of digital resources.

– OR –

Several months ago, we mailed you a packet with a survey about your use of digital resources.

According to our records, you didn't respond to that survey. At this time, we'd like to ask you just a few questions about your reasons for not responding to the survey. We only need about 5 minutes of your time.

Survey History

Do you remember receiving that email [or survey]?

- ❑ Yes
- ❑ No

To the best of your recollection, which of these reasons might explain why you didn't respond to the survey? [Please select all that apply]

- ❑ You never got the announcement [or the survey].
- ❑ You intended to respond, but forgot.
- ❑ You're too busy or didn't have time.
- ❑ It wasn't relevant, because you don't teach at a college or university.
- ❑ It wasn't relevant, because you don't know anything about digital resources.
- ❑ You are opposed to using digital resources in your teaching.
- ❑ Digital resources don't apply to your discipline or to the way that you teach.
- ❑ You had technical problems with the survey website or with your computer.
- ❑ Other: _____

Digital Resource Use

Now I have a few brief questions about your use of digital resources.

Please indicate how often you use or have used the following types of **digital resources** in your undergraduate teaching:

How often have you used…

Digital images or visual materials (such as drawings, photographs, art, posters, etc.)

- ❑ Almost all the time
- ❑ Often
- ❑ Sometimes
- ❑ Rarely
- ❑ Never

Online or digitized documents (including translations)

- ❑ Almost all the time
- ❑ Often
- ❑ Sometimes
- ❑ Rarely
- ❑ Never

Online news or other media sources or archives

- ❑ Almost all the time
- ❑ Often
- ❑ Sometimes
- ❑ Rarely
- ❑ Never

"Portals" that provide links or URLs relevant to particular disciplinary topics

- ❑ Almost all the time
- ❑ Often
- ❑ Sometimes
- ❑ Rarely
- ❑ Never

- ❑ Never use digital resources <volunteer>

On a scale of 1 to 7, where 1 is low enthusiasm and 7 is high enthusiasm , how would you rate your enthusiasm about using digital resources?

1 2 3 4 5 6 7

DEMOGRAPHICS

Finally, I have a few questions for statistical purposes.

In which of these academic discipline(s) do you teach undergraduates?
(Please select all that apply.)

- ❑ Languages & Literature:
  - o English
  - o Languages ; Please specify: _____
  - o Literature ; Please specify: _____
  - o Writing or composition
- ❑ Anthropology
- ❑ Archaeology
- ❑ Architecture
- ❑ Art history
- ❑ Art practice, visual art, other art ; Please specify: _____
- ❑ Classics
- ❑ Geography
- ❑ History
- ❑ Political science
- ❑ Other; Please specify: _____
- ❑ None: I never teach undergraduate courses <volunteer>

At what institution (or institutions) do you teach? _____

What is the highest degree that you have obtained? [select one]

- ❑ Associate's degree
- ❑ Undergraduate (bachelor's) degree
- ❑ Master's degree
- ❑ Ph.D.
- ❑ M.D.
- ❑ J.D.
- ❑ Other degree. _____

In what year did you receive this degree? _____

In what year were you born? _____

Those are all of the questions I have for you. Do you have any additional thoughts or comments for me? _____

Thank you for your time, and for answering these questions.

<Interviewer: Note respondent's gender>

- ❑ Male
- ❑ Female

Appendix F: Faculty Survey – Non-response Results Tables

KEY:
* p-value, from t-test (estimate of likelihood of difference between the means)
** p-value, from chi-square analysis (estimate of likelihood of difference between the distributions)
† Note: Chi-square may not be a valid test – more than 25% of cells have expected counts less than 5.

Table F.1: Based on non-response survey

	OVERALL			Univ. of Calif.			Liberal Arts Coll.			Community Coll.		
Question	Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey	
	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val
N	128	831		41	522		43	88		44	209	
Do you remember receiving that email [or survey]?												
No	74% (86)	—	—									
Yes	26% (30)	—	—									
To the best of your recollection, which of these reasons might explain why you didn't respond to the survey? Would you say that…												
You never got the announcement [or the survey].	40% (44)	—	—									
You intended to respond, but it slipped your mind.	12% (15)	—	—									
You're too busy or didn't have time.	25% (31)	—	—									
It wasn't relevant, because you don't teach at a college or university.	0% (0)	—	—									
It wasn't relevant, because you don't know anything about digital resources.	1% (1)	—	—									
You are opposed to using digital resources in your teaching.	0% (0)	—	—									

Question	OVERALL			Univ. of Calif.			Liberal Arts Coll.			Community Coll.		
	Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey	
	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val
Digital resources don't apply to your discipline or to the way that you teach.	2% (2)	—	—									
You had technical problems with the survey website or with your computer.	0% (0)	—	—									
Other reason	27% (34)	—	—									
In which of these academic discipline(s) do you teach undergraduates?												
None: I never teach undergraduate courses	0% (0)	0% (0)	—	0% (0)	0% (0)	—	0% (0)	0% (0)	—	0% (0)	0% (0)	—
Languages & Literature:	18% (23)	—	—	0% (0)	—	—						—
English	18% (23)	22% (182)	0.31**	9.80% (4)	15% (80)	0.34**	9.30% (4)	19% (17)	0.14**	34% (15)	39% (81)	0.53**
Languages	20% (26)	18% (149)	0.52**	22% (9)	19% (101)	0.69**	19% (8)	18% (16)	0.95**	20% (9)	13% (27)	0.20**
Literature	29% (37)	22% (182)	0.08**	24% (10)	23% (121)	0.86**	37% (16)	20% (18)	0.04**	25% (11)	20% (42)	0.49**
Writing or composition	27% (34)	20% (165)	0.08**	12% (5)	13% (67)	0.91**	28% (12)	17% (15)	0.15**	39% (17)	38% (79)	0.95**
Anthropology	5% (6)	7% (62)	0.25**	7.30% (3)	7.70% (40)	0.94**†	7.00% (3)	9.10% (8)	0.68**†	0% (0)	6.30% (13)	0.09**†
Archaeology	2% (2)	3% (24)	0.39**†	4.90% (2)	3.50% (18)	0.63**†	0% (0)	1.10% (1)	0.48**†	0% (0)	1.50% (3)	0.42**†
Architecture	1% (1)	2% (20)	0.24**†	2.40% (1)	2.10% (11)	0.89**†	0% (0)	1.10% (1)	0.48**†	0% (0)	3.90% (8)	0.19**†
Art history	9% (11)	6% (47)	0.20**	7.30% (3)	4.80% (25)	0.47**†	9.30% (4)	10% (9)	0.87**†	9.10% (4)	6.30% (13)	0.50**†
Art practice, visual art, other art	13% (17)	8% (63)	0.03**	4.90% (2)	6.70% (35)	0.65**†	12% (5)	6.80% (6)	0.35**†	23% (10)	11% (22)	0.03**
Classics	5% (6)	2% (19)	0.11**†	2.40% (1)	3.10% (16)	0.82**†	9.30% (4)	1.10% (1)	0.02**†	2.30% (1)	0.97% (2)	0.47**†
Geography	1% (1)	3% (24)	0.16**†	0% (0)	2.90% (15)	0.27**†	0% (0)	0% (0)	—	2.30% (1)	3.90% (8)	0.61**†
History	19% (24)	15% (128)	0.34**	32% (13)	16% (81)	0.007**	21% (9)	22% (19)	0.93	4.60% (2)	13% (27)	0.11**
Political science	14% (18)	11% (92)	0.33**	15% (6)	12% (61)	0.57**†	16% (7)	20% (18)	0.57	11% (5)	6.30% (13)	0.24**†
Other	24% (31)	19% (157)	0.16**	29% (12)	18% (96)	0.09**	23% (10)	16% (14)	0.31	20% (9)	20% (42)	0.98**
What is the highest degree that you have obtained?												
Associate's degree	1% (1)	1% (1)	0.16*	0% (0)	0% (0)	0.73*	0% (0)	0% (0)	0.93*	2.30% (1)	0.54% (1)	0.63*

Question		OVERALL			Univ. of Calif.			Liberal Arts Coll.			Community Coll.		
		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey	
		% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val
	Undergraduate (bachelor's) degree	3% (4)	2% (18)		2.40% (1)	1.70% (8)		0% (0)	1.20% (1)		6.80% (3)	4.90% (9)	
	Master's degree	30% (38)	26% (198)		12% (5)	11% (54)		12% (5)	9.80% (8)		64% (28)	71% (132)	
	Ph.D.	63% (81)	69% (519)		83% (34)	86% (406)		88% (38)	88% (72)		20% (9)	19% (36)	
	M.D.	2% (2)	1% (4)		2.40% (1)	0.21% (1)		0% (0)	1.20% (1)		2.30% (1)	1.10% (2)	
	J.D.	0% (0)	1% (7)		0% (0)	0.84% (4)		0% (0)	0% (0)		0% (0)	1.60% (3)	
	Other degree	2% (2)	1% (3)		0% (0)	0.21% (1)		0% (0)	0% (0)		4.60% (2)	1.10% (2)	
In what year did you receive this degree? (mean ± SD)		1985 ± 11	1986 ± 12	0.69*	1985 ± 11	1986 ± 11	0.73*	1985 ± 11	1989 ± 11	0.07*	1986 ± 12	1986 ± 12	0.68*
In what year were you born? (mean ± SD)		1953 ± 10	1954 ± 11	0.49*	1953 ± 11	1954 ± 11	0.44*	1952 ± 11	1957 ± 11	0.04*	1954 ± 9.4	1952 ± 11	0.22*
Gender													
	Male	57% (73)	49% (362)	0.09**	68% (28)	55% (257)	0.10**	51% (22)	48% (38)	0.70**	52% (23)	35% (64)	0.03**
	Female	43% (55)	51% (379)		32% (13)	45% (212)		49% (21)	53% (42)		48% (21)	65% (119)	
How often do you or have you used the following types of digital resources in your undergraduate teaching:													
Digital images or visual materials													
	Almost all the time	23% (30)	28% (227)		27% (11)	27% (140)		16% (7)	24% (20)		27% (12)	32% (63)	
	Often	19% (24)	24% (192)		15% (6)	22% (115)		19% (8)	26% (22)		23% (10)	27% (54)	
	Sometimes	23% (30)	23% (183)	0.08*	27% (11)	23% (116)	0.87*	23% (10)	22% (19)	0.06*	20% (9)	22% (44)	0.19*
	Rarely	29% (24)	14% (111)		20% (8)	13% (68)		19% (8)	18% (15)		18% (8)	13% (26)	
	Never	15% (19)	12% (95)		9.80% (4)	14% (73)		23% (10)	11% (9)		11% (5)	6.50% (13)	
Online or digitized documents (including translations)													
	Almost all the time	9% (11)	11% (85)		5% (2)	11% (54)		12% (5)	16% (13)		9.10% (4)	9.00% (17)	
	Often	26% (33)	18% (137)		25% (10)	18% (89)		23% (10)	23% (19)		30% (13)	15% (28)	
	Sometimes	25% (32)	22% (269)	0.05*	30% (12)	22% (111)	0.42*	30% (13)	22% (18)	0.67*	16% (7)	21% (40)	0.18*
	Rarely	18% (23)	15% (117)		20% (8)	15% (73)		19% (8)	7.30% (6)		16% (7)	20% (37)	
	Never	22% (28)	35% (269)		20% (8)	34% (169)		16% (7)	32% (26)		30% (13)	35% (67)	

Question	OVERALL			Univ. of Calif.			Liberal Arts Coll.			Community Coll.		
	Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey		Non-response follow-up	Faculty Survey	
	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val
Online news or other media sources or archives												
Almost all the time	9% (11)	9% (74)		10% (4)	8.90% (44)		7.00% (3)	14% (12)		9.10% (4)	8.60% (17)	
Often	20% (26)	26% (204)		18% (7)	20% (100)		21% (9)	39% (33)		23% (10)	35% (68)	
Sometimes	27% (34)	29% (228)	0.31*	23% (9)	26% (130)	0.88*	26% (11)	20% (17)	0.02*	32% (14)	39% (76)	0.04*
Rarely	24% (31)	13% (106)		30% (12)	16% (80)		26% (11)	9.50% (8)		18% (8)	8.60% (17)	
Never	20% (25)	22% (177)		20% (8)	29% (143)		21% (9)	17% (14)		18% (8)	9.60% (19)	
Portals that provide links or URLs relevant to particular disciplinary topics												
Almost all the time	10% (13)	12% (96)		18% (7)	12% (60)		9.30% (4)	12% (10)		4.60% (2)	12% (24)	
Often	19% (24)	23% (179)		20% (8)	21% (102)		19% (8)	27% (23)		18% (8)	26% (51)	
Sometimes	33% (42)	28% (221)	0.49*	23% (9)	28% (139)	0.60*	35% (15)	29% (25)	0.42*	41% (18)	28% (54)	0.17*
Rarely	15% (19)	14% (112)		18% (7)	16% (75)		14% (6)	9.40% (8)		14% (6)	13% (26)	
Never	23% (29)	23% (179)		23% (9)	24% (121)		23% (10)	22% (19)		23% (10)	20% (39)	
Total Use	7.5 ± 3.7	7.5 ± 3.8	0.92*	7.6 ± 3.6	7.1 ± 3.9	0.45*	7.3 ± 3.6	8.2 ± 3.9	0.18*	7.6 ± 4.0	7.9 ± 3.7	0.62*
On a scale of 1 to 7, where 1 is low enthusiasm and 7 is high enthusiasm, how would you rate your enthusiasm about using digital resources? (mean ± SD)	4.9 ± 1.7	4.9 ± 1.7	0.60*	4.9 ± 1.9	4.8 ± 1.8	0.74*	5.1 ± 1.7	4.7 ± 1.6	0.28*	4.8 ± 1.7	5.0 ± 1.7	0.50*

Table F.2: Based on all eligible subjects

Question		OVERALL			Univ. of Calif.			Liberal Arts Coll.			Community Coll.		
		All non-responders	Faculty Survey		All non-responders	Faculty Survey		All non-respond-ers	Faculty Survey		All non-responders	Faculty Survey	
		% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val	% (N)	% (N)	p-val
N		3,612	831		1,894	522		340	88		1,373	209	
Discipline:													
	English language or lit	27% (947)	27% (216)		19% (358)	20% (104)		22% (74)	22% (19)		38% (515)	45% (93)	
	Foreign language or lit	19% (669)	21% (169)		22% (408)	26% (134)		20% (68)	17% (15)		14% (193)	9.6% (20)	
	Anthropology	6% (216)	7% (58)		7.7% (146)	7.7% (40)		6.50% (22)	8.00% (7)		3.5% (48)	5.3% (11)	
	Archaeology	0.10% (4)	0.40% (3)		0.2% (4)	0.6% (3)		0% (0)	0% (0)		0% (0)	0% (0)	
	Architecture	4% (120)	3% (24)		5.0% (94)	3.3% (17)		0% (0)	0% (0)		1.9% (26)	3.4% (7)	
	Art history	3% (99)	3% (28)	0.004** [0.01** lumped]	2.8% (52)	3.0% (18)	0.05** [0.03** lumped]	5.00% (17)	5.70% (5)	0.92** [0.86** lumped] †	2.2% (30)	2.4% (5)	0.13** [0.24** lumped]
	Art practice or applied arts	9% (320)	6% (45)		6.0% (114)	4.0% (21)		5.60% (19)	4.60% (4)		14% (187)	9.6% (20)	
	Geography	3% (116)	3% (21)		4.1% (77)	2.7% (14)		0.29% (1)	0% (0)		2.80% (38)	3.4% (7)	
	History	14% (509)	14% (112)		18% (337)	14% (73)		15% (50)	20% (18)		8.9% (122)	10% (21)	
	Political Science	9% (323)	12% (96)		10% (191)	13% (68)		18% (62)	19% (17)		5.1% (70)	5.3% (11)	
	Classics	1% (47)	2% (13)		2.1% (40)	2.3% (12)		1.80% (6)	1.10% (1)		0.07% (1)	0% (0)	
	Languages and lit, n.s.	2% (67)	1% (10)		0.16% (3)	0% (0)		2.10% (7)	0% (0)		4.2% (57)	4.8% (10)	
	Art and architecture, n.s.	3% (113)	2% (14)		1.90% (36)	1.70% (9)		2.70% (9)	2.30% (2)		5.0% (68)	1.40% (3)	
Gender													
	Male	56% (1615)	51% (359)	0.01**	61% (937)	55% (247)	0.02**	52% (149)	47% (39)	0.38**	50% (529)	41% (73)	0.03**
	Female	44% (1258)	49% (347)		39% (590)	45% (199)		48% (135)	53% (44)		50% (533)	59% (104)	

Appendix G: Principal Component Analysis – Factor Matrices

Table G.1: Types (and sources) of digital resources *(5 factors)*

		Use Factor 1	Use Factor 2	Use Factor 3	Use Factor 4	Use Factor 5
		General-purpose and reference materials	Images and audiovisual materials	Historical documents, maps, and primary sources	Data, news/media, and governmental resources	Discussion and curricular materials
q05a_images	5a. How often do you use... Images or visual materials	-0.05	0.18	0.20	-0.05	-0.15
q05b_maps	5b. How often do you use... Maps	-0.15	0.04	0.31	0.13	-0.10
q05c_simul	5c. How often do you use... Simulations or animations	-0.17	0.23	-0.02	0.04	0.22
q05d_film	5d. How often do you use... Digital film or video	-0.07	0.28	-0.06	0.06	-0.06
q05e_audio	5e. How often do you use... Audio materials	-0.02	0.22	-0.07	0.02	0.00
q05f_manusc	5f. How often do you use... Digital facsimiles of ancient or historical manuscripts	-0.08	-0.08	0.34	-0.03	0.05
q05g_docs	5g. How often do you use... Online or digitized documents	0.03	-0.13	0.16	0.02	0.16
q05h_govdocs	5h. How often do you use... Government documents	-0.09	-0.10	0.07	0.38	0.05
q05i_data	5i. How often do you use... Data archives	-0.11	-0.04	0.02	0.41	-0.01
q05j_news	5j. How often do you use... News or other media sources and archives	0.07	0.07	-0.15	0.27	-0.09
q05k_refer	5k. How often do you use... Online reference resources	0.19	0.02	-0.08	-0.03	-0.04
q05l_portal	5l. How often do you use... "Portals" that provide links or URL's relevant to particular disciplinary topics	0.21	0.02	-0.09	-0.06	0.01
q05m_blog	5m. How often do you use... Personal online diaries	-0.11	0.14	-0.19	0.07	0.38
q05n_discuss	5n. How often do you use... Online class discussions	-0.05	-0.05	-0.02	-0.07	0.49

		Use Factor 1	Use Factor 2	Use Factor 3	Use Factor 4	Use Factor 5
		General-purpose and reference materials	Images and audiovisual materials	Historical documents, maps, and primary sources	Data, news/media, and governmental resources	Discussion and curricular materials
q05o_curric	5o. How often do you use... Curricular materials and websites that are created by other faculty and/or other institutions	0.08	0.08	-0.15	-0.04	0.17
q05p_coursepack	5p. How often do you use... Digital readers or coursepacks	-0.09	-0.08	0.07	-0.02	0.42
q06a_searcheng	6a. How often do you use digital resources from... Search engines/directories	0.19	0.06	-0.09	0.02	-0.14
q06b_owncoll	6b. How often do you use digital resources from... My own personal collection of digital materials	-0.02	0.07	0.15	-0.06	0.04
q06c_free_img	6c. How often do you use digital resources from... Public online image databases	0.05	0.06	0.17	-0.07	-0.06
q06d_comm_img	6d. How often do you use digital resources from... Commercial image databases	0.06	0.21	-0.04	-0.10	-0.09
q06e_campus_img	6e. How often do you use digital resources from... Campus image databases from my own institution	0.08	0.14	0.03	-0.17	-0.03
q06f_portal	6f. How often do you use digital resources from... “Portals” that provide links or URL’s relevant to particular disciplinary topics	0.25	-0.02	-0.05	-0.11	-0.04
q06g_exhibit	6g. How often do you use digital resources from... Online exhibits	0.12	0.07	0.09	-0.13	-0.04
q06h_diglib	6h. How often do you use digital resources from... Library collections	0.17	-0.18	0.13	-0.04	0.01
q06i_journal	6i. How often do you use digital resources from... Online journals	0.16	-0.24	0.17	0.05	-0.03
q06j_media	6j. How often do you use digital resources from... Media sites	0.17	-0.01	-0.15	0.21	-0.14

Table G.2: Ways that people use resources *(4 factors)*

		How Factor 1	How Factor 2	How Factor 3	How Factor 4
		Student assignments	Web posting	Online courses	In-class presentation
q10a_in_class	10a. How often do you use digital resources... Presented during my lectures/class	-0.15	-0.06	-0.13	0.95
q10b_post_web	10b. How often do you use digital resources... Posted directly on my course website.	-0.17	0.61	-0.08	-0.03
q10c_link_web	10c. How often do you use digital resources... Linked from my course website.	-0.11	0.57	-0.09	-0.04
q10d_st_project	10d. How often do you use digital resources... Assigned for student research projects or problem-based learning assignments.	0.55	-0.14	-0.10	-0.12
q10e_st_portfolio	10e. How often do you use digital resources... Assigned to students to create their own digital portfolios and/or multimedia projects.	0.47	-0.20	-0.05	0.04
q10f_study	10f. How often do you use digital resources... Assigned to students for review and/or study.	0.39	0.09	-0.07	-0.21
q10g_test	10g. How often do you use digital resources... Used in tests and quizzes.	0.10	-0.08	0.09	0.31
q10h_online_lec	10h. How often do you use digital resources... Presented in my online lectures.	-0.14	-0.08	0.58	0.02
q10i_online_disc	10i. How often do you use digital resources... Presented in the context of an online discussion.	-0.04	-0.10	0.62	-0.19

Table G.3: Reasons for using or not using resources *(8 factors)*

		Reason Factor1	Reason Factor2	Reason Factor3	Reason Factor4	Reason Factor5	Reason Factor6	Reason Factor7	Reason Factor8
		Pedagogical reasons	Expectations & reputation	Inappropri-ateness	Concerns about students' interpretation and information literacy	Time, convenience, access	Teaching information literacy and critical thinking	Making information publicly available	Using free and publicly available materials
q12a_why_context	12a. Agree/Disagree: I use digital resources in my teaching to provide students a context for a topic.	0.24	-0.02	0.07	-0.02	-0.15	-0.13	0.08	0.05
q12b_why_excited	12b. Agree/Disagree: I use digital resources in my teaching to get students excited about a topic.	0.24	0.02	0.04	0.01	-0.15	-0.12	0.01	0.03
q12c_why_primsource	12c. Agree/Disagree: I use digital resources in my teaching to integrate primary source material into the course.	0.11	-0.16	0.05	0.00	-0.06	0.09	0.17	0.13
q12d_why_research	12d. Agree/Disagree: I use digital resources in my teaching to integrate my research interests into my course.	0.02	-0.11	0.05	0.00	-0.08	0.05	0.36	0.14
q12e_why_examples	12e. Agree/Disagree: I use digital resources in my teaching to provide students with both good and bad examples of different kinds of scholarship.	-0.15	-0.08	-0.01	-0.05	0.03	0.54	0.02	0.03
q12f_why_infolit	12f. Agree/Disagree: I use digital resources in my teaching to teach information literacy (i.e., evaluating the online materials themselves).	-0.06	0.02	-0.01	-0.01	-0.03	0.53	-0.19	-0.09
q12g_why_critthink	12g. Agree/Disagree: I use digital resources in my teaching to teach critical thinking skills.	0.06	0.01	0.01	-0.03	-0.17	0.30	-0.01	-0.05
q12h_why_preview	12h. Agree/Disagree: I use digital resources in my teaching to provide students a preview of the course before they register.	-0.07	0.12	0.01	0.01	-0.01	-0.16	0.41	-0.03
q13a_why_learn	13a. Agree/Disagree: I use digital resources in my teaching because it improves my students' learning.	0.22	0.01	0.02	-0.04	0.01	-0.12	-0.10	-0.06

		Reason Factor1	Reason Factor2	Reason Factor3	Reason Factor4	Reason Factor5	Reason Factor6	Reason Factor7	Reason Factor8
		Pedagogical reasons	Expectations & reputation	Inappropri-ateness	Concerns about students' interpretation and information literacy	Time, convenience, access	Teaching information literacy and critical thinking	Making information publicly available	Using free and publicly available materials
q13b_why_creative	13b. Agree/Disagree: I use digital resources in my teaching because it allows my students to be more creative.	0.18	0.01	-0.04	0.06	-0.05	0.06	-0.11	-0.13
q13c_why_savetime	13c. Agree/Disagree: I use digital resources in my teaching because it saves me time.	-0.09	-0.09	-0.03	-0.02	0.46	-0.02	0.02	0.09
q13d_why_convenient	13d. Agree/Disagree: I use digital resources in my teaching because it is more convenient for my students and their schedules.	-0.05	0.03	0.07	-0.04	0.45	-0.06	-0.06	-0.03
q13e_why_community	13e. Agree/Disagree: I use digital resources in my teaching because it creates a sense of community for students enrolled in my course.	-0.03	0.09	0.08	-0.06	0.08	-0.02	0.21	-0.03
q13f_why_domore	13f. Agree/Disagree: I use digital resources in my teaching because it allows me to do things in the classroom that I could never do otherwise.	0.21	0.00	0.03	0.01	0.09	-0.10	-0.15	-0.07
q13g_why_access	13g. Agree/Disagree: I use digital resources in my teaching because it provides access to resources that we don't have at our college.	0.15	-0.18	-0.04	0.16	0.28	0.02	-0.16	0.02
q13h_why_studexpect	13h. Agree/Disagree: I use digital resources in my teaching because my students expect or ask for more technology.	0.06	0.31	-0.04	0.03	0.00	-0.09	-0.18	-0.04
q13i_why_uptodate	13i. Agree/Disagree: I use digital resources in my teaching because it allows me to stay up-to-date with my colleagues.	0.03	0.22	-0.05	0.07	0.08	-0.01	-0.12	-0.04
q13j_why_admin	13j. Agree/Disagree: I use digital resources in my teaching because the administration encourages me to use digital resources more.	-0.06	0.36	0.01	-0.02	-0.08	-0.06	0.03	0.03

		Reason Factor1	Reason Factor2	Reason Factor3	Reason Factor4	Reason Factor5	Reason Factor6	Reason Factor7	Reason Factor8
		Pedagogical reasons	Expectations & reputation	Inappropri-ateness	Concerns about students' interpretation and information literacy	Time, convenience, access	Teaching information literacy and critical thinking	Making information publicly available	Using free and publicly available materials
q13k_why_tenure	13k. Agree/Disagree: I use digital resources in my teaching because it may help me get promoted or get tenure.	-0.11	0.35	0.06	-0.09	-0.15	-0.01	0.12	0.08
q13l_why_like	13l. Agree/Disagree: I use digital resources in my teaching because I like or feel very comfortable with the new technologies.	0.14	-0.06	-0.03	0.05	0.14	-0.11	0.03	-0.03
q13m_why_avail_world	13m. Agree/Disagree: I use digital resources in my teaching because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	-0.03	-0.02	0.02	-0.01	0.04	-0.01	0.32	-0.08
q14a_whynot_notime	14a. Agree/Disagree: I don't use digital resources , because I don't have time to use digital resources.	0.01	0.11	0.30	-0.15	0.11	0.06	-0.30	0.03
q14b_whynot_nosubst	14b. Agree/Disagree: I don't use digital resources , because they cannot substitute for the teaching approaches I use.	0.05	0.00	0.41	-0.08	0.09	-0.02	-0.07	-0.08
q14c_whynot_distract	14c. Agree/Disagree: I don't use digital resources , because using them distracts from the core goals of my teaching.	0.01	0.02	0.39	-0.06	-0.07	-0.02	0.15	0.01
q14d_whynot_irrelevant	14d. Agree/Disagree: I don't use digital resources , because they are irrelevant to my field.	0.04	-0.05	0.30	0.01	-0.05	-0.02	0.11	-0.04
q14e_whynot_infolit	14e. Agree/Disagree: I don't use digital resources , because students don't have the information literacy skills to assess the credibility of digital resources.	0.04	-0.04	-0.05	0.38	-0.03	0.03	-0.04	0.05
q14f_whynot_decontext	14f. Agree/Disagree: I don't use digital resources , because digital material can be presented outside its original context.	0.04	-0.06	-0.06	0.43	0.03	-0.03	0.04	-0.09

		Reason Factor1	Reason Factor2	Reason Factor3	Reason Factor4	Reason Factor5	Reason Factor6	Reason Factor7	Reason Factor8
		Pedagogical reasons	Expectations & reputation	Inappropri-ateness	Concerns about students' interpretation and information literacy	Time, convenience, access	Teaching information literacy and critical thinking	Making information publicly available	Using free and publicly available materials
q14g_whynot_plagiarize	14g. Agree/Disagree: I don't use digital resources , because I don't want my students to copy or plagiarize material from the web.	0.02	0.05	-0.09	0.43	-0.01	-0.13	0.01	0.02
q15a_depend_free	15a. Agree/Disagree: My use of digital resources is very dependent on whether they are available to me for free.	-0.03	-0.01	0.02	-0.07	0.08	0.00	-0.03	0.52
q15b_depend_password	15b. Agree/Disagree: My use of digital resources is very dependent on whether they require registration or a password.	-0.04	0.04	-0.07	0.06	-0.04	-0.09	0.07	0.55

Table G.4: Barriers to digital resource use *(5 factors)*

		Barrier Factor1	Barrier Factor2	Barrier Factor3	Barrier Factor4	Barrier Factor5
		Finding resources	High-end multimedia equipment and software	Personal equipment t	Resource availability or existence	Student equipment
q16a_barrier_overwhelm	16a. Agree/Disagree: I have difficulty using digital resources because there are too many resources out there for me to take advantage of—I am overwhelmed.	0.27	-0.13	0.03	-0.10	-0.02
q16b_barrier_locate	16b. Agree/Disagree: I have difficulty using digital resources because I don't know how to locate the online materials I need.	0.29	-0.08	-0.05	-0.12	0.00
q16c_barrier_search_eng	16c. Agree/Disagree: I have difficulty using digital resources because search engines provide irrelevant results for my needs.	0.16	-0.09	-0.04	0.12	0.03
q16d_barrier_unavail	16d. Agree/Disagree: I have difficulty using digital resources because the content I need or want is just not available online.	-0.11	-0.01	0.00	0.49	-0.06
q16e_barrier_quality	16e. Agree/Disagree: I have difficulty using digital resources because the academic quality of available materials is too poor to meet my needs.	-0.08	-0.11	0.07	0.50	-0.03
q16f_barrier_distrib	16f. Agree/Disagree: I have difficulty using digital resources because the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	0.20	-0.06	-0.05	0.03	0.01
q16g_barrier_unreliable	16g. Agree/Disagree: I have difficulty using digital resources because web sites I would use are unreliable, and I can't count on them being there when I need them.	0.06	0.05	-0.13	0.18	0.05
q16h_barrier_credibility	16h. Agree/Disagree: I have difficulty using digital resources because I don't have time to assess the credibility of the available resources.	0.19	-0.15	0.06	0.09	-0.03

		Barrier Factor1	Barrier Factor2	Barrier Factor3	Barrier Factor4	Barrier Factor5
		Finding resources	High-end multimedia equipment and software	Personal equipment t	Resource availability or existence	Student equipment
q16i_barrier_copyright	16i. Agree/Disagree: I have difficulty using digital resources because I have difficulty understanding the issues surrounding copyright and digital collections.	0.20	-0.02	-0.02	-0.07	-0.02
q17a_barrier_software_img	17a. Agree/Disagree: I have difficulty using digital resources because available software is unsuitable for viewing and displaying digital images.	-0.05	0.35	-0.15	-0.01	0.01
q17b_barrier_software_audio_vide	17b. Agree/Disagree: I have difficulty using digital resources because available software is unsuitable for integrating audio or video into my course.	-0.03	0.37	-0.19	-0.05	0.03
q17c_barrier_stud_computer	17c. Agree/Disagree: I have difficulty using digital resources because my students don't have reliable access to computers.	-0.02	-0.06	-0.06	-0.04	0.54
q17d_barrier_stud_connect	17d. Agree/Disagree: I have difficulty using digital resources because my students don't have a high-speed connection.	-0.02	-0.07	-0.06	-0.01	0.55
q17e_barrier_me_computer	17e. Agree/Disagree: I have difficulty using digital resources because I don't have reliable access to a computer.	-0.04	-0.18	0.48	0.04	-0.04
q17f_barrier_me_connect	17f. Agree/Disagree: I have difficulty using digital resources because I don't have reliable access to a high-speed connection.	0.01	-0.21	0.48	0.01	-0.05
q17g_barrier_classroom_equip	17g. Agree/Disagree: I have difficulty using digital resources because I don't have reliable access to physical resources in my classroom(s).	-0.12	0.14	0.16	0.00	0.02
q17h_barrier_server	17h. Agree/Disagree: I have difficulty using digital resources because it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	-0.06	0.14	0.16	-0.02	-0.04

		Barrier Factor1	Barrier Factor2	Barrier Factor3	Barrier Factor4	Barrier Factor5
		Finding resources	High-end multimedia equipment and software	Personal equipment t	Resource availability or existence	Student equipment
q17i_barrier_scanner	17i. Agree/Disagree: I have difficulty using digital resources because I don't have reliable access to scanners.	-0.04	0.14	0.21	-0.03	-0.13
q17j_barrier_lms	17j. Agree/Disagree: I have difficulty using digital resources because course management software packages are inadequate for my needs.	-0.15	0.36	-0.06	0.08	-0.11
q17k_barrier_save_pres	17k. Agree/Disagree: I have difficulty using digital resources because I don't know how to save presentations to my computer so they can be run without a live connection.	0.17	0.12	0.03	-0.21	-0.11
q17l_barrier_link_excerpt	17l. Agree/Disagree: I have difficulty using digital resources because web formats allow me to link to whole documents, but not to specific excerpts within a text.	0.08	0.23	-0.08	-0.16	0.00

Table G.5: Activities that require support *(2 factors)*

		Support Factor1	Support Factor2
		Technical activities	Intellectual and content-based activities
q18a_support_find	18a. How important is it for you to have support with... finding digital resources.	-0.07	0.28
q18b_support_credib	18b. How important is it for you to have support with... assessing the credibility of digital resources.	-0.16	0.38
q18c_support_appropr	18c. How important is it for you to have support with... evaluating the appropriateness of resources for my teaching goals.	-0.16	0.38
q18d_support_copyright	18d. How important is it for you to have support with... interpreting copyright laws and/or securing copyright permission.	-0.05	0.23
q18e_support_website	18e. How important is it for you to have support with... creating my own website.	0.19	-0.08
q18f_support_import	18f. How important is it for you to have support with... importing resources into a course website or a database.	0.20	-0.07
q18g_support_learn_lms	18g. How important is it for you to have support with... learning how to use a learning management system.	0.21	-0.09
q18h_support_integrate_lms	18h. How important is it for you to have support with... integrating resources into a learning management system.	0.21	-0.09
q18i_support_digitize	18i. How important is it for you to have support with... digitizing existing resources.	0.20	-0.08
q18j_support_organize	18j. How important is it for you to have support with... gathering, organizing, and maintaining digital materials.	0.14	0.01
q18k_support_train	18k. How important is it for you to have support with... training students to find or evaluate digital resources.	0.05	0.13
q18l_support_infrastr	18l. How important is it for you to have support with... obtaining or setting up technical infrastructure.	0.17	-0.06

Appendix H: Faculty Survey – Results Tables

Table H.1: Faculty survey responses, broken out by institution type

	All	University of California	Liberal arts colleges	Community colleges
N	831	522	90	206
How often do you use the following types of digital resources in your undergraduate teaching:				
Images or visual materials	75%	72%	71%	80%
News or other media sources and archives	64%	55%	74%	81%
"Portals" that provide links or URL's relevant to particular disciplinary topics	63%	61%	68%	66%
Online reference resources	62%	57%	67%	72%
Digital film or video	62%	57%	66%	72%
Maps	53%	52%	53%	51%
Online or digitized documents	50%	52%	60%	43%
Audio materials	46%	41%	46%	54%
Curricular materials and websites that are created by other faculty and/or other institutions	35%	32%	36%	43%
Digital readers or coursepacks	30%	29%	59%	20%
Online class discussions	28%	29%	30%	27%
Government documents	27%	23%	38%	35%
Data archives	27%	24%	27%	31%
Digital facsimiles of ancient or historical manuscripts	23%	24%	19%	20%
Simulations or animations	19%	15%	17%	29%
Personal online diaries	9%	7%	8%	12%
How often do you use digital resources in your undergraduate teaching from each of the following sources?				
Search engines/directories	81%	77%	88%	87%
My own personal collection of digital materials	69%	69%	64%	71%
Online journals	62%	65%	80%	46%
Public online image databases	62%	62%	60%	62%
Media sites	57%	52%	60%	69%
Library collections	57%	57%	70%	52%
"Portals" that provide links or URL's relevant to particular disciplinary topics	55%	53%	59%	58%
Online exhibits	37%	36%	43%	37%
Campus image databases from my own institution	24%	21%	31%	26%
Commercial image databases	9%	5%	10%	15%
How often have you heard about sources of digital resources from each of the following?				
Word of mouth from colleagues	74%	73%	77%	73%
Word of mouth from students	57%	54%	57%	61%
Professional societies or discussion lists	55%	57%	69%	46%
Recommendation from a campus librarian	51%	49%	53%	57%
A campus department devoted to instructional technology	41%	40%	39%	46%
How often do you use digital resources in each of these ways?				
Presented during my lectures/class	71%	68%	72%	78%
Assigned to students for review and/or study	59%	56%	65%	64%
Assigned for student research projects or problem-based learning assignments	56%	50%	68%	65%
Posted directly on my course website	52%	57%	48%	38%
Linked from my course website	49%	53%	48%	39%
Used in tests and quizzes	25%	20%	24%	37%
Assigned to students to create their own digital portfolios and/or multimedia projects	20%	18%	27%	22%
Presented in the context of an online discussion	12%	9%	11%	21%

	All	University of California	Liberal arts colleges	Community colleges
Presented in my online lectures	12%	9%	7%	21%
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…				
because it improves my students' learning.	78%	77%	70%	86%
to integrate primary source material into the course.	78%	76%	82%	82%
to provide students a context for a topic.	75%	72%	77%	81%
to get students excited about a topic.	73%	69%	75%	84%
because it allows me to do things in the classroom that I could never do otherwise.	68%	67%	69%	68%
because it provides access to resources that we don't have at our college.	61%	51%	80%	76%
because it allows my students to be more creative.	56%	51%	52%	72%
to teach critical thinking skills.	56%	47%	61%	75%
to integrate my research interests into my course.	55%	53%	60%	59%
because I like or feel very comfortable with the new technologies.	53%	49%	55%	63%
because it is more convenient for my students and their schedules.	51%	50%	49%	55%
to teach information literacy (i.e., evaluating the online materials themselves).	43%	36%	54%	56%
because it saves me time.	41%	41%	40%	41%
because my students expect or ask for more technology.	38%	35%	38%	43%
because it allows me to stay up-to-date with my colleagues.	37%	31%	36%	55%
to provide students with both good and bad examples of different kinds of scholarship.	32%	25%	35%	49%
because it creates a sense of community for students enrolled in my course.	32%	29%	29%	40%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	25%	22%	25%	31%
because the administration encourages me to use digital resources more.	23%	18%	28%	32%
to provide students a preview of the course before they register.	22%	21%	13%	27%
because it may help me get promoted or get tenure.	9%	8%	11%	12%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…				
they cannot substitute for the teaching approaches I use.	75%	78%	81%	66%
I don't have time to use digital resources.	66%	67%	72%	61%
using them distracts from the core goals of my teaching.	47%	49%	59%	34%
I don't want my students to copy or plagiarize material from the web.	33%	35%	21%	34%
they are irrelevant to my field.	30%	30%	38%	28%
students don't have the information literacy skills to assess the credibility of digital resources.	29%	25%	27%	39%
digital material can be presented outside its original context.	25%	24%	19%	31%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...				
I don't have reliable access to physical resources in my classroom(s).	53%	52%	43%	63%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	43%	56%	46%
there are too many resources out there for me to take advantage of—I am overwhelmed.	44%	42%	51%	47%
I don't have time to assess the credibility of the available resources.	43%	42%	48%	44%
the content I need or want is just not available online.	41%	47%	48%	25%
the academic quality of available materials is too poor to meet my needs.	39%	45%	40%	24%
I don't have reliable access to scanners.	39%	40%	34%	39%
I don't know how to locate the online materials I need.	36%	33%	43%	40%

	All	University of California	Liberal arts colleges	Community colleges
I don't know how to save presentations to my computer so they can be run without a live connection.	35%	35%	35%	36%
available software is unsuitable for integrating audio or video into my course.	34%	31%	40%	40%
search engines provide irrelevant results for my needs.	34%	31%	35%	39%
I have difficulty understanding the issues surrounding copyright and digital collections.	33%	33%	33%	34%
my students don't have a high-speed connection.	32%	28%	13%	54%
course management software packages are inadequate for my needs.	32%	32%	41%	29%
web sites I would use are unreliable, and I can't count on them being there when I need them.	32%	30%	39%	33%
available software is unsuitable for viewing and displaying digital images.	31%	29%	39%	31%
my students don't have reliable access to computers.	30%	24%	10%	54%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	28%	28%	21%	32%
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	27%	23%	21%	38%
I don't have reliable access to a high-speed connection.	21%	19%	15%	32%
I don't have reliable access to a computer.	13%	10%	11%	21%
How important is it for you to have support or assistance with each of the following activities for your teaching?				
obtaining or setting up technical infrastructure	82%	81%	89%	84%
creating my own website	82%	81%	87%	81%
digitizing existing resources	80%	79%	92%	78%
learning how to use a learning management system	79%	78%	85%	80%
importing resources into a course website or a database	79%	79%	81%	77%
gathering, organizing, and maintaining digital materials	78%	77%	86%	77%
integrating resources into a learning management system	78%	75%	83%	81%
finding digital resources	72%	69%	75%	78%
training students to find or evaluate digital resources	71%	67%	77%	79%
interpreting copyright laws and/or securing copyright permission	65%	62%	69%	70%
assessing the credibility of digital resources	50%	43%	50%	69%
evaluating the appropriateness of resources for my teaching goals	42%	35%	38%	60%
How satisfied or dissatisfied are you with the support you have received from the following sources?				
Campus librarians	84%	85%	83%	84%
Friends or family	83%	81%	76%	90%
Graduate students	80%	81%	64%	75%
Campus educational technology or IT support staff	73%	74%	76%	68%
Other faculty	71%	70%	72%	74%
Undergraduate students	70%	73%	65%	69%
My departmental or college staff	66%	68%	66%	63%
Workshops	60%	55%	59%	67%
Online help or guides	47%	44%	48%	53%
Overall digital resource use (0–100)	31	29	34	32
Overall technology use (0=no usage; 16=max usage)	14.5	14.8	14.8	13.6
Principal Component Scores:				
What resources people use				
General purpose and reference materials	0.00	-0.03	0.23	-0.02
Images and audiovisual materials	0.02	-0.15	-0.28	0.57
Historical documents, maps, and primary sources	-0.03	0.06	0.04	-0.35
Data, news/media, and governmental resources	0.00	-0.12	0.23	0.19
Discussion and curricular materials	0.00	-0.01	0.26	-0.06

	All	University of California	Liberal arts colleges	Community colleges
How people use digital resources				
Student assignments	0.01	-0.07	0.20	0.17
Web posting	0.00	0.14	-0.01	-0.39
Online courses	0.00	-0.13	-0.14	0.41
In-class presentation	0.01	-0.05	-0.11	0.20
Motivations for use or non-use				
Pedagogical reasons	0.03	-0.03	0.04	0.21
Expectations and reputation	-0.05	-0.10	-0.12	0.12
Inappropriateness	0.02	0.10	0.33	-0.33
Concerns about students' interpretation and information literacy	0.01	-0.06	-0.09	0.25
Time, convenience, and access	-0.02	-0.05	0.06	0.01
Teaching information literacy and critical thinking	0.03	-0.15	0.24	0.40
Making information publicly available	0.02	0.06	-0.12	-0.04
Using free and publicly available materials	-0.06	-0.04	0.06	-0.16
Barriers to use				
Finding resources	0.02	-0.04	0.24	0.05
High-end multimedia equipment and software	0.00	-0.02	0.18	0.01
Personal equipment	0.00	-0.07	-0.20	0.28
Resource availability or existence	0.02	0.11	0.16	-0.29
Student equipment	-0.01	-0.11	-0.59	0.54
Activities with which support is needed				
Technical activities	0.00	0.01	0.27	-0.15
Intellectual and content-based activities	0.01	-0.12	-0.03	0.36

Table H.2: Faculty survey responses, broken out by discipline

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
N	831	65	102	99	90	33	93	235	18	26	13
How often do you use the following types of digital resources in your undergraduate teaching:											
Images or visual materials	75%	76%	92%	78%	56%	67%	85%	64%	100%	88%	75%
News or other media sources and archives	64%	63%	57%	63%	77%	81%	70%	59%	72%	63%	67%
"Portals" that provide links or URL's relevant to particular disciplinary topics	63%	69%	75%	61%	52%	76%	60%	60%	56%	54%	75%
Online reference resources	62%	48%	61%	62%	42%	72%	77%	71%	61%	54%	50%
Digital film or video	62%	65%	77%	61%	44%	69%	63%	59%	44%	76%	82%
Maps	53%	69%	44%	81%	50%	23%	69%	37%	100%	65%	8%
Online or digitized documents	50%	48%	46%	68%	48%	48%	52%	46%	50%	50%	42%
Audio materials	46%	26%	38%	44%	30%	55%	69%	52%	11%	65%	50%
Curricular materials and websites that are created by other faculty and/or other institutions	35%	34%	46%	28%	21%	47%	49%	31%	44%	29%	50%
Digital readers or coursepacks	30%	49%	32%	37%	35%	32%	27%	18%	28%	28%	36%
Online class discussions	28%	35%	33%	31%	28%	57%	17%	25%	22%	25%	42%
Government documents	27%	26%	11%	51%	58%	24%	9%	15%	44%	40%	25%
Data archives	27%	27%	16%	30%	58%	21%	15%	12%	83%	50%	25%
Digital facsimiles of ancient or historical manuscripts	23%	23%	17%	49%	12%	10%	16%	24%	11%	25%	0%
Simulations or animations	19%	21%	44%	14%	10%	17%	23%	9%	44%	13%	8%
Personal online diaries	9%	5%	15%	9%	6%	25%	7%	8%	0%	4%	25%
How often do you use digital resources in your undergraduate teaching from each of the following sources?											
Search engines/directories	81%	76%	77%	86%	68%	91%	83%	83%	89%	77%	83%
My own personal collection of digital materials	69%	81%	81%	74%	67%	58%	69%	58%	83%	84%	83%
Online journals	62%	77%	42%	75%	81%	71%	33%	61%	61%	63%	67%
Public online image databases	62%	61%	68%	71%	48%	53%	65%	57%	82%	64%	67%
Media sites	57%	57%	53%	55%	80%	73%	50%	52%	56%	50%	58%
Library collections	57%	58%	53%	72%	56%	77%	39%	59%	44%	60%	67%

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
"Portals" that provide links or URL's relevant to particular disciplinary topics	55%	65%	62%	57%	48%	67%	50%	50%	44%	56%	58%
Online exhibits	37%	37%	67%	65%	11%	40%	35%	27%	17%	40%	17%
Campus image databases from my own institution	24%	20%	47%	25%	12%	23%	22%	18%	28%	16%	25%
Commercial image databases	9%	7%	24%	8%	1%	10%	7%	6%	0%	4%	17%
How often have you heard about sources of digital resources from each of the following?											
Word of mouth from colleagues	74%	78%	70%	78%	67%	91%	74%	73%	72%	65%	75%
Word of mouth from students	57%	51%	71%	56%	41%	66%	53%	55%	67%	65%	75%
Professional societies or discussion lists	55%	52%	47%	77%	55%	50%	54%	52%	44%	62%	58%
Recommendation from a campus librarian	51%	48%	40%	61%	42%	72%	38%	61%	22%	62%	58%
A campus department devoted to instructional technology	41%	33%	43%	38%	24%	44%	56%	43%	50%	46%	27%
How often do you use digital resources in each of these ways?											
Presented during my lectures/class	71%	84%	81%	84%	67%	61%	75%	57%	82%	84%	75%
Assigned to students for review and/or study	59%	56%	71%	52%	58%	53%	70%	55%	39%	48%	67%
Assigned for student research projects or problem-based learning assignments	56%	52%	57%	55%	52%	63%	62%	55%	78%	48%	75%
Posted directly on my course website	52%	63%	60%	52%	60%	48%	57%	38%	56%	58%	50%
Linked from my course website	49%	65%	57%	49%	59%	41%	55%	36%	50%	50%	55%
Used in tests and quizzes	25%	22%	37%	27%	19%	29%	36%	16%	28%	12%	42%
Assigned to students to create their own digital portfolios and/or multimedia projects	20%	15%	42%	20%	5%	27%	21%	15%	28%	15%	17%
Presented in the context of an online discussion	12%	15%	18%	13%	7%	30%	8%	9%	13%	8%	25%
Presented in my online lectures	12%	15%	20%	12%	8%	13%	7%	6%	35%	8%	33%
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…											
because it improves my students' learning.	78%	85%	82%	81%	70%	80%	90%	71%	88%	88%	83%
to integrate primary source material into the course.	78%	80%	87%	89%	73%	73%	85%	71%	78%	72%	82%

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
to provide students a context for a topic.	75%	77%	77%	84%	65%	69%	82%	73%	83%	80%	45%
to get students excited about a topic.	73%	79%	71%	84%	64%	73%	81%	68%	78%	76%	55%
because it allows me to do things in the classroom that I could never do otherwise.	68%	66%	73%	79%	63%	66%	79%	56%	78%	72%	67%
because it provides access to resources that we don't have at our college.	61%	54%	76%	63%	49%	61%	70%	55%	72%	46%	67%
because it allows my students to be more creative.	56%	51%	74%	53%	37%	53%	67%	53%	61%	58%	75%
to teach critical thinking skills.	56%	62%	58%	63%	45%	83%	48%	55%	61%	52%	50%
to integrate my research interests into my course.	55%	68%	60%	47%	58%	30%	54%	51%	72%	76%	82%
because I like or feel very comfortable with the new technologies.	53%	55%	72%	61%	46%	60%	63%	43%	78%	28%	58%
because it is more convenient for my students and their schedules.	51%	49%	64%	40%	55%	72%	52%	44%	72%	40%	42%
to teach information literacy (i.e., evaluating the online materials themselves).	43%	43%	47%	43%	24%	80%	33%	48%	67%	28%	40%
because it saves me time.	41%	45%	53%	33%	44%	59%	39%	35%	39%	35%	42%
because my students expect or ask for more technology.	38%	36%	48%	41%	28%	50%	34%	32%	44%	33%	50%
because it allows me to stay up-to-date with my colleagues.	37%	30%	52%	29%	21%	53%	45%	37%	50%	29%	45%
to provide students with both good and bad examples of different kinds of scholarship.	32%	36%	43%	29%	23%	57%	20%	33%	39%	17%	60%
because it creates a sense of community for students enrolled in my course.	32%	27%	39%	22%	19%	59%	38%	33%	28%	20%	58%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	25%	25%	36%	23%	23%	30%	34%	16%	39%	33%	18%
because the administration encourages me to use digital resources more.	23%	21%	30%	20%	8%	30%	26%	24%	17%	24%	25%
to provide students a preview of the course before they register.	22%	34%	30%	18%	14%	20%	23%	19%	22%	0%	40%
because it may help me get promoted or get tenure.	9%	13%	16%	7%	3%	20%	13%	6%	0%	4%	8%

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…											
they cannot substitute for the teaching approaches I use.	75%	64%	61%	79%	73%	90%	83%	84%	39%	76%	58%
I don't have time to use digital resources.	66%	57%	57%	68%	70%	58%	73%	74%	28%	64%	50%
using them distracts from the core goals of my teaching.	47%	51%	34%	51%	53%	55%	45%	51%	11%	39%	50%
I don't want my students to copy or plagiarize material from the web.	33%	41%	25%	27%	26%	42%	34%	37%	28%	33%	33%
they are irrelevant to my field.	30%	18%	19%	29%	24%	43%	41%	40%	11%	28%	25%
students don't have the information literacy skills to assess the credibility of digital resources.	29%	31%	26%	31%	21%	30%	27%	32%	11%	39%	18%
digital material can be presented outside its original context.	25%	25%	15%	21%	22%	26%	31%	28%	11%	32%	18%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...											
I don't have reliable access to physical resources in my classroom(s).	53%	53%	49%	51%	48%	62%	61%	55%	39%	63%	42%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	38%	39%	44%	36%	48%	55%	51%	28%	32%	58%
there are too many resources out there for me to take advantage of—I am overwhelmed.	44%	41%	25%	41%	38%	62%	43%	54%	44%	52%	25%
I don't have time to assess the credibility of the available resources.	43%	46%	35%	41%	39%	45%	59%	42%	50%	48%	25%
the content I need or want is just not available online.	41%	44%	41%	38%	34%	36%	45%	43%	22%	60%	50%
the academic quality of available materials is too poor to meet my needs.	39%	46%	44%	34%	27%	36%	36%	42%	33%	42%	42%
I don't have reliable access to scanners.	39%	30%	31%	46%	35%	33%	52%	39%	39%	38%	42%
I don't know how to locate the online materials I need.	36%	39%	29%	35%	32%	34%	40%	41%	12%	36%	50%
I don't know how to save presentations to my computer so they can be run without a live connection.	35%	32%	29%	33%	32%	36%	38%	42%	22%	38%	33%

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
available software is unsuitable for integrating audio or video into my course.	34%	33%	31%	37%	35%	41%	49%	29%	28%	38%	25%
search engines provide irrelevant results for my needs.	34%	33%	29%	33%	28%	32%	43%	39%	22%	38%	17%
I have difficulty understanding the issues surrounding copyright and digital collections.	33%	31%	38%	25%	19%	24%	54%	30%	33%	42%	42%
my students don't have a high-speed connection.	32%	37%	29%	30%	24%	28%	37%	35%	33%	48%	17%
course management software packages are inadequate for my needs.	32%	36%	37%	30%	26%	16%	41%	29%	35%	48%	17%
web sites I would use are unreliable, and I can't count on them being there when I need them.	32%	25%	30%	36%	29%	28%	44%	31%	28%	33%	25%
available software is unsuitable for viewing and displaying digital images.	31%	24%	41%	32%	29%	34%	38%	28%	17%	26%	25%
my students don't have reliable access to computers.	30%	33%	26%	31%	15%	34%	38%	31%	22%	61%	8%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	28%	24%	24%	23%	25%	32%	33%	28%	33%	55%	17%
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	27%	29%	36%	21%	19%	12%	39%	22%	28%	35%	25%
I don't have reliable access to a high-speed connection.	21%	22%	20%	23%	11%	21%	26%	24%	11%	22%	17%
I don't have reliable access to a computer.	13%	10%	16%	12%	7%	14%	20%	12%	0%	17%	8%
How important is it for you to have support or assistance with each of the following activities for your teaching?											
obtaining or setting up technical infrastructure	82%	84%	84%	87%	82%	70%	90%	76%	72%	91%	92%
creating my own website	82%	74%	81%	90%	74%	72%	86%	83%	72%	87%	92%
digitizing existing resources	80%	82%	82%	89%	69%	62%	90%	78%	67%	83%	92%
learning how to use a learning management system	79%	80%	85%	82%	67%	62%	93%	78%	67%	83%	75%
importing resources into a course website or a database	79%	75%	76%	87%	74%	64%	85%	79%	72%	87%	92%
gathering, organizing, and maintaining digital materials	78%	75%	85%	78%	72%	59%	85%	77%	56%	87%	92%
integrating resources into a learning management system	78%	78%	84%	81%	64%	64%	91%	76%	61%	87%	75%
finding digital resources	72%	66%	80%	70%	63%	72%	81%	73%	61%	70%	83%
training students to find or evaluate digital resources	71%	70%	78%	75%	59%	52%	73%	71%	61%	87%	50%

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
interpreting copyright laws and/or securing copyright permission	65%	62%	66%	67%	54%	41%	80%	62%	56%	87%	67%
assessing the credibility of digital resources	50%	36%	59%	44%	36%	41%	64%	53%	56%	65%	58%
evaluating the appropriateness of resources for my teaching goals	42%	37%	41%	40%	26%	29%	58%	45%	50%	57%	50%
How satisfied or dissatisfied are you with the support you have received from the following sources?											
Campus librarians	84%	87%	82%	82%	75%	95%	78%	89%	80%	91%	86%
Friends or family	83%	83%	79%	85%	88%	93%	88%	80%	88%	85%	100%
Graduate students	80%	92%	80%	79%	83%	33%	72%	77%	91%	71%	100%
Campus educational technology or IT support staff	73%	77%	58%	72%	74%	88%	74%	79%	85%	67%	64%
Other faculty	71%	81%	58%	74%	72%	80%	70%	75%	100%	77%	86%
Undergraduate students	70%	78%	64%	84%	67%	80%	59%	72%	71%	64%	100%
My departmental or college staff	66%	70%	60%	64%	77%	80%	62%	65%	69%	67%	60%
Workshops	60%	57%	51%	52%	46%	78%	70%	66%	36%	43%	75%
Online help or guides	47%	41%	53%	41%	58%	65%	48%	45%	46%	19%	40%
Overall digital resource use (0–100)	31	33	33	36	28	32	32	27	42	31	31
Overall technology use (0=no usage; 16=max usage)	14.5	14.8	14.0	15.1	14.5	14.2	14.3	14.5	14.4	14.7	15.0
Principal Component Scores:											
What resources people use											
General purpose and reference materials	0.00	-0.12	0.05	-0.05	-0.20	0.44	-0.09	0.15	-0.35	-0.34	0.16
Images and audiovisual materials	0.02	-0.18	0.89	-0.18	-0.74	0.00	0.53	-0.13	0.20	-0.02	0.51
Historical documents, maps, and primary sources	-0.03	0.35	-0.01	0.88	-0.16	-0.75	-0.31	-0.32	0.51	0.28	-0.77
Data, news/media, and governmental resources	0.00	0.00	-0.67	0.27	0.99	0.03	-0.25	-0.28	0.97	0.45	0.00
Discussion and curricular materials	0.00	0.19	0.11	0.02	0.02	0.48	-0.11	-0.08	-0.38	-0.26	0.48
How people use digital resources											
Student assignments	0.01	-0.23	0.52	-0.18	-0.31	0.32	0.13	0.03	-0.03	-0.37	0.14
Web posting	0.00	0.40	0.06	0.05	0.29	-0.21	0.12	-0.28	0.01	0.10	-0.22

	All	Anthropology & Archaeology	Art & Architecture	History	Political science	Writing	Foreign language	Literature & English language	Geography	Ethnic, gender, and cultural studies	Media studies & communications
Online courses	0.00	-0.05	0.12	-0.06	-0.08	0.44	-0.12	-0.07	0.28	-0.08	0.55
In-class presentation	0.01	0.24	0.31	0.47	-0.17	-0.51	0.01	-0.31	0.62	0.17	0.18
Motivations for use or non-use											
Pedagogical reasons	0.03	0.05	0.20	0.31	-0.27	-0.10	0.39	-0.18	0.21	0.27	-0.18
Expectations and reputation	-0.05	-0.07	0.09	-0.22	-0.40	0.54	0.06	-0.01	-0.30	-0.19	0.16
Inappropriateness	0.02	-0.25	-0.32	0.08	0.09	0.31	0.19	0.26	-0.98	-0.03	-0.46
Concerns about students' interpretation and information literacy	0.01	0.01	-0.11	-0.03	-0.21	0.11	0.03	0.07	-0.02	0.36	0.13
Time, convenience, and access	-0.02	-0.14	0.40	-0.25	0.10	0.22	0.12	-0.22	0.26	-0.35	0.09
Teaching information literacy and critical thinking	0.03	0.04	0.10	0.07	-0.17	0.61	-0.40	0.21	0.26	-0.14	0.18
Making information publicly available	0.02	0.39	0.08	-0.10	-0.02	-0.14	0.06	-0.11	0.12	0.28	0.35
Using free and publicly available materials	-0.06	0.16	0.03	0.07	-0.07	-0.44	-0.10	-0.16	0.11	-0.19	-0.35
Barriers to use											
Finding resources	0.02	-0.13	-0.22	-0.10	-0.03	0.10	0.22	0.18	-0.15	-0.03	-0.14
High-end multimedia equipment and software	0.00	-0.09	0.10	0.09	0.09	-0.14	0.22	-0.14	-0.06	0.07	-0.12
Personal equipment	0.00	-0.05	-0.07	-0.04	-0.20	-0.07	0.18	0.04	-0.17	0.27	-0.11
Resource availability or existence	0.02	0.25	0.07	-0.03	-0.22	-0.25	0.08	0.03	-0.15	0.17	0.08
Student equipment	-0.01	0.11	-0.04	-0.10	-0.32	0.12	0.10	0.03	0.03	0.39	-0.24
Activities with which support is needed											
Technical activities	0.00	-0.01	0.07	0.23	-0.13	-0.20	0.22	-0.07	-0.53	0.21	-0.39
Intellectual and content-based activities	0.01	-0.18	0.18	-0.04	-0.41	-0.30	0.34	0.08	-0.03	0.22	-0.04

Table H.3: Faculty survey responses, broken out by age group

	All	00-35	36-44	45-53	54-61	62+
N	831	76	169	181	184	120
How often do you use the following types of digital resources in your undergraduate teaching:						
Images or visual materials	75%	76%	78%	77%	76%	61%
News or other media sources and archives	64%	70%	64%	65%	61%	56%
"Portals" that provide links or URL's relevant to particular disciplinary topics	63%	64%	66%	65%	66%	46%
Online reference resources	62%	70%	59%	67%	62%	45%
Digital film or video	62%	67%	60%	62%	60%	56%
Maps	53%	56%	55%	52%	55%	44%
Online or digitized documents	50%	59%	57%	53%	46%	41%
Audio materials	46%	47%	52%	40%	45%	44%
Curricular materials and websites that are created by other faculty and/or other institutions	35%	38%	39%	37%	32%	23%
Digital readers or coursepacks	30%	38%	33%	31%	31%	23%
Online class discussions	28%	29%	31%	30%	30%	22%
Government documents	27%	34%	28%	26%	25%	25%
Data archives	27%	37%	26%	22%	26%	22%
Digital facsimiles of ancient or historical manuscripts	23%	24%	22%	21%	28%	18%
Simulations or animations	19%	26%	18%	14%	22%	13%
Personal online diaries	9%	13%	8%	9%	7%	5%
How often do you use digital resources in your undergraduate teaching from each of the following sources?						
Search engines/directories	81%	82%	81%	81%	85%	67%
My own personal collection of digital materials	69%	72%	67%	73%	72%	64%
Online journals	62%	79%	69%	66%	58%	47%
Public online image databases	62%	65%	67%	60%	66%	49%
Media sites	57%	67%	61%	53%	57%	52%
Library collections	57%	67%	62%	59%	57%	44%
"Portals" that provide links or URL's relevant to particular disciplinary topics	55%	53%	58%	55%	60%	44%
Online exhibits	37%	35%	44%	39%	41%	23%
Campus image databases from my own institution	24%	21%	24%	20%	29%	20%
Commercial image databases	9%	11%	6%	7%	11%	7%
How often have you heard about sources of digital resources from each of the following?						
Word of mouth from colleagues	74%	81%	75%	74%	74%	67%
Word of mouth from students	57%	46%	52%	62%	66%	50%
Professional societies or discussion lists	55%	49%	55%	61%	56%	53%
Recommendation from a campus librarian	51%	43%	54%	47%	58%	51%
A campus department devoted to instructional technology	41%	36%	44%	38%	47%	39%
How often do you use digital resources in each of these ways?						
Presented during my lectures/class	71%	84%	76%	71%	73%	57%
Assigned to students for review and/or study	59%	61%	60%	62%	60%	51%
Assigned for student research projects or problem-based learning assignments	56%	66%	53%	58%	60%	47%
Posted directly on my course website	52%	54%	55%	50%	56%	43%
Linked from my course website	49%	54%	54%	49%	52%	35%
Used in tests and quizzes	25%	31%	25%	23%	26%	21%
Assigned to students to create their own digital portfolios and/or multimedia projects	20%	23%	17%	21%	19%	16%
Presented in the context of an online discussion	12%	17%	12%	10%	13%	12%
Presented in my online lectures	12%	18%	6%	10%	15%	10%
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…						

	All	00-35	36-44	45-53	54-61	62+
because it improves my students' learning.	78%	85%	78%	82%	75%	75%
to integrate primary source material into the course.	78%	79%	81%	80%	79%	68%
to provide students a context for a topic.	75%	86%	79%	79%	71%	60%
to get students excited about a topic.	73%	84%	77%	77%	73%	56%
because it allows me to do things in the classroom that I could never do otherwise.	68%	70%	68%	73%	66%	57%
because it provides access to resources that we don't have at our college.	61%	58%	59%	63%	66%	51%
because it allows my students to be more creative.	56%	63%	59%	53%	57%	45%
to teach critical thinking skills.	56%	70%	56%	59%	55%	41%
to integrate my research interests into my course.	55%	68%	57%	54%	55%	46%
because I like or feel very comfortable with the new technologies.	53%	70%	53%	54%	53%	43%
because it is more convenient for my students and their schedules.	51%	60%	51%	51%	53%	44%
to teach information literacy (i.e., evaluating the online materials themselves).	43%	51%	52%	41%	41%	29%
because it saves me time.	41%	51%	41%	41%	40%	41%
because my students expect or ask for more technology.	38%	37%	40%	30%	45%	28%
because it allows me to stay up-to-date with my colleagues.	37%	41%	37%	34%	40%	33%
to provide students with both good and bad examples of different kinds of scholarship.	32%	47%	38%	25%	32%	25%
because it creates a sense of community for students enrolled in my course.	32%	34%	31%	31%	31%	27%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	25%	30%	24%	22%	21%	27%
because the administration encourages me to use digital resources more.	23%	22%	23%	22%	29%	16%
to provide students a preview of the course before they register.	22%	30%	19%	20%	24%	17%
because it may help me get promoted or get tenure.	9%	11%	14%	9%	6%	4%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…						
they cannot substitute for the teaching approaches I use.	75%	66%	80%	76%	75%	75%
I don't have time to use digital resources.	66%	59%	74%	69%	66%	58%
using them distracts from the core goals of my teaching.	47%	45%	45%	50%	49%	45%
I don't want my students to copy or plagiarize material from the web.	33%	36%	34%	30%	34%	30%
they are irrelevant to my field.	30%	31%	25%	33%	36%	28%
students don't have the information literacy skills to assess the credibility of digital resources.	29%	24%	31%	28%	33%	25%
digital material can be presented outside its original context.	25%	24%	24%	19%	29%	25%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...						
I don't have reliable access to physical resources in my classroom(s).	53%	48%	53%	58%	58%	42%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	50%	46%	43%	43%	47%
there are too many resources out there for me to take advantage of—I am overwhelmed.	44%	42%	45%	42%	45%	47%
I don't have time to assess the credibility of the available resources.	43%	37%	44%	45%	43%	44%
the content I need or want is just not available online.	41%	39%	43%	43%	38%	39%
the academic quality of available materials is too poor to meet my needs.	39%	38%	36%	45%	39%	34%
I don't have reliable access to scanners.	39%	38%	43%	40%	41%	29%
I don't know how to locate the online materials I need.	36%	32%	33%	33%	39%	44%
I don't know how to save presentations to my computer so they can be run without a live connection.	35%	22%	32%	39%	35%	40%
available software is unsuitable for integrating audio or video into my course.	34%	27%	40%	30%	38%	25%

	All	00-35	36-44	45-53	54-61	62+
search engines provide irrelevant results for my needs.	34%	32%	32%	31%	36%	37%
I have difficulty understanding the issues surrounding copyright and digital collections.	33%	30%	34%	30%	32%	36%
my students don't have a high-speed connection.	32%	33%	35%	32%	35%	22%
course management software packages are inadequate for my needs.	32%	28%	32%	32%	32%	35%
web sites I would use are unreliable, and I can't count on them being there when I need them.	32%	31%	31%	31%	36%	27%
available software is unsuitable for viewing and displaying digital images.	31%	24%	32%	29%	32%	26%
my students don't have reliable access to computers.	30%	32%	29%	33%	28%	23%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	28%	19%	26%	28%	33%	29%
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	27%	28%	36%	24%	23%	16%
I don't have reliable access to a high-speed connection.	21%	16%	20%	23%	23%	21%
I don't have reliable access to a computer.	13%	7%	10%	15%	14%	14%
How important is it for you to have support or assistance with each of the following activities for your teaching?						
obtaining or setting up technical infrastructure	82%	84%	88%	82%	85%	67%
creating my own website	82%	85%	86%	84%	77%	78%
digitizing existing resources	80%	84%	81%	83%	80%	72%
learning how to use a learning management system	79%	84%	82%	80%	79%	69%
importing resources into a course website or a database	79%	80%	81%	84%	78%	69%
gathering, organizing, and maintaining digital materials	78%	84%	79%	80%	76%	74%
integrating resources into a learning management system	78%	84%	83%	79%	77%	63%
finding digital resources	72%	65%	74%	70%	75%	71%
training students to find or evaluate digital resources	71%	80%	74%	68%	74%	60%
interpreting copyright laws and/or securing copyright permission	65%	75%	66%	63%	68%	52%
assessing the credibility of digital resources	50%	49%	52%	49%	50%	50%
evaluating the appropriateness of resources for my teaching goals	42%	45%	40%	38%	39%	47%
How satisfied or dissatisfied are you with the support you have received from the following sources?						
Campus librarians	84%	77%	82%	83%	84%	94%
Friends or family	83%	100%	84%	85%	79%	71%
Graduate students	80%	75%	79%	77%	78%	91%
Campus educational technology or IT support staff	73%	70%	73%	75%	68%	79%
Other faculty	71%	79%	64%	73%	68%	77%
Undergraduate students	70%	76%	76%	69%	59%	76%
My departmental or college staff	66%	66%	69%	69%	58%	71%
Workshops	60%	66%	60%	62%	56%	55%
Online help or guides	47%	65%	50%	50%	35%	41%
Overall digital resource use (0–100)	31	34	33	31	32	25
Overall technology use (0=no usage; 16=max usage)	14.5	14.8	14.9	14.7	14.5	13.6
Principal Component Scores:						
What resources people use						
General purpose and reference materials	0.00	0.09	0.12	0.04	0.03	-0.35
Images and audiovisual materials	0.02	0.04	-0.03	-0.03	0.10	-0.15
Historical documents, maps, and primary sources	-0.03	-0.01	0.09	-0.01	0.08	-0.25
Data, news/media, and governmental resources	0.00	0.32	0.04	-0.13	-0.08	-0.08
Discussion and curricular materials	0.00	0.18	0.06	0.00	-0.01	-0.15
How people use digital resources						
Student assignments	0.01	0.09	-0.02	0.05	0.08	-0.13
Web posting	0.00	0.06	0.11	0.05	0.00	-0.23
Online courses	0.00	0.14	-0.11	-0.09	0.01	0.11

	All	00-35	36-44	45-53	54-61	62+
In-class presentation	0.01	0.21	0.09	-0.04	0.06	-0.22
Motivations for use or non-use						
Pedagogical reasons	0.03	0.21	0.06	0.14	-0.01	-0.29
Expectations and reputation	-0.05	-0.01	0.09	-0.12	-0.03	-0.26
Inappropriateness	0.02	-0.10	0.13	0.19	-0.03	-0.21
Concerns about students' interpretation and information literacy	0.01	0.01	-0.02	-0.08	0.11	-0.05
Time, convenience, and access	-0.02	0.07	-0.03	-0.07	-0.02	0.06
Teaching information literacy and critical thinking	0.03	0.25	0.13	-0.09	0.04	-0.10
Making information publicly available	0.02	0.26	-0.04	-0.02	0.06	-0.06
Using free and publicly available materials	-0.06	-0.03	0.01	0.03	-0.05	-0.30
Barriers to use						
Finding resources	0.02	0.00	-0.01	0.03	0.00	0.13
High-end multimedia equipment and software	0.00	-0.11	0.11	-0.04	0.06	-0.19
Personal equipment	0.00	0.04	-0.01	0.06	-0.03	-0.06
Resource availability or existence	0.02	0.08	0.01	0.09	0.00	-0.08
Student equipment	-0.01	0.01	0.04	0.01	0.06	-0.31
Activities with which support is needed						
Technical activities	0.00	0.07	0.15	0.09	-0.02	-0.36
Intellectual and content-based activities	0.01	-0.01	-0.03	-0.06	0.03	0.10

Table H.4: Faculty survey responses, broken out by level of use of digital resources

	All	non–light users	light–medium users	medium–heavy users	heavy users
N	831	113	306	259	153
How often do you use the following types of digital resources in your undergraduate teaching:					
Images or visual materials	75%	21%	70%	88%	97%
News or other media sources and archives	64%	20%	56%	75%	90%
"Portals" that provide links or URL's relevant to particular disciplinary topics	63%	8%	50%	79%	94%
Online reference resources	62%	22%	52%	71%	90%
Digital film or video	62%	16%	57%	73%	82%
Maps	53%	5%	45%	62%	84%
Online or digitized documents	50%	4%	36%	61%	89%
Audio materials	46%	9%	38%	53%	70%
Curricular materials and websites that are created by other faculty and/or other institutions	35%	3%	26%	40%	64%
Digital readers or coursepacks	30%	7%	19%	36%	52%
Online class discussions	28%	1%	19%	30%	60%
Government documents	27%	5%	15%	34%	54%
Data archives	27%	4%	18%	29%	51%
Digital facsimiles of ancient or historical manuscripts	23%	2%	15%	25%	48%
Simulations or animations	19%	2%	8%	17%	53%
Personal online diaries	9%	0%	5%	8%	22%
How often do you use digital resources in your undergraduate teaching from each of the following sources?					
Search engines/directories	81%	48%	77%	88%	94%
My own personal collection of digital materials	69%	29%	59%	81%	92%
Online journals	62%	45%	52%	67%	83%
Public online image databases	62%	29%	51%	69%	88%
Media sites	57%	22%	50%	63%	80%
Library collections	57%	29%	47%	63%	85%
"Portals" that provide links or URL's relevant to particular disciplinary topics	55%	14%	41%	66%	83%
Online exhibits	37%	4%	21%	44%	76%
Campus image databases from my own institution	24%	4%	17%	27%	42%
Commercial image databases	9%	1%	5%	7%	22%
How often have you heard about sources of digital resources from each of the following?					
Word of mouth from colleagues	74%	41%	73%	79%	83%
Word of mouth from students	57%	29%	51%	63%	71%
Professional societies or discussion lists	55%	43%	47%	62%	68%
Recommendation from a campus librarian	51%	37%	49%	55%	59%
A campus department devoted to instructional technology	41%	16%	39%	45%	53%
How often do you use digital resources in each of these ways?					
Presented during my lectures/class	71%	22%	63%	83%	94%
Assigned to students for review and/or study	59%	14%	53%	66%	83%
Assigned for student research projects or problem-based learning assignments	56%	16%	47%	64%	82%
Posted directly on my course website	52%	15%	41%	60%	79%
Linked from my course website	49%	13%	37%	58%	77%
Used in tests and quizzes	25%	5%	12%	32%	48%
Assigned to students to create their own digital portfolios and/or multimedia projects	20%	0%	10%	22%	46%
Presented in the context of an online discussion	12%	0%	5%	13%	32%
Presented in my online lectures	12%	1%	4%	13%	31%

	All	non–light users	light–medium users	medium–heavy users	heavy users
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…					
because it improves my students' learning.	78%	31%	75%	84%	96%
to integrate primary source material into the course.	78%	49%	68%	86%	98%
to provide students a context for a topic.	75%	35%	70%	80%	95%
to get students excited about a topic.	73%	35%	68%	79%	92%
because it allows me to do things in the classroom that I could never do otherwise.	68%	35%	55%	77%	91%
because it provides access to resources that we don't have at our college.	61%	22%	51%	69%	82%
because it allows my students to be more creative.	56%	19%	48%	61%	82%
to teach critical thinking skills.	56%	20%	47%	63%	78%
to integrate my research interests into my course.	55%	25%	45%	64%	75%
because I like or feel very comfortable with the new technologies.	53%	12%	42%	64%	78%
because it is more convenient for my students and their schedules.	51%	25%	46%	53%	68%
to teach information literacy (i.e., evaluating the online materials themselves).	43%	10%	32%	50%	69%
because it saves me time.	41%	30%	41%	39%	50%
because my students expect or ask for more technology.	38%	13%	33%	43%	49%
because it allows me to stay up-to-date with my colleagues.	37%	11%	32%	43%	50%
to provide students with both good and bad examples of different kinds of scholarship.	32%	12%	25%	31%	59%
because it creates a sense of community for students enrolled in my course.	32%	5%	24%	34%	55%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	25%	10%	13%	28%	50%
because the administration encourages me to use digital resources more.	23%	10%	22%	25%	28%
to provide students a preview of the course before they register.	22%	10%	16%	20%	42%
because it may help me get promoted or get tenure.	9%	6%	8%	9%	13%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…					
they cannot substitute for the teaching approaches I use.	75%	86%	81%	74%	59%
I don't have time to use digital resources.	66%	75%	67%	67%	55%
using them distracts from the core goals of my teaching.	47%	61%	51%	45%	31%
I don't want my students to copy or plagiarize material from the web.	33%	44%	37%	29%	23%
they are irrelevant to my field.	30%	44%	35%	27%	20%
students don't have the information literacy skills to assess the credibility of digital resources.	29%	34%	30%	30%	20%
digital material can be presented outside its original context.	25%	37%	25%	25%	15%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...					
I don't have reliable access to physical resources in my classroom(s).	53%	49%	56%	60%	40%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	53%	53%	43%	28%
there are too many resources out there for me to take advantage of—I am overwhelmed.	44%	51%	54%	43%	21%
I don't have time to assess the credibility of the available resources.	43%	55%	47%	47%	22%
the content I need or want is just not available online.	41%	47%	47%	41%	26%
the academic quality of available materials is too poor to meet my needs.	39%	50%	41%	39%	30%
I don't have reliable access to scanners.	39%	38%	41%	43%	28%
I don't know how to locate the online materials I need.	36%	49%	45%	30%	19%

	All	non–light users	light–medium users	medium–heavy users	heavy users
I don't know how to save presentations to my computer so they can be run without a live connection.	35%	39%	39%	38%	17%
available software is unsuitable for integrating audio or video into my course.	34%	20%	35%	38%	34%
search engines provide irrelevant results for my needs.	34%	38%	41%	30%	22%
I have difficulty understanding the issues surrounding copyright and digital collections.	33%	34%	36%	33%	27%
my students don't have a high-speed connection.	32%	24%	29%	38%	34%
course management software packages are inadequate for my needs.	32%	29%	33%	35%	27%
web sites I would use are unreliable, and I can't count on them being there when I need them.	32%	33%	33%	35%	24%
available software is unsuitable for viewing and displaying digital images.	31%	24%	33%	36%	22%
my students don't have reliable access to computers.	30%	23%	29%	34%	26%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	28%	27%	31%	32%	17%
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	27%	26%	23%	34%	21%
I don't have reliable access to a high-speed connection.	21%	29%	24%	21%	10%
I don't have reliable access to a computer.	13%	17%	15%	13%	5%
How important is it for you to have support or assistance with each of the following activities for your teaching?					
obtaining or setting up technical infrastructure	82%	70%	80%	88%	84%
creating my own website	82%	76%	83%	86%	76%
digitizing existing resources	80%	73%	81%	83%	79%
learning how to use a learning management system	79%	73%	82%	82%	72%
importing resources into a course website or a database	79%	77%	82%	80%	71%
gathering, organizing, and maintaining digital materials	78%	70%	79%	81%	76%
integrating resources into a learning management system	78%	70%	79%	80%	75%
finding digital resources	72%	65%	77%	73%	66%
training students to find or evaluate digital resources	71%	64%	69%	76%	70%
interpreting copyright laws and/or securing copyright permission	65%	52%	65%	67%	69%
assessing the credibility of digital resources	50%	44%	55%	48%	49%
evaluating the appropriateness of resources for my teaching goals	42%	41%	44%	41%	38%
How satisfied or dissatisfied are you with the support you have received from the following sources?					
Campus librarians	84%	87%	86%	88%	75%
Friends or family	83%	76%	81%	85%	87%
Graduate students	80%	87%	80%	78%	80%
Campus educational technology or IT support staff	73%	61%	73%	74%	75%
Other faculty	71%	82%	73%	74%	60%
Undergraduate students	70%	76%	67%	66%	78%
My departmental or college staff	66%	69%	71%	64%	61%
Workshops	60%	60%	53%	68%	57%
Online help or guides	47%	41%	37%	51%	54%
Overall digital resource use (0–100)	31	7	23	37	54
Overall technology use (0=no usage; 16=max usage)	14.5	13.7	14.3	14.7	15.2
Principal Component Scores:					
What resources people use					
General purpose and reference materials	0.00	-0.81	-0.28	0.17	0.63
Images and audiovisual materials	0.02	-0.91	-0.22	0.13	0.76
Historical documents, maps, and primary sources	-0.03	-0.66	-0.32	0.16	0.50
Data, news/media, and governmental resources	0.00	-0.53	-0.22	0.10	0.52

	All	non–light users	light–medium users	medium–heavy users	heavy users
Discussion and curricular materials	0.00	-0.22	-0.26	-0.07	0.74
How people use digital resources					
Student assignments	0.01	-0.70	-0.21	0.13	0.65
Web posting	0.00	-0.54	-0.21	0.16	0.44
Online courses	0.00	-0.06	-0.18	-0.08	0.51
In-class presentation	0.01	-0.83	-0.25	0.26	0.56
Motivations for use or non-use					
Pedagogical reasons	0.03	-1.19	-0.22	0.26	0.67
Expectations and reputation	-0.05	-0.29	-0.06	0.02	-0.03
Inappropriateness	0.02	0.39	0.09	0.01	-0.30
Concerns about students' interpretation and information literacy	0.01	0.24	0.02	0.02	-0.15
Time, convenience, and access	-0.02	-0.43	-0.12	0.02	0.28
Teaching information literacy and critical thinking	0.03	-0.37	-0.16	0.08	0.52
Making information publicly available	0.02	-0.14	-0.13	-0.02	0.47
Using free and publicly available materials	-0.06	-0.15	-0.13	0.03	-0.04
Barriers to use					
Finding resources	0.02	0.19	0.22	-0.02	-0.41
High-end multimedia equipment and software	0.00	-0.26	-0.03	0.15	-0.02
Personal equipment	0.00	0.18	0.01	0.07	-0.26
Resource availability or existence	0.02	0.10	0.11	0.01	-0.21
Student equipment	-0.01	-0.21	-0.06	0.05	0.09
Activities with which support is needed					
Technical activities	0.00	-0.07	-0.02	0.13	-0.13
Intellectual and content-based activities	0.01	-0.03	0.08	-0.04	-0.03

Table H.5: Faculty survey responses (community colleges only), broken out by institution size

	All community colleges	small	medium	large
N	206	51	82	73
How often do you use the following types of digital resources in your undergraduate teaching:				
Images or visual materials	80%	82%	82%	77%
News or other media sources and archives	81%	86%	78%	81%
"Portals" that provide links or URL's relevant to particular disciplinary topics	66%	69%	71%	59%
Online reference resources	72%	75%	70%	71%
Digital film or video	72%	72%	76%	69%
Maps	51%	60%	51%	46%
Online or digitized documents	43%	48%	47%	36%
Audio materials	54%	51%	59%	52%
Curricular materials and websites that are created by other faculty and/or other institutions	43%	51%	41%	40%
Digital readers or coursepacks	20%	21%	26%	12%
Online class discussions	27%	31%	33%	18%
Government documents	35%	33%	40%	30%
Data archives	31%	29%	39%	25%
Digital facsimiles of ancient or historical manuscripts	20%	17%	22%	21%
Simulations or animations	29%	25%	36%	25%
Personal online diaries	12%	19%	12%	6%
How often do you use digital resources in your undergraduate teaching from each of the following sources?				
Search engines/directories	87%	83%	89%	87%
My own personal collection of digital materials	71%	71%	68%	72%
Online journals	46%	38%	54%	44%
Public online image databases	62%	57%	71%	56%
Media sites	69%	72%	77%	57%
Library collections	52%	43%	59%	51%
"Portals" that provide links or URL's relevant to particular disciplinary topics	58%	56%	68%	48%
Online exhibits	37%	35%	45%	30%
Campus image databases from my own institution	26%	13%	34%	26%
Commercial image databases	15%	4%	22%	16%
How often have you heard about sources of digital resources from each of the following?				
Word of mouth from colleagues	73%	67%	79%	71%
Word of mouth from students	61%	69%	64%	54%
Professional societies or discussion lists	46%	45%	32%	61%
Recommendation from a campus librarian	57%	54%	57%	60%
A campus department devoted to instructional technology	46%	38%	51%	47%
How often do you use digital resources in each of these ways?				
Presented during my lectures/class	78%	73%	82%	77%
Assigned to students for review and/or study	64%	67%	66%	60%
Assigned for student research projects or problem-based learning assignments	65%	65%	68%	61%
Posted directly on my course website	38%	37%	42%	34%
Linked from my course website	39%	41%	46%	29%
Used in tests and quizzes	37%	33%	37%	39%
Assigned to students to create their own digital portfolios and/or multimedia projects	22%	20%	29%	17%
Presented in the context of an online discussion	21%	20%	26%	16%
Presented in my online lectures	21%	24%	24%	16%

	All community colleges	small	medium	large
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…				
because it improves my students' learning.	86%	82%	89%	87%
to integrate primary source material into the course.	82%	80%	85%	80%
to provide students a context for a topic.	81%	73%	86%	80%
to get students excited about a topic.	84%	84%	83%	84%
because it allows me to do things in the classroom that I could never do otherwise.	68%	73%	70%	61%
because it provides access to resources that we don't have at our college.	76%	73%	80%	75%
because it allows my students to be more creative.	72%	62%	69%	82%
to teach critical thinking skills.	75%	73%	77%	75%
to integrate my research interests into my course.	59%	62%	56%	61%
because I like or feel very comfortable with the new technologies.	63%	58%	71%	57%
because it is more convenient for my students and their schedules.	55%	51%	66%	45%
to teach information literacy (i.e., evaluating the online materials themselves).	56%	51%	61%	53%
because it saves me time.	41%	43%	51%	29%
because my students expect or ask for more technology.	43%	40%	44%	44%
because it allows me to stay up-to-date with my colleagues.	55%	52%	59%	53%
to provide students with both good and bad examples of different kinds of scholarship.	49%	50%	53%	42%
because it creates a sense of community for students enrolled in my course.	40%	40%	47%	33%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	31%	29%	33%	30%
because the administration encourages me to use digital resources more.	32%	21%	37%	34%
to provide students a preview of the course before they register.	27%	28%	30%	22%
because it may help me get promoted or get tenure.	12%	12%	16%	8%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…				
they cannot substitute for the teaching approaches I use.	66%	72%	53%	77%
I don't have time to use digital resources.	61%	61%	51%	74%
using them distracts from the core goals of my teaching.	34%	40%	25%	41%
I don't want my students to copy or plagiarize material from the web.	34%	39%	29%	38%
they are irrelevant to my field.	28%	33%	21%	35%
students don't have the information literacy skills to assess the credibility of digital resources.	39%	41%	33%	45%
digital material can be presented outside its original context.	31%	32%	28%	33%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...				
I don't have reliable access to physical resources in my classroom(s).	63%	52%	60%	74%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	46%	43%	46%	48%
there are too many resources out there for me to take advantage of—I am overwhelmed.	47%	48%	47%	47%
I don't have time to assess the credibility of the available resources.	44%	46%	39%	48%
the content I need or want is just not available online.	25%	24%	23%	27%
the academic quality of available materials is too poor to meet my needs.	24%	27%	19%	28%
I don't have reliable access to scanners.	39%	31%	36%	51%
I don't know how to locate the online materials I need.	40%	41%	41%	37%
I don't know how to save presentations to my computer so they can be run without a live connection.	36%	33%	39%	33%
available software is unsuitable for integrating audio or video into my course.	40%	39%	39%	41%
search engines provide irrelevant results for my needs.	39%	36%	36%	45%
I have difficulty understanding the issues surrounding copyright and digital collections.	34%	38%	32%	32%

	All community colleges	small	medium	large
my students don't have a high-speed connection.	54%	53%	47%	62%
course management software packages are inadequate for my needs.	29%	26%	24%	38%
web sites I would use are unreliable, and I can't count on them being there when I need them.	33%	44%	26%	34%
available software is unsuitable for viewing and displaying digital images.	31%	24%	34%	34%
my students don't have reliable access to computers.	54%	48%	52%	60%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	32%	20%	33%	40%
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	38%	44%	34%	37%
I don't have reliable access to a high-speed connection.	32%	31%	29%	36%
I don't have reliable access to a computer.	21%	13%	17%	33%
How important is it for you to have support or assistance with each of the following activities for your teaching?				
obtaining or setting up technical infrastructure	84%	82%	79%	91%
creating my own website	81%	84%	78%	83%
digitizing existing resources	78%	75%	75%	84%
learning how to use a learning management system	80%	80%	79%	83%
importing resources into a course website or a database	77%	77%	76%	78%
gathering, organizing, and maintaining digital materials	77%	73%	74%	83%
integrating resources into a learning management system	81%	80%	79%	85%
finding digital resources	78%	73%	79%	81%
training students to find or evaluate digital resources	79%	84%	76%	78%
interpreting copyright laws and/or securing copyright permission	70%	70%	71%	68%
assessing the credibility of digital resources	69%	68%	68%	71%
evaluating the appropriateness of resources for my teaching goals	60%	61%	54%	66%
How satisfied or dissatisfied are you with the support you have received from the following sources?				
Campus librarians	84%	77%	81%	92%
Friends or family	90%	93%	88%	91%
Graduate students	75%	80%	100%	60%
Campus educational technology or IT support staff	68%	68%	68%	68%
Other faculty	74%	76%	76%	70%
Undergraduate students	69%	87%	72%	54%
My departmental or college staff	63%	54%	68%	62%
Workshops	67%	61%	68%	70%
Online help or guides	53%	50%	48%	60%
Overall digital resource use (0–100)	32	34	34	29
Overall technology use (0=no usage; 16=max usage)	13.6	13.9	13.7	13.4
Principal Component Scores:				
What resources people use				
General purpose and reference materials	-0.02	-0.03	0.07	-0.12
Images and audiovisual materials	0.57	0.46	0.71	0.50
Historical documents, maps, and primary sources	-0.35	-0.37	-0.34	-0.34
Data, news/media, and governmental resources	0.19	0.34	0.24	0.02
Discussion and curricular materials	-0.06	-0.04	0.09	-0.24
How people use digital resources				
Student assignments	0.17	0.09	0.24	0.15
Web posting	-0.39	-0.38	-0.31	-0.51
Online courses	0.41	0.47	0.51	0.25
In-class presentation	0.20	0.11	0.26	0.19
Motivations for use or non-use				
Pedagogical reasons	0.21	0.10	0.15	0.35

	All community colleges	small	medium	large
Expectations and reputation	0.12	0.14	0.13	0.09
Inappropriateness	-0.33	-0.36	-0.57	-0.03
Concerns about students' interpretation and information literacy	0.25	0.25	0.18	0.32
Time, convenience, and access	0.01	0.05	0.17	-0.20
Teaching information literacy and critical thinking	0.40	0.36	0.45	0.39
Making information publicly available	-0.04	-0.05	0.06	-0.15
Using free and publicly available materials	-0.16	0.00	-0.10	-0.34
Barriers to use				
Finding resources	0.05	0.15	0.04	-0.03
High-end multimedia equipment and software	0.01	-0.14	-0.04	0.19
Personal equipment	0.28	0.18	0.22	0.42
Resource availability or existence	-0.29	-0.29	-0.30	-0.27
Student equipment	0.54	0.55	0.46	0.63
Activities with which support is needed				
Technical activities	-0.15	-0.22	-0.23	-0.01
Intellectual and content-based activities	0.36	0.32	0.30	0.46

Table H.6: Faculty survey responses (community colleges only), broken out by district population density

	All community colleges	rural	suburban	urban
N	206	87	64	55
How often do you use the following types of digital resources in your undergraduate teaching:				
Images or visual materials	80%	78%	87%	76%
News or other media sources and archives	81%	86%	76%	79%
"Portals" that provide links or URL's relevant to particular disciplinary topics	66%	72%	64%	60%
Online reference resources	72%	77%	71%	63%
Digital film or video	72%	72%	80%	63%
Maps	51%	57%	46%	49%
Online or digitized documents	43%	49%	47%	31%
Audio materials	54%	61%	60%	38%
Curricular materials and websites that are created by other faculty and/or other institutions	43%	48%	47%	33%
Digital readers or coursepacks	20%	18%	23%	19%
Online class discussions	27%	22%	40%	19%
Government documents	35%	40%	26%	35%
Data archives	31%	35%	22%	35%
Digital facsimiles of ancient or historical manuscripts	20%	19%	22%	20%
Simulations or animations	29%	23%	33%	33%
Personal online diaries	12%	16%	9%	8%
How often do you use digital resources in your undergraduate teaching from each of the following sources?				
Search engines/directories	87%	89%	85%	87%
My own personal collection of digital materials	71%	76%	73%	60%
Online journals	46%	45%	50%	44%
Public online image databases	62%	68%	58%	57%
Media sites	69%	78%	64%	60%
Library collections	52%	53%	62%	38%
"Portals" that provide links or URL's relevant to particular disciplinary topics	58%	61%	59%	52%
Online exhibits	37%	37%	39%	35%
Campus image databases from my own institution	26%	27%	27%	22%
Commercial image databases	15%	13%	14%	20%
How often have you heard about sources of digital resources from each of the following?				
Word of mouth from colleagues	73%	75%	74%	68%
Word of mouth from students	61%	60%	68%	56%
Professional societies or discussion lists	46%	45%	47%	45%
Recommendation from a campus librarian	57%	60%	68%	42%
A campus department devoted to instructional technology	46%	56%	47%	29%
How often do you use digital resources in each of these ways?				
Presented during my lectures/class	78%	80%	78%	75%
Assigned to students for review and/or study	64%	67%	74%	50%
Assigned for student research projects or problem-based learning assignments	65%	64%	78%	53%
Posted directly on my course website	38%	33%	58%	24%
Linked from my course website	39%	36%	53%	29%
Used in tests and quizzes	37%	41%	40%	27%
Assigned to students to create their own digital portfolios and/or multimedia projects	22%	22%	25%	20%
Presented in the context of an online discussion	21%	16%	34%	14%
Presented in my online lectures	21%	15%	37%	14%

	All community colleges	rural	suburban	urban
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…				
because it improves my students' learning.	86%	88%	87%	84%
to integrate primary source material into the course.	82%	85%	85%	76%
to provide students a context for a topic.	81%	83%	79%	78%
to get students excited about a topic.	84%	85%	83%	82%
because it allows me to do things in the classroom that I could never do otherwise.	68%	62%	74%	69%
because it provides access to resources that we don't have at our college.	76%	82%	74%	70%
because it allows my students to be more creative.	72%	69%	72%	76%
to teach critical thinking skills.	75%	72%	85%	70%
to integrate my research interests into my course.	59%	66%	65%	44%
because I like or feel very comfortable with the new technologies.	63%	64%	65%	60%
because it is more convenient for my students and their schedules.	55%	53%	65%	47%
to teach information literacy (i.e., evaluating the online materials themselves).	56%	62%	58%	45%
because it saves me time.	41%	46%	41%	35%
because my students expect or ask for more technology.	43%	44%	50%	33%
because it allows me to stay up-to-date with my colleagues.	55%	52%	57%	58%
to provide students with both good and bad examples of different kinds of scholarship.	49%	55%	43%	45%
because it creates a sense of community for students enrolled in my course.	40%	33%	58%	31%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	31%	32%	33%	27%
because the administration encourages me to use digital resources more.	32%	32%	39%	24%
to provide students a preview of the course before they register.	27%	28%	37%	16%
because it may help me get promoted or get tenure.	12%	13%	13%	10%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…				
they cannot substitute for the teaching approaches I use.	66%	70%	64%	62%
I don't have time to use digital resources.	61%	66%	66%	48%
using them distracts from the core goals of my teaching.	34%	34%	36%	34%
I don't want my students to copy or plagiarize material from the web.	34%	29%	36%	40%
they are irrelevant to my field.	28%	35%	29%	18%
students don't have the information literacy skills to assess the credibility of digital resources.	39%	36%	27%	57%
digital material can be presented outside its original context.	31%	29%	33%	31%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...				
I don't have reliable access to physical resources in my classroom(s).	63%	62%	54%	74%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	46%	47%	48%	42%
there are too many resources out there for me to take advantage of—I am overwhelmed.	47%	53%	45%	42%
I don't have time to assess the credibility of the available resources.	44%	45%	34%	54%
the content I need or want is just not available online.	25%	27%	24%	22%
the academic quality of available materials is too poor to meet my needs.	24%	22%	24%	28%
I don't have reliable access to scanners.	39%	41%	33%	44%
I don't know how to locate the online materials I need.	40%	46%	29%	42%
I don't know how to save presentations to my computer so they can be run without a live connection.	36%	42%	27%	36%
available software is unsuitable for integrating audio or video into my course.	40%	46%	36%	34%
search engines provide irrelevant results for my needs.	39%	42%	38%	36%
I have difficulty understanding the issues surrounding copyright and digital collections.	34%	35%	29%	38%

	All community colleges	rural	suburban	urban
my students don't have a high-speed connection.	54%	59%	38%	64%
course management software packages are inadequate for my needs.	29%	26%	24%	41%
web sites I would use are unreliable, and I can't count on them being there when I need them.	33%	44%	25%	27%
available software is unsuitable for viewing and displaying digital images.	31%	37%	28%	28%
my students don't have reliable access to computers.	54%	55%	36%	72%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	32%	31%	26%	40%
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	38%	39%	28%	47%
I don't have reliable access to a high-speed connection.	32%	41%	18%	35%
I don't have reliable access to a computer.	21%	27%	4%	32%
How important is it for you to have support or assistance with each of the following activities for your teaching?				
obtaining or setting up technical infrastructure	84%	81%	81%	90%
creating my own website	81%	82%	78%	84%
digitizing existing resources	78%	80%	69%	86%
learning how to use a learning management system	80%	79%	78%	85%
importing resources into a course website or a database	77%	77%	70%	84%
gathering, organizing, and maintaining digital materials	77%	75%	72%	84%
integrating resources into a learning management system	81%	82%	75%	86%
finding digital resources	78%	77%	76%	82%
training students to find or evaluate digital resources	79%	78%	74%	86%
interpreting copyright laws and/or securing copyright permission	70%	65%	74%	72%
assessing the credibility of digital resources	69%	65%	65%	80%
evaluating the appropriateness of resources for my teaching goals	60%	54%	56%	72%
How satisfied or dissatisfied are you with the support you have received from the following sources?				
Campus librarians	84%	93%	86%	66%
Friends or family	90%	94%	89%	88%
Graduate students	75%	70%	80%	80%
Campus educational technology or IT support staff	68%	71%	80%	49%
Other faculty	74%	78%	76%	65%
Undergraduate students	69%	54%	79%	75%
My departmental or college staff	63%	66%	64%	55%
Workshops	67%	64%	79%	56%
Online help or guides	53%	42%	69%	50%
Overall digital resource use (0–100)	32	33	33	30
Overall technology use (0=no usage; 16=max usage)	13.6	13.6	14.1	13.3
Principal Component Scores:				
What resources people use				
General purpose and reference materials	-0.02	0.04	0.10	-0.25
Images and audiovisual materials	0.57	0.58	0.62	0.49
Historical documents, maps, and primary sources	-0.35	-0.37	-0.27	-0.38
Data, news/media, and governmental resources	0.19	0.38	-0.07	0.18
Discussion and curricular materials	-0.06	-0.16	0.18	-0.19
How people use digital resources				
Student assignments	0.17	0.15	0.35	0.01
Web posting	-0.39	-0.41	-0.20	-0.58
Online courses	0.41	0.27	0.91	0.10
In-class presentation	0.20	0.23	0.21	0.14
Motivations for use or non-use				
Pedagogical reasons	0.21	0.20	0.29	0.14

	All community colleges	rural	suburban	urban
Expectations and reputation	0.12	0.05	0.37	-0.07
Inappropriateness	-0.33	-0.30	-0.25	-0.46
Concerns about students' interpretation and information literacy	0.25	0.17	0.13	0.49
Time, convenience, and access	0.01	0.02	0.12	-0.13
Teaching information literacy and critical thinking	0.40	0.47	0.36	0.35
Making information publicly available	-0.04	-0.07	0.12	-0.17
Using free and publicly available materials	-0.16	-0.04	-0.31	-0.17
Barriers to use				
Finding resources	0.05	0.15	-0.03	-0.03
High-end multimedia equipment and software	0.01	-0.02	-0.06	0.14
Personal equipment	0.28	0.38	-0.10	0.55
Resource availability or existence	-0.29	-0.30	-0.29	-0.27
Student equipment	0.54	0.52	0.27	0.88
Activities with which support is needed				
Technical activities	-0.15	-0.19	-0.19	-0.07
Intellectual and content-based activities	0.36	0.27	0.29	0.57

Table H.7: Faculty survey responses and H-Net survey responses

	California faculty survey	H-Net Survey
N	831	452
How often do you use the following types of digital resources in your undergraduate teaching:		
Images or visual materials	75%	87%
News or other media sources and archives	64%	71%
"Portals" that provide links or URL's relevant to particular disciplinary topics	63%	70%
Online reference resources	62%	62%
Digital film or video	62%	62%
Maps	53%	70%
Online or digitized documents	50%	70%
Audio materials	46%	47%
Curricular materials and websites that are created by other faculty and/or other institutions	35%	45%
Digital readers or coursepacks	30%	32%
Online class discussions	28%	37%
Government documents	27%	50%
Data archives	27%	39%
Digital facsimiles of ancient or historical manuscripts	23%	43%
Simulations or animations	19%	22%
Personal online diaries	9%	13%
How often do you use digital resources in your undergraduate teaching from each of the following sources?		
Search engines/directories	81%	81%
My own personal collection of digital materials	69%	
My personal collection of digital resources that includes materials created by others		77%
My personal collection of digital resources that includes materials I have created myself		71%
A colleague's personal collection of digital resources		30%
Online journals	62%	79%
Public online image databases	62%	73%
Media sites	57%	61%
Library collections	57%	71%
"Portals" that provide links or URL's relevant to particular disciplinary topics	55%	60%
Online exhibits	37%	52%
Campus image databases from my own institution	24%	26%
Commercial image databases	9%	12%
How often have you heard about sources of digital resources from each of the following?		
Word of mouth from colleagues	74%	77%
Word of mouth from students	57%	46%
Professional societies or discussion lists	55%	84%
Recommendation from a campus librarian	51%	58%
A campus department devoted to instructional technology	41%	40%
How often do you use digital resources in each of these ways?		
Presented during my lectures/class	71%	86%
Assigned to students for review and/or study	59%	70%
Assigned for student research projects or problem-based learning assignments	56%	71%
Posted directly on my course website	52%	61%
Linked from my course website	49%	63%
Used in tests and quizzes	25%	38%
Assigned to students to create their own digital portfolios and/or multimedia projects	20%	21%
Presented in the context of an online discussion	12%	20%
Presented in my online lectures	12%	16%
How much do you agree or disagree with the following statements about your reasons for using digital resources? I use digital resources in my teaching…		

	California faculty survey	H-Net Survey
because it improves my students' learning.	78%	88%
to integrate primary source material into the course.	78%	86%
to provide students a context for a topic.	75%	87%
to get students excited about a topic.	73%	86%
because it allows me to do things in the classroom that I could never do otherwise.	68%	84%
because it provides access to resources that we don't have at our college.	61%	76%
because it allows my students to be more creative.	56%	62%
to teach critical thinking skills.	56%	73%
to integrate my research interests into my course.	55%	62%
because I like or feel very comfortable with the new technologies.	53%	74%
because it is more convenient for my students and their schedules.	51%	52%
to teach information literacy (i.e., evaluating the online materials themselves).	43%	59%
because it saves me time.	41%	42%
because my students expect or ask for more technology.	38%	45%
because it allows me to stay up-to-date with my colleagues.	37%	40%
to provide students with both good and bad examples of different kinds of scholarship.	32%	40%
because it creates a sense of community for students enrolled in my course.	32%	37%
because I enjoy having my teaching practices and course materials available to anyone in the world who would like to use them.	25%	35%
because the administration encourages me to use digital resources more.	23%	32%
to provide students a preview of the course before they register.	22%	18%
because it may help me get promoted or get tenure.	9%	20%
How much do you agree or disagree with the following statements about your reasons for *not* using digital resources? I don't use digital resources in certain teaching situations, because…		
they cannot substitute for the teaching approaches I use.	75%	70%
I don't have time to use digital resources.	66%	63%
using them distracts from the core goals of my teaching.	47%	45%
I don't want my students to copy or plagiarize material from the web.	33%	30%
they are irrelevant to my field.	30%	23%
students don't have the information literacy skills to assess the credibility of digital resources.	29%	25%
digital material can be presented outside its original context.	25%	25%
How much do you agree or disagree with the following statements? I have difficulty using digital resources the way I would like, because...		
I don't have reliable access to physical resources in my classroom(s).	53%	49%
the digital resources are distributed in so many places that it is difficult for me to organize them for use in my teaching.	45%	42%
there are too many resources out there for me to take advantage of—I am overwhelmed.	44%	42%
I don't have time to assess the credibility of the available resources.	43%	41%
the content I need or want is just not available online.	41%	48%
the academic quality of available materials is too poor to meet my needs.	39%	41%
I don't have reliable access to scanners.	39%	30%
I don't know how to locate the online materials I need.	36%	30%
I don't know how to save presentations to my computer so they can be run without a live connection.	35%	21%
available software is unsuitable for integrating audio or video into my course.	34%	32%
search engines provide irrelevant results for my needs.	34%	33%
I have difficulty understanding the issues surrounding copyright and digital collections.	33%	34%
my students don't have a high-speed connection.	32%	35%
course management software packages are inadequate for my needs.	32%	38%
web sites I would use are unreliable, and I can't count on them being there when I need them.	32%	33%
available software is unsuitable for viewing and displaying digital images.	31%	29%
my students don't have reliable access to computers.	30%	32%
web formats allow me to link to whole documents, but not to specific excerpts within a text.	28%	26%

	California faculty survey	H-Net Survey
it is difficult to get server space or access to a server in order to store/host digital resources for teaching.	27%	28%
I don't have reliable access to a high-speed connection.	21%	15%
I don't have reliable access to a computer.	13%	11%
How important is it for you to have support or assistance with each of the following activities for your teaching?		
obtaining or setting up technical infrastructure	82%	86%
creating my own website	82%	75%
digitizing existing resources	80%	75%
learning how to use a learning management system	79%	74%
importing resources into a course website or a database	79%	70%
gathering, organizing, and maintaining digital materials	78%	71%
integrating resources into a learning management system	78%	76%
finding digital resources	72%	63%
training students to find or evaluate digital resources	71%	65%
interpreting copyright laws and/or securing copyright permission	65%	69%
assessing the credibility of digital resources	50%	42%
evaluating the appropriateness of resources for my teaching goals	42%	38%
How satisfied or dissatisfied are you with the support you have received from the following sources?		
Campus librarians	84%	80%
Friends or family	83%	84%
Graduate students	80%	81%
Campus educational technology or IT support staff	73%	70%
Other faculty	71%	69%
Undergraduate students	70%	67%
My departmental or college staff	66%	61%
Workshops	60%	57%
Online help or guides	47%	55%
Overall digital resource use (0–100)	31	35
Overall technology use (0=no usage; 16=max usage)	14.5	15.4

Appendix I: Specific digital resources listed by faculty

Table I.1: Faculty survey results: What specific digital resources do you use? (categorized)

Type of site	# responses	% responses	# people	% people
Database/archive/collection/dig lib	306	11.7%	219	23.0%
Scholarly journals	231	8.8%	200	21.0%
Search engines	185	7.1%	172	18.1%
Abstracting & indexing databases	154	5.9%	122	12.8%
News/Media/Magazines	169	6.5%	120	12.6%
Images & Video collections	137	5.2%	115	12.1%
Government sites	154	5.9%	107	11.3%
Library catalogues	115	4.4%	102	10.7%
Curricular materials (incl. textbook resources)	118	4.5%	89	9.4%
Other	102	3.9%	88	9.3%
Portals	83	3.2%	73	7.7%
My own collection	75	2.9%	68	7.2%
Non-profit organizations/institutions	79	3.0%	67	7.0%
Reference resources	82	3.1%	61	6.4%
Museum websites (real, physical museums)	73	2.8%	57	6.0%
Profession/Academic Associations/Societies	57	2.2%	54	5.7%
Mailing lists, discussion groups, or blogs	47	1.8%	36	3.8%
Commercial sites (corporations or retailers)	28	1.1%	24	2.5%
Geography materials (maps, data, etc.)	29	1.1%	21	2.2%
Bibliographies	19	0.7%	18	1.9%
Social science (arch, anthro, poli sci)	17	0.6%	17	1.8%
Arts (fine arts, performing, arch)	16	0.6%	15	1.6%
Data collections (primarily numeric data)	19	0.7%	15	1.6%
Audio collections	8	0.3%	8	0.8%

Table I.2: Faculty survey results: What specific digital resources do you use?

Response (site name or description)	URL	# respon-ses	% respon-ses	# people	% people
JSTOR – The Scholarly Journal Archive	http://www.jstor.org	154	5.9%	153	16.1%
Google	www.google.com	142	5.4%	142	14.9%
Library of Congress	loc.gov	42	1.6%	42	4.4%
Library of Congress American Memory Project	http://memory.loc.gov/	42	1.6%	42	4.4%
FindLaw		40	1.5%	39	4.1%
Lexis Nexis	http://www.lexisnexis.com	40	1.5%	40	4.2%
my own digitized images		37	1.4%	37	3.9%
libraries – library databases/catalogues		34	1.3%	34	3.6%
New York Times	http://www.nytimes.com	32	1.2%	32	3.4%
news/newspapers online		30	1.1%	30	3.2%
websites – museums in general		30	1.1%	30	3.2%
my own digital resources		28	1.1%	28	2.9%
search engines		25	1.0%	25	2.6%
Modern Language Association (MLA)	http://www.mla.org/	23	0.9%	23	2.4%
websites/databases – images – general		22	0.8%	22	2.3%
Perseus Digital Libraries	http://www.perseus.tufts.edu	21	0.8%	21	2.2%
Oxford English Dictionary online	http://www.oed.com/	20	0.8%	20	2.1%
Project Muse	http://muse.jhu.edu/	19	0.7%	19	2.0%
database – general		18	0.7%	18	1.9%
websites – government		18	0.7%	18	1.9%
websites – of textbook publisher		17	0.6%	17	1.8%
Census	http://www.census.gov	15	0.6%	15	1.6%
Melvyl	http://melvyl.cdlib.org/	15	0.6%	15	1.6%
list – H-Net		15	0.6%	15	1.6%

Response (site name or description)	URL	# responses	% responses	# people	% people
library – general		14	0.5%	14	1.5%
History Matters	http://historymatters.gmu.edu	13	0.5%	13	1.4%
Yahoo	yahoo.com	13	0.5%	13	1.4%
EEBO (early english books online)	http://eebo.chadwyck.com/	12	0.5%	12	1.3%
California Digital Library (CDL)	http://www.cdlib.org/	11	0.4%	11	1.2%
EBSCO	http://www.ebsco.com/home/	11	0.4%	11	1.2%
PBS	http://www.pbs.org	11	0.4%	11	1.2%
ProQuest	http://www.umi.com/proquest/	11	0.4%	11	1.2%
Project Gutenberg	http://gutenberg.net	11	0.4%	11	1.2%
online collections of maps		11	0.4%	11	1.2%
National Archives & Records Adminstration (NARA)	http://www.archives.gov/	10	0.4%	10	1.1%
The Art Museum Image Consortium (AMICO)	http://www.amico.org	10	0.4%	10	1.1%
database – Expanded Academic Indexes ASAP		10	0.4%	10	1.1%
Internet Medieval Sourcebook	http://www.fordham.edu/halsall/sbook1j.html	9	0.3%	9	0.9%
Internet Sourcebooks – by Paul Halsall	http://www.fordham.edu/halsall/	9	0.3%	9	0.9%
database – InfoTrac		9	0.3%	9	0.9%
FindLaw	findlaw.com	8	0.3%	8	0.8%
Healy's Literature Online (LION)	http://lion.chadwyck.co.uk	8	0.3%	8	0.8%
Labyrinth	http://www.georgetown.edu/labyrinth/	8	0.3%	8	0.8%
Voice of the Shuttle	http://vos.ucsb.edu/	8	0.3%	8	0.8%
websites – film		8	0.3%	8	0.8%
websites – links to primary sources		8	0.3%	8	0.8%
Avalon Project	http://www.yale.edu/lawweb/avalon/avalon.htm	7	0.3%	7	0.7%
NPR National Public Radio	http://www.npr.org/	7	0.3%	7	0.7%
OCLC (Online Computer Library Center) includes Worldcat and	http://www.oclc.org/	7	0.3%	7	0.7%
OWL	http://owl.english.purdue.edu/	7	0.3%	7	0.7%
online portals		7	0.3%	7	0.7%
Bedford/St. Martin's publisher – online companion	http://www.bedfordstmartins.com/	6	0.2%	6	0.6%
Historical Maps (University of Texas at Austin)	http://www.lib.utexas.edu/maps/	6	0.2%	6	0.6%
MERLOT (Multimedia Educational Resource for Learning and Onl	http://www.merlot.org/Home.po	6	0.2%	6	0.6%
Metropolitan Museum of Art	http://www.metmuseum.org/	6	0.2%	6	0.6%
University of Virginia (UVA) Electronic Text	http://etext.lib.virginia.edu/	6	0.2%	6	0.6%
Washington Post archives	http://www.washingtonpost.com/	6	0.2%	6	0.6%
libraries – UC library catalogues		6	0.2%	6	0.6%
online dictionaries/reference		6	0.2%	6	0.6%
CNN	CNN.com	5	0.2%	5	0.5%
ERIC	http://eric.ed.gov/	5	0.2%	5	0.5%
GALE Eighteenth Century Collections Online	http://www.gale.com/EighteenthCentury/	5	0.2%	5	0.5%
Houghton Mifflin Company publisher's site	http://www.hmco.com/	5	0.2%	5	0.5%
ICPSR (InterUniversity Consortium for Political and Social R	http://www.icpsr.org/	5	0.2%	5	0.5%

Response (site name or description)	URL	# responses	% responses	# people	% people
Latin American Network Information Center	http://lanic.utexas.edu	5	0.2%	5	0.5%
Mark Harden's Artchive	http://www.artchive.com/	5	0.2%	5	0.5%
Oyez	http://www.oyez.org/	5	0.2%	5	0.5%
Smithsonian	http://www.si.edu/	5	0.2%	5	0.5%
Thesaurus Linguae Graecae	http://www.tlg.uci.edu/	5	0.2%	5	0.5%
Women and Social Movements	http://womhist.binghamton.edu/	5	0.2%	5	0.5%
database – America: History and Life		5	0.2%	5	0.5%
database – Historical Abstracts		5	0.2%	5	0.5%
database – online articles		5	0.2%	5	0.5%
online bibliographies		5	0.2%	5	0.5%
online exhibitions		5	0.2%	5	0.5%
websites – for authors and issues		5	0.2%	5	0.5%
websites – of artists		5	0.2%	5	0.5%
websites – of other colleagues		5	0.2%	5	0.5%
websites – syllabi of other teachers		5	0.2%	5	0.5%
websites – university-based		5	0.2%	5	0.5%
Archnet (Archeology Net)	http://archnet.asu.edu/	4	0.2%	4	0.4%
Artcyclopedia	http://www.artcyclopedia.com/	4	0.2%	4	0.4%
BBC	http://www.bbc.co.uk/	4	0.2%	4	0.4%
Bartleby	http://www.bartleby.com	4	0.2%	4	0.4%
Documenting the American South	http://docsouth.unc.edu/neh	4	0.2%	4	0.4%
Early Canadiana Online	http://www.canadiana.org/eco/index.html	4	0.2%	4	0.4%
Grove Dictionary of Art Online	http://www.groveart.com/index.html	4	0.2%	4	0.4%
Internet Modern History Sourcebook	http://www.fordham.edu/halsall/mod/modsbook.html	4	0.2%	4	0.4%
Making of America	http://cdl.library.cornell.edu/moa/	4	0.2%	4	0.4%
Middle English Compendium (includes Dictionary)	http://ets.umdl.umich.edu/m/mec/	4	0.2%	4	0.4%
Miguel de Cervantes Digital Library	http://www.cervantesvirtual.com/	4	0.2%	4	0.4%
SPIRO	http://www.mip.berkeley.edu/spiro/	4	0.2%	4	0.4%
THOMAS	http://thomas.loc.gov/	4	0.2%	4	0.4%
World Bank	http://www.worldbank.org	4	0.2%	4	0.4%
archive – electronic archives		4	0.2%	4	0.4%
news online – French		4	0.2%	4	0.4%
websites – historical		4	0.2%	4	0.4%
websites – literature/ literary		4	0.2%	4	0.4%
Arts & Letters Daily	http://www.aldaily.com	3	0.1%	3	0.3%
Bibliography of the History of Art	The BHA is available via the Internet by subscription from D	3	0.1%	3	0.3%
Bibliotheque nationale de France	http://www.bnf.fr/	3	0.1%	3	0.3%
Blogs		3	0.1%	3	0.3%
Central Intelligence Agency (CIA)	http://www.cia.gov/	3	0.1%	3	0.3%
Cleveland Museum of Art Image Database	http://www.clevelandart.org/	3	0.1%	3	0.3%
Corbis digital photo archive	http://www.corbis.com/	3	0.1%	3	0.3%
Encyclopedia Britannica online	http://www.eb.com/	3	0.1%	3	0.3%
Great Buildings Collection	Greatbuildings.com	3	0.1%	3	0.3%

Response (site name or description)	URL	# responses	% responses	# people	% people
History Cooperative	http://www.historycooperative.org/	3	0.1%	3	0.3%
Instituto Cervantes	http://www.cervantes.es/	3	0.1%	3	0.3%
Los Angeles Times (LA times)	http://www.latimes.com/	3	0.1%	3	0.3%
Online Reference Book for Medieval Studies	http://www.the-orb.net	3	0.1%	3	0.3%
Orion (UCLA Library Catalogue)	http://orion2.library.ucla.edu/	3	0.1%	3	0.3%
Population Reference Bureau	http://www.prb.org/	3	0.1%	3	0.3%
Prelinger Archives	http://www.archive.org/movies/prelinger.php	3	0.1%	3	0.3%
Real Academia Espanola	http://www.rae.es/	3	0.1%	3	0.3%
Rhizome	http://rhizome.org/	3	0.1%	3	0.3%
The Valley of Shadow	http://valley.vcdh.virginia.edu/	3	0.1%	3	0.3%
Thomson Heinle publisher	http://www.heinle.com/	3	0.1%	3	0.3%
USGS	http://www.usgs.gov/	3	0.1%	3	0.3%
Web of Science	http://www.isinet.com/products/citation/wos/	3	0.1%	3	0.3%
Webmuseum	http://www.ibiblio.org/wm/	3	0.1%	3	0.3%
database – Anthropological Literature		3	0.1%	3	0.3%
database – museum image collection		3	0.1%	3	0.3%
libraries – UC Berkeley library electronic indexes	http://www.lib.berkeley.edu/	3	0.1%	3	0.3%
libraries – UCLA collections		3	0.1%	3	0.3%
libraries – universities		3	0.1%	3	0.3%
online catalogues – general		3	0.1%	3	0.3%
online discussion groups		3	0.1%	3	0.3%
online media		3	0.1%	3	0.3%
online periodicals		3	0.1%	3	0.3%
online resources – digital statistical resources		3	0.1%	3	0.3%
websites – audio		3	0.1%	3	0.3%
websites – links to archaeological material		3	0.1%	3	0.3%
(ARTFL) American and French Research on the Treasury of the	http://humanities.uchicago.edu/orgs/ARTFL/	2	0.1%	2	0.2%
AP Photo Archive	http://ap.accuweather.com/apphoto/	2	0.1%	2	0.2%
ARTstor	http://www.artstor.org/	2	0.1%	2	0.2%
ATLA (American Theological Library Association) Religion Dat	http://www.atla.com/products/catalogs/catalogs_rdb.html	2	0.1%	2	0.2%
Access to Insight	http://www.accesstoinsight.org/	2	0.1%	2	0.2%
Adobe	http://www.adobe.com/	2	0.1%	2	0.2%
AfricaFocus – University of Wisconsin, Madison	http://webcat.library.wisc.edu:3200/AfricaFocus/	2	0.1%	2	0.2%
Amazon	Amazon.com	2	0.1%	2	0.2%
American Anthropological Association	http://www.aaanet.org/	2	0.1%	2	0.2%
American Museum of the Moving Image	http://www.ammi.org	2	0.1%	2	0.2%
American Sociological Association	http://www.asanet.org/	2	0.1%	2	0.2%
American Studies Electronic Crossroad Project	http://www.georgetown.edu/crossroads/	2	0.1%	2	0.2%
American Studies, University of Virginia	http://xroads.virginia.edu/	2	0.1%	2	0.2%
Annual Egyptological Bibliography	http://www.leidenuniv.nl/nino/aeb.html	2	0.1%	2	0.2%
Apple	Apple.com	2	0.1%	2	0.2%
Archaelogical Data Serivce	http://ads.ahds.ac.uk/	2	0.1%	2	0.2%
Art Index	www.artindex.com	2	0.1%	2	0.2%

Response (site name or description)	URL	# respon-ses	% respon-ses	# people	% people
Avery library	http://www.columbia.edu/cu/lweb/indiv/avery/DAcollections.ht	2	0.1%	2	0.2%
Beazley	http://www.beazley.ox.ac.uk/	2	0.1%	2	0.2%
Becoming Human	http://www.becominghuman.org/	2	0.1%	2	0.2%
British Columbia Archives	http://www.bcarchives.gov.bc.ca/sn-14769EA/index.htm	2	0.1%	2	0.2%
Brown Women Writers Project	http://www.wwp.brown.edu/	2	0.1%	2	0.2%
C18-L (18th century studies)	http://www.personal.psu.edu/special/C18/c18-l.htm	2	0.1%	2	0.2%
CELT – Corpus of Electronic Texts	http://www.ucc.ie/celt/	2	0.1%	2	0.2%
Canadian Broadcasting Corporation	http://archives.cbc.ca/index.asp?IDLan=1	2	0.1%	2	0.2%
Center for Disease Control and Prevention	http://www.cdc.gov/	2	0.1%	2	0.2%
Center for History and New Media, George Mason University	http://chnm.gmu.edu/index1.html	2	0.1%	2	0.2%
Chicago Historical Society	http://www.chicagohs.org/	2	0.1%	2	0.2%
Chronicle of Higher Education	http://chronicle.com/	2	0.1%	2	0.2%
Congressional Quarterly Researcher	http://library2.cqpress.com/cqresearcher/	2	0.1%	2	0.2%
Cornell University	cornell.edu	2	0.1%	2	0.2%
Digital Scriptorium	http://sunsite.berkeley.edu/Scriptorium/	2	0.1%	2	0.2%
ESTC The English Short Title Catalogue database through Melv		2	0.1%	2	0.2%
Early American Imprints (Digital Collection)	http://www.readex.com/digital/digcoll.html	2	0.1%	2	0.2%
Electronic Poetry Center (EPC)	http://wings.buffalo.edu/epc/	2	0.1%	2	0.2%
Gallup (poll)	http://www.gallup.com/poll/	2	0.1%	2	0.2%
Gilder Lehrman Center for the Study of Slavery, Resistance,	http://www.yale.edu/glc/	2	0.1%	2	0.2%
Guggenheim Museum	http://www.guggenheim.org/	2	0.1%	2	0.2%
Guide to Grammar and Writing	http://www.ccc.commnet.edu/grammar/	2	0.1%	2	0.2%
Harper's Magazine	http://www.harpers.org/	2	0.1%	2	0.2%
Harvard Chaucer Page	http://www.courses.fas.harvard.edu/~chaucer/	2	0.1%	2	0.2%
Himalayan Art	http://www.himalayanart.org/	2	0.1%	2	0.2%
Historical Census	http://fisher.lib.virginia.edu/collections/stats/histcensus/	2	0.1%	2	0.2%
History Channel	http://www.historychannel.com/	2	0.1%	2	0.2%
IPUMS (Integrated Public Use Microdata Series)	www.ipums.umn.edu	2	0.1%	2	0.2%
International Medieval Bibliography	http://www.brepols.net/publishers/imb_info_en.htm	2	0.1%	2	0.2%
Internet Classics Archive	http://classics.mit.edu/	2	0.1%	2	0.2%
Internet History of Science Sourcebook	http://www.fordham.edu/halsall/science/sciencesbook.html	2	0.1%	2	0.2%
Kairos	http://english.ttu.edu/kairos/	2	0.1%	2	0.2%
Lacus Curtius	http://penelope.uchicago.edu/Thayer/E/Roman/home.html	2	0.1%	2	0.2%
Literature Resource Center	http://www.gale.com/LitRC/	2	0.1%	2	0.2%
MSNBC	MSNBC.com	2	0.1%	2	0.2%
McGraw-Hill publisher's site	http://www.mcgraw-hill.com/	2	0.1%	2	0.2%
NASA	nasa.gov	2	0.1%	2	0.2%

Response (site name or description)	URL	# responses	% responses	# people	% people
NCTE National Council of Teachers of English	http://www.ncte.org/	2	0.1%	2	0.2%
National Archives of Canada	http://www.collectionscanada.ca/	2	0.1%	2	0.2%
National Center for Science Education	http://www.ncseweb.org/	2	0.1%	2	0.2%
National Election Studies	http://www.umich.edu/~nes/	2	0.1%	2	0.2%
National Institute of Health	http://www.nih.gov/	2	0.1%	2	0.2%
Netscape	http://netscape.com	2	0.1%	2	0.2%
New Testament Gateway	http://www.ntgateway.com/	2	0.1%	2	0.2%
Paradigm Online Writing Assistant (POWA)	http://powa.org/	2	0.1%	2	0.2%
Patrologia Latina	http://pld.chadwyck.com/	2	0.1%	2	0.2%
Personal website of authors/literary movements	http://guweb2.gonzaga.edu/faculty/campbell/enl311/aufram.htm	2	0.1%	2	0.2%
Petrie Museum of Egyption Archaeology	http://www.petrie.ucl.ac.uk/	2	0.1%	2	0.2%
Pew Research Center	http://people-press.org/	2	0.1%	2	0.2%
Polling Report.com	pollingreport.com	2	0.1%	2	0.2%
Portraits/Shaping of the Modern World/Brooklyn College	http://academic.brooklyn.cuny.edu/history/virtual/portrait.h	2	0.1%	2	0.2%
Poynter Online (for Journalists)	http://poynter.org/	2	0.1%	2	0.2%
Quia	http://www.quia.com/	2	0.1%	2	0.2%
Royal Historical Society Bibliography	http://www.rhs.ac.uk/bibwel.asp	2	0.1%	2	0.2%
SF Chronicle archives	http://www.sfgate.com/chronicle/	2	0.1%	2	0.2%
The Academy American of Poets	poets.org	2	0.1%	2	0.2%
The Bryn Mawr Classical Review	http://ccat.sas.upenn.edu/bmcr/	2	0.1%	2	0.2%
The Getty Collections	http://www.getty.edu/art/collections	2	0.1%	2	0.2%
UBU Web	http://www.ubu.com/	2	0.1%	2	0.2%
Victorian Web	http://www.victorianweb.org/	2	0.1%	2	0.2%
Wikipedia	http://en.wikipedia.org/wiki/Main_Page	2	0.1%	2	0.2%
Xipolis	http://www.xipolis.net/	2	0.1%	2	0.2%
database – Ethnic News Watch		2	0.1%	2	0.2%
database – Ingenta	www.ingentaconnect.com	2	0.1%	2	0.2%
database – PsycINFO		2	0.1%	2	0.2%
database – Sociological Abstracts		2	0.1%	2	0.2%
database – audio/ audio archives		2	0.1%	2	0.2%
database – government		2	0.1%	2	0.2%
images – art images		2	0.1%	2	0.2%
libraries – Bancroft Library online		2	0.1%	2	0.2%
libraries – Bodleian Library, Oxford		2	0.1%	2	0.2%
libraries – Cambridge University Library (UK)		2	0.1%	2	0.2%
libraries – manuscript websites		2	0.1%	2	0.2%
list – AnSax-L		2	0.1%	2	0.2%
list- H-LATAM		2	0.1%	2	0.2%
my own blog		2	0.1%	2	0.2%
my own department's digitized slide collection		2	0.1%	2	0.2%
my own video		2	0.1%	2	0.2%
news online – Indian		2	0.1%	2	0.2%
news online – US		2	0.1%	2	0.2%
online archaeology information		2	0.1%	2	0.2%
online coursepacks		2	0.1%	2	0.2%

Response (site name or description)	URL	# responses	% responses	# people	% people
online data sources in general		2	0.1%	2	0.2%
online indexes – for art history		2	0.1%	2	0.2%
online resources – art history		2	0.1%	2	0.2%
online resources – for writing		2	0.1%	2	0.2%
personal collection – a colleague's digital photos		2	0.1%	2	0.2%
resources/ collections – French		2	0.1%	2	0.2%
websites – ESL		2	0.1%	2	0.2%
websites – US state departments sites	http://www.state.gov/	2	0.1%	2	0.2%
websites – companion for writing handbook		2	0.1%	2	0.2%
websites – grammar		2	0.1%	2	0.2%
websites – music		2	0.1%	2	0.2%
websites – poetry collections		2	0.1%	2	0.2%
websites – reviews of books/articles		2	0.1%	2	0.2%
websites – with government publications		2	0.1%	2	0.2%
AATA Online	http://aata.getty.edu/NPS/	1	0.0%	1	0.1%
AATG American Association of Teachers of German	http://www.aatg.org/	1	0.0%	1	0.1%
ABZU Bibliography	http://www.etana.org/abzu/	1	0.0%	1	0.1%
ACADIA (Association for Computer Aided Design in Architectur	http://www.acadia.org/	1	0.0%	1	0.1%
AFL-CIO	http://www.aflcio.org/	1	0.0%	1	0.1%
AHEAD (Association on Higher Education and Disability)	http://www.ahead.org/	1	0.0%	1	0.1%
AIA American Institute of Architects	http://www.aia.org/	1	0.0%	1	0.1%
ARCHON – National Archives (UK)	http://www.archon.nationalarchives.gov.uk/archon/	1	0.0%	1	0.1%
ARTbibliographies Modern	http://www.csa.com/csa/factsheets/artbm.shtml	1	0.0%	1	0.1%
About.com	About.com	1	0.0%	1	0.1%
Ad*Acess	http://scriptorium.lib.duke.edu/adaccess/	1	0.0%	1	0.1%
Adavanced Academic		1	0.0%	1	0.1%
Adbusters	http://adbusters.org/home/	1	0.0%	1	0.1%
Adcritic	http://www.adcritic.com/	1	0.0%	1	0.1%
AddAll Book search and price comparison	http://www.addall.com/	1	0.0%	1	0.1%
Advanced Papyrological Information System (APIS)	http://www.columbia.edu/cu/lweb/projects/digital/apis/	1	0.0%	1	0.1%
Africa Research Program	http://africa.gov.harvard.edu/	1	0.0%	1	0.1%
Allyn & Bacon/ Longman	http://www.ablongman.com/	1	0.0%	1	0.1%
AltaVista	http://www.altavista.com/	1	0.0%	1	0.1%
American Association of Teachers of French	http://www.frenchteachers.org/	1	0.0%	1	0.1%
American Library Association	http://www.ala.org/	1	0.0%	1	0.1%
American Meteorological Society	http://www.ametsoc.org/	1	0.0%	1	0.1%
American Presidency Project	http://www.presidency.ucsb.edu/	1	0.0%	1	0.1%
American Studies Web	http://cfdev.georgetown.edu/cndls/asw/	1	0.0%	1	0.1%
Anarchy Archives	http://dwardmac.pitzer.edu/Anarchist_Archives/	1	0.0%	1	0.1%
AnthroPhoto	http://www.anthrophoto.com/cgi-bin/ImageFolio31/imageFolio.c	1	0.0%	1	0.1%
Anthropology in the News	http://www.tamu.edu/anthropology/news.html	1	0.0%	1	0.1%
Arcat (architecture)	http://www.arcat.com/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Architecture Record	http://archrecord.construction.com/	1	0.0%	1	0.1%
Archive of Turkish Oral Narrative	http://aton.ttu.edu/	1	0.0%	1	0.1%
Archives Network of Alberta Database	http://asalive.archivesalberta.org:8080/access/asa/archaa/	1	0.0%	1	0.1%
Archives and Museum Informatics	www.archimuse.com	1	0.0%	1	0.1%
Archives of American Art	http://archivesofamericanart.si.edu/start.htm	1	0.0%	1	0.1%
Art Nexus (art magazine)	http://www.artnexus.com/index2.html	1	0.0%	1	0.1%
ArtLex Art Dictionary	http://artlex.com/	1	0.0%	1	0.1%
ArtUnframed	http://www.artunframed.com/stuart_2.htm	1	0.0%	1	0.1%
ArteHistoria	http://www.artehistoria.com/	1	0.0%	1	0.1%
Arts and Culture Dictionary, Glossary, and Terms Directory	http://www.glossarist.com/glossaries/arts-culture/	1	0.0%	1	0.1%
Arts and Humanities Data Service	http://ahds.ac.uk/	1	0.0%	1	0.1%
Asahi Shinbun (Japanese Newspaper online)	http://www.asahi.com/	1	0.0%	1	0.1%
Associated Press	http://www.ap.org	1	0.0%	1	0.1%
Association for Asian Studies	http://www.aasianst.org/	1	0.0%	1	0.1%
Atlantic Monthly	http://www.theatlantic.com	1	0.0%	1	0.1%
BeeHive Hypertext/Hypermedia Literary Journal	http://beehive.temporalimage.com/	1	0.0%	1	0.1%
Berkeley Digital Library Sunsite	http://sunsite.berkeley.edu/	1	0.0%	1	0.1%
BiblePlaces	http://www.bibleplaces.com/	1	0.0%	1	0.1%
Biblical Archaeology Society (BAS)	http://www.basarchive.org/	1	0.0%	1	0.1%
Bibliography of Asian Studies	http://www.aasianst.org/bassub.htm	1	0.0%	1	0.1%
Biography Channel	biography.com	1	0.0%	1	0.1%
Board of Governors of the Federal Reserve System	http://www.federalreserve.gov/	1	0.0%	1	0.1%
Britannia	http://www.britannia.com/	1	0.0%	1	0.1%
British Film Institute	http://www.bfi.org.uk/	1	0.0%	1	0.1%
Brown v. Board of Education Digital Archive (ASALH)	http://kpearson.project.tcnj.edu/category/	1	0.0%	1	0.1%
BuddhaNet	http://buddhanet.net/	1	0.0%	1	0.1%
Bureau of Economic Analysis	http://www.bea.doc.gov/	1	0.0%	1	0.1%
Bureau of Justice Statistics	http://www.ojp.usdoj.gov/bjs/	1	0.0%	1	0.1%
Bureau of Labor Statistics	http://www.bls.gov/	1	0.0%	1	0.1%
CAADIA (Computer Aided Architectural Design in Asia)	http://www.caadria.org/caadria/	1	0.0%	1	0.1%
CERES California Environmental Resources Evaluation System	http://ceres.ca.gov/	1	0.0%	1	0.1%
CLOE – Co-operative Learning Object Exchange	http://cloe.on.ca/	1	0.0%	1	0.1%
CPJ Freedom Press Online	http://www.cpj.org/	1	0.0%	1	0.1%
CROW Course Resources on the Web	http://www.millikin.edu/aci/crow/	1	0.0%	1	0.1%
CUMINCAD (Cumulative Index of Computer Aided Architectural D	http://cumincad.scix.net/	1	0.0%	1	0.1%
California Association for Postsecondary Education and Disab	http://www.caped.net/	1	0.0%	1	0.1%
California Courts: Rules	http://www.courtinfo.ca.gov/rules/	1	0.0%	1	0.1%
California Ethnic and Multicultural Archives	http://cemaweb.library.ucsb.edu/cema_index.html	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Camoes Institute website	http://www.instituto-camoes.pt/	1	0.0%	1	0.1%
Carol Gerten's Fine Art CGFA: A virtual art museum	http://cgfa.sunsite.dk/	1	0.0%	1	0.1%
Celtic Studies Association of North America on-line bibliogr	http://www.humnet.ucla.edu/humnet/celtic/csanabib.html	1	0.0%	1	0.1%
Center for American Women and Politics	http://www.cawp.rutgers.edu/	1	0.0%	1	0.1%
Center for Budgets and Policy Priorities	http://www.cbpp.org/	1	0.0%	1	0.1%
Center for Land Use Information	http://clui.org/	1	0.0%	1	0.1%
Center for Technology in Government	http://www.ctg.albany.edu/	1	0.0%	1	0.1%
Center for the Study of Ancient Documents	http://www.csad.ox.ac.uk/CSAD/	1	0.0%	1	0.1%
Center for the Study of the American South	http://www.unc.edu/depts/csas/	1	0.0%	1	0.1%
Child Trends	http://www.childtrends.org/	1	0.0%	1	0.1%
Chimpanzoo	http://www.chimpanzoo.org/	1	0.0%	1	0.1%
Chinese and Japanese Art History WWW Virtual Library	http://www.nyu.edu/gsas/dept/fineart/html/chinese/index.html	1	0.0%	1	0.1%
Christian Classics Ethereal Library	http://www.ccel.org/	1	0.0%	1	0.1%
Christian Science Monitor	http://csmonitor.com	1	0.0%	1	0.1%
Civil War Photos	http://www.civilwarphotos.net/files/group_photos.htm	1	0.0%	1	0.1%
Classroom.com	classroom.com	1	0.0%	1	0.1%
Cleansurface	cleansurface.org "living archive of public trouble-making, …"	1	0.0%	1	0.1%
Columbia Encyclopedia Online	available through yahoo or bartleby	1	0.0%	1	0.1%
Common-place	http://common-place.org/	1	0.0%	1	0.1%
Computer Aided Instruction Program	http://cai.ucdavis.edu/	1	0.0%	1	0.1%
Congressional Biography	http://bioguide.congress.gov	1	0.0%	1	0.1%
Conjuguemos	conjuguemos.com	1	0.0%	1	0.1%
Connecticut History Online	http://www.cthistoryonline.org/	1	0.0%	1	0.1%
Coolhomepages (webdesign)	http://www.coolhomepages.com/	1	0.0%	1	0.1%
Corpus Christianorum	http://www.corpuschristianorum.org/home.html	1	0.0%	1	0.1%
Cultura	http://web.mit.edu/french/culturaNEH/	1	0.0%	1	0.1%
Cumulus Digital Image Database		1	0.0%	1	0.1%
Cuneiform Digital Library Initiative	http://cdli.ucla.edu/	1	0.0%	1	0.1%
CyberJournalist.net	http://cyberjournalist.net/	1	0.0%	1	0.1%
Cyberspace and Critical Theory	http://www.cyberartsweb.org/cpace/	1	0.0%	1	0.1%
DASL Data and Story Library	http://lib.stat.cmu.edu/DASL/	1	0.0%	1	0.1%
DV (Digital Video)	http://dv.com/	1	0.0%	1	0.1%
Daily Dutch News broadcast archive	http://www.nos.nl/	1	0.0%	1	0.1%
David Rumsey Historical Map Collection	http://www.davidrumsey.com	1	0.0%	1	0.1%
De imperatoribus romanis (online Encyclopedia of Roman Emper	http://www.roman-emperors.org/	1	0.0%	1	0.1%
Dictionary.com	Dictionary.com	1	0.0%	1	0.1%
DigiZeitschriften	http://www.digizeitschriften.de/	1	0.0%	1	0.1%
Digital History	http://www.digitalhistory.uh.edu/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Digital National Security Archive (Proquest)	http://nsarchive.chadwyck.com/	1	0.0%	1	0.1%
Digitale Bibliothek Deutscher Klassiker	http://klassiker.chadwyck.com/	1	0.0%	1	0.1%
Diotima: Women and Gender in the Ancient World	http://www.stoa.org/diotima/	1	0.0%	1	0.1%
Discovery Channel	discovery.com	1	0.0%	1	0.1%
Dogpile (search engine page)	http://www.dogpile.com/	1	0.0%	1	0.1%
EBSCOHost	http://ejournals.ebsco.com/disclaimer.asp	1	0.0%	1	0.1%
EH.Net- Economic History Services	http://eh.net/	1	0.0%	1	0.1%
ESRI – GIS Software	http://esri.com/	1	0.0%	1	0.1%
ETOH database	http://etoh.niaaa.nih.gov/	1	0.0%	1	0.1%
Early Modern England Sources	http://www.quelle.org/emes/research.html	1	0.0%	1	0.1%
Ecole Initiative	http://www2.evansville.edu/ecoleweb/	1	0.0%	1	0.1%
EconLit	http://www.econlit.org/	1	0.0%	1	0.1%
Economic History Services	http://eh.net/	1	0.0%	1	0.1%
Edsource (California)	http://www.edsource.org/	1	0.0%	1	0.1%
Education Data Partnership (California)	http://www.ed-data.k12.ca.us/welcome.asp	1	0.0%	1	0.1%
El Genero en Historia/ Gender in History	http://www.sas.ac.uk/ilas/genero.htm	1	0.0%	1	0.1%
Electric Library	http://www.electriclibrary.com/	1	0.0%	1	0.1%
Electronic Literature Organization (eliterature)	http://www.eliterature.org/	1	0.0%	1	0.1%
Electronic Text Corpus of Sumerian Literature	http://www-etcsl.orient.ox.ac.uk/	1	0.0%	1	0.1%
Encyclopedia.com	http://www.encyclopedia.com/	1	0.0%	1	0.1%
Environmental Protection Agency	http://epa.gov/	1	0.0%	1	0.1%
Equal Employment Opportunity Commission	http://www.eeoc.gov/	1	0.0%	1	0.1%
Etcetera (online Mexican magazine)	http://etcetera.com.mx/	1	0.0%	1	0.1%
Eugenics Archive	http://www.eugenicsarchive.org/	1	0.0%	1	0.1%
Eurasianet	http://www.eurasianet.org/	1	0.0%	1	0.1%
EuroDocs: Western European Primary Historical Documents	http://library.byu.edu/~rdh/eurodocs/	1	0.0%	1	0.1%
European Journalism Center	http://www.ejc.nl/	1	0.0%	1	0.1%
European Social Survey	http://www.europeansocialsurvey.org/	1	0.0%	1	0.1%
FAMSF Fine Arts Museum of San Francisco	http://www.thinker.org/index.asp	1	0.0%	1	0.1%
Fabula	http://www.fabula.org/	1	0.0%	1	0.1%
Factiva	http://www.factiva.com/	1	0.0%	1	0.1%
Fannie Mae	http://www.fanniemae.com/index.jhtml	1	0.0%	1	0.1%
Fayum Project	http://fayum.arts.kuleuven.ac.be/	1	0.0%	1	0.1%
Federal Reserve Bank – Atlanta	http://www.frbatlanta.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Boston	http://www.bos.frb.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Chicago	http://www.chicagofed.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Cleveland	http://www.clevelandfed.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Dallas	http://www.dallasfed.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Kansas City	http://www.kansascityfed.org/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Federal Reserve Bank – Minneapolis	http://www.minneapolisfed.org/	1	0.0%	1	0.1%
Federal Reserve Bank – New York	http://www.newyorkfed.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Philadelphia	http://www.philadelphiafed.org/	1	0.0%	1	0.1%
Federal Reserve Bank – Richmond	http://www.rich.frb.org/	1	0.0%	1	0.1%
Federal Reserve Bank – San Francisco	http://www.frbsf.org/	1	0.0%	1	0.1%
Federal Reserve Bank – St. Louis	http://www.stlouisfed.org/	1	0.0%	1	0.1%
Financial Times	http://news.ft.com/home/us	1	0.0%	1	0.1%
Finfo (Finnish Information Site)	http://www.finfo.dk/	1	0.0%	1	0.1%
First Monday (online journal)	http://www.firstmonday.dk/	1	0.0%	1	0.1%
Flash Kit, a flash developer resource	http://www.flashkit.com/index.shtml	1	0.0%	1	0.1%
Foto Marburg	http://www.fotomarburg.de/index_e.htm	1	0.0%	1	0.1%
Foundation for the Advancement of Mesoamerican Studies, Inc.	http://www.famsi.org/	1	0.0%	1	0.1%
Fox	http://www.foxnews.com/	1	0.0%	1	0.1%
France's Institut National de l'Audiovisuel	http://www.ina.fr	1	0.0%	1	0.1%
French Colonial Archives		1	0.0%	1	0.1%
French in Action resource website	http://yalepress.yale.edu/yupbooks/FiA/FrenchinAction.html	1	0.0%	1	0.1%
GGRENir – Internetography on Renaissance Intellectual Histor	http://www.phil-hum-ren.uni-muenchen.de/GGRENirDB/	1	0.0%	1	0.1%
Galileo Project	http://galileo.rice.edu/	1	0.0%	1	0.1%
Gallica	http://gallica.bnf.fr/	1	0.0%	1	0.1%
General Social Survey (GSS) by National Opinion Research Cen	http://www.norc.uchicago.edu/projects/gensoc.asp	1	0.0%	1	0.1%
GeoCritica	http://www.ub.es/geocrit/menu.htm	1	0.0%	1	0.1%
Geography Departments Worldwide	http://univ.cc/geolinks/	1	0.0%	1	0.1%
George Eastman House	http://www.eastmanhouse.org/	1	0.0%	1	0.1%
German Propaganda Archive	http://www.calvin.edu/academic/cas/gpa/	1	0.0%	1	0.1%
Getty Images	http://www.gettyimages.com	1	0.0%	1	0.1%
Gilder Lehrman Institute of American History	http://www.gilderlehrman.org/	1	0.0%	1	0.1%
Glenbow Museum	http://www.glenbow.org/	1	0.0%	1	0.1%
Glowlab	http://glowlab.blogs.com/	1	0.0%	1	0.1%
Goethe Institute	http://www.goethe.de/enindex.htm	1	0.0%	1	0.1%
Goo (online Japanese dictionary)	http://dictionary.goo.ne.jp/	1	0.0%	1	0.1%
Government Printing Office	http://www.gpoaccess.gov/index.html	1	0.0%	1	0.1%
Government Resources	http://www.lib.umich.edu/govdocs/	1	0.0%	1	0.1%
Greek Grammar	http://perswww.kuleuven.ac.be/~u0013314/greekg.htm	1	0.0%	1	0.1%
Grizzard: Construction of UVA	http://etext.virginia.edu/jefferson/grizzard/	1	0.0%	1	0.1%
Hanover Historical Texts Project	http://history.hanover.edu/project.html	1	0.0%	1	0.1%
HarpWeek	http://www.harpweek.com/	1	0.0%	1	0.1%
Harry Ransom Humanities Research Center (HRC)	http://www.hrc.utexas.edu/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Hartman Center for Sales, Advertising and Marketing History	http://scriptorium.lib.duke.edu/hartman/	1	0.0%	1	0.1%
Harvey Goldberg Center	http://history.wisc.edu/Goldberg/Legacy.htm	1	0.0%	1	0.1%
Heidelberger Gesamtverzeichnis	http://www.rzuser.uni-heidelberg.de/~gv0/gvz.html	1	0.0%	1	0.1%
Historical Text Archive	http://historicaltextarchive.com/	1	0.0%	1	0.1%
History News Network	http://hnn.us/	1	0.0%	1	0.1%
History of Science Society	http://www.hssonline.org/	1	0.0%	1	0.1%
Hodge's Health Center – Care Domains – Model	http://www.p-jones.demon.co.uk/	1	0.0%	1	0.1%
Hoover's Online: The Business Information Authority	hoovers.com	1	0.0%	1	0.1%
Humbul Humanities Hub	http://www.humbul.ac.uk/	1	0.0%	1	0.1%
Huntington Archive (Buddhist art)	http://kaladarshan.arts.ohio-state.edu/	1	0.0%	1	0.1%
Hypertext Preprocessor	http://www.php.net/	1	0.0%	1	0.1%
IESBS (International Encyclopedia of the Social and Behavior		1	0.0%	1	0.1%
IMF International Monetary Fund	http://www.imf.org/	1	0.0%	1	0.1%
IPU Inter-Parliamentary Union	http://www.ipu.org/english/home.htm	1	0.0%	1	0.1%
ISTAT? Integrating Science Teaching and Technology	http://www.ucmp.berkeley.edu/IU/	1	0.0%	1	0.1%
Indiana Digital Images Collection		1	0.0%	1	0.1%
Indiana University Languages Online	http://languagelab.bh.indiana.edu/korean.html	1	0.0%	1	0.1%
Information Wissenschaft & Praxis	http://www.dgd.de/dgi/nfd/	1	0.0%	1	0.1%
Inner City Struggle	schoolsnotjails.com	1	0.0%	1	0.1%
Interactive Web Casting		1	0.0%	1	0.1%
International Bibliography of the Social Sciences (IBSS data		1	0.0%	1	0.1%
International Public Management Association for Human Resour	http://www.ipma-hr.org/	1	0.0%	1	0.1%
Internet Movie Database	http://www.imdb.com/	1	0.0%	1	0.1%
Internet Scout Project	http://scout.wisc.edu/	1	0.0%	1	0.1%
Islamicity – Islam and the Global Muslim eCommunity	http://www.islamicity.com/	1	0.0%	1	0.1%
Iter: Gateway to the Middle Ages and Rennaisance	http://www.itergateway.org/	1	0.0%	1	0.1%
Jack Lynch's Guide to Grammar and Style	http://andromeda.rutgers.edu/~jlynch/Writing/	1	0.0%	1	0.1%
Jane Goodall Institute	http://www.janegoodall.org/	1	0.0%	1	0.1%
Japanese Text Initiative	http://etext.lib.virginia.edu/japanese/	1	0.0%	1	0.1%
Jensen's Scholar's Guide to Humanities and Social Sciences	http://tigger.uic.edu/~rjensen/	1	0.0%	1	0.1%
Johannine Literature (Felix Just)	http://myweb.lmu.edu/fjust/John.htm	1	0.0%	1	0.1%
Kamusi Project (Swahili Dictionary)	www.yale.edu/swahili/home.html	1	0.0%	1	0.1%
Kenkyusha (online Japanese dictionary)	http://www.kenkyusha.co.jp/online-dic/on-dic1.html	1	0.0%	1	0.1%
Kinsey Institute Library	http://www.indiana.edu/~kinsey/library/library.html	1	0.0%	1	0.1%
Korean History: A Bibliography	http://www2.hawaii.edu/korea/bibliography/biblio.htm	1	0.0%	1	0.1%
Korean Studies at Sogang	http://korean.sogang.ac.kr/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Korean daily newspaper site 1	http://donga.com/	1	0.0%	1	0.1%
Korean daily newspaper site 2	http://www.chosun.com/	1	0.0%	1	0.1%
L'Annee philologique	http://www.annee-philologique.com/aph/	1	0.0%	1	0.1%
LDA Learning Disabilities Association	http://www.ldanatl.org/	1	0.0%	1	0.1%
LEO German English Dictionary	http://dict.leo.org/	1	0.0%	1	0.1%
LVR Mai-Tagung	www.mai-tagung.de	1	0.0%	1	0.1%
Le Monde (daily news)	http://www.lemonde.fr	1	0.0%	1	0.1%
Le Monde diplomatique (monthly newspaper)	http://www.monde-diplomatique.fr	1	0.0%	1	0.1%
Learn Spanish	http://www.studyspanish.com/	1	0.0%	1	0.1%
Legal Information Institute (LII)	http://www.law.cornell.edu/	1	0.0%	1	0.1%
Lenin Internet Archive	http://www.marxists.org/archive/lenin/	1	0.0%	1	0.1%
Leuven Database of Ancient Books	http://ldab.arts.kuleuven.ac.be/	1	0.0%	1	0.1%
Leuven Database of Papyrus Collections Worldwide	http://lhpc.arts.kuleuven.ac.be/collections/	1	0.0%	1	0.1%
Lexikon des Mittelalters	http://www.uni-tuebingen.de/ub/db/index.htm?http://silvanus.	1	0.0%	1	0.1%
Liberature, newspaper	http://www.liberation.fr	1	0.0%	1	0.1%
Lindesmith	http://library.soros.org/lindesmith.html	1	0.0%	1	0.1%
Living Landscapes	http://www.livinglandscapes.bc.ca/	1	0.0%	1	0.1%
Ljud och Bild (Sound and Image) Swedish government archive	http://www.ljudochbildarkivet.se	1	0.0%	1	0.1%
Lycos	http://www.lycos.com/	1	0.0%	1	0.1%
MACTiA	http://www.mactia.berkeley.edu/	1	0.0%	1	0.1%
MIT Open Course Ware	http://ocw.mit.edu/index.html	1	0.0%	1	0.1%
Macromedia	macromedia.com	1	0.0%	1	0.1%
Mannheim University Social Science Data Archive	http://www.mzes.uni-mannheim.de/frame.php?oben=titel_e.html&	1	0.0%	1	0.1%
MapInfo	http://www.mapinfo.com/	1	0.0%	1	0.1%
Mapquest	mapquest.com	1	0.0%	1	0.1%
Maryland Faculty Online	http://www.mdfaconline.org/	1	0.0%	1	0.1%
Masters of Photography	http://www.masters-of-photography.com/	1	0.0%	1	0.1%
McConnell/The Good Earth	http://www.mhhe.com/earthsci/geology/mcconnell/	1	0.0%	1	0.1%
Medical Humanities Resource Database	http://www.mhrd.ucl.ac.uk/	1	0.0%	1	0.1%
Medline database	http://medline.cos.com/	1	0.0%	1	0.1%
Mesolore	http://www.mesolore.com/home.htm	1	0.0%	1	0.1%
Microscopy Society of America	http://www.msa.microscopy.com/	1	0.0%	1	0.1%
Middle East Maps (Dartmouth)	http://www.dartmouth.edu/~gov46/	1	0.0%	1	0.1%
Ministere de la Culture	http://www.culture.gouv.fr/	1	0.0%	1	0.1%
Monash University Arts	http://www.arts.monash.edu.au/korean/	1	0.0%	1	0.1%
Mudcat Café	http://www.mudcat.org/alltitles.cfm	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Musee Nicephore Niepce	http://www.museeniepce.com/indexplorer.html	1	0.0%	1	0.1%
Museum national d'Histoire naturelle (Musee de l'Homme Paris	http://www.mnhn.fr/	1	0.0%	1	0.1%
Museum of Modern Art	http://www.moma.org/	1	0.0%	1	0.1%
NCSC – National Center for State Courts	http://www.ncsconline.org/	1	0.0%	1	0.1%
NGDC National Geophysical Data Center GLOBE	http://www.ngdc.noaa.gov/seg/topo/globe.shtml	1	0.0%	1	0.1%
NKCA Neighborhood Knowledge California	http://www.nkca.ucla.edu/	1	0.0%	1	0.1%
NOAA National Weather Service	http://www.nws.noaa.gov/	1	0.0%	1	0.1%
Nanzan Institute for Religion and Culture	http://www.ic.nanzan-u.ac.jp/SHUBUNKEN/	1	0.0%	1	0.1%
National Atlas of the USA	http://www.nationalatlas.gov/	1	0.0%	1	0.1%
National Bureau of Economic Research (NBER)	http://www.nber.org/	1	0.0%	1	0.1%
National Center for Digital Government (Harvard)	http://www.ksg.harvard.edu/digitalcenter/	1	0.0%	1	0.1%
National Data Buoy Center	http://www.ndbc.noaa.gov/	1	0.0%	1	0.1%
National Gallery of Art	http://www.nga.gov/	1	0.0%	1	0.1%
National Gallery of Australia (NGA)	http://www.nga.gov.au/Home/index.cfm	1	0.0%	1	0.1%
National Geographic Online	http://www.nationalgeographic.com/	1	0.0%	1	0.1%
National Library of Scotland	http://www.nls.uk/	1	0.0%	1	0.1%
National Portrait Gallery	http://www.npg.org.uk/live/index.asp	1	0.0%	1	0.1%
Nettime mailing lists	http://www.nettime.org/	1	0.0%	1	0.1%
New Advent Catholic Encyclopedia Online	http://www.newadvent.org/cathen/	1	0.0%	1	0.1%
New Deal Library	http://newdeal.feri.org/index.htm	1	0.0%	1	0.1%
New York Public Library's Picture Collection Online	http://digital.nypl.org/mmpco/	1	0.0%	1	0.1%
New York Review of Books	http://www.nybooks.com/	1	0.0%	1	0.1%
Newsbank	http://www.newsbank.com/	1	0.0%	1	0.1%
Nuts and Bolts of College Writing	http://nutsandbolts.washcoll.edu/	1	0.0%	1	0.1%
Office of Personnel Management	http://www.opm.gov/	1	0.0%	1	0.1%
OhioLINK	http://www.ohiolink.edu/	1	0.0%	1	0.1%
Online Medelian Inheritance in Man (OMIM)	http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=OMIM	1	0.0%	1	0.1%
Ontario Archives	http://www.archives.gov.on.ca/	1	0.0%	1	0.1%
Our Future, Our Past	http://www.ourfutureourpast.ca/	1	0.0%	1	0.1%
OurRoots/Nos Racines: The Canadian Digital Local Histories S	http://www.ourroots.ca/	1	0.0%	1	0.1%
Oxford Dictionary of National Biography	http://www.oup.com/oxforddnb/info/	1	0.0%	1	0.1%
Oxford Digital Library	http://www.odl.ox.ac.uk/	1	0.0%	1	0.1%
Oxford Text Archive	http://ota.ahds.ac.uk/	1	0.0%	1	0.1%
PAL: Perspectives in American Literature	http://www.csustan.edu/english/reuben/pal/TABLE.HTML	1	0.0%	1	0.1%
PASSIA (Palestinian Academic Society for the Study of Intern	www.passia.org	1	0.0%	1	0.1%
Patriagrande	http://www.patriagrande.net/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Peabody Museum	http://www.peabody.harvard.edu/	1	0.0%	1	0.1%
Pennsylvania Sumerian Dictionary	http://psd.museum.upenn.edu/	1	0.0%	1	0.1%
Phronesis: Ancient and Modern Philosophy	http://phronesis.org/	1	0.0%	1	0.1%
PhysicalGeography	http://www.physicalgeography.net/	1	0.0%	1	0.1%
PiCarta	http://picarta.pica.nl/	1	0.0%	1	0.1%
Picture History	http://www.picturehistory.com/	1	0.0%	1	0.1%
Poole's Index to Periodical Literature		1	0.0%	1	0.1%
Postcolonial and Postimperial Literature	http://www.postcolonialweb.org/	1	0.0%	1	0.1%
Precolumbian Art Research Institute	http://www.mesoweb.com/pari/	1	0.0%	1	0.1%
Premodern Japanese Studies (PMJS) archive and list	http://www.meijigakuin.ac.jp/~pmjs/	1	0.0%	1	0.1%
Prentice Hall Publisher	http://vig.prenhall.com/	1	0.0%	1	0.1%
Prentice Hall Publisher's companion website	http://www.prenhall.com/powell/	1	0.0%	1	0.1%
Primate Gallery	http://staff.washington.edu/timk/primate/main.html	1	0.0%	1	0.1%
Princeton Dante Project	http://etcweb.princeton.edu/dante/index.html	1	0.0%	1	0.1%
PubMed (two possible websites both are NIH related)	http://www.pubmedcentral.nih.gov/	1	0.0%	1	0.1%
Questia	http://www.questia.com/	1	0.0%	1	0.1%
RFE/RL (Radio Free Europe/Radio Liberty)	http://www.rferl.org/	1	0.0%	1	0.1%
RLG Cultural Materials	http://www.rlg.org/	1	0.0%	1	0.1%
RaceSci: History of Race in Science	http://www.racesci.org/	1	0.0%	1	0.1%
Radio France internationale (radio website)	http://www.rfi.fr	1	0.0%	1	0.1%
Refworks	http://refworks.com/	1	0.0%	1	0.1%
Religious Liberty Archive	http://www.churchstatelaw.com/	1	0.0%	1	0.1%
Resources for Earth Science and Geography Instruction	http://webs.cmich.edu/resgi/	1	0.0%	1	0.1%
Roper Center for Public Opinion Research	http://www.ropercenter.uconn.edu/	1	0.0%	1	0.1%
Runme	http://runme.org/	1	0.0%	1	0.1%
Rutgers	http://www.rutgers.edu/	1	0.0%	1	0.1%
SAH (Society of Architectural Historians): Image Exchange	http://www.sah.org/index.php?module=ContentExpress&func=disp	1	0.0%	1	0.1%
SF Museum of Modern Art	http://www.sfmoma.org/	1	0.0%	1	0.1%
SIRS School Improvement Research Series	http://www.nwrel.org/scpd/sirs/	1	0.0%	1	0.1%
Salon.com	salon.com	1	0.0%	1	0.1%
San Jose State's Image Repository	http://worldart.sjsu.edu/	1	0.0%	1	0.1%
Saskia Ltd	http://www.saskia.com	1	0.0%	1	0.1%
ScienceDirect	http://www.sciencedirect.com/	1	0.0%	1	0.1%
Senate Historical Office	http://www.senate.gov/artandhistory/history/common/generic/S	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Shakespeare Sources	http://www.shakespeare-w.com/english/shakespeare/source.html	1	0.0%	1	0.1%
Shifting Baselines	http://www.shiftingbaselines.org/index.php	1	0.0%	1	0.1%
Slavery Images – University of Virginia (UVA)	http://hitchcock.itc.virginia.edu/Slavery/	1	0.0%	1	0.1%
Social Science Research Network (SSRN)	http://www.ssrn.com/	1	0.0%	1	0.1%
Societe Francaise de Photographie	http://www.sfp.photographie.com/	1	0.0%	1	0.1%
Society for Medical Anthropology	http://medanthro.net/	1	0.0%	1	0.1%
Sor Juana Inez de la Cruz Project	http://www.dartmouth.edu/~sorjuana/	1	0.0%	1	0.1%
Southern California Swell Model	http://cdip.ucsd.edu/	1	0.0%	1	0.1%
Stanford Encyclopedia of Philosophy	http://plato.stanford.edu	1	0.0%	1	0.1%
Stanford University Jguide	http://jguide.stanford.edu/	1	0.0%	1	0.1%
State Library – South Australiana (Mortlock Library)	http://www.catalog.slsa.sa.gov.au:1084/screens/opacmenu.html	1	0.0%	1	0.1%
Stateline.org	http://www.stateline.org/stateline/	1	0.0%	1	0.1%
Storytellers: Native American Authors Online	http://www.hanksville.org/storytellers/	1	0.0%	1	0.1%
Strindberg Museum	http://www.strindbergsmuseet.se/index_eng.html	1	0.0%	1	0.1%
TBRC – Tibetan Buddhist Resource Center	http://www.tbrc.org/	1	0.0%	1	0.1%
TEAMS Middle English Text	http://www.teamsmedieval.org/texts/	1	0.0%	1	0.1%
Talk Origins	http://www.talkorigins.org/	1	0.0%	1	0.1%
Tate Museum	http://www.tate.org.uk/home/default.htm	1	0.0%	1	0.1%
Teaching Tolerance	http://www.tolerance.org/	1	0.0%	1	0.1%
Tekom	www.tekom.de	1	0.0%	1	0.1%
Tennessee Bob's Famous French Links	http://www.utm.edu/departments/french/french.html	1	0.0%	1	0.1%
TerraServer	http://terraserver-usa.com/	1	0.0%	1	0.1%
The Black Elk Speaks	http://www.blackelkspeaks.unl.edu/	1	0.0%	1	0.1%
The British Museum	http://www.thebritishmuseum.ac.uk/	1	0.0%	1	0.1%
The Brookings Institution	http://www.brookings.edu/	1	0.0%	1	0.1%
The Century Foundation	http://www.tcf.org/	1	0.0%	1	0.1%
The Daguerreotype: the Daugerreian Society	http://www.daguerre.org/	1	0.0%	1	0.1%
The Decameron Web	http://www.brown.edu/Departments/Italian_Studies/dweb/dweb.s	1	0.0%	1	0.1%
The Economist	http://www.economist.com/	1	0.0%	1	0.1%
The Forest History Society Databases	http://www.lib.duke.edu/forest/Research/databases.html	1	0.0%	1	0.1%
The Founders' Constitution	http://press-pubs.uchicago.edu/founders/	1	0.0%	1	0.1%
The Hermitage Museum		1	0.0%	1	0.1%
The Kanji Site	http://www.kanjisite.com/	1	0.0%	1	0.1%
The Medieval Review (TMR)	http://www.hti.umich.edu/t/tmr/	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
The National Gallery, London	http://www.nationalgallery.org.uk/	1	0.0%	1	0.1%
The Old Bailey Online	http://www.oldbaileyonline.org/	1	0.0%	1	0.1%
The Online Books Page	http://digital.library.upenn.edu/books/	1	0.0%	1	0.1%
The Oriental Institute	http://oi.uchicago.edu/OI/default.html	1	0.0%	1	0.1%
The Philosophy Pages/Die Philosophie-Seiten	http://www.philo.de/Philosophie-Seiten/	1	0.0%	1	0.1%
The Society for Political Methodology	http://polmeth.wustl.edu/	1	0.0%	1	0.1%
The Teaching Resources Center Online Writing Project	http://cai.ucdavis.edu/trc/trcdefault.html	1	0.0%	1	0.1%
The Urban Institute	http://www.urban.org/	1	0.0%	1	0.1%
The World and I	http://www.worldandi.com/	1	0.0%	1	0.1%
The Writings of Charles Darwin	http://pages.britishlibrary.net/charles.darwin/	1	0.0%	1	0.1%
Thursby's Religious Studies at University of Florida	http://www.clas.ufl.edu/users/gthursby/rel/	1	0.0%	1	0.1%
Topozone	http://topozone.com/	1	0.0%	1	0.1%
Transcendentalists	http://www.transcendentalists.com/	1	0.0%	1	0.1%
Typography.com	http://typography.com/	1	0.0%	1	0.1%
U.S. Holocaust Memorial Museum	http://www.ushmm.org/	1	0.0%	1	0.1%
UC Davis' History Project	http://historyproject.ucdavis.edu/	1	0.0%	1	0.1%
UC History Digital Archive	http://sunsite.berkeley.edu/uchistory/	1	0.0%	1	0.1%
UC Writing Institute	http://ucwrite.org/	1	0.0%	1	0.1%
UCSB Hull Digital Image Library (HDIL)	http://www.womst.ucsb.edu/projects/hull/	1	0.0%	1	0.1%
US Coast Guard Lighthouses	http://www.uscg.mil/hq/g-cp/history/h_lhindex.html	1	0.0%	1	0.1%
US Department of Energy	http://www.energy.gov/engine/content.do	1	0.0%	1	0.1%
US Department of Labor	http://www.dol.gov/	1	0.0%	1	0.1%
US Diplomatic Mission to Germany	http://www.usembassy.de/usa/garelations4555.htm	1	0.0%	1	0.1%
US Supreme Court	http://www.supremecourtus.gov/	1	0.0%	1	0.1%
Uncle Tom's cabin and American Culture	http://www.iath.virginia.edu/utc/	1	0.0%	1	0.1%
United Nations (UN)	http://www.un.org/	1	0.0%	1	0.1%
University of California Berkeley library German collections		1	0.0%	1	0.1%
University of California eScholarship press	http://ark.cdlib.org/ark:/13030/ft038n99hg/	1	0.0%	1	0.1%
University of Edinburgh Walter Scott archive	http://www.walterscott.lib.ed.ac.uk/	1	0.0%	1	0.1%
University of Kansas' primary documents page		1	0.0%	1	0.1%
University of Toronto archives	http://www.library.utoronto.ca/utarms/	1	0.0%	1	0.1%
VERA – Virtual Electronic Resource Access	http://river.mit.edu/mitlibweb/FMPro?-db=RS_Items.fp5&-Lay=w	1	0.0%	1	0.1%
Vanderbilt Television Archives	http://tvnews.vanderbilt.edu/	1	0.0%	1	0.1%
Vincent Ferraro's International Relations and Foreign Policy	http://www.mtholyoke.edu/acad/intrel/feros-pg.htm	1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
Virtual Courseware	http://vcourseware5.calstatela.edu/	1	0.0%	1	0.1%
Virtual Data Center	http://thedata.org/	1	0.0%	1	0.1%
Virtual Jamestown	http://www.virtualjamestown.org/	1	0.0%	1	0.1%
Virtual Salt	http://virtualsalt.com/	1	0.0%	1	0.1%
Virtual Vaudeville	http://www.virtualvaudeville.com/	1	0.0%	1	0.1%
Visual Sourcebook for Chinese Civilization	http://depts.washington.edu/chinaciv/	1	0.0%	1	0.1%
Visual Thesaurus	http://www.visualthesaurus.com/	1	0.0%	1	0.1%
Vroma: A Virtual Community for Teaching and Learning Classic	http://www.vroma.org/	1	0.0%	1	0.1%
Washington Monthly	http://www.washingtonmonthly.com/	1	0.0%	1	0.1%
Washington State University's online history course		1	0.0%	1	0.1%
Web Archaeology – Levi Jordan Plantation	http://www.webarchaeology.com	1	0.0%	1	0.1%
Web Gallery of Art	http://www.wga.hu/index.html	1	0.0%	1	0.1%
Webref (reference site)	http://webref.org/	1	0.0%	1	0.1%
Westlaw	http://web2.westlaw.com/	1	0.0%	1	0.1%
Whitney Museum	http://www.whitney.org/	1	0.0%	1	0.1%
Willkommen bei Sammelpunkt. Elektronisch archivierte Theorie	http://sammelpunkt.philo.at:8080/	1	0.0%	1	0.1%
Witcombe's art history materials on the Sweet Briar College	http://witcombe.sbc.edu/ARTHLinks.html	1	0.0%	1	0.1%
Women's Budget Groups	http://www.wbg.org.uk/	1	0.0%	1	0.1%
World Health Organization	http://www.who.int/en/	1	0.0%	1	0.1%
World History Center	http://www.whc.neu.edu/	1	0.0%	1	0.1%
World History Center – migration	http://www.whc.neu.edu/	1	0.0%	1	0.1%
World History Connected	http://worldhistoryconnected.press.uiuc.edu/	1	0.0%	1	0.1%
World War II Poster Collection (Northwestern University)	http://www.library.northwestern.edu/govpub/collections/wwii-	1	0.0%	1	0.1%
World of Stereoviews: US States	http://www.worldofstereoviews.com/USstatespage1.htm	1	0.0%	1	0.1%
Worlds of Difference	http://homelands.org/worlds/	1	0.0%	1	0.1%
Wright American Fiction	http://www.letrs.indiana.edu/web/w/wright2/	1	0.0%	1	0.1%
Zogby (poll)	http://www.zogby.com/	1	0.0%	1	0.1%
academic websites on writing/pedagogy		1	0.0%	1	0.1%
an online syllabus	http://www.swarthmore.edu/Humanities/kjohnso1/pictures/paint	1	0.0%	1	0.1%
chat rooms		1	0.0%	1	0.1%
collocation/corpus/concordancing programs		1	0.0%	1	0.1%
database – ABI/Inform (business database)		1	0.0%	1	0.1%
database – American Periodical Series		1	0.0%	1	0.1%
database – BIOSIS		1	0.0%	1	0.1%
database – Chuyus		1	0.0%	1	0.1%
database – Dialog		1	0.0%	1	0.1%
database – Dialog – Philosopher's Index		1	0.0%	1	0.1%
database – Die Deutsche Bibliothek Database	http://dbf-opac.ddb.de/	1	0.0%	1	0.1%

Response (site name or description)	URL	# respon-ses	% respon-ses	# people	% people
database – Dissertation Abstracts international		1	0.0%	1	0.1%
database – GALE databases		1	0.0%	1	0.1%
database – History of science, technology, and medicine		1	0.0%	1	0.1%
database – Humanities Databases		1	0.0%	1	0.1%
database – KV 55 Database (egyptology?)		1	0.0%	1	0.1%
database – OCLC ArticleFirst		1	0.0%	1	0.1%
database – STN		1	0.0%	1	0.1%
database – UC Davis historical images	http://historyproject.ucdavis.edu/imageapp.php	1	0.0%	1	0.1%
database – anthropology		1	0.0%	1	0.1%
database – historical images		1	0.0%	1	0.1%
database – languages		1	0.0%	1	0.1%
database – literature		1	0.0%	1	0.1%
database – periodical		1	0.0%	1	0.1%
database – political science ressearch		1	0.0%	1	0.1%
database – speech archives		1	0.0%	1	0.1%
database – university		1	0.0%	1	0.1%
dictionaries – Chinese – English		1	0.0%	1	0.1%
digitized collections of painting, sculpture and installatio		1	0.0%	1	0.1%
digitized images from departmental slide library		1	0.0%	1	0.1%
images – Departmental digital image collection for history c		1	0.0%	1	0.1%
images – digital image libraries		1	0.0%	1	0.1%
images – online galleries		1	0.0%	1	0.1%
images – online galleries for Nazism/Holocaust		1	0.0%	1	0.1%
images – university's digital image library		1	0.0%	1	0.1%
lapl.org is LA public library site	lapl.edu	1	0.0%	1	0.1%
libraries – Huntington Library Online		1	0.0%	1	0.1%
libraries – Kansas University (KU)	http://www.lib.ku.edu/	1	0.0%	1	0.1%
libraries – UCB Pathfinder	http://sunsite5.berkeley.edu:8000/	1	0.0%	1	0.1%
libraries – UCSB Alexandria Digital Library		1	0.0%	1	0.1%
libraries – UCSD Library Catalogue (Roger)		1	0.0%	1	0.1%
libraries – UCSD Library Catalogue (SAGE)		1	0.0%	1	0.1%
libraries – University of Aberdeen Library (Scotland)		1	0.0%	1	0.1%
libraries – archived collections		1	0.0%	1	0.1%
libraries – audio/digital sound libraries		1	0.0%	1	0.1%
libraries – library reference collections		1	0.0%	1	0.1%
libraries – websites of national libraries		1	0.0%	1	0.1%
list – ANE		1	0.0%	1	0.1%
list – FLTEACH		1	0.0%	1	0.1%
list – H-Afro-Am		1	0.0%	1	0.1%
list – H-AmInd (American Indian)		1	0.0%	1	0.1%
list – H-Environment	http://www.h-net.org/~environ/	1	0.0%	1	0.1%
list – H-German		1	0.0%	1	0.1%
list – H-Polmeth		1	0.0%	1	0.1%
list – H-Rhetor		1	0.0%	1	0.1%
list – H-Teach		1	0.0%	1	0.1%
list – H-World		1	0.0%	1	0.1%
list – Queatre (Quebec Theatre discussion)		1	0.0%	1	0.1%
list – VICTORIA and its archives	https://listserv.indiana.edu/archives/victoria.html	1	0.0%	1	0.1%
list – WMST-L (Women's Studies Email list)		1	0.0%	1	0.1%
list – WPA		1	0.0%	1	0.1%
list – archived lists		1	0.0%	1	0.1%
list- H-Film		1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
list- H-Urban		1	0.0%	1	0.1%
my own audio		1	0.0%	1	0.1%
my own blog – kim	http://professorkim.blogspot.com/	1	0.0%	1	0.1%
my own department's Writing Center website		1	0.0%	1	0.1%
my own digitized map collection		1	0.0%	1	0.1%
my own primary achaeological data		1	0.0%	1	0.1%
my own simulations		1	0.0%	1	0.1%
my own website – EdIndex	http://www.pitt.edu/~poole/edmenu.html	1	0.0%	1	0.1%
myUCDavis portal	http://my.ucdavis.edu/	1	0.0%	1	0.1%
news – historical newspapers online		1	0.0%	1	0.1%
news online – Arabic		1	0.0%	1	0.1%
news online – Indonesia		1	0.0%	1	0.1%
news online – Italian		1	0.0%	1	0.1%
news online – South Asia		1	0.0%	1	0.1%
news online – international		1	0.0%	1	0.1%
news online – scientific news		1	0.0%	1	0.1%
oVID/ cinovid	http://cinovid.org/	1	0.0%	1	0.1%
online – collections of Buddhist sutras		1	0.0%	1	0.1%
online – collections of historical documents		1	0.0%	1	0.1%
online Russian magazines		1	0.0%	1	0.1%
online bibliographies – for art history		1	0.0%	1	0.1%
online books		1	0.0%	1	0.1%
online collections – Victorian British Collections		1	0.0%	1	0.1%
online collections of German medieval manuscripts		1	0.0%	1	0.1%
online collections of images for Latin America		1	0.0%	1	0.1%
online companion to Oxford Anthology of American Poetry		1	0.0%	1	0.1%
online data – from Population Research Board		1	0.0%	1	0.1%
online data – from child welfare websites		1	0.0%	1	0.1%
online dictionaries – Buddhist		1	0.0%	1	0.1%
online dictionaries – Michaelis (Portuguese)		1	0.0%	1	0.1%
online discussion groups – Anglo Saxon		1	0.0%	1	0.1%
online game communities and subcultures		1	0.0%	1	0.1%
online guides – "how to"		1	0.0%	1	0.1%
online index – Hispanic american periodicals index		1	0.0%	1	0.1%
online journals – American Psychology Association (APA) jour		1	0.0%	1	0.1%
online journals – biological sciences		1	0.0%	1	0.1%
online language dictionary from another university		1	0.0%	1	0.1%
online magazines		1	0.0%	1	0.1%
online portals – for news		1	0.0%	1	0.1%
online portals – for non-profits		1	0.0%	1	0.1%
online resources – for books		1	0.0%	1	0.1%
online resources – government statistical resources		1	0.0%	1	0.1%
online resources – historical info		1	0.0%	1	0.1%
online resources – oral histories		1	0.0%	1	0.1%
online simulations		1	0.0%	1	0.1%
online social science abstracts		1	0.0%	1	0.1%
online thesaurus		1	0.0%	1	0.1%
personal collection – a colleague's digital video		1	0.0%	1	0.1%
search engines – Japanese		1	0.0%	1	0.1%
streaming video		1	0.0%	1	0.1%
student guides on critical thinking and web use		1	0.0%	1	0.1%
textbases- text archives		1	0.0%	1	0.1%
the White House	http://www.whitehouse.gov/	1	0.0%	1	0.1%
university art museum websites		1	0.0%	1	0.1%

Response (site name or description)	URL	# respon-ses	% respon-ses	# people	% people
usgvt.edu	usgvt.edu	1	0.0%	1	0.1%
website for Amelia Statistical Software	http://gking.harvard.edu/stats.shtml/#amelia	1	0.0%	1	0.1%
websites – biblical commentary		1	0.0%	1	0.1%
websites – African		1	0.0%	1	0.1%
websites – African Diaspora Art		1	0.0%	1	0.1%
websites – Dead Sea Scrolls		1	0.0%	1	0.1%
websites – Foreign Affairs department of East Asian states(K		1	0.0%	1	0.1%
websites – French		1	0.0%	1	0.1%
websites – German TV		1	0.0%	1	0.1%
websites – German radio		1	0.0%	1	0.1%
websites – Gothic architecture		1	0.0%	1	0.1%
websites – Holy Grail		1	0.0%	1	0.1%
websites – Japanese		1	0.0%	1	0.1%
websites – Korean		1	0.0%	1	0.1%
websites – Kyoto and Tokyo National Museums		1	0.0%	1	0.1%
websites – Mary Magdalen		1	0.0%	1	0.1%
websites – Michigan State's sites on Africa		1	0.0%	1	0.1%
websites – Paris Faculty of Medicine		1	0.0%	1	0.1%
websites – Renaissance Art		1	0.0%	1	0.1%
websites – Shakespeare		1	0.0%	1	0.1%
websites – South African resistance in art		1	0.0%	1	0.1%
websites – Spanish		1	0.0%	1	0.1%
websites – Templars		1	0.0%	1	0.1%
websites – Turner's paintings		1	0.0%	1	0.1%
websites – U.S. executive branch agencies		1	0.0%	1	0.1%
websites – US/Canadian universities on teaching Indonesian		1	0.0%	1	0.1%
websites – World War I		1	0.0%	1	0.1%
websites – about travel		1	0.0%	1	0.1%
websites – academic		1	0.0%	1	0.1%
websites – accessibility sites (508 compliance)		1	0.0%	1	0.1%
websites – activists		1	0.0%	1	0.1%
websites – advocacy and policy		1	0.0%	1	0.1%
websites – art – images – Chicano art		1	0.0%	1	0.1%
websites – artwork – religious artwork		1	0.0%	1	0.1%
websites – biographies of women		1	0.0%	1	0.1%
websites – coins		1	0.0%	1	0.1%
websites – comedia		1	0.0%	1	0.1%
websites – commercial websites related to course materials		1	0.0%	1	0.1%
websites – conspiracy theories generally		1	0.0%	1	0.1%
websites – designers/ design agencies		1	0.0%	1	0.1%
websites – drama		1	0.0%	1	0.1%
websites – electronic text centers		1	0.0%	1	0.1%
websites – for Western Civilization textbooks		1	0.0%	1	0.1%
websites – government – US law		1	0.0%	1	0.1%
websites – historical images		1	0.0%	1	0.1%
websites – index to traditional sources (books and articles)		1	0.0%	1	0.1%
websites – legal history		1	0.0%	1	0.1%
websites – links Camino de Santiago		1	0.0%	1	0.1%
websites – links US Mexico Border		1	0.0%	1	0.1%
websites – links on other people's/ organization's sites		1	0.0%	1	0.1%
websites – links to Society of American Poets		1	0.0%	1	0.1%
websites – local government site		1	0.0%	1	0.1%
websites – maintained by the Society of Shin Buddhism (in Ja		1	0.0%	1	0.1%
websites – major university site for Chicano/Latino studies		1	0.0%	1	0.1%
websites – of Spanish textbooks		1	0.0%	1	0.1%

Response (site name or description)	URL	# responses	% responses	# people	% people
websites – of current organizations compiling data on voting		1	0.0%	1	0.1%
websites – of departments		1	0.0%	1	0.1%
websites – of laboratories		1	0.0%	1	0.1%
websites – of organizations		1	0.0%	1	0.1%
websites – of researchers		1	0.0%	1	0.1%
websites – official EU websites		1	0.0%	1	0.1%
websites – on house and senate		1	0.0%	1	0.1%
websites – on legal codes		1	0.0%	1	0.1%
websites – online translations of classical texts		1	0.0%	1	0.1%
websites – personal webpages		1	0.0%	1	0.1%
websites – personal, non-commercial on Indonesian short stor		1	0.0%	1	0.1%
websites – political economy		1	0.0%	1	0.1%
websites – presentation of visual material		1	0.0%	1	0.1%
websites – public broadcasting		1	0.0%	1	0.1%
websites – public interest		1	0.0%	1	0.1%
websites – related to radios		1	0.0%	1	0.1%
websites – resisting Vietnam		1	0.0%	1	0.1%
websites – site that is a list of other sites (portal)		1	0.0%	1	0.1%
websites – state government		1	0.0%	1	0.1%
websites – state parks		1	0.0%	1	0.1%
websites – that provide cultural or linguistic realia and in		1	0.0%	1	0.1%
websites – university-based Anthropology		1	0.0%	1	0.1%
websites – university-based Humanities		1	0.0%	1	0.1%

Appendix J: Faculty Survey Breakdown: Digital Resource Use in the Community College System

Among the community colleges, it is possible to break down the results by the size of the institution and the population density of the community college district (urban, suburban, or rural). Because the Ns of each group are relatively small, we should interpret with caution. Note that all three sizes of community college (large, medium and small) occur in all three geographic regions (rural, suburban, and urban). (See Tables H.5 and H.6 in Appendix H.)

Overall, instructors at both rural and suburban schools use more digital resources than those at urban schools. Suburban instructors are more enthusiastic about digital resources, and seem to be involved in more technologically advanced applications; for example, they are twice as likely as rural or urban faculty to use materials in the context of online lectures or online discussions. In general, suburban instructors experience the fewest barriers to digital resource use. Suburban instructors have the best access to classroom technology, servers, and scanners, and the best access to computers and high-speed connections for both themselves and their students. Suburban instructors also need less support for almost all tasks. It appears that suburban community colleges provide the best technical infrastructure and support to their teachers and students, and perhaps attract instructors who are more skilled and adept at using online materials.

Rural institutions are also heavy users of digital resources. Rural instructors are the most likely to be motivated to use digital resources to gain access to materials that would otherwise be unavailable at their school. They also believe that digital resources improve their students' learning, by providing access to primary sources, helping teach information literacy, and providing examples of good and bad scholarship.

Urban instructors are particularly concerned about their students' preparation and skills—the students' lack of access to computers and Internet connections, but also the students' inability to assess the credibility of online resources and their tendency to copy or plagiarize from online sources. Urban instructors need support with a broad range of activities—both technical activities, such as setting up the technical infrastructure, and intellectual, content-based activities, such as finding and organizing digital materials and assessing their credibility and appropriateness for teaching. Access to equipment is an issue in rural California, as well. As one instructor said, "At the community college level in rural California, there are just not enough computers."

Within each geographic category, larger institutions tend to be lighter digital resource users. Larger schools are the most likely to have problems with access to technology, including classroom technology, scanners, and computers for both students and instructors. Instructors at larger institutions also express a greater need for support, particularly with technical needs. Perhaps resources and support may be spread quite thin at the larger community colleges.

Appendix K: Cluster Descriptions

Table K.1: Cluster descriptions, part 1

	Institution	Position	Disciplines	Type of course	Age	Gender	Education	Total Use	Enthusiasm
All N=608	63% UC 12% LAC 24% CC	66% tenure-track 33% non-tenure-track 79% full time 21% part time	27% English/literature 12% Foreign languages 12% Art/architecture 12% History 11% Political science 9% Anthro/archaeo 4% Writing 3% Ethnic/gender/cultural 3% Geography 2% Media/communication	57% Seminar 14% Lab 43% Small lecture 52% Medium lecture 31% Large lecture 22% Very large lecture 5% Online course 21% Hybrid course 87%Traditional course	49.2 ± 10.5	48% Male 52% Female	2% AA/BA 25% Master's 72% Ph.D.	33.6 ± 14.4	5. ± 1.6
Cluster 1 N=60	70% UC 13% LAC 15% CC	73% tenure-track 25% non-tenure-track 79% full time 21% part time	42% English/literature 5% Foreign languages 5% Art/architecture 7% History 17% Political science 8% Anthro/archaeo 3% Writing 2% Ethnic/gender/cultural 2% Geography 2% Media/communication	70% Seminar 3% Lab 32% Small lecture 45% Medium lecture 42% Large lecture 23% Very large lecture 2% Online course 3% Hybrid course 97%Traditional course	53.8 ± 10.1	67% Male 33% Female	3% AA/BA 13% Master's 83% Ph.D.	14.4 ± 7.6	2.3 ± 1.1
Cluster 2 N=106	51% UC 11% LAC 37% CC	60% tenure-track 39% non-tenure-track 78% full time 22% part time	42% English/literature 11% Foreign languages 5% Art/architecture 10% History 9% Political science 4% Anthro/archaeo 5% Writing 8% Ethnic/gender/cultural 1% Geography 1% Media/communication	45% Seminar 11% Lab 42% Small lecture 53% Medium lecture 25% Large lecture 14% Very large lecture 2% Online course 6% Hybrid course 92%Traditional course	50.7 ± 10.3	42% Male 58% Female	1% AA/BA 38% Master's 61% Ph.D.	27.7 ± 9.2	4.1 ± 1.3

	Institution	Position	Disciplines	Type of course	Age	Gender	Education	Total Use	Enthusiasm
All N=608	63% UC 12% LAC 24% CC	66% tenure-track 33% non-tenure-track 79% full time 21% part time	27% English/literature 12% Foreign languages 12% Art/architecture 12% History 11% Political science 9% Anthro/archaeo 4% Writing 3% Ethnic/gender/cultural 3% Geography 2% Media/communication	57% Seminar 14% Lab 43% Small lecture 52% Medium lecture 31% Large lecture 22% Very large lecture 5% Online course 21% Hybrid course 87%Traditional course	49.2 ± 10.5	48% Male 52% Female	2% AA/BA 25% Master's 72% Ph.D.	33.6 ± 14.4	5. ± 1.6
Cluster 3a N=48	69% UC 27% LAC 4 ± 20% CC	65% tenure-track 31% non-tenure-track 81% full time 19% part time	35% English/literature 13% Foreign languages 6% Art/architecture 6% History 23% Political science 4% Anthro/archaeo 4% Writing 0% Ethnic/gender/cultural 0% Geography 2% Media/communication	71% Seminar 2% Lab 50% Small lecture 60% Medium lecture 23% Large lecture 15% Very large lecture 4% Online course 17% Hybrid course 83%Traditional course	46.9 ± 10.2	52% Male 48% Female	0% AA/BA 13% Master's 88% Ph.D.	23.4 ± 8	4.8 ± 1.3
Cluster 3b N=95	72% UC 9% LAC 19%CC	67% tenure-track 32% non-tenure-track 76% full time 24% part time	23% English/literature 13% Foreign languages 21% Art/architecture 11% History 3% Political science 13% Anthro/archaeo 3% Writing 2% Ethnic/gender/cultural 2% Geography 1% Media/communication	69% Seminar 13% Lab 48% Small lecture 48% Medium lecture 40% Large lecture 23% Very large lecture 1% Online course 14% Hybrid course 96%Traditional course	48.4 ± 9.6	34% Male 66% Female	0% AA/BA 25% Master's 74% Ph.D.	30.5 ± 9.3	5.1 ± 1.1
Cluster 3c N=63	81% UC 10% LAC 10%CC	81% tenure-track 19% non-tenure-track 90% full time 10% part time	27% English/literature 13% Foreign languages 5% Art/architecture 19% History 16% Political science 6% Anthro/archaeo 0% Writing 5% Ethnic/gender/cultural 5% Geography 0% Media/communication	63% Seminar 5% Lab 41% Small lecture 57% Medium lecture 32% Large lecture 32% Very large lecture 0% Online course 25% Hybrid course 83%Traditional course	49.6 ± 10.8	66% Male 34% Female	0% AA/BA 10% Master's 90% Ph.D.	34.5 ± 10.9	5.4 ± 1.2

	Institution	Position	Disciplines	Type of course	Age	Gender	Education	Total Use	Enthusiasm
All N=608	63% UC 12% LAC 24% CC	66% tenure-track 33% non-tenure-track 79% full time 21% part time	27% English/literature 12% Foreign languages 12% Art/architecture 12% History 11% Political science 9% Anthro/archaeo 4% Writing 3% Ethnic/gender/cultural 3% Geography 2% Media/communication	57% Seminar 14% Lab 43% Small lecture 52% Medium lecture 31% Large lecture 22% Very large lecture 5% Online course 21% Hybrid course 87%Traditional course	49.2 ± 10.5	48% Male 52% Female	2% AA/BA 25% Master's 72% Ph.D.	33.6 ± 14.4	5. ± 1.6
Cluster 4a N=62	76% UC 8% LAC 15%CC	79% tenure-track 18% non-tenure-track 87% full time 13% part time	18% English/literature 5% Foreign languages 6% Art/architecture 29% History 10% Political science 16% Anthro/archaeo 0% Writing 5% Ethnic/gender/cultural 5% Geography 2% Media/communication	69% Seminar 10% Lab 40% Small lecture 55% Medium lecture 34% Large lecture 45% Very large lecture 0% Online course 10% Hybrid course 95%Traditional course	47.9 ± 9.5	60% Male 40% Female	2% AA/BA 13% Master's 85% Ph.D.	37.6 ± 11.2	6. ± 1.2
Cluster 4b N=36	56% UC 8% LAC 31% CC	53% tenure-track 44% non-tenure-track 60% full time 40% part time	25% English/literature 14% Foreign languages 14% Art/architecture 6% History 14% Political science 11% Anthro/archaeo 6% Writing 0% Ethnic/gender/cultural 3% Geography 3% Media/communication	39% Seminar 22% Lab 39% Small lecture 42% Medium lecture 19% Large lecture 14% Very large lecture 3% Online course 17% Hybrid course 86%Traditional course	46.8 ± 12.3	36% Male 64% Female	17% AA/BA 28% Master's 56% Ph.D.	42.3 ± 10.1	5.8 ± 1.
Cluster 4c N=68	62% UC 18% LAC 19% CC	66% tenure-track 34% non-tenure-track 81% full time 19% part time	10% English/literature 21% Foreign languages 26% Art/architecture 7% History 9% Political science 9% Anthro/archaeo 1% Writing 4% Ethnic/gender/cultural 6% Geography 0% Media/communication	53% Seminar 35% Lab 44% Small lecture 51% Medium lecture 37% Large lecture 25% Very large lecture 0% Online course 50% Hybrid course 69%Traditional course	48.5 ± 9.7	51% Male 49% Female	4% AA/BA 32% Master's 62% Ph.D.	48.6 ± 11.1	6.3 ± 1

	Institution	Position	Disciplines	Type of course	Age	Gender	Education	Total Use	Enthusiasm
All N=608	63% UC 12% LAC 24% CC	66% tenure-track 33% non-tenure-track 79% full time 21% part time	27% English/literature 12% Foreign languages 12% Art/architecture 12% History 11% Political science 9% Anthro/archaeo 4% Writing 3% Ethnic/gender/cultural 3% Geography 2% Media/communication	57% Seminar 14% Lab 43% Small lecture 52% Medium lecture 31% Large lecture 22% Very large lecture 5% Online course 21% Hybrid course 87%Traditional course	49.2 ± 10.5	48% Male 52% Female	2% AA/BA 25% Master's 72% Ph.D.	33.6 ± 14.4	5. ± 1.6
Cluster 5a N=48	46% UC 8% LAC 46% CC	44% tenure-track 54% non-tenure-track 77% full time 23% part time	19% English/literature 13% Foreign languages 8% Art/architecture 6% History 13% Political science 13% Anthro/archaeo 13% Writing 2% Ethnic/gender/cultural 0% Geography 6% Media/communication	42% Seminar 27% Lab 54% Small lecture 52% Medium lecture 17% Large lecture 10% Very large lecture 13% Online course 52% Hybrid course 67%Traditional course	47.5 ± 10.7	21% Male 79% Female	2% AA/BA 35% Master's 63% Ph.D.	41.4 ± 10.1	5.7 ± 1.3
Cluster 5b N=22	14% UC 5% LAC 73%CC	55% tenure-track 41% non-tenure-track 77% full time 23% part time	14% English/literature 5% Foreign languages 23% Art/architecture 18% History 5% Political science 5% Anthro/archaeo 5% Writing 0% Ethnic/gender/cultural 9% Geography 5% Media/communication	27% Seminar 18% Lab 23% Small lecture 73% Medium lecture 36% Large lecture 14% Very large lecture 68% Online course 64% Hybrid course 86%Traditional course	50.2 ± 14.7	55% Male 45% Female	5% AA/BA 59% Master's 36% Ph.D.	58.7 ± 11	6.8 ± 0.4

Table K.2: Cluster descriptions, part 2

	Personal Collection	What do you use?	How do you use it?	Why do or don't you use it?	What are your barriers?	What support do you need?
All N=608	3.4 ± 1.4	Genl purp/references 0.06 ± 0.98 Images/AV 0.03 ± 1.02 Historical/primary 0.03 ± 0.98 News/data 0.02 ± 1.02 Discussions/curricular 0.02 ± 1.03	Projects 0.07 ± 1.01 Post to web 0.04 ± 1.0 Online class 0.00 ± 1.01 In class 0.06 ± 0.99	Improve learning 0.07 ± 0.99 Expectations/reputation –0.02 ± 0.96 Inappropriateness 0.02 ± 1.02 Concerns about interpretation 0.01 ± 0.98 Time/convenience/access –0.01 ± 0.96 Teach info literacy 0.03 ± 1.0 Make info public 0.04 ± 0.98 Use free materials –0.04 ± 0.91	Finding 0.02 ± 1.0 Institution's equip 0.00 ± 0.97 Personal equip –0.01 ± 0.97 Availability 0.03 ± 0.98 Student equip 0.01 ± 1.01	Technical 0.03 ± 0.96 Intellectual –0.01 ± 0.98
Cluster 1 N=60	1.9 ± 1	Genl purp/references – 0.80 ± 0.70 Images/AV –0.74 ± 0.59 Historical/primary –0.67 ± 0.55 News/data –0.38 ± 0.60 Discussions/curricular – 0.13 ± 0.62	Projects –0.65 ± 0.54 Post to web – 0.71 ± 0.41 Online class – 0.01 ± 0.32 In class –0.90 ± 0.64	Improve learning –1.66 ± 0.64 Expectations/reputation –0.41 ± 0.50 Inappropriateness 0.21 ± 0.97 Concerns about interpretation 0.24 ± 1.07 Time/convenience/access –0.38 ± 0.76 Teach info literacy –0.41 ± 0.61 Make info public –0.33 ± 0.53 Use free materials –0.22 ± 1.14	Finding 0.34 ± 1.09 Institution's equip – 0.28 ± 1.01 Personal equip 0.20 ± 1.05 Availability 0.48 ± 1.21 Student equip –0.37 ± 0.89	Technical –0.26 ± 1.18 Intellectual –0.07 ± 0.92
Cluster 2 N=106	2.4 ± 1.1	Genl purp/references – 0.32 ± 0.88 Images/AV 0.12 ± 0.78 Historical/primary –0.48 ± 0.71 News/data 0.32 ± 0.95 Discussions/curricular – 0.48 ± 0.66	Projects –0.03 ± 0.87 Post to web – 0.62 ± 0.72 Online class – 0.24 ± 0.44 In class –0.02 ± 0.81	Improve learning –0.17 ± 0.68 Expectations/reputation 0.23 ± 0.95 Inappropriateness 0.03 ± 0.91 Concerns about interpretation 0.15 ± 1.05 Time/convenience/access –0.52 ± 0.75 Teach info literacy 0.31 ± 1.0 Make info public –0.44 ± 0.88 Use free materials –0.11 ± 0.94	Finding 0.68 ± 0.92 Institution's equip 0.09 ± 1.01 Personal equip 0.18 ± 1.03 Availability –0.20 ± 0.93 Student equip –0.06 ± 1.04	Technical 0.12 ± 0.80 Intellectual 0.44 ± 0.96
Cluster 3a N=48	2.5 ± 1	Genl purp/references 0.30 ± 0.81 Images/AV –1.13 ± 0.68 Historical/primary –0.41 ± 0.68 News/data –0.20 ± 0.95 Discussions/curricular 0.46 ± 0.75	Projects –0.07 ± 0.82 Post to web – 0.02 ± 0.78 Online class – 0.08 ± 0.53 In class –1.07 ± 0.77	Improve learning –0.36 ± 0.81 Expectations/reputation –0.19 ± 1.12 Inappropriateness 0.51 ± 0.75 Concerns about interpretation 0.01 ± 0.98 Time/convenience/access 0.17 ± 0.93 Teach info literacy –0.18 ± 1.05 Make info public 0.21 ± 0.90 Use free materials 0.17 ± 0.79	Finding 0.28 ± 0.77 Institution's equip 0.07 ± 0.97 Personal equip 0.11 ± 1.01 Availability 0.04 ± 0.86 Student equip –0.23 ± 0.87	Technical 0.49 ± 0.63 Intellectual –0.11 ± 1.0

	Personal Collection	What do you use?	How do you use it?	Why do or don't you use it?	What are your barriers?	What support do you need?
All N=608	3.4 ± 1.4	Genl purp/references 0.06 ± 0.98 Images/AV 0.03 ± 1.02 Historical/primary 0.03 ± 0.98 News/data 0.02 ± 1.02 Discussions/curricular 0.02 ± 1.03	Projects 0.07 ± 1.01 Post to web 0.04 ± 1.0 Online class 0.00 ± 1.01 In class 0.06 ± 0.99	Improve learning 0.07 ± 0.99 Expectations/reputation –0.02 ± 0.96 Inappropriateness 0.02 ± 1.02 Concerns about interpretation 0.01 ± 0.98 Time/convenience/access –0.01 ± 0.96 Teach info literacy 0.03 ± 1.0 Make info public 0.04 ± 0.98 Use free materials –0.04 ± 0.91	Finding 0.02 ± 1.0 Institution's equip 0.00 ± 0.97 Personal equip –0.01 ± 0.97 Availability 0.03 ± 0.98 Student equip 0.01 ± 1.01	Technical 0.03 ± 0.96 Intellectual –0.01 ± 0.98
Cluster 3b N=95	3.6 ± 1.1	Genl purp/references 0.30 ± 0.77 Images/AV 0.24 ± 0.68 Historical/primary 0.16 ± 0.77 News/data –0.47 ± 0.90 Discussions/curricular – 0.49 ± 0.81	Projects –0.10 ± 0.91 Post to web 0.25 ± 0.99 Online class – 0.31 ± 0.52 In class 0.27 ± 0.83	Improve learning 0.35 ± 0.67 Expectations/reputation 0.51 ± 1.06 Inappropriateness 0.31 ± 0.90 Concerns about interpretation 0.35 ± 0.98 Time/convenience/access 0.00 ± 0.96 Teach info literacy –0.30 ± 1.03 Make info public –0.07 ± 0.86 Use free materials 0.27 ± 0.74	Finding 0.36 ± 0.84 Institution's equip 0.16 ± 0.94 Personal equip 0.15 ± 1.20 Availability 0.29 ± 0.94 Student equip 0.19 ± 0.94	Technical 0.57 ± 0.54 Intellectual 0.18 ± 0.92
Cluster 3c N=63	3.9 ± 1.2	Genl purp/references 0.25 ± 0.90 Images/AV –0.62 ± 0.78 Historical/primary 0.55 ± 0.97 News/data 0.01 ± 1.11 Discussions/curricular 0.08 ± 0.77	Projects –0.11 ± 0.90 Post to web 1.12 ± 0.86 Online class – 0.45 ± 0.53 In class –0.38 ± 0.83	Improve learning 0.07 ± 0.89 Expectations/reputation –0.18 ± 0.78 Inappropriateness 0.03 ± 1.10 Concerns about interpretation – 0.18 ± 0.81 Time/convenience/access 0.55 ± 0.83 Teach info literacy –0.39 ± 0.85 Make info public 0.19 ± 1.09 Use free materials –0.14 ± 0.94	Finding –0.14 ± 0.83 Institution's equip 0.04 ± 0.89 Personal equip –0.27 ± 0.84 Availability 0.30 ± 0.77 Student equip 0.05 ± 1.04	Technical –0.29 ± 1.0 Intellectual –0.19 ± 0.82
Cluster 4a N=62	4.3 ± 1	Genl purp/references – 0.43 ± 0.91 Images/AV –0.03 ± 0.74 Historical/primary 1.20 ± 0.94 News/data 0.06 ± 1.07 Discussions/curricular – 0.24 ± 0.82	Projects –0.48 ± 0.88 Post to web – 0.05 ± 1.08 Online class – 0.23 ± 0.68 In class 1.05 ± 0.54	Improve learning 0.73 ± 0.72 Expectations/reputation –0.54 ± 0.74 Inappropriateness 0.02 ± 1.17 Concerns about interpretation – 0.50 ± 0.89 Time/convenience/access –0.89 ± 0.76 Teach info literacy –0.20 ± 0.86 Make info public 0.13 ± 0.87 Use free materials 0.02 ± 0.88	Finding –0.58 ± 0.98 Institution's equip – 0.05 ± 0.97 Personal equip –0.09 ± 0.89 Availability 0.02 ± 1.03 Student equip –0.05 ± 1.05	Technical –0.13 ± 1.08 Intellectual –0.56 ± 0.90

	Personal Collection	What do you use?	How do you use it?	Why do or don't you use it?	What are your barriers?	What support do you need?
All N=608	3.4 ± 1.4	Genl purp/references 0.06 ± 0.98 Images/AV 0.03 ± 1.02 Historical/primary 0.03 ± 0.98 News/data 0.02 ± 1.02 Discussions/curricular 0.02 ± 1.03	Projects 0.07 ± 1.01 Post to web 0.04 ± 1.0 Online class 0.00 ± 1.01 In class 0.06 ± 0.99	Improve learning 0.07 ± 0.99 Expectations/reputation –0.02 ± 0.96 Inappropriateness 0.02 ± 1.02 Concerns about interpretation 0.01 ± 0.98 Time/convenience/access –0.01 ± 0.96 Teach info literacy 0.03 ± 1.0 Make info public 0.04 ± 0.98 Use free materials –0.04 ± 0.91	Finding 0.02 ± 1.0 Institution's equip 0.00 ± 0.97 Personal equip –0.01 ± 0.97 Availability 0.03 ± 0.98 Student equip 0.01 ± 1.01	Technical 0.03 ± 0.96 Intellectual –0.01 ± 0.98
Cluster 4b N=36	3.3 ± 1.4	Genl purp/references 0.74 ± 0.89 Images/AV 0.48 ± 1.04 Historical/primary –0.32 ± 0.83 News/data 0.66 ± 0.97 Discussions/curricular – 0.54 ± 0.85	Projects 0.62 ± 0.91 Post to web – 0.67 ± 0.79 Online class – 0.28 ± 0.65 In class 0.61 ± 0.66	Improve learning 0.54 ± 0.78 Expectations/reputation –0.43 ± 0.69 Inappropriateness –0.37 ± 0.94 Concerns about interpretation – 0.10 ± 0.78 Time/convenience/access 0.64 ± 0.79 Teach info literacy 0.60 ± 0.96 Make info public –0.86 ± 0.58 Use free materials 0.15 ± 0.85	Finding –0.60 ± 0.57 Institution's equip 0.12 ± 1.13 Personal equip 0.09 ± 1.04 Availability 0.05 ± 0.91 Student equip –0.09 ± 1.06	Technical –0.01 ± 0.96 Intellectual –0.73 ± 0.65
Cluster 4c N=68	4.5 ± 0.7	Genl purp/references 0.37 ± 1.01 Images/AV 0.99 ± 0.97 Historical/primary 0.37 ± 0.91 News/data 0.12 ± 1.14 Discussions/curricular 0.49 ± 1.22	Projects 1.01 ± 1.0 Post to web 0.59 ± 0.81 Online class – 0.23 ± 0.88 In class 0.80 ± 0.75	Improve learning 0.62 ± 0.85 Expectations/reputation –0.24 ± 0.81 Inappropriateness –0.21 ± 1.11 Concerns about interpretation – 0.35 ± 0.81 Time/convenience/access 0.36 ± 0.89 Teach info literacy 0.50 ± 1.0 Make info public 0.72 ± 0.87 Use free materials –0.02 ± 0.88	Finding –0.60 ± 0.87 Institution's equip – 0.10 ± 0.82 Personal equip –0.22 ± 0.70 Availability –0.11 ± 0.90 Student equip 0.08 ± 1.04	Technical –0.19 ± 0.94 Intellectual –0.11 ± 0.96
Cluster 5a N=48	4. ± 0.9	Genl purp/references 0.68 ± 0.86 Images/AV 0.24 ± 1.07 Historical/primary –0.43 ± 0.85 News/data 0.14 ± 0.92 Discussions/curricular 1.09 ± 1.05	Projects 0.64 ± 0.94 Post to web 0.31 ± 0.86 Online class 1.12 ± 1.33 In class –0.15 ± 1.0	Improve learning 0.34 ± 0.68 Expectations/reputation 0.40 ± 0.92 Inappropriateness –0.18 ± 0.92 Concerns about interpretation 0.40 ± 0.90 Time/convenience/access 0.50 ± 0.68 Teach info literacy 0.40 ± 0.87 Make info public 0.63 ± 0.97 Use free materials –0.46 ± 0.86	Finding –0.08 ± 0.77 Institution's equip – 0.12 ± 0.91 Personal equip –0.26 ± 0.77 Availability –0.30 ± 0.93 Student equip 0.46 ± 0.98	Technical –0.22 ± 1.11 Intellectual 0.46 ± 0.99

	Personal Collection	What do you use?	How do you use it?	Why do or don't you use it?	What are your barriers?	What support do you need?
All N=608	3.4 ± 1.4	Genl purp/references 0.06 ± 0.98 Images/AV 0.03 ± 1.02 Historical/primary 0.03 ± 0.98 News/data 0.02 ± 1.02 Discussions/curricular 0.02 ± 1.03	Projects 0.07 ± 1.01 Post to web 0.04 ± 1.0 Online class 0.00 ± 1.01 In class 0.06 ± 0.99	Improve learning 0.07 ± 0.99 Expectations/reputation –0.02 ± 0.96 Inappropriateness 0.02 ± 1.02 Concerns about interpretation 0.01 ± 0.98 Time/convenience/access –0.01 ± 0.96 Teach info literacy 0.03 ± 1.0 Make info public 0.04 ± 0.98 Use free materials –0.04 ± 0.91	Finding 0.02 ± 1.0 Institution's equip 0.00 ± 0.97 Personal equip –0.01 ± 0.97 Availability 0.03 ± 0.98 Student equip 0.01 ± 1.01	Technical 0.03 ± 0.96 Intellectual –0.01 ± 0.98
Cluster 5b N=22	4.9 ± 0.4	Genl purp/references 0.24 ± 1.0 Images/AV 1.25 ± 0.83 Historical/primary 0.50 ± 0.92 News/data 0.56 ± 1.02 Discussions/curricular 1.72 ± 0.96	Projects 0.48 ± 1.17 Post to web 0.54 ± 0.33 Online class 3.36 ± 0.87 In class 0.42 ± 0.53	Improve learning 0.75 ± 0.59 Expectations/reputation 0.43 ± 1.19 Inappropriateness –1.11 ± 0.93 Concerns about interpretation – 0.25 ± 1.08 Time/convenience/access 0.51 ± 0.84 Teach info literacy 0.48 ± 1.03 Make info public 0.90 ± 1.0 Use free materials –0.22 ± 0.91	Finding –0.72 ± 0.84 Institution's equip 0.05 ± 1.16 Personal equip –0.40 ± 0.45 Availability –0.77 ± 0.63 Student equip 0.25 ± 1.02	Technical –0.36 ± 1.01 Intellectual –0.01 ± 1.01

Appendix L: Literature Review on User Profiling

Prepared by Sarah Ellinger

This literature review was undertaken to seek answers to the following questions:

- What are the theoretical bases for user profiling? Ideally, what should it accomplish?
- What are the current practices in user profiling?

Alan Cooper and abstract profiling: Rather than depending on coarse notions of market segments, Cooper (2004) outlines a notion of "persona", a "precise description of our user and what he wishes to accomplish", as a formative evaluation tool—that is, a tool which is used in the creation of a product. A persona does not represent a particular user, but should be precisely envisioned down to a name, skills and an end goal; since one of the greatest values of a persona is its power to suggest extreme situations, it is more desirable that the persona be precise than it be an accurate or likely case.[125] Cooper strongly distinguishes between goals (end results) and tasks (the process by which the result is reached). Users are often unable to accurately describe their goals, especially personal goals (i.e., not wanting to feel embarrassed at one's inability to use a product). Once designers have created the relevant personas (Cooper recommends that a product have no more than three), they create "scenarios", walking their personas through possible use situations to identify constraints and shortcomings.

Web services and personal profiling: While the Cooper model (abstract profiling) has thrived mostly in discussions of how to design new products, there is a parallel notion of user profiling in the computer science literature relating to user profiling as a tool for resources currently in use. The focus of this literature is automated user profiling, in which systems collect implicit data about users without their explicit participation, either for the purposes of analysis or in order to dynamically "personalize" the site for that user. All suggested models of personal profiling operate by collecting and weighting information such as cookies, search keywords, bookmarks, browser history, time spent at a page, navigation patterns and scrolling behavior. Digital privacy advocates such as Roger Clarke (1994) have said that personal profiling is "a potentially threatening, demeaning, and perhaps socially dangerous phenomenon."

Current practice in digital cultural and educational resources: The Alice Grant Consulting (2003b) report on current evaluation practice in digital cultural collections found that 78% of responding institutions either used user profiling as a means of evaluation or (more commonly) worked from an informal model of their intended audience. The report suggests that there is a need for a standard of user profiling for cultural heritage and similar institutions; however, the profiles listed are based on descriptions of qualities rather than goals, as Cooper suggests.

Other literature on digital libraries supports the conclusion that user profiling is not a common approach to designing cultural/education digital resources. There is a body of literature that argues that profiling should be adopted by libraries, but not outlining any more specialized principles that would be helpful.

[125] Cooper seems to take it for granted that the organization behind the product itself has precise and measurable goals (i.e., turning a profit). Many digital collections, especially the less formal ones, may have a much hazier mission.

Gary Marchionini and user/task taxonomies: Marchionini's user type/task taxonomy was first outlined in his book, *Information Seeking In Electronic Environments* (1997), and was revised in Hert and Marchionini (1997) and Marchionini (2000). The taxonomy attempts to unify information about users' individual characteristics with information about their tasks and their information environments (Hert and Marchionini, 1997). However, it is worth noting that Marchionini does not describe any new approach to gathering information user's individual characteristics, but rather uses a mixture of common methodologies (surveys, interviews, observations), institutional divisions (university scholars, K–12 teachers), and self-reported categories to establish the primary user types which are then further granulated by the taxonomy.[126] Marchionini's 1997 version breaks down users by their

- Personal attributes (physical, cognitive and social)
- Prior experience in the relevant domain of knowledge
- Experience in using the relevant information technology.

Tasks, in contrast, are broken down by

- Complexity (number of facets, amount of abstraction)
- Specificity (how able or confident the user is to evaluate the accuracy and completeness of results)
- Quantity (the amount of information expected)
- Criticality (how important it is that the need be met)
- Timeliness (how much time the user is willing to spend).

Marchionini suggests that it is possible but impractical to define each attribute on a scale and create a complete matrix to populate with example cases. Instead he combines these dimensions into:

- Motivation – the personal situation that brings a user to the resource, including quantity, criticality, and timeliness
- Domain knowledge – related to the particular need, including knowledge of the subject area
- Library system knowledge – including information technology
- Focus – combining complexity, quantity and specificity
- Time allocated – combining timeliness and criticality.

Taking a metaphor from linguistics, Hert and Marchionini (1997) suggest describing tasks according to three dimensions: the pragmatic (what is the situation of the query), the semantic (what is the meaning of the query), and the syntagmatic (what is the expression of the query).

[126] An example of a taxonomy in use is given in Marchionini 2000, analyzing users of the National Digital Library.

Carol Tenopir: Carol Tenopir (2003) argues for a more broadly focused profile including information about both tasks and users, and recommends the following six attributes:

- Status
- Discipline
- Task
- Institution
- Age
- Gender

Appendix M: Web TLA Software Package Comparison

A number of software packages already exist for performing TLA. Among the approximately thirty-five free options, we evaluated the three that seem most viable. We compared them with three of the most widely used commercial packages, and with our own in-house system.

Free tools:

- AWStats (http://awstats.sourceforge.net/): Of the free options, AWStats is the most full-featured. It is awkward to configure (it requires editing a text configuration file) and it is not too powerful when compared with some commercial options, but it is decent, frequently maintained, and produces good numbers.
- Analog (http://www.analog.cx/): Analog is maintained at the same rate as AWStats but seeks to address a different mode of use. Because Analog is frequently paired with a separate reporting tool, "Report Magic," the output looks sparse unless it has been re-processed by this tool. Analog is able to stand on its own, but on its own, it is inferior to AWStats.
- Webalizer (http://www.mrunix.net/webalizer/): Webalizer hasn't been updated since 2002, its numbers may be questionable, and its reports could be more significant. Nevertheless, it does something, and it does it well enough that it is still widely used. Again, configuration is cumbersome.

Inexpensive commercial tool:

- Wusage (http://www.boutell.com/wusage/): Wusage offers few features that are not offered by free packages, but it comes with commercial support. It is cheap enough to be affordable for any project, and the availability of support may be beneficial. Because Wusage is not open-source, it is not possible to modify or customize its analyses or to verify its calculations (although this is unlikely to be a problem for most applications).

High-end commercial tools:

- **Urchin** (http://www.urchin.com/): In many ways, Urchin is a midpoint between Wusage and WebTrends. Urchin presents a similar range of reports as Wusage or free tools, but its strength lies in its very usable GUI. Configuration is still a challenge (as with Wusage), but the overall experience may be more user-friendly. As with WebTrends, Urchin can be configured for specific, customized reports.
- **WebTrends** (http://www.webtrends.com/): WebTrends is a very complex system that takes some getting used to. However, it is very powerful (legitimately addressing a range from hobby sites through international operations with multiple server rooms) and simplifies a wide range of marketing-related analyses. WebTrends may not be flexible enough to tackle an unlimited and arbitrary set of questions (such as some that are not financial in nature), but it will do a lot right out of the box. Despite its high cost, WebTrends may still be cheaper than coding a system in-house, depending on the specific situation.

Our in-house system:

- **In-house + SAS** (http://digitalresourcestudy.berkeley.edu): Our custom-developed system used a series of Perl scripts to preprocess the raw logs, loaded the data into a relational database (PostgreSQL), and calculated statistics using SAS. Like AWStats, Analog, and Webalizer, this package is potentially open-source, meaning the calculation of each number can be traced. The system is by far the most powerful of the tools we evaluated, due to its heavy dependence on PostgreSQL and SAS, both of which offer great data transparency and are widely used for manipulating large data sets. However, the system has not been packaged for re-distribution, and it is quite complicated to install without our help.

Table M.1: TLA software package comparison

Feature	Wusage	Webtrends	Urchin	AWStats	Analog	Webalizer	CSHE + SAS
Version	8.0 P50 (9/16/04)	7.0 (2005)	6.0 ASP[127] (9/2005)	6.4 (3/16/05)	6.0 (12/19/04)	2.01-10 (4/16/02)	0.064, 0.251 (2005)
Source code available	No	No	No	Yes	Yes	Yes	Maybe
Price/license	$25 to $100 for academic use	$10,000 for 20M annual page views	$200/(100k page views/mo)+$100/1M	Free/GPL	Free/GPL	Free/GPL	Unknown/BSD?
Requires tracking server/service[128]	No	Yes, but a hosted solution is available that requires no tracking server.	No – the web server can double for this purpose. Also, a hosted solution is available.	No	No	No	No
Requires JavaScript + cookies[129]	Yes	Yes	Yes	No	No	No	No
Process load balanced logs	Yes	Yes	Yes	Yes	Yes	No	Untested, but ought to work
Report session duration	No	Yes	Yes	Yes	No	No	Yes
Report countries[130]	DNS	DNS or geo-location	DNS, possibly geo-location	DNS or geo-location	DNS	DNS	DNS
Report hosts	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Report/filter robots	Yes	Yes	Yes	Yes	Yes	No	Yes

[127] We were unable to evaluate the newest version of Urchin first-hand. Our analysis is based on experience with a previous version and company literature about the newer release.

[128] A tracking server is a machine that records a log of human website activity in parallel with the web server's own log. Whereas the web server log records all web-server activity (including bots), a tracking server records events generated by JavaScript code, which is more specific to human behaviors.

[129] Requiring JavaScript implies that the website must be modified to integrate with the analysis software.

[130] Assuming a country report is available, what method was used to determine countries? DNS implies a method based on DNS lookups, and geolocation implies the use of a large index of all IP addresses and their likely country of origin

Feature	Wusage	Webtrends	Urchin	AWStats	Analog	Webalizer	CSHE + SAS
Report/filter worms	No	Unknown	Unknown	Yes	No	No	Possible with SAS regular expressions
Report days of week	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Report most frequently viewed pages	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Report entry/exit pages	Yes	Yes	Yes	Yes	No	Yes	Possible with SAS/SQL
Report pages by directory	Yes	Yes	Yes	No	Yes	No	Possible with SAS regexp
Report file types	Yes	Yes	Yes	Yes	Yes	No	Yes
Report search engines used	Yes	Yes	Yes	Yes	Yes	No	Yes
Report keywords used	Yes	Yes	Yes	Yes	Partially	Partially	Yes
Report referring web page with/without query	Partially	Yes	Yes	Yes	No	Partially	Yes
Report HTTP errors	Yes	Yes	Yes	Yes	Yes	Yes	No[131]
Custom analysis	No	Yes	Yes	No	No	No	Yes
Export aggregated data	Yes (html)	Yes (html, Word, CSV)	Yes (html), likely others	Yes (html, xml, txt)	Yes (html, txt)	Yes (html, txt)	Yes (tab)
Export observations[132]	No	Maybe	Maybe	No	No	No	Yes (RDBMS)

[131] Errors are filtered and attributed to a non-existent user rather than being tagged.

[132] That is, will the software export data that is meaningful to manipulate with a third-party tool toward any useful end? Exporting aggregated results will clearly not yield much in terms of data reuse, and the raw logs aren't appropriate to be loaded into Excel, for example, so does the package offer a happy medium?

Feature	Wusage	Webtrends	Urchin	AWStats	Analog	Webalizer	CSHE + SAS
Anonymization [133]	No	No	No	No	No	No	Yes
Barriers to entry	Moderate: inexpensive license, commercial support available, requires sysadmin to install.	Extensive: very expensive software, hardware requirements, slow process, learning curve, requires sysadmin.	Moderate to Extensive: more powerful software with commercial support; requires a sysadmin for installation.	Moderate: simplistic software, no commercial support, requires sysadmin.	Moderate: simplistic software, no commercial support, requires sysadmin.	Moderate: simplistic software, no commercial support, requires sysadmin.	Extensive: requires sysadmin to install, knowledge of SAS; complex, powerful system, somewhat cryptic codebase, steep learning curve to SAS.
Relative Power	* *	* * * * *	* * * * *	* *	*	*	* * * * *
Installation Difficulty	* * *	* * * *	* * * * *	* *	* *	* *	* * * * *
Ease of use[134]	* * *	* * * *	* * * *	* *	* *	* *	* *

[133] Anonymization isn't explicitly impossible with these packages, but the feature is unique to our process. As the need hasn't been anticipated by other packages and the technique has unique properties (it affects reverse hostname lookup) the effect may be undesirable if used with other packages.

[134] The in-house software is very complex for performing simple analysis but appropriate for complex analysis. We've rated many packages as being "easy to use," but it is largely due to the very restricted set of functionality they offer (meaning it wouldn't be so simple to hack a simple program to perform complex analyses).

Appendix N: Online website survey instrument (from SPIRO site)

1. Which title best describes you?
   - University/college instructor/professor
   - Undergraduate student
   - Graduate student
   - Independent researcher/scholar
   - Librarian
   - K–12 instructor
   - K–12 student
   - Other

2. For what purposes do you use the SPIRO site? *(Check all that apply.)*
   - Conducting research
   - Creating presentations, including lectures
   - Developing teaching materials
   - Making my own collection of digital resources
   - Other. Please specify.

3. How often do you use the SPIRO site?
   - Today is my first time
   - Daily
   - Weekly
   - Monthly
   - Every six months
   - Once a year
   - Less than once a year
   - Other. Please specify.

4. Where are you accessing the site from now?
   - Home
   - Dormitory
   - On campus office/lab
   - Library
   - Office/lab
   - Other. Please specify.

5. How often do you do the following activities on the SPIRO site? *(Almost all the time; Often; Sometimes; Rarely; Never)*
   - Find text
   - Download text
   - Find images
   - Download thumbnail images (128 pixels)
   - Download larger images (650 pixels)
   - Find images to license
   - Browse to see what's available
   - Use the site as a reference tool to verify citations
   - Other. Please specify.

6. If you download larger images (650 pixels) from SPIRO, does this size meet your needs?
    Yes
    No
    Other. Please specify.

7. What is your affiliation?
    Research university. Please specify.
    4-year college. Please specify.
    Community college. Please specify.
    High School
    Elementary or middle school
    Library. Please specify.
    Museum. Please specify.
    Governmental agency. Please specify.
    Business. Please specify.
    Other. Please specify.

Appendix O: CSHE Digital Resource Providers Study – Interview Protocol

INTRODUCTION

Thank you for agreeing to take part in this important study about user research. The interview should take about 1 hour. Your participation is voluntary, and you may decline to answer any questions or stop this interview at any time.

I want to talk with you today about the <name of project> website. There are no right or wrong answers; we are simply interested in your opinion and your experiences. Please listen to each question carefully and answer as accurately as possible.

DEMOGRAPHICS

1) Name _____

2) Title _____

3) In what capacity have you been affiliated with the **<name of project>** website? *(prompt: what is your role?)*

4) How long have you been affiliated with the **<name of project>** website?

5) It's my understanding that the **<name of project>** website is **<content/purpose/description summary>**. Is this correct? *(Could you briefly describe the type of website that you currently operate? What IS the site?)*

FOCUS OF THE COLLECTION

6) I'm going to read a list of possible users that your website serves. I will then ask you if that particular user base is currently one of your actual audiences, and if that user base was one of your originally intended audiences.

Do **K–12 students** currently use your website? ☐
Were **K–12 students** an originally intended audience for your website? ☐
Do **K–12 teachers** currently use your website? ☐
Were **K–12 teachers** an originally intended audience for your website? ☐
Do **college/university students** currently use your website? ☐
Were **college/university students** an originally intended audience for your website? ☐
Do **college/university teachers** currently use your website? ☐
Were **college/university teachers** an originally intended audience for your website? ☐
Do **scholars** currently use your website? ☐
Were **scholars** an originally intended audience for your website? ☐
Does the **general public** currently use your website? ☐
Was the **general public** an originally intended audience for your website? ☐
Are there any **other users** (not mentioned already) that currently use your website? ☐
Explain: _____
Were any **other users** (not mentioned already) an originally intended audience for your website? ☐
Explain: _____

If there are no differences between actual and intended audiences, skip to Question 6c.

6b) How have you responded to these new audiences in your planning, design, budgeting, etc.? *Has this actual audience influenced your site's goals, content, or services?*

6c) Are there costs to accommodating secondary and/or "informal learners"?

6d) Is it important for you to distinguish among various educational audiences and contexts (e.g., community college, R1s, AP courses, fully online vs. on-campus hybrid, international markets, liberal arts, vocational, etc.)?

6e) How important is it to distinguish between those willing to pay and not pay for use of online resources (e.g., undergraduate contexts vs. informal learners, etc.)? Between intentional users who have specific educational goals and broad spectrum users?

COLLECTION GOALS

7) For what purpose or use are your materials intended? *What are the goals of your site? (Skip to question 10 if educational purposes are mentioned)*

8) Are there specific goals/intentions for using materials from the **<name of project>** website in formal educational contexts? *Informal?* Please explain.

9) Are you aware of any possible educational uses for the **<name of project>** website?
☐ Yes
☐ No

MEASURING USE

The following questions address issues around measuring use and users. We would like to better understand the relationship between the information about users that you seek to understand, the data you collect (and the methods you use to collect it), and how you apply that knowledge.

10a) What are the most important questions **about users** for which you want or need answers?

10b) What **metrics** do you use/have you used to answer those questions?

10c) Now I'd like to talk a little about the types of data you collect to get at those specific metrics. I'm going to read a list of possible ways to collect data about website use. Please answer "yes" if you use this method to measure the usage of your website, or answer "no" if you do not use the method.
☐ do not do any user research at this time
☐ user registration Why?
☐ analysis of web traffic logs Why?
☐ online surveys Why?
☐ help questions – analyzed Why?
☐ email feedback Why?

- ☐ analysis of user search strategies Why?
- ☐ anecdotal research Why?
- ☐ interviews Why?
- ☐ focus groups Why?
- ☐ usability tests Why?
- ☐ other Why?

12a) Which data are most successful at answering the questions you have about users? *What collected information has been useful? What has not been useful?*

12b) How does this information influence the website? *Of these methods, have you used the results? (Connection between research and decision-making.)*

11) Now I'm going to read a list of possible reasons why information about users may be collected. Please answer "yes" or "no" if the listed reason explains why you collect usage data in general.

- ☐ curiosity
- ☐ defend site funding
- ☐ appeal for more funding
- ☐ use for development (assess server size, etc.)
- ☐ target marketing efforts/increase use by new audiences. Explain *(replaces Q. 18)*
- ☐ amend content
- ☐ change design
- ☐ other _____

13) Can you give me a general overview of what you currently know about the usage of the **<name of project>** website?

14) What do you know about what users do with the materials/information they retrieve? *(Prompt: how collection materials are used in teaching & learning, types of activities, etc.)*

15) Are you satisfied with the level of use of your site? If not, what would you like to see change?

16) What would you like to know about the **<name of project>** website usage that you have not been able to determine?

17) What barriers make it difficult for you to conduct all of the user research that you might like to do?

- ☐ time
- ☐ staff
- ☐ funding
- ☐ knowledge or skills
- ☐ technical challenges
- ☐ low priority relative to other tasks
- ☐ other _____

Now I'd like to ask you a few questions about user research in general.

18a) In your opinion, where are the gaps in current data about users, and how might those gaps be filled? *What are the best methods to employ for strategic planning purposes?*

18b) Should or can online (or open) projects be thinking about common questions, metrics, and approaches to understanding users?

18c) In your opinion, what are the consequences, if any, of poor sampling? Application of user results to wrong questions? Are there consequences to not doing user demand/market analyses before building content?

HISTORY AND DEVELOPMENT OF THE COLLECTION

19) How did the collection originate? Did you…
☐ Digitize existing print material
☐ License existing digital material from external sources
☐ Organize your own existing digital material
☐ Create new digital material
☐ Other _____

20) Is content contributed to the site by outside users (non-staff)?
☐ Yes
☐ No (skip to question 20)
21) Is there a formal review process for the materials that are contributed?
☐ Yes
☐ No
Explain _____

22) How often is the collection updated?
☐ *Never*
☐ *Daily*
☐ *Weekly*
☐ *Twice a month*
☐ *Monthly*
☐ *Every few months*
☐ *6 months*
☐ *Annually*

23) Are you aware of existing/similar materials available?
Where?
Which resources?

24) What year was the site first launched?

25) How do you market the **<name of project>** website to potential users?
☐ Personal contacts
☐ Advertising
☐ Other sites link to your site
☐ Search engine optimization *(designing the site explicitly in a way that it will improve ranking for search engine results)*

☐ Other _____

MANAGEMENT AND FUNDING

26) Approximately how many staff members work on the **<name of project>** website?
Actual
FTE

27) What percentage of your budget *(staff time)* is dedicated to assessing website use?

28) What is the **<name of project>** website's current operating budget?

☐ *no budget*
☐ *<10K*
☐ *10-49K*
☐ *50-99K*
☐ *100-499K*
☐ *500-1 MIL*
☐ *>1MIL*

29) I'm going to read a list of possible funding methods. Please indicate "yes" if the **<name of project>** website is currently funded using this method, or "no" if it is not.
☐ self-supporting (through registration or licensing income)
☐ self-supporting (through advertising on the site)
☐ supported by income from the rest of the organization
☐ private funding
☐ grants from foundations
☐ government grants
☐ other _____

30) Is the current funding model sustainable?
☐ Yes *(explain, then skip to question 32)*
☐ No
Explain _____

31) What are your plans to make it sustainable?
(Have you developed a business plan, sustainability model? If so, when did you develop this model? If not, do you have plans to develop one? Anticipated future funding sources from list?)
☐ self-supporting (through registration or licensing income)
☐ self-supporting (through advertising on the site)
☐ supported by income from the rest of the organization
☐ private funding
☐ grants from foundations
☐ government grants
☐ other _____

31b) How do you both give something away and at the same time create a revenue model that will allow it to support itself?

42) What role does "success" play in the sustainability of your project?

43a) How do you know if your website is successful or valuable?

43b) Who or what determines that value?

43c) How is that value measured? *How many users do you need to have to be considered successful? Fundable? How would your site persist if you had fewer than that number (or hardly any)?*

44a) What kind of plan is in place, if any, to ensure the ongoing technical sustainability of your website? (e.g., software/hardware upgrades and support, archiving)

44b) What about content updates?

44c) Has your institution (or organization) made any type of formal commitment to support your website?

32) I'm going to read a list of possible funding methods. Please answer "yes" if the **<name of project>** website was originally financed using the listed funding method, or "no" if it was not.

☐ self-supporting (through registration or licensing income)
☐ self-supporting (through advertising on the site)
☐ supported by income from the rest of the organization
☐ private funding
☐ grants from foundations
☐ government grants
☐ other _____

33) Who provided the funding support in the past?

34) What was the site/collection's approximate start-up budget?

☐ *no budget*
☐ *<10K*
☐ *10-49K*
☐ *50-99K*
☐ *100-499K*
☐ *500-1 MIL*
☐ *>1MIL*

TECHNICAL QUESTIONS ABOUT THE SITE

The following questions are intended to help us better understand how you make the content of your site useable to various audiences or learning communities.

35) Are the items on the site stored in some sort of database?

☐ Yes
☐ No (skip to question 38)

Explain _____

36) Does the database use some sort of structured metadata (a structured description of each item with separate fields, such as title, author, date, subject, etc.)?

☐ Yes
☐ No
Explain _____

37) Is the database and/or metadata scheme designed to be interoperable with other systems; for example, so that your collection could be merged with other similar collections?
☐ Yes
☐ No
Explain _____

38) Is the collection currently included as part of a merged collection, or included in any cross-collection searching? *Prompt: Have you provided your materials to any other groups who want to distribute your material on their website?*
☐ Yes
☐ No
Explain _____

39) Does the collection include any materials imported (or licensed) from another collection or source? *Prompt: Did you obtain any of your digital materials from some other website or collection?*
☐ Yes
☐ No
Explain _____

40) Are the materials on the site specifically designed to be exportable into another system (e.g., a learning management system)?
☐ Yes
☐ No
Explain _____

Before we conclude the interview, I'd like to give you the opportunity to address any issues that we may have not covered.

41) Is there anything else that you'd like to tell us? (Prompt: please feel free to comment about any topic related to the **<name of project>** website. Is there anything that else that we have not discussed that may be useful to know about the **<name of project>** website?)

Follow-up Questions[135]

45) Please provide the percentage breakdown of use for your site during a normal month according to these categories:

K–12 students:
K–12 teachers:
College/University students:
College/University teachers:
Scholars (university-based researchers):

[135] Sent via email to individual participants

General Public:
Other (please describe if you know who these users are): _____

46) Please provide your total usage during a normal month (use metrics that are most beneficial to you...hits, unique visitors, etc.)

Appendix P: OER Meeting – Participants

Meeting held at the Center for Studies in Higher Education, UC Berkeley, May 23-24, 2005

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Appendix Q: OER Meeting – Agenda

Meeting held at the Center for Studies in Higher Education, UC Berkeley, May 23-24, 2005

ONLINE EDUCATIONAL RESOURCES: WHY STUDY USERS?

What do we know about users of Online Educational Resources (OER)? What more do we need to know, and how do we find out?

- Our target is to begin consolidating knowledge about the spectrum of current and potential users of online educational resources (OER), and their motivations for using these resources. Topics for discussion will include why and how educational content providers conduct user studies, what they actually know about their users, how that knowledge is applied in strategic planning, and how research results can be shared more easily.
- The format will be relatively informal and flexible to maximize discussion. Proceedings will be recorded, transcribed, and summarized.

MONDAY, MAY 23, 2005

9:00 – 9:30 Continental breakfast available: Geballe Room, Townsend Center, 220 Stephens Hall

9:30 – 11:15 Introductions & Perspectives: Who are the current and potential users of OER? How do we know?

What do developers know about the demographics, behavior, and motivations of users and non-users of online educational resources? How do they find out? What do they want to know?

Survey of select projects (~10 minutes each)

- Curricula (CMU, Connexions, Merlot, UC Irvine, MIT)
- Digital Libraries (RLG, JSTOR, NSDL)
- Tools and Reuse (Carnegie, MIT, IKSME)
- Foundation and Society perspectives (Fisher, Wang)

11:15 – 12:30 Codifying content and contexts

Diane Harley, Jonathan Henke, Gary Matkin
Quick (30 min) overview CSHE findings on humanities/social science users in three higher education contexts (survey and focus group data, "authentic" use, non-users, barriers to use). Followed by discussion, critique, and recommendations.

- How does the variety of online educational content available (canned curricula, digital libraries, media sites, electronic textbooks, learning object repositories, etc.) and the infinite number of ways users can combine resources (e.g., individual digital objects and canned curricula; mixture of free and proprietary content, comprehensive and niche resources) influence our ability to make sense of the current and future landscape of user behavior and motivation?

12:30 – 1:30 pm **Lunch**

1:30 – 3:30 pm **Making OER useful to varied users and communities**

Gary Matkin, Vijay Kumar, Toru Iiyoshi (comments followed by general discussion)

- Is it important for content providers to distinguish among various educational audiences and contexts (e.g., community college, R1s, AP courses, fully online vs. on-campus hybrid, international markets, liberal arts, vocational, etc.)?
- How is localization, translation of open content to be handled? Who are the mediators? How can we help users access and share pedagogical knowledge and innovations to better use OER?
- How important is it to distinguish between those willing to pay and not pay for use of online resources (e.g., undergraduate contexts vs informal learners, etc.)? Between intentional users who have specific educational goals and broad spectrum users?

3:30 – 5:30 pm **Users, user demand, and sustainability**

Saul Fisher, Vijay Kumar, Roger Schonfeld, Candace Thille (comments followed by general discussion)

- What do we mean by sustainability? What are the dimensions of sustainability for Open Content?
- What is the relationship, if any, between understanding current and potential users, and questions of user demand and sustainability of open educational content?
- Comparison of specific projects on sustainability models. What are the key aspects of a project that render it sustainable?

6:00 pm **Dinner**

TUESDAY, MAY 24, 2005

8:30 – 10:30 am **What do we want to know about users? How do we find out?**

Shannon Lawrence, Diane Harley, Flora McMartin, Roger Schonfeld
Overview of CSHE interviews on OER user studies (SL, ~30 minutes followed by discussion of summary document to be made available prior to meeting)

- Where are the gaps in current data about users, and how might those gaps be filled? What are the best methods to employ for strategic planning purposes? Should/can OER projects be thinking about common questions, metrics, and approaches to understanding users?
- What are consequences, if any, of poor sampling? Application of user results to wrong questions? Are there consequences to not doing user demand/market analyses before building content?

10:30 am – 12:00 pm **Next Steps**

- What are best ways to leverage activities across multiple projects?
- What are the larger research questions and agendas that need to be addressed?

12:00 – 1:00 pm **Adjournment & Lunch**