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This paper investigates the current trends which exist in digital libraries in the humanities regarding their suitability for structured educational use, including the extent to which faculty collaboration affects digital library development, the proportion of total use of these libraries comprised by students, and the preparations which both librarians and faculty have made to encourage this use.

Based on the findings of these investigations, recommendations were made for the implementation of the IEEE Learning Object Metadata standard within the Southern Stories project, a multimedia folklore collection with a strong educational component. The results of these suggestions, as well as the negotiation of technical and pedagogical limitations which stand in their way, hold implications for the future of metadata development for all digital collections with a disciplinary focus in the humanities.

Headings:

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APPLICATION OF THE IEEE LEARNING OBJECT METADATA STANDARD TO
MULTIMEDIA FOLKLORE COLLECTIONS: ITS IMPLICATIONS FOR
HUMANITIES EDUCATION

by
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Introduction

The propagation of digital libraries over the past several years has led to their use in many contexts and disciplines. In particular, educators and librarians alike are realizing the utility of digital libraries resources as tools for educating students at all levels of learning. In response to this trend, digital library professionals are charged with the task of enabling educational resource discovery in order to improve the effectiveness of these collections. Developing effective educational metadata standards is an integral component of this task.

Science digital libraries have been at the forefront of this development. Digital libraries in the humanities, on the other hand, lack the history of their scientific counterparts. Many of these projects are still very much in the planning stages, and their metadata guidelines are still being generated and refined. Furthermore, much exists in humanities research and learning paradigm to suggest that the educational metadata description guidelines which exist in the sciences may be ill-equipped to address the types of learning with which digital libraries in the humanities will engage. In any case, there is a wealth of opportunity for developing metadata solutions for these projects.

The purpose of this project is to initiate the process of developing best practice guidelines for an implementation of the IEEE Learning Object Metadata (LOM) standard (<http://ltsc.ieee.org/wg12>) within a digital library in the humanities. Specifically, it focused on the Southern Stories project, a newly developing multimedia collection with an interdisciplinary focus and a stated ambition to be “an inter-institutional, collaborative

resource for Southern life and culture” (<http://www.ibiblio.org/ferris>). This enterprise includes the development and evaluation of specific educational materials which will supplement the primary source material within the collection. This mandate, coupled with the project’s relative infancy, make it an exceptionally good focal point.

Because the extent and scope of educational materials relating to digital library resources in the humanities is minor when compared to their extent in science digital libraries, and because metadata guidelines for those materials are correspondingly scarce, this project also notes that participation by educators in the process of generating those guidelines is essential to ensuring their efficacy. To that end, one of its secondary objectives was to determine the current state of digital libraries in the classroom, both from the perspective of collaboration with faculty in their development as well as that of their actual use by instructors.

Literature review

Trends of educational Internet use

As the quality and quantity of digital library resources increase, librarians in charge of maintaining those resources must take the resource discovery patterns of their patrons into account. Students are an important user group within these libraries, with unique use patterns. They are increasingly adept at using the Internet in pursuit of their educational objectives; furthermore, they have come to expect that it will provide tools which supplement these objectives.

The Pew Internet and American Life Project study, “The Internet Goes to College” (Jones 2002), sheds important light on the shifts in attitude which have taken place among college students in the past several years. For example, 86% of college student respondents said that they had used the Internet, compared with just 59% of the population at large. Within that 86%, the vast majority reported that the Internet had had “a positive impact” on their academic experience. Further evidence of these trends may be found in the study’s findings regarding student study habits, in which nearly three in four college students polled reported that they used the Internet to find information prior to going to the library.

Faculty attitudes

One of the observations put forward by the Pew Internet study was a perceived “generation gap” separating students from faculty with respect to their use of the Internet. Despite the very high percentage of students who reported productive academic use of

the Internet, only about half of student respondents noted that they had been encouraged to use e-mail or Internet tools in class. When professors did use Internet channels of communication, their method of choice was far more likely to be e-mail than any other medium. The study noted that “it is likely that there is still some reluctance among university faculty to adopt Internet technology and put it to use in the classroom.”

When casual observers take note of this “reluctance” to accept technological trends, it is often faculty in the humanities who come to mind. Such perceptions are occasionally reflected by the literature. A study conducted at Hebrew University (Lazinger, Bar-Ilan, & Peritz 1997), polled faculty as to the extent of their Internet use, and the types of Internet applications they used. The results revealed a significant difference in levels of use among the humanities faculty at Hebrew, relative to faculty in other disciplines. Not only were survey return rates among humanities faculty lower than among science and agriculture faculty, but those who did return the survey reported use rates of just 62%, far lower than the 85-90% reported by most other disciplines.

These attitudes persist into the 21st century. A round-table discussion on American history education for undergraduates revealed that of the eleven participants, only two used Internet resources regularly in their courses (Kornblith & Lasser 2001). The attitudes revealed by these professors are both revealing and instructive. Some cited their age or time constraints in class preparation as reasons why they elected not to use Internet resources; one specifically mentioned the American Memory project as an exceptional resource, but felt personally uncomfortable using it in his own courses. Others questioned whether students were able to evaluate individual Internet sites fairly

and negotiate the differences between a “legitimate Web site” and “pop history sites ... where the wildest conspiracies are transformed into reality.” Another agreed:

My answer so far has been to wheel in that Trojan Horse, uncover where it came from, and then analyze its promise as well as its danger. But, undoubtedly, the belief that we can simply incorporate it as a tool and keep our critical distance is in part illusory, and it will, for better and worse, change the very environment in which we work and in which we become who we are as teachers.

Even as recently as last year, it was reported that only six percent of American history survey course instructors provided links to Internet resources in their online syllabi (Cohen & Rosenzweig 2005).

Aware of the perceptions of humanities faculty, Virginia Massey-Burzio (1999) conducted a study at Johns Hopkins in 1998 to determine their attitudes toward the Internet. While the study did find that faculty were wary of the Internet’s utility as an educational resource, in part reflecting the “generation gap” which the Pew Internet study would make explicit four years later, Massey-Burzio stressed that the professors surveyed should not be “dismissed as Luddites.” Indeed, the criticisms of Internet resources made by faculty were largely valid. Chief among them was the cost of going digital. Many lacked the tools, time, and/or willingness to learn new technology which would facilitate the use of digital resources. Some noted that the librarians responsible for instituting these changes were moving too quickly to encourage the use of these resources and not allowing for the different skill sets and searching patterns possessed by humanists. Interestingly, one faculty member wondered if digital resources would subvert his authority in the classroom, asking if students would be searching the Internet for information while he was trying to teach.

Despite their misgivings about the rate at which technology was advancing and at which libraries were adopting it, the professors had a remarkable amount of trust in the

ability of librarians to mediate it for them. There was some fear that, as librarians became more technologically adept, their role as subject specialists would fall by the wayside. Others made the observation that, even before the advent of computers, librarians had always been more aware of technology than the average humanities faculty member and played an important role as a go-between for them.

Although the Johns Hopkins study was conducted in 1998, the rate of technological change in the humanities is such that these concerns are still important and worthy of consideration. Especially important is the idea of “trust” which the Johns Hopkins study established – that one of the roles played by librarians for the humanities faculty was as a mediator between new technology and the user. This is a role which will be crucial to this project as it goes forward.

Digital library development

In response to the trend toward Internet familiarity, among undergraduates as well as professionals, libraries and information providers began to look into ways in which the Internet could be used as a tool to provide effective educational resources. One of the pioneers in this type of digital library development was the National Science Digital Library (NSDL), developed by the National Science Foundation (<http://www.nsdlib.org>). The NSDL emerged from a 1996 report issued by the NSF investigating methods by which science, technology, engineering, and mathematics (STEM) education could be improved. Out of this report came the call for implementation of information technology in the classroom and, more specifically, for the construction of a “national digital library” in the sciences which would foster it (National Science Foundation 1996). From these pedagogical roots grew the physical manifestation of the NSDL, which was unveiled in

2000. Currently, 192 separate digital library projects operate under the auspices of the NSDL (<http://www.nsd.org/about/index.php?pager=projects>). It remains one of the most important locations in the field of digital library education.

Independent of the NSDL, one of the earliest digital library projects with an educational focus was the University of Michigan Digital Library Project. This project focused on the relevance of digital libraries to inquiry-based learning, with a focus on middle-school science education. In particular, it focused on the currency of items available within the digital library; “in many circumstances, students will use the same data and information sources as scientists” when they utilize digital library resources. Its emphasis on the importance of a digital library which directs students toward independent inquiries and self-directed learning, and on an educational system which facilitates those objectives, are a common thread in the literature on this subject (Wallace 1996).

More recently, Borgman et al. (2000) have done work on the Alexandria Digital Earth Prototype (ADEPT) and its role as a teaching tool in undergraduate geoscience classes (<http://www.alexandria.ucsb.edu>). Using similar evaluative criteria as those employed by the UMDL study, the ADEPT project proposed a number of research questions related to the use of digital libraries in undergraduate education. Among them:

- How can ADEPT modules support domain knowledge, work practices, and reasoning models of multiple disciplines that use geo-spatial resources?
- How can ADEPT accommodate users with different skills, knowledge, cognitive styles, and pedagogical styles?
- How can ADEPT help users view primary geographical evidence in new ways to answer scientific or geographical questions?
- How can ADEPT support the range of heterogeneous resources and their metadata necessary for learning applications?

These questions have driven much of the ensuing development of digital libraries of educational resources and learning materials, independent of disciplinary focus.

Digital library development in the humanities

In spite of what appear to be prevailing trends toward skepticism regarding the Internet among humanists, the discipline has been making steps toward providing access to digital resources. Ann Wynne (2001) discusses trends at the turn of the century related to digital teaching of history to undergraduates. Although the study focused less on the concept of a “digital library” as currently understood and more on simple hypertext and autonomous websites, Wynne raises interesting points about the types of issues which hindered progress in this area at the time.

Wynne underscores the need for an intellectual community to develop around the Internet resources designated for use in the classroom. It is not enough to simply deploy the sites and trust that they will be utilized, she suggests; rather, it is the role of the instructor to act as a “sage” rather than as a “guide.” Wynne ties together the experiences of two courses in “Western Civilization” and their respective uses of digital teaching tools to note that, in any successful digital teaching project in the humanities, it is the agency of the instructor and their ability to impart a sense of independent evaluation and content interpretation among their students which leads to the fostering of productive community around these projects.

A number of successful digital library projects in the humanities are currently in development. One of the most well-known and well-documented examples of a humanities digital library is the Perseus Project, in continuing development at Tufts University since 1987 (<http://www.perseus.tufts.edu>). The ultimate objective of the Perseus Project is to establish, through the digital library, “an environment that can break down the barriers between academia and broader historical discourse about the past” (Crane et al. 2003). The contributions of Perseus toward this goal in its first decade have

mostly involved the provision of content regarding Greco-Roman antiquity, including Greek and Latin texts and images of classical artwork of the period.

From the outset, Perseus was intended to serve as an educational tool. A series of interviews conducted with professors across the humanities disciplines in 1987 revealed enthusiasm for Perseus's role as a content provider for their students, but resignations about the possibility that the project might play too active a role in privileging a particular viewpoint. In light of these concerns, the Perseus team "focus[ed] on primary source material that scholars and students might use to create their own interpretations rather than instructional materials that explicated meaning didactically" (Marchionini 2000). The approach has been successful, finding that nearly one-fourth of Perseus web traffic was generated by undergraduates (Marchionini, Scaife, & Crane 2000).

Additional examples of such digital library projects include the American Memory project at the Library of Congress (<http://www.loc.gov/ammem>), as well as the Institute for Advanced Technology in the Humanities at the University of Virginia (<http://www.iath.virginia.edu>).

IEEE Learning Object Metadata

To date, the literature on digital collections in the humanities has been primarily concerned with the provision of content, through interface solutions and digitization workflows. Comparatively little attention has been paid to the generation of metadata. An exception to this rule is the Library of Congress American Memory project, which was an early adopter of the Open Archives Initiative. Under its auspices, the Library of Congress became a leader in the development in the OAI Protocol for Metadata Harvesting, and more broadly in the trend toward interoperable metadata records for

cultural resources across institutional boundaries (Arms 2003). However, most humanities-related digital projects have little to no public documentation of their metadata strategies. As these digital collections begin to propagate across the Internet, metadata standards will become more broadly applied and documented; additionally, specialized standards, designed with an eye toward particular user groups and patterns of use, will be more easily implemented within the core element sets.

It was in response to the emergence of such trends within the educational community that the IEEE Learning Object Metadata (LOM) standard emerged (Learning Technology Standards Committee 2002). LOM was developed in order to better provide access to specific types of educational resources known as “learning objects,” defined as “any entity, digital or non-digital, which can be used, re-used or referenced during technology-supported learning.” As part of the LOMv1.0 Base Schema, the current LOM draft standard defines nine basic categories of metadata:

- *General* – “general information that describes the learning object as a whole”
- *Lifecycle* – “the features related to the history and current state of this learning object”
- *Meta-Metadata* – “information about the metadata instance itself”
- *Technical* – “the technical requirements and characteristics of the learning object”
- *Educational* – “the educational and pedagogic characteristics of the learning object”
- *Rights* – “the intellectual property rights and conditions of use for the learning object”
- *Relation* – “features that define the relationship between the learning object and other related learning objects”
- *Annotation* – “comments on the educational use of the learning object ... information on when and by whom the comments were created”
- *Classification* – “describes this relationship in relation to a particular classification system” (LTSC 2002 6-7).

Within these nine types, individual data elements address the specific imperatives defined by each. All LOM elements are optional; implementers may choose to use as much or as little of the standard as they wish, depending on institutional policies and defined best practices. The draft standard provides recommendations for mapping LOM data elements to the Dublin Core Metadata Initiative (DCMI), providing for best

practices in crosswalking between the two; additionally, the draft standard notes that “the LOM working group is committed to working with the Dublin Core Metadata Initiative to develop interoperable metadata” (LTSC 2002 44).

The development of the LOM standard heralded the emergence of learning objects as a model of educational content management. For some information professionals, learning objects represent a fundamental shift in the nature of educational resource provision. Mark Merkow (2002) makes a number of points in support of the learning object:

- Learning objects simplify collaboration, sharing, and reuse of instructional content...
- Evaluation of the quality of learning systems is dramatically simplified...
- Because they're standardized, learning objects are easily corrected when flaws are discovered...
- Learning objects may also be supportive of continuous evaluation with each use and reuse.

The current state of the literature indicates that students are increasingly comfortable working within the digital world in order to pursue their educational objectives. Educators will need to take this into account when planning future lesson plans; the increase of digital educational resources will ultimately have a profound effect on the ways in which classes are conducted, as the Massey-Burzio study indicates. The current status of this digital resource development in the humanities is slightly behind that of the sciences; although several advances have been made in the past several years, much remains to be done.

This observation is especially true of specialized resource discovery directed at educators and their patterns of use. Proponents of educational metadata often speak of revolutionizing educational practice; if it is true that digital resources will themselves effect this type of widespread change within the humanities classroom, encouraging the use of LOM across institutions within that discipline by promoting particular best

practices will do as much to connect these institutions and promote interoperability as it does to provide educational materials to relevant user groups. In pursuing this study and others like it, both of these objectives must be fully considered in order to establish an environment where future implementations of the LOM standard to humanities collections may flourish.

Research questions

In light of the issues discussed above, this paper asks the following questions within the context of the Southern Stories project:

- What best-practice guidelines can be immediately established toward the effective implementation of the LOM standard within a particular data description framework?
- What types of internal barriers might such a project encounter on the road to execution?

Based on the answers generated from pursuing these questions, it continues on to address a number of points more generally related to digital projects in the humanities:

- What lessons from the Southern Stories experience, if any, can be applied broadly to the experience of metadata implementation in humanities digital libraries?
- How can a LOM-enriched collection be promoted to the user base which will ultimately use it?

The implications of this project for digital librarians in all disciplines, but especially in the humanities, are quite important. Most immediately, there is a movement afoot to institute LOM as a standard within projects with significant educational capital; the literature on developing inter-institutional encoding standards, however, is only recently coming into its own. Much of this literature is based on observations and prognostications based on previous instantiations of the LOM standard. By basing a local implementation of the standard on these suggestions, this project hopes to make a contribution to that literature by determining their effectiveness within a specific framework. Doing so will assist in the overall development of the LOM standard, both generally and as it pertains to this type of material.

It is also important to recognize that metadata development along these lines cannot exist in a vacuum; rather, as the materials which educational metadata describes

are developed for and by the educational community, steps can and must be taken to ensure that the community has a say in their construction. Toward that objective, this project hoped to gain an understanding of the role of faculty in digital library development and the extent of student use of digital libraries to further their own personal educational objectives. Its intents and purposes in doing so were to be better equipped to address the relevance of educational metadata to digital libraries in the humanities, as well as evaluate the environment of library-faculty cooperation in their development; such cooperation will ultimately be necessary for a successful deployment of educational metadata standards.

Method

This study was divided into two parts. The first was the administration of a questionnaire to selected digital library developers in charge of maintaining collections with a humanities focus. The purpose of this questionnaire was to investigate two current trends: the role of faculty in digital library development, and the extent to which students are currently using digital libraries in pursuit of their own educational objectives. A sample set of twenty digital library administrators was selected, and questionnaires were sent out via electronic mail. Data collected from the responses was then encoded and analyzed for any prevailing trends which might emerge.

Using the results derived from this questionnaire as guidance, the project then embarked on its primary objective – to establish guidelines for implementing the LOM standard within the Southern Stories project. This objective served a practical purpose for the project's success; as it will ultimately serve an educational function, through the provision of secondary educational materials and learning objects related to the items contained within it, the importance of clearly stating metadata objectives and guidelines related to that function is not in doubt. Beyond the immediate concerns of Southern Stories, however, establishing these guidelines served the academic purpose of developing a LOM application profile which would best serve the interests of the Southern Stories project. It additionally hoped to pinpoint specific shortcomings of the current standard, both generally and as it pertains to the needs of digital libraries in the

humanities, and advise interested librarians on how to proceed with their own implementations.

The Southern Stories project was especially singled out for participation because it is currently in the early stages of development. Although a functional interface is in place, only a handful of materials have yet been digitized. Frameworks are in place for the organization of materials and collections into specific thematic groups, such as geography, discipline (i.e. music, literature, etc.), and media type. Ultimately, every collection within the project will contain four specific media types: audio clips, video clips, still images, and transcripts of interviews and other recordings. In addition, it is envisioned that at the item level, the Southern Stories project will provide educational materials which will enrich the learning experience for students at all levels of learning by providing for interactivity between them and the items which Southern Stories hosts. As the provision of these educational materials remains a future objective of the project and has not yet been put into practice, the level of description of these materials is still in doubt.

The workflow required for the implementation consisted mostly of conversations conducted with the Southern Stories project team. The purpose of these conversations was to establish the philosophical objectives and technical considerations to be navigated in order to successfully develop best practice guidelines locally for the project. Three such discussions were held. The first, with the entire team, served as an introduction to the project, including the ideal research and educational objectives which it would serve and the means by which team members could move toward those objectives in the short term. The second, with the project's lead visionary, William Ferris, established in clearer

detail the educational aims of the Southern Stories project. The third and final conversation, with technical coordinators of the Southern Stories project, provided the necessary technical context in which to execute the project's metadata initiatives, including establishing finally the relationship between the Southern Stories data dictionary and its parent project, Documenting the American South. This relationship is crucial to understanding the local implementation of the LOM standard. Based on the information gathered from these conversations, metadata application guidelines were developed which would inform future development of educational materials supplemental to the Southern Stories material.

Results and discussion

The results of this study were affected by its scope; working with a small sample set of questionnaire respondents as well as a limited set of potential materials to which LOM encoding could be applied, there were only a handful of trends to be observed and recommendations to be implemented in response to them. The data which was produced by this project, however, does indicate that student use is a considerable percentage of the overall use of digital collections in the humanities, and that these libraries can do more to prepare for structured classroom use. Based on these observations and on the existing metadata guidelines within the Southern Stories project, metadata recommendations were made for encoding of future educational materials which would ensure that the broadest possible preparations were made for this type of use.

Questionnaire

Of the twenty questionnaires which were distributed among digital library practitioners, five were returned. Although the low response rate strongly suggests that further study should be done in order to reinforce the trends indicated by this study, the responses which were received provide important insights on the extent to which both students are using digital libraries for research, and digital libraries are prioritizing such use. Results indicated that students do comprise a substantial proportion of overall digital library traffic, but not all digital libraries privileged this use to the same extent.

About how many visitors use your digital collection on a monthly basis?	
<100	0
100-500	0
500-1000	0
1000-2000	1
>2000	4
About what percentage of that use is generated by student activity?	
0-20	2
20-40	3
40-60	0
60-80	0
80-100	0

Table 1. Traffic information.

Table 1 shows the statistics which were collected regarding the traffic patterns of participating libraries, both generally as well as accounting solely for student use. As the results show, all but one reported over two thousand users per month, and the majority estimated that between 20-40% of that traffic consisted of student use. Respondents reported a number of methods for retrieving these statistics, ranging from simple web log analysis (using *grep* and *sed* to locate referrers, IP addresses, etc.) to home-grown or outsourced statistical reports, which analyze use according to session (rather than individual page hits) and take account of session length, pages visited, and other details. (An example of such an interface may be found at <http://stats.umdl.umich.edu>.)

These numbers provide an informative but nevertheless incomplete look at the extent of student use of digital collections. The questionnaire as submitted was far from exhaustive, and its relative informality provided only a glimpse into the digital library use patterns of the average student. Furthermore, while access logs and statistical reports are invaluable tools for evaluating overall traffic patterns, they fall short in establishing the context of such use. Although the advent of classroom management software allows for easier determination of classroom-oriented digital library use, at least in theory (i.e. if a referral comes from a school's Blackboard server), one can only go so far in making such

determinations while relying solely on usage statistics. Ultimately, a more substantial answer to these questions can only be deduced through conversations with educators and students.

Did potential student use factor into the discussions regarding the digital library's design and content?	
Yes	2
No	2
How important of a factor is student use?	
Not important	1
Slightly important	1
Very important	2
Essential	0

Table 2. Student use information.

The results diverged on the subject of design intentions and the development process, as indicated by Table 2 above. The “development process” is defined here as the creation of mission statements, collection development policies, and pedagogical imperatives prior to the publishing of digital library materials. Interestingly, while all respondents noted that faculty played an important role in the development process, their responses were split on the importance of student use as a variable in that development. Only half noted that, in their discussions with faculty concerning the design of their digital libraries, student use was an overarching consideration. Somewhat paradoxically, however, half again replied that student use was considered “very important” in the overall functionality of their digital library. These responses were not strictly correlative; respondents who replied negatively to the first question gave an answer of “very important” to the second. Again, the inexhaustivity of the study, coupled with the lack of responses, render these results effectively inconclusive. More work remains to be done in order to identify trends in this area.

Although the results of the questionnaire cannot be considered completely authoritative, they nevertheless point to certain trends which warrant further investigation. In some ways, they indicate an information environment in which adequate preparations for structured classroom use have not yet been made. Much of this is due to the collection development and design policies of individual digital projects. Often, and especially in the humanities, digital libraries are designed as primary source repositories, without any structured secondary-source material which would advance particular educational objectives. Although such material is sometimes generated upon full realization of a project's immediate digitization objectives, examples available on the Internet indicate that this type of use is not prioritized to the same extent.

These observations are partially reflected by the results of this survey, which found that digital libraries which did not initially prepare for student use nevertheless later stated that it was, in fact, an important part of their overall mission. As students become more comfortable with digital resources, and indeed refer to them as primary sources of information in pursuit of their educational objectives, it will become more important for digital libraries to respond to these needs. This issue will be considered closely as the project goes forward.

Implementation

The results of the questionnaire for digital librarians indicated that employing educational metadata standards for the purposes of enriching the educational quality of objects within digital collections in the humanities was a useful objective, in light of the substantial proportion of student use of these collections. Based on the stated educational objectives of the Southern Stories project, as well as the existing technical and

architectural framework underlying it, it was possible to make specific metadata recommendations which could immediately be employed within the project database to expedite rich description of educational materials.

It is important to distinguish the long-term pedagogical and technical objectives of the Southern Stories project from the short-term implementations which necessity dictated that this project address. There are many specific barriers to a complete application of the LOM standard within the Southern Stories project, for which preparations will have to be made down the line. The most important implementation guideline to establish for the Southern Stories project was the creation of metadata fields which would serve the specific resource discovery objectives of the project's educational materials.

This particular objective was prioritized for two reasons. The first of those reasons relates to the Southern Stories project's relationship with its parent digital initiative, Documenting the American South (DocSouth). Because the projects are related, and because the former will ultimately be contained within the latter, Southern Stories shares its dictionary of database elements. However, support within that data dictionary for educational metadata falls somewhat short in its ability to describe contextual information about the use of supplementary educational materials. In order to fully develop the project's eventual educational objectives, LOM support, and specifically that of its educational elements, was deemed immediately necessary.

Although no supplemental educational materials for the contents of the Southern Stories project have yet been created, and in that respect any description guidelines thereof are speculative at best, the importance of creating a standard by which this

material might be easily located by educators was considered to be an important preliminary step in the creation of that material by all members of the project team. In order to provide for the completion of this task, fields were chosen specifically from the LOM standard's "Education" data type and cross-checked to locate fields for which analogous entries in the DocSouth data dictionary existed; having established this, new fields were selected which were thought to be directly relevant to the potential material as well as easily applicable by future participants in the project.

LOM Field	Definition (LTSC 2002 23-30)	Analogue in DAS database?	Recommended?
Interactivity Type	"Predominant mode of learning supported by this learning object."	<i>no</i>	Yes
Learning Resource Type	"Specific kind of learning object."	type_id	
Interactivity Level	"The degree of interactivity characterizing this learning object."	<i>no</i>	Yes
Semantic Density	"The degree of conciseness of a learning object."	<i>no</i>	No
Intended End User Role	"Principal user(s) for which this learning object was designed, most dominant first."	<i>no</i>	Yes
Context	"The principal environment within which the learning and use of this learning object is intended to take place."	<i>no</i>	Yes
Typical Age Range	"Age of the typical intended user."	<i>no</i>	Yes
Difficulty	"How hard it is to work with or through this learning object for the typical intended target audience."	<i>no</i>	Yes
Typical Learning Time	"Approximate or typical time it takes to work with or through this learning object for the typical intended target audience."	<i>no</i>	Yes
Description	"Comments on how this learning object is to be used."	body	
Language	"The human language used by the typical intended user of this learning object."	<i>no</i>	No

Table 3. Educational metadata implementation suggestions.

The results of this process can be found in Table 3 above. In total, seven elements were recommended for inclusion in the Southern Stories database table reserved for educational resource description. The LOM fields included therein are meant to supplement the database's initial bibliographic description of these materials with richer contextual information about the specific *types* of use which are possible with the educational materials so described.

The primary difficulty encountered in preparing this list of recommendations was the lack of specificity inherent in many of the educational elements within LOM. Most LOM elements have very specific vocabularies from which value entries must be drawn. Some elements of type Educational, for instance, contain value entries which must be encoded on a five-part Likert scale. For example, LOM element 5.8, Educational.Difficulty, may have values ranging from “very easy” to “very difficult” (LTSC 2002 29). The relative subjectivity of such field vocabularies, and the ensuing difficulties inherent in pre-emptively considering their application, were both noted as potential limiting factors by the project team. In addition, while the LOM draft standard provides these field vocabularies, it does not provide application guidelines for them; such decisions must be made on a project-to-project basis.

After considering these issues, two application recommendations for the chosen LOM elements were made by the project team. First, in order to ensure that the widest and richest potential data set was made available for future description of supplemental educational materials, all elements so recommended would be included within the data dictionary, despite the current lack of standards and protocols for implementing them. Secondly, the project team recommended that prior to the population of these data elements, a pilot study should be undertaken in which a handful of learning resources of many different types would be created. This task ensures that future project metadata specialists, be they librarians or educators, will have a corpus of relevant materials upon which to draw when developing local standards and protocols for learning object resource description within the framework of Southern Stories.

Future directions for research

The guidelines detailed above were the only recommendations made by this project which could immediately be put into practice, due to the timetable on which this project operated as well as the limitations of the Southern Stories data architecture. Beyond these guidelines, the recommendations for LOM application to the Southern Stories project require an expenditure of resources quite beyond the capacity of this study. These expenditures include conversations with DocSouth staff to determine the best possible application profile for LOM record generation, for the purposes of OAI metadata harvesting, as well as consultations with educators at all levels of learning as to the best methods of generating supplemental educational materials and their corresponding pedagogical objectives.

These tasks are not strictly unique to the success of the Southern Stories project. The lessons which can be learned from the implementation of these recommendations can and should be applied generally to all digital library projects within the humanities. Doing so will help in the development of both an active community of educational users and stakeholders, as well as generate an active literature on the topic which will help to sustain professional interest in the subject.

These recommendations can be carried out according to a three-fold approach. In the first, recommendations for LOM applications which forward the interoperability goals of the LOM standard itself, and of the projects which have invested heavily in it, will be discussed. The second set of recommendations addresses local institutional

considerations which must be taken in order for LOM to be successfully applied; specific examples from Southern Stories will be cited, but generalized across the spectrum of like-minded digital libraries.

Finally, considerations based on the unique needs of humanities-based digital libraries, as distinguished from their counterparts in the sciences, will be addressed. These will necessarily be less technical than the recommendations in the previous two groups; although there are differences in LOM application based on the different ways in which research and learning are facilitated in the two disciplines, much of the focus of the third set of considerations will focus on the ways in which use of digital library educational materials might be encouraged among educators, and how their active participation in the development of these materials might be facilitated. Growing the population of educators who make active use of LOM-encoded digital library resources is essential to the long-term success of the project; indeed, mechanisms exist within the standard itself which actively encourage this community of users to develop.

1. Think globally. Interoperability remains a primary objective of projects associated with the development and refinement of the LOM standard as a device for enabling resource discovery. Projects such as the CanCore initiative (<http://www.cancore.ca>) exist in order to provide a base of operations for the work of other projects within the field, which seek to apply the standard in a way which not only serves their own purposes, but also advances the interoperability objectives of LOM developers and advocates. In particular, CanCore seeks to establish a set of best practices for the implementation of a core set of LOM elements which will provide for the most effective path to resource

discovery for learning objects while remaining usable for the largest possible number of institutions.

Beyond the process of describing learning objects locally using the standard, resource discovery may be promoted in two ways. First, the development of an LOM application profile, predicated on the practices of other institutions as well as the recommendations of academic and professional authorities such as CanCore, will ensure that many digital projects with significant supplemental educational materials are working with the same set of tools. The concept of an application profile was defined by Heery and Patel (2000), who described them as “schemas which consist of data elements drawn from one or more namespaces, combined together by implementers, and optimized for a particular local application.” More than simply having applicability to “local applications,” however, they are essential to ensuring that many widespread projects are using the same metadata guidelines. It is not enough simply to generate these metadata guidelines, however; libraries must also take advantage of services such as the OAI Protocol for Metadata Harvesting, which is LOM-compatible, in order to maximize the exposure of their encoded objects.

Carol Jean Godby, an OCLC researcher, conducted an analysis (2004) of the application profiles of several projects utilizing the LOM standard in order to determine which elements were most widespread. In particular, she found that most LOM application profiles closely approximated the Dublin Core Metadata Initiative (DCMI) element set; that is to say, the most commonly applied LOM fields were analogous to the fifteen primary DCMI elements. Her findings also located two barriers to interoperability: that local practices necessarily differed between institutions, and that

geographically distant projects were less likely to share common LOM elements in their own profiles. Somewhat counter-productively, Godby found that educational elements – the fields on which the standard was at least nominally based – were among the least-frequently applied.

Based on these observations, Godby made her own recommendation for LOM best practice by dividing the standard into three priority levels for the purposes of implementation:

- **Core elements**, ideally those which closely mapped to Dublin Core elements as shown above, which could be easily applied across the largest number of collections in order to promote the largest possible degree of interoperability.
- **Local interest elements**, drawn from locally-encoded data regarding usage of the resource, i.e. where it is located, relevant access restrictions, etc.
- **Lifecycle elements**, ironically the elements which give LOM most of its uniqueness relative to general-purpose metadata standards; these include most of the educational fields, as well as annotative fields, meta-metadata, etc. Godby notes that these fields “will perhaps always remain a small percentage of the total”; however, the example of DLESE proves that, on a large scale, such elements can take on a life of their own when a community of critical mass develops around the collections of resources they describe (Godby 2004).

Although de-prioritizing the elements which make the LOM standard so essential for the rich description of learning resources seems inefficient, there is nothing in this prioritization which necessitates that there be *no* lifecycle elements in an eventual best-practice LOM record; rather, that lifecycle elements may ultimately remain a small portion of such a LOM record, until such time as the definition of those fields may be standardized. In applying the Educational LOM fields to their project, the Southern Stories team noted that many of the fields contained therein had highly subjective definitions. In many cases, such definitions may only be approached through meaningful collaboration between projects on the subject.

Southern Stories, and other digital library projects in the humanities, can take steps toward establishing this collaboration by creating their own local guidelines for the generation of LOM records based on the recommendations of both scholars such as Godby and initiatives such as CanCore, and sharing those experiences with others. This project is a first step toward initiating that conversation, but it is by no means the last; there is far more work to be done by the Southern Stories project in developing the necessary vocabulary for generating LOM records which can be aggregated by the OAI harvester and distributed broadly.

2. Think locally. In the case of Southern Studies, there were a number of variables which stood in the way of a full set of best practice recommendations for implementing the LOM standard. Many of them had to do with the project's development status; without a set of supplemental educational materials to which to apply the standard, most of the work that could be done toward that end was theoretical. Beyond these issues, there were technical limitations placed on the project by its dependence on the metadata guidelines of DocSouth; it is from these limitations that the second recommendation category is derived.

There seem to be two ways of approaching this concept. The first, already mentioned, is to consider the resources and the limitations of one's parent institution. The example of Southern Stories provides a clear example of the necessity of negotiating the ideal implementation situation with the reality to which it must be applied. Beyond the institutional level, one must think locally in terms of digital projects which share pedagogical objectives or thematic focus. In her application profile analysis, Godby uses the word "local" to mean something strictly geographical; here it is additionally used in

a more disciplinary sense, to indicate digital libraries in the humanities communicating with similar projects in order to develop guidelines for using the LOM standard which suit their own purposes.

In the case of Southern Stories, much of the limitation in developing these guidelines lies in the metadata generation process of DocSouth. Metadata records for items contained within DocSouth are not permanently stored in a designated repository. When the project wishes to create metadata records – for example, for OAI harvesting – it executes a script which queries the project’s internal MySQL database for fields which map to DCMI elements and dynamically generates an XML record which can then be set aside for metadata aggregation. Within the framework of this study, Southern Stories could not participate in this process, because its own project data dictionary is still under development. A future task of the project as it moves forward will be to determine the process by which it will generate its own metadata records for OAI harvesting, LOM included, and develop the tools necessary to dynamically generate those records.

Despite its current technical limitations, however, Southern Stories has done much to address the concerns of local implementation simply by establishing the framework by which educational metadata will be developed. The next step along these lines for the project will involve the development of supplemental educational materials, as well as a conceptualization of how those materials will reflect the overall mission of the digital library. It is hoped that, by initiating this process and sharing their experiences during it, Southern Stories will be able to influence other projects to do likewise.

In thinking locally by discipline, engaging like-minded digital library projects is not simply important in terms of standards development. It could well be said that an

essential component of promoting collaborative metadata development is the development of a community of digital libraries which share a similar focus. Developing LOM guidelines for the humanities among a wide array of digital library projects will ensure that such guidelines apply to many different types of primary as well as secondary source material. Furthermore, by developing these communities or contributing to already-existing ones, meaningful evaluation and refinement of LOM's applications to the humanities may be effected.

The nature of humanities research and learning itself presents an obstacle in the application of LOM to its digital projects; the paradigm in which studies are conducted within the discipline is quite simply not the same as in the sciences. In an article by Carole Palmer (2005) which details the mechanics of scholarly communication in the digital world, she outlines two distinct modes of research practice undertaken by humanists and scientists. In contrast to the problem-based research methods of the sciences, in which outside resources are discovered and applied to a core set of data and resources around which research is centered, humanists tend to start from one single text and follow several lines of inquiry related to the intellectual and historical context within which that text operates. These findings indicate that, contrary to the educational metadata guidelines of projects such as DLESE where learning objects are often described at the collection level, humanities digital libraries with educational materials – or even *without* educational materials – may need to consider the possibility that the primary source materials contained within them may themselves be learning objects, and develop their own application guidelines accordingly.

Palmer notes one development in response to these research trends, which is the development of “thematic research collections” which collect and digitize materials within a particular broad intellectual context. She provides practical examples such as the Blake Archive (<http://www.blakearchive.org>) and the Rossetti Archive (<http://www.rossettiarchive.org>) to illustrate this concept, and it is certainly influential to the digitization of the Ferris materials and the development of Southern Stories as well. Noting that such collections exist on the Internet, and are in fact becoming commonplace, is the first step toward developing the community of these libraries described above.

A primary example of this online community formation is the MERLOT History portal (http://taste.merlot.org/portal/working/history_portal), “an educational resource for teaching and learning.” The portal allows for easy access to digital collections and resources based on topic or area of study, facilitates discussions between educators, and provides links to external resources which are not linked within the MERLOT database of resources. The utility of MERLOT History as a resource for developing innovative educational techniques within history – and, indeed, within humanities education generally – is quite clear. With such a framework in place, there too is the potential for developing effective and interoperable educational metadata application profiles. By engaging a number of these projects in developing these guidelines, in the long-term it may be possible to enriching the educational metadata landscape even further and providing for more integrated e-learning activities. This is an end result toward which this project is certainly a step.

3. Think contextually. The previous two categories of recommendation are architectural in nature. In addition to considering the technical limitations inherent in an

implementation of LOM, thinking contextually about its implications for digital libraries in the humanities obviously requires a consideration of the potential users of the resources it describes. This consideration goes beyond simple resource discovery, however. LOM is an especially effective standard for the complete description of qualitative aspects of an educational resource because it allows for the communication channel between user and object – and, in fact, between two spatially distant users – to be a two-way street.

The mechanics for enabling these communication channels to be opened are contained within the standard itself, in the form of elements designed for the purpose of annotating records with notes concerning the learning objects they describe (LTSC 2002 33). The “Annotation” element type is quite simple, consisting of only three fields – Entity (the party responsible for the annotation), Date (the date on which the annotation was made), and Description (the text contained within the annotation). The minimal work required to conceptualize how annotation would work within an LOM application profile seems to indicate that it would make a good candidate for inclusion.

It is notable that these fields closely resemble the comments which a user might make to a weblog. By instituting the functionality of a content management system such as WordPress within the framework of a digital library, and developing a process by which the comments to an individual learning object could be integrated within the learning object database, it is certainly possible that meaningful annotative metadata may be implemented internally on a project-to-project basis. However, Godby specifically points out the “Annotation” element type as one used least often by LOM projects; clearly, then, work toward this end remains to be done. In particular, the Southern

Stories project has expressed a great deal of interest in pursuing this type of functionality, when its own supplemental educational materials are developed; it is possible that this project could in fact be a leader in the process of instituting annotative capability to humanities digital libraries.

Externally, too, a number of initiatives to encourage collaboration among educators and effective evaluation frameworks for digital resources in education have been developed. Again, much of the original work in this vein was done in the sciences. The most well known of these projects is probably the Digital Library for Earth System Education (DLESE) (<http://www.dlese.org>), originally developed by Columbia University and now affiliated with the NSDL. Its aim is

to provide: (a) ready access to high-quality educational materials about the Earth and environment; (b) information, tools and services to maximize the usefulness of the materials provided; and (c) a community center that fosters interaction, collaboration and sharing among educators, learners, and resource creators (Kastens & Holzman 2006).

To support the second objective, DLESE has developed a Community Review System (CRS) which allows for annotative information to be developed for each resource concerning its effectiveness as a teaching and learning tool. To develop the CRS, students were solicited for input on DLESE resources which were employed in their classes. Although there was some difficulty in acquiring substantial meaningful input from students, those who did report back provided “among the most substantive [reports] that the CRS has received.” The researchers found that the reviews allowed for modification of teachers’ instructional styles and provided opportunities for students to reflect on their own learning processes, thereby fostering a kind of individual inquiry-based learning which digital libraries have often sought to facilitate.

Currently, evaluation and collaboration are two of the four cornerstones of DLESE's overall functionality, and the services which it provides continue to influence the development of several digital learning projects which have followed. One example affiliated with the NSDL itself is the Instructional Architect (IA), a tool developed at Utah State University which provided teachers with effective tools for using NSDL resources in the classroom (Recker, Dorward, et al. 2005). These tools allowed educators to locate resources within the NSDL, aggregate them within a personalized web page and provide annotations, and publish the projects they created and make them available to the broader Web. A workshop utility was also built into the IA, which allowed for educators to evaluate their own work as well as that of others.

In evaluating educators' use of the IA, the team made a number of meaningful discoveries. Educators – especially those who considered themselves quite familiar and adept with the use of computers, both at home and in the classroom – felt that the IA, and by extension the NSDL, were quite valuable classroom tools. Measured on a Likert scale from 0 to 4, respondents representing the four workshops who were most familiar with computers and the Internet rated the “value of NSDL” variable at 3.5, and the “recommend NSDL to other teachers” variable at 3.6. In spite of these findings, the team reported that “persistent use remains difficult to obtain,” noting that very few educators continued using the IA after the evaluation workshops on which the study was based concluded. This climate may change, as faculty become more comfortable with the Internet as an educational tool and as student expectations mandate that they become so. Nevertheless it is a variable which must be noted as similar projects go forward.

Within the humanities, too, such tools are beginning to take shape. The MERLOT History portal provides a section on “teaching history”, in which are contained assignments designed for various history courses based on the information provided by the portal, as well as links to external resources which are not associated with the portal itself. Perhaps the most interesting component of MERLOT, from the standpoint of collaboration among educators, is the “personal collections” feature, in which educators may create a list of links to collections which they have found to be particularly useful in the classroom. Personal collection lists can be maintained by individuals or whole departments.

Additionally, the MERLOT browsing framework allows for users to click on the “Collections” link associated with a given resource and see the users who have filed that resource in their own personal collections. Currently, it is not possible to search the collections according to their popularity, based on their inclusion in these ratings; the rating framework within MERLOT is based on peer review evaluations, which are not written in the history portal to any great extent.

The fact that such evaluation and collaboration frameworks now exist for digital collections in the humanities, in spite of their relative lack of organization compared to more well-established initiatives such as those associated with DLESE, is a positive sign for the contextual recommendations which this project would suggest. By participating in such projects and encouraging an active conversation among participating libraries and educators regarding the development of effective metadata standards for education, Southern Stories and projects like it will be able to encourage the sort of active

participation in collaboration and evaluation which has made DLESE such a successful experiment.

More generally, though, additional studies need to be done in order to determine the extent to which educators, specifically those in the humanities, currently use digital library resources constructively in the classroom. This project constituted a brief investigation into the trends, but its findings did not focus strictly on the information-seeking patterns of educators and left many questions unanswered. What motivates teachers to use digital library resources as teaching tools? How do they locate these resources? Do they find them more or less effective than non-digital resources? How do they integrate digital and analog resources in their lesson plans? Future studies into the habits of educators will need to address any or all of these issues, in order to better understand the ways in which educational metadata can serve its intended user base.

Conclusions

The purpose of this study was to address a perceived lack of humanities representation in the overall landscape of digital collections and metadata resources. The selection of the Southern Folklife Digital Archive as a project for study was intended to provide a simple introduction to the process by which a humanities collection might consider the workflow process of applying a new metadata standard. In the end, this project did not have the time or resources necessary for a full-fledged implementation of the LOM standard; however, it has raised a number of pertinent issues suitable for future inquiry and research.

One of the outstanding weaknesses of this study is quite simply that it is among the first of its kind. A side effect of there having been relatively little work done in applying the LOM standard to strictly humanities-based digital collections is that best practices do not yet exist; institutions wishing to apply rich metadata records for enabling greater resource discovery must do so within the confines of their own local institutional policies, without contributions or assistance from others. Future studies and projects done toward the ends sought out by this paper would benefit greatly from increased cooperation between digital projects, and the evolution of best practices and metadata application profiles which would accompany it.

Improving the links between digital projects in educational resources and the professionals who will use them is a necessary component of increased cooperation. One of the primary shortcomings of this study is that it was unable to gain an understanding of

the commonalities – and, more importantly, the differences – between information professionals’ deployment of digital resources and educators’ uses of them. Failure to adequately negotiate the distance between these two groups, especially when one moves beyond the undergraduate level to elementary and secondary-level users, presents a cause for concern. The operational vocabularies used by these two professions may not be the same, and failure to account for this will obstruct the road toward resource discovery which educational metadata is meant to make passable. Future research will need to address these concerns, as well as seeking out the patterns by which educators locate their chosen classroom resources (both digital and print) and apply those patterns to the metadata they create.

The way ahead consists of two primary objectives: refinement of the metadata fields and vocabularies used to define the educational aspects of digital resources in the humanities, and collaboration between stakeholders to ensure that this metadata is applied effectively and in a sustainable fashion. This project serves as an example of one way in which this might be accomplished on a local level, but there is much work yet to be done. In an IMS-sponsored white paper on connecting “learning environments” and library resources, McLean and Lynch (2004) noted this quite succinctly:

There is a growing realization ... that learning activity as distinct from learning objects requires complex metadata infrastructural support which is as yet little understood. ... Metadata issues are broader than defining data elements. We also need to consider the vocabularies of values that can be used to populate data elements.

Projects such as MERLOT do much to promote the type of communication which will allow for the emergence of rich metadata standards such as LOM to establish themselves within the community of digital resources on the Internet. There is much work which remains to be done toward this end; this projects hopes to serve as one of the

first forays toward enhancing educational metadata vocabularies, in order to engage them with a wider array of topics and provide for more interdisciplinary digital learning experiences.

Appendix A: Sample LOM record

The example provided below shows the structure of a typical LOM record, as applied to an object digitized by the Southern Stories project (Lightle and Ridgway 2003). Encoded in XML, each element is nested within the data type which contains it; for example, <general> contains <identifier> contains <catalog> and <entry>. The tag library provided for LOM correlates directly with the names of the individual data elements themselves, providing for easier implementation.

```

<lom>
<general>
  <identifier>
    <catalog>URI</catalog>

<entry>http://www.ibiblio.org/ferris/people/bbking/BBKing1_video.php</en
try>
  </identifier>
  <title>Give My Poor Heart Ease (excerpt)</title>
  <language>en</language>
  <description>An excerpt from the documentary Give My Poor Heart Ease:
Mississippi Delta Bluesmen, featuring BB King. In this clip, BB King is
performing in his apartment in New York and for a class at Yale
University in 1974.</description>
  <keyword>"en", "B.B. King"</keyword>
  <keyword>"en", "Blues"</keyword>
  <keyword>"en", "Delta Blues"</keyword>
  <keyword>"en", "Performances"</keyword>
  <coverage>"en", "American South"</coverage>
  <coverage>"en", "20th century"</coverage>
  <structure>atomic</structure>
  <aggregationlevel>1</aggregationlevel>
</general>

<lifecycle>
  <status>draft</status>
  <contribute>
    <role>Author</role>
    <entity>William Ferris</entity>
    <date>1974</date>
  </contribute>
</lifecycle>

...
</lom>

```



Appendix B: Digital library questionnaire

1.) Do you track traffic patterns for your digital collection?

Yes [Continue to question 2.]

No [Skip to question 3.]

2.) If so, what methods do you use to track these traffic patterns?

3.) About how many visitors use your digital collection on a monthly basis? Provide an estimate if no concrete data is available.

100 or less

100-500

500-1000

1000-2000

2000 or more

4.) About what percentage of the general use of your digital collection would you estimate to be generated by classroom activity? Provide an estimate if no concrete data is available.

0-20%

20-40%

40-60%

60-80%

80-100%

5.) Have faculty members, or representatives of the faculty, consulted with you during the process of collection construction?

Yes

No

6.) During this consultation, did potential student use factor into the digital collection's design and content?

Yes

No

7.) How important of a factor was it? I.e., was the collection designed specifically for structured classroom use, or were the motivations strictly based in professional research?

Not important; its expected use is near-exclusive to advanced and open-ended research.

___ Slightly important; research is paramount, but classroom use is possible with the proper directions.

___ Very important; the collection was designed to be accessible for student novices as well as seasoned historical researchers.

___ Essential; self-consciously targeted at the classroom.

Bibliography

- Arms, C. R. (2003.) "Available and Useful: OAI at the Library of Congress." *Library Hi Tech*, 21(2), 129-139. Retrieved March 2, 2006 from the World Wide Web: <http://memory.loc.gov/ammem/techdocs/libht2003.html>.
- Borgman, C. L., Gilliland-Swetland, A. J., H. Leazer, G., Mayer, R., Gwynn, D., Gazan, R., & Mautone, P. (2000.) "Evaluating Digital Libraries for Teaching and Learning in Undergraduate Education: A Case Study of the Alexandria Digital Earth ProtoType (ADEPT)." *Library Trends*, 49(2), 228-250.
- Cohen, D. J. & Rosenzweig, R. (2005.) "Web of Lies? Historical Knowledge on the Internet." *First Monday*, 10(12). Retrieved March 2, 2006 from http://www.firstmonday.org/issues/issue10_12/cohen/index.html.
- Crane, G., Wulfman, C. E., Cerrato, L. M., Mahoney, A., Milbank, T. L., Mimno, D., Rydberg-Cox, J. A., Smith, D. A., & York, C. (2003.) "Towards a Cultural Heritage Digital Library." *Proceedings of the 3rd ACM/IEEE-CS Joint Conference on Digital Libraries*, 75-86.
- Godby, C. J. (2004.) "What Do Application Profiles Reveal about the Learning Object Metadata Standard?" *Ariadne*, 41. Retrieved January 16, 2006 from <http://www.ariadne.ac.uk/issue41/godby>.
- Heery, R. and Patel, M. (2000.) "Application Profiles: Mixing and Matching Metadata Schemas." *Ariadne*, 25. Retrieved January 16, 2006 from <http://www.ariadne.ac.uk/issue25/app-profiles>.
- Jones, S. (2002.) *The Internet Goes to College*. Retrieved March 30, 2006, from Pew Internet and American Life Project web site: http://www.pewinternet.org/pdfs/PIP_College_Report.pdf.
- Kastens, K. A. & Holzman, N. (2006.) "The Digital Library for Earth System Education Provides Individualized Reports for Teachers on the Effectiveness of Educational Resources in Their Own Classrooms." *D-Lib*, 12(1). Retrieved January 29, 2006 from <http://www.dlib.org/dlib/january06/kastens/01kastens.html>.
- Kornblith, G. & Lasser, K. (2001.) "Teaching the American History Survey at the Opening of the Twenty-First Century: A Round Table Discussion." *American History Review*, 87. Retrieved March 2, 2006 from the World Wide Web: <http://www.indiana.edu/~jah/textbooks/2001>.

- Lazinger, S. S., Bar-Ilan, J., & Peritz, B. C. (1997.) "Internet Use by Faculty Members in Various Disciplines: A Comparative Case Study." *Journal of the American Society for Information Science*, 48(6), 508-518.
- Learning Technology Standards Committee. (2002.) *Draft Standard for Learning Object Metadata*. Retrieved March 23, 2006 from the Institute of Electrical and Electronics Engineers Web site:
http://ltsc.ieee.org/wg12/files/LOM_1484_12_1_v1_Final_Draft.pdf.
- Lightle, K. S. & Ridgway, J. S. (2003.) "Generation of XML Records across Multiple Metadata Standards." *D-Lib*, 9(9). Retrieved April 10, 2006 from
<http://www.dlib.org/dlib/september03/lightle/09lightle.html>.
- Marchionini, G. (2000.) "Evaluating Digital Libraries: A Longitudinal and Multifaceted View." *Library Trends*, 49(2), 304-333.
- Marchionini, G., Scaife, R., & Crane, G. (2000.) *Final Evaluation Report on the Perseus Project Publication Model, 1997-2000*. Retrieved February 20, 2006 from the World Wide Web: http://www.ils.unc.edu/~march/perseus/final_report.pdf.
- Massey-Burzio, V. (1999.) "The Rush to Technology: A View from the Humanists." *Library Trends*, 47(4), 620-639.
- McLean, N. & Lynch, C. (2004.) "Interoperability between Library Information Services and Learning Environments – Bridging the Gaps." Retrieved March 30, 2006 from the IMS Global Learning Consortium:
http://www.imsglobal.org/digitalrepositories/CNIandIMS_2004.pdf.
- Merkow, M. (2002.) "Learning Objects Spark an E-Learning Revolution." *Techlearning*, March 1, 2002. Retrieved February 12, 2006 from the World Wide Web: http://www.techlearning.com/db_area/archives/WCE/archives/mmerkow.htm.
- National Science Foundation. (1996.) *Information Technology: Its Impact on Undergraduate Education in Science, Mathematics, Engineering, and Technology* (NSF 98-82). Retrieved March 2, 2006 from the World Wide Web:
http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf9882.
- Palmer, C. (2005.) "Scholarly Work and the Shaping of Digital Access." *Journal of the American Society for Information Science and Technology*, 56(11), 1140-1153.
- Recker, M., Dorward, J., Dawson, D., Halioris, S., Liu, Y., Mao, X., Palmer, B., & Park, J. (2005.) "You Can Lead a Horse to Water: Teacher Development and Use of Digital Library Resources." *Proceedings of the 5th ACM/IEEE-CS Joint Conference on Digital Libraries*, 1-8.

- Wallace, R., Krajcik, J., & Soloway, E. (1996.) "Digital Libraries in the Science Classroom: An Opportunity for Inquiry." *D-Lib*, 2(8). Retrieved February 9, 2006, from <http://www.dlib.org/dlib/september96/umdl/09wallace.html>.
- Wynne, A. (2001.) "History Instruction and the Internet: A Literature Review." In Trinkle, D.A. & Merriman, S. A. (Eds.), *History.edu: Essays on Teaching with Technology* (pp. 25-37). Armonk, NY: M. E. Sharpe.