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Archives as knowledge sources in the Semantic Web: Educational impact in formal education programs

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■ ARCHIVES AS KNOWLEDGE SOURCES IN THE SEMANTIC WEB: EDUCATIONAL IMPACT IN FORMAL EDUCATION PROGRAMS

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Abstract

Knowledge management in the archival discipline and conceptual access to digital primary source material employed in the classroom offer a number of challenges to formal learning: anytime, anywhere access, improved motivation, opportunities for independent learning, integration of information and communication technology (ICT) tools, and increased parental engagement. Still, the key issue remains: do these benefits create more opportunities for students to “construct” their learning? This paper seeks to identify the extent to which these two components of knowledge constitute effective tools used in two cohesive areas within the realm of formal educational programs:

- to support access to and use of archival digital content by educators
- to assess the forthcoming benefits for teaching personnel and students

Keywords

archives, knowledge management, formal education.

INTRODUCTION

Based on the outcome that the up-to-date research has yielded in the fields of artificial intelligence and pedagogy, the following presentation suggests that the fundamental principles of educational technology and flexible learning, when applied to the archival material, are of dual significance: they widen the historical conception of educational professionals. Such an approach enhances an interactive dialogue with the past due to the direct conceptual access of primary sources through existing technological advances. Resulting from this interconnected process, educators formulate an environment in which students are given the opportunity to approach history in an engaging and direct manner; this process, in turn, sustains a multiplicity of viewpoints necessary in the discourse on history.

TERMS TO DEFINE

Archives- Primary source materials are the stuff of history- the documents, photos, letters, diaries, oral interviews and more from our past. Increasingly, primary source materials from the collections of archival institutions, as representative cultural heritage sectors, are being digitised and made available through online databases. Educators and their students are the natural consumers of this content-rich cultural material of historical nature. Primary source materials offer students the opportunity to “do” history rather than

merely learn it. History that is learned by doing is far more relevant and engaging to students than the myriad of seemingly unrelated facts typically presented in many of the textbooks used in schools. Beyond their common content-related use, primary sources readily lend themselves to the development of critical thinking and research skills. They are logical resources to be used in the promotion of reading, writing and information literacy.

Digital libraries- Capturing, defining, and modeling the essence of archival context in forms of digital libraries are challenging, and prominent issues for interdisciplinary research and discussion within the archival community. Digital libraries of archival sources are constructed – collected and organized – by and for a community of users (educators, students, researchers etc.). Functional capabilities of digital libraries in the archival domain support the information needs and uses of that community. They are a component of communities in which individuals and groups interact with each other, using archival data, historical information, and knowledge resources and systems. In this sense digital libraries are an extension, enhancement, and integration of archives as physical places, where sources are selected, collected, organized, preserved, and accessed in support of a user community; but digital libraries also extend and serve a variety of community settings, including classrooms, offices, laboratories, homes and public spaces (Borgman et al 2000).

Technology- The roots of the emergence in digitizing archival context lie in the inconsistencies and ambivalent definitions of technology across and within different research specializations, such as computer science, artificial intelligence, information studies, social sciences, and history (Giouvanakis et al. 2002). Early in the development of this paper, the author expanded the disciplines reviewed to include education. The purpose was to incorporate hypotheses, methodologies, and perhaps baseline data that would assist in framing the evaluation of digital libraries in the archival domain. So, rather than debate the ultimate definition of technology, preceded by the appropriate adjective (education, learning etc.), keep in mind Reeves' (1998) definition. The definition acknowledges the many different definitions of technology, and media, and then distinguishes between them as follows: "With respect to education, media are the symbol systems that teachers and students use to represent knowledge; technologies are the tools that allow them to share their knowledge representations with others" (p. 1).

Impact on learning- The advent of mobile context-aware computing of raw historical evidence has stimulated broad and contrasting interpretations due to the shift from traditional static desktop research to heterogeneous mobile learning environments of historical nature. This transition poses many challenging, complex, and largely unanswered research issues for impact on learning relating to contextual interactions and usability (Di Blas & Poggi 2006). While defining impact is relatively easy (the effect or impression of one thing on another), the literature from all the disciplines indicates that researchers are still grappling with how to structure evaluation studies to identify impact (Stewart 2001). Oliver and Harvey (2002) observe that "...most projects concerned with the introduction of new technology... aim to have some kind of impact on students. Often this is framed in terms of an impact on learning, although perhaps more commonly observed are changes in behaviour" (p. 19). However, studies also evaluated the educational impact of digital libraries on

learning and teaching in other groups such as teachers, administrators, and more broadly, organizations and infrastructure, while expecting impact to manifest in a variety of behaviors, attitudes and skills (Giersch et al. 2003).

As a parenthetical note, due to its relatively to the subject under discussion, it needs to be mentioned here that contextual features of digital libraries often complicate the identification of the impact that learning has on technology (Ankiewicz et al. 2006). Archivists at the beginning of the new millennium are challenged to develop archival systems that can operate beyond the level of the individual or corporate archive, and of collective archives as we now know them. Archivists are challenged to describe parallel record keeping universes, encompassing the world views of all parties to the transactions, and providing meaningful access paths via technology (Gilliland-Swetland et al. 2004).

Knowledge management- The knowledge management (KM) area has become so diverse over the past ten years as researchers have begun to investigate not only the mechanics of knowledge creation and transfer but also of social and cultural issues that are of importance in understanding this topic. KM is the process of leveraging and utilizing the vast, untapped potential of both implied and documented knowledge to achieve optimal performance (Malhotra 1997). As information professionals, archivists are challenged to facilitate the use of semantic web as "conceptual infrastructure in the web" and of knowledge management as metadata design in archival resources for formal education programs.

Formal education programs- The process of training and developing people in knowledge, skills, mind, and character in a structured and certified program is defined as formal education (LinguaLinks Library 1999). For archivists, it is a necessity to identify and explore several research issues for the future of conceptual infrastructure in the semantic web, when constructing digital libraries for formal learning education programs. First, users of metadata will expect the delivery of full archival content, rather than just pointers to content. Second, users will move beyond information systems that are fairly independent of each other to systems of interoperability that incorporate related applications. Third, users will experience a system of global computer networks that will foster and support more collaboration between groups, rather than individuals, whose tasks will span boundaries and communities. Fourth, users will expect systems that are navigable in more flexible and adaptable ways than query searching (Horsman 2000).

Flexible learning- Flexible learning provides the expanded choice on what, when, where and how people learn. It supports different styles of learning, including e-learning. Flexibility means anticipating, and responding to, the ever-changing needs and expectations of users within the education communities. E-learning, as a component of flexible learning, involves the application of electronic media in the delivery of flexible student focused vocational education and training (VET) programs (Bournemouth University- Learning and Teaching Development Committee 2002).

Ontologies- Ontologies, as schemes developed of metadata-based annotation tools and inference engines, may specify formal semantics of data. Thus, in the archival domain ontologies allow various intelligent services to perform knowledge-level information transformation, search, and retrieval of primitive historical information. Within this challenging scope the goal for archives is to achieve the best possible knowledge-sharing and learning-support systems

for education communities, to build and to use metadata repositories and to integrate learning objects into educational environments. The scope of knowledge management in the archival sector for formal education purposes envisages the web enriched with numerous domain schemes, resulted at creation of structured ontologies for primary source materials (Kourtoumi 2005).

SUPPORTING ACCESS TO AND USE OF ARCHIVAL DIGITAL CONTENT BY EDUCATORS

As many classroom support activities embrace a collaborative approach between schools and cultural sectors to serving student populations, educators along with cultural heritage personnel are exploring how to integrate common spaces in the digital era (Mejias 2006). Knowledge management in archives via metadata conforming to ontologies may drive process improvement, enable cultural information sharing, and improve historical research. Knowledge management applications in the archival domain may also encourage innovation, engender learning, facilitate collaboration and promote systems thinking (Evans et al. 2005).

The return on investment from knowledge management may produce high-performance archival institutions. The bottom line is that knowledge management offers the opportunity to leverage information technology (IT) investment to fully utilize the rich intellectual capital of archives, provided and syndicated in domain-specific knowledge bases (Gourlay 2000). In this swiftly changing and rapidly growing domain of cultural knowledge management, the importance of creating newly coherent strategies for archival content description in a global prospect is important (Piggott 2003).

In planning and implementing public access projects in the archival domain- when *using it* is equally important as *building it*- it is generally admitted that relatively little evaluative work has been done to date on access to and use of archival digital content by educators (Clifford & Friesen 2001). In the digital age it is also a general statement that the tutors of historical knowledge (the educators) along with the stewards of primitive sources' knowledge (the archivists) have each become more professionalized; and, as an unintended by-product, they have become less engaged in the ways in which the work of each depends on the work of the other (Korteweg & Trofanenko 2002). Exacerbated by the dynamics that are a part of the digital age, their work seems to be worlds apart.

Teaching and archiving of historical information are interrelated, but their issues are usually addressed separately. Examples are legion:

- Archival institutions digitise primary resources to respond to the demands of educators; educators do not always recognize the complexity of carrying out this task nor do they understand the demands placed on archivists who need to improve access and ensure preservation
- Educators increasingly encompass digital publication as a tool; at the same time, archivists find that the contract law that controls access to such publications makes preservation impossible and access problematic
- Quality support of many special collections requires the expertise of the subject area of the educator-specialist; though, this competency is not widely available within the archival profession

Archivists and educators are increasingly becoming more active collaborators in developing effective approaches to the interrelated domains of archival production and historical knowledge in the digital era. They come to realize that they both share common concerns. These concerns arise in various professional development workshops and interactions among and between the educators and the archive personnel: the nature of teaching, the use of digital primary source material, the benefits and the limits of technologies in the classroom. Various professional development activities are planned, instituted, and evaluated, primarily through workshops, summer institutes, and working sessions. Theoretical frameworks and practical strategies are presenting, effectively engaging with issues about teaching the past through the use of digital objects (Bennett & Trofantenko 2002). As a result, conceptual classification of raw material of historical evidence for e-learning is effectively broadened and access ensured.

Towards this direction of collaboration, teachers and archive personnel are interacting in different perspectives with topics specific to creating and teaching with digital archival content: current research about history education and the tension between knowing what is considered “history” and the past; the notion of primary sources and the analysis of primary source material; the meanings of archival objects and the way they change through digitised imaging; and, the interpretive and educational roles and limits the teachers and archive personnel have in the understanding of students (Barnes 1992). The goal is to bring the teachers together with the archival curators and archival educators to further develop learning activities and to engage with issues concerning digital content of archives; notably, how differences in the media of primary sources (i.e. written text, photograph, audio) influence the ability of students to learn about the past and of teachers to teach about the past (Fox-Turnbull 2006).

Educators and archive personnel are introduced to topics specific to teaching with digital content, such as:

- the historical understanding of the educators' and the way it influences the knowledge of students about the past
- the meaning of objects and the ways they change through digitized imaging
- the role of the objects as mediums for learning in the classroom

The focus is on understanding, developing, and advancing the social context, or “communities of practice” (Lave & Wenger 1991). Assistance is provided to educators to enable them to integrate the digital materials of archives into their curriculum. It is not enough for teachers to hear about theory; they must also be given hands-on assistance to enable them to use the technology in their classroom, emphasizing ways to integrate technology in conjunction with the planning of the course (Cantu 2000).

The aim is not to participate in producing educators who have already managed to succeed in traditional ways of teaching history, and wish now to succeed in understanding and addressing the new knowledge and issues associated with the educational intent of digital environments. The aim is to identify and describe the collaborative environments conducive to developing technological and educational competence in the educators and archive personnel. As Thornton (2005) states, the target is to create for students “greater possibilities for identifying relevant knowledge, all with an aim of improving their educational experiences” (p.7). By taking a collaborative approach that focuses on the

sociocultural contribution, each participating sector offers to education. As a result, this collaboration contributes to collective and interactive attainments, rather than to limited individual successes (Sechrist 2005).

At this point, it is crucial to refer to some interesting recommendations from analogous projects, such as the Illinois Digital Cultural Heritage Community (<http://images.library.uiuc.edu/projects/dch>) or the Learning@Europe (www.learningateurope.net). These projects built and tested an electronic database of historical information collected from participating archives (museums, libraries) and based in part on curricular requirements (Bennett et al. 2002, Cabot et al. 2005). Recommendations included are the following:

- link digitised content to curricular standards
- ensure the robustness of the database
- concentrate more on enabling teachers to utilize images and metadata offline in the classroom and for assignments, and on high-quality, rather than high-quantity resources
- undertake continuous evaluation of the database use
- ensure that information in the database continues to be “trustworthy”

The identification of knowledge needs of the educators is based on the principle of flexible learning for their students. Under this scope, flexible learning does not simply equal uses various forms of electronic communication with digitised archival material to deliver a course (Brown & Voltz 2005). When referring to archival sources, the whole approach is much broader than this and is best realised by integrating the benefits of electronic communication with more traditional modes of delivery in a pedagogically principled way. The aim is to allow educators and students to access primitive historical information from a variety of learning resources and to interact collaboratively on that information. This caters for individual learning preferences and for students to have more freedom to self-pace. This approach provides more satisfying teaching experiences for lecturers too. It evolves new approaches for more creative teaching through the understanding that there is a high pedagogical value to the conceptual availability of “trustworthy” primary sources via the web (Gilliland et al. 2005).

In any attempt to create e-learning materials from archival sources for formal education programs a combination of approaches is needed, in which technology provides educators with the structures of flexible learning. This combination gives the latter access to databases with all the variations such that they can build into the standardized safe structures unique characteristics. The more each participant is aware of the move towards a collaboration, of the necessity to explore changing relationships between archives and changing educator interaction, the more effort each individual may be willing to invest (Wells 1994).

Educators and archive personnel can move even further to uncover the possibilities for their own learning and teaching. This rests on their knowledge about educational reform in the digital era, which in turn requires new considerations in the management of archival material in student learning. Conceptions of history through technology involve for educators and archive staff the understanding of skill development in relation to technologies in their respective field. Conceptions also involve their own personal interests and perceived opportunities to develop these interests.

ASSESSING BENEFITS FOR TEACHING PERSONNEL AND STUDENTS

Learning in the virtual environment seems to be very easy. Still, the experience so far indicates that this is a big illusion. On pedagogic grounds, it would be generally both perverse and impractical to employ information technology as the sole means of communicating with users. Education is a social process and social interaction between students and teachers is an essential part of high-quality learning. Even within the most formalized parts of educational processes there are many that computers cannot yet do, such as assessment of verbal performance and aesthetic design. To be successful in creating effective learning environments the virtual education space requires a new kind of knowledge-based ground. This ground must be commonly accepted among both faculty and students, inspiring new forms of collaboration between teachers, pedagogical experts and cultural information specialists (Frydenberg 2002).

On pedagogic grounds, then, the issue for archival institutions is not a choice between conventional and e-learning delivery methods, but a choice of the most appropriate balance between the uses of these different methods in different contexts. This is a process, which involves the professional judgment of educators, taking into account the changing needs, demands, interests and capabilities of students (O'Brien 2005). However, there is a significant scope to enhance the quality and reach of education by appropriate and well-planned developments of e-learning in archival institutions: to embrace the idea that the most useful forms of representation of archival information and knowledge, the most powerful analogies, illustrations, examples, explanations, and demonstrations; in a word, the most powerful the ways of representing and formulating the subject that make it comprehensible to students (Bothman 2002).

On pedagogical content knowledge embedding digital libraries of archival material also includes an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different ages and backgrounds bring with them to the learning of those most frequently taught topics and lessons focused on databases from archival sources (Shulman 1987). This "conceptual infrastructure" databases for archival sources need to be linked with new tools whereby both verbal and visual quoting is an integral part of the software. Access to it is combined with spaces for collaborative and personal creation and co-creation. There are challenges to find new ways of visual and verbal quotation, of reference, of building on the richness of the past to arrive at a more creative future. Combining the universal approaches of art and sciences through the particular approaches of historical evidences, as presented in the archival heritage from the past to the present, offers a valuable key to future creativity (Hedstrom 2002).

On the semantic web educators and their students can locate archival sources, put the collected ones in their historical context, classify and present them by time, geography, theme, or subject, in addition to keyword searches. Thus, they construct their own digital libraries, within the archival digital collections. This feedback works as powerful tool to help activate the background knowledge of students on a particular topic or issue and spark an interest to find out more (Stiles 2002). It can even supplements their narratives with virtually unbounded collections of sources, notes, graphs, charts, images, and links

that even a profligate publisher could not hope to fit into a book. In addition, given the open access of the web, it seems appropriate to cast the widest possible net, highlighting materials that can be tied into classroom curriculum. This is preferable more than just focusing on figures such as official data and national policies which will likely dominate coverage in print of relative textbooks (Bloom & Stout 2005).

The marginal cost of reaching different open access archives is almost zero. With the semantic web interested colleagues can access an online subject-based archival source (in a form of a photo, a diary, a catalogue, an oral history interview or a document) as cheaply and simply as a dozen. Moreover, the structure of the semantic web allows interested parties to access the primary source material from any internet-connected computer, at any time, and even to search the evidence for phrases or keywords. Educators and students alike may link this piece of evidence to others on the web, catalogue and copy it, and even print it if so desired (Cohen 2004).

The massive knowledge capacity of the semantic web means that educators and students (=users) can push beyond the selectivity of paper collections to create more comprehensive archives with multiple viewpoints and multiple formats (including audio and video as well as text). These archives, hopefully partially making up for their lack of the curator's touch with their size, scope and immediacy, will in turn require more sophisticated tools for future research (for example, see the two Harvard's Open Collections Programs, "Women Working, 1800-1930" (<http://ocp.hul.harvard.edu/ww/>) and "Immigration to the United States, 1789-1930" (<http://ocp.hul.harvard.edu/ei>)). If carefully developed, such collections- ideally interoperable with others of their ilk- provide history engaged and history aware students, with the means to understand the past in a more direct and coherent way and, hopefully, more deeply (Mercier & Wykoff 2005).

Educators and students will be able, then, to express the inimitable regional and local dimensions of history. They will entail simultaneously realities at local, regional and national levels internationally, illustrating the importance of the cultural context in how educational ideas are interpreted, reshaped and realized to improve classroom learning (Barnes 1992). Providing "conceptual infrastructure" in the web for archival sources, new knowledge-based approaches can be achieved in the domain for formal education programs, leading in (Kourtoumi 2004):

- providing frameworks for information exchange and resource interoperability in high quality primitive resources
- assisting users in understanding historical content
- assisting information providers with conceptualising a topic
- mapping out the conceptual structure and providing a common language for research/curriculum fields in social studies
- providing classification/typology and concept definitions
- clarifying concepts by putting them into context
- providing orientation and serving as a reference tool for educators and students
- assisting with the exploration of the conceptual context of a research problem and in structuring the problem; thereby, providing the conceptual basis for the design of good research, for the consistent definition of variables;

and thus, providing the accumulation of research results within the curriculum

- providing the conceptual basis for the exploration of the various aspects of a program in program planning, in the identification of approaches and strategies, and in the development of evaluation criteria
- supporting (both technical and human) for consistent communication between education communities and archival institutions

CONCLUSIONS

Archives as knowledge sources in their various forms -expert historical knowledge, knowing what to teach and how, embodied cognition, professional and craft practices- is a central concern for educational research, both from a practical and a theoretical viewpoint. By using the power and the flexibility of knowledge management within the framework of educational impact in formal education programs and for the benefit of archives, specific conceptual areas can be developed in order to create tools and standards in a global environment:

- *knowledge navigation*, focusing on the organization of archival concepts and their relations in a conceptually clear context
- *separation of content and context*, allowing the user to maintain an overview of the conceptual archival landscape. Contexts are connected through contextual neighborhoods
- *content management*, enabling flexible learning for formal learning through the dynamic creation of educational courses or research fields related to archival resources
- *formation of a basis for a global knowledge project*, intending to evolve and capture more and more of the accumulated human knowledge from archival sources
- *experience-orientated environments from archival resources*, where educators and students can annotate learning objects

There are even more potentials for interactivity and interoperability, maybe less developed at the time, but able to create new types of communication in the near future, namely:

- the potential for *interoperability*, meaning the interactions not just among interested audiences but between audiences and their subjects
- the *integration* of using the web not only to present the past but also to collect it

If the target in knowledge management for the archival sector is to postulate new, more appropriate and ideally more enlightening forms of online open access to primary source materials worldwide, then it is efficient to look beyond the distribution of archives. It is efficient to consider instead the collections, interrelation and exploration of the archival content. Thus, archival institutions offer the opportunity to students to "construct" their learning through use of primary resources in the digital era.

Much of the problem here is conceptual: instead of discussing about web pages and website, the educational community along with the archival one can focus on searching, sorting, gathering and communicating. Within the framework of formal education educators, students and archivists have to re-orient

themselves by remembering that the semantic web is a subset, an evolutionary stage of the internet. Its very name represents the way this computer network shuttles information between and among people, and presents knowledge, rather than just a publishing medium that goes from one point (an archival description) to another (an interested audience).

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BIBLIOGRAPHY

Ankiewicz P., De Swardt E. & De Vries M. (2006), Some Implications of the Philosophy of Technology for Science, Technology and Society (STS) Studies, *International Journal of Technology and Design Education*, 16(2), 117 – 141, [http://www.springerlink.de/\(uk0vjjjydwssyt45h5h4fl55\)/app/home/contribution.asp?referrer=parent&backto=issue,2,7;journal,2,47;linkingpublicationresults,1:102912,1](http://www.springerlink.de/(uk0vjjjydwssyt45h5h4fl55)/app/home/contribution.asp?referrer=parent&backto=issue,2,7;journal,2,47;linkingpublicationresults,1:102912,1).

Barnes D. (1992), The significance of teachers' frames for teaching. In T. Russell & H. Munby (Eds.), *Teachers and teaching: from classroom to reflection*, London: The Falmer Press, 9-32.

Bennett N. & Trofanenko Br. (2002), Digital Primary Source Materials in the Classroom, *Proceedings, Museums and the Web 2002*, <http://www.archimuse.com/mw2002/papers/bennett/bennett.html>.

Bennett N., Sandore B. & Pianfetti E. (2002), Illinois Digital Cultural Heritage Community - Collaborative Interactions Among Libraries, Museums and Elementary Schools, *D-Lib Magazine* 8(1), <http://www.dlib.org/dlib/january02/bennett/01bennett.html>.

Bloom N. & Stout C. (2005), Using digitised primary source materials in the classroom: A Colorado case study, *First Monday*, 10 (6), http://firstmonday.org/issues/issue10_6/bloom/index.html.

Borgman C., Gilliland-Swetland A., Leazer G., Mayer R., Gwynn D., Gazan R., Mau-tone 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, <http://is.gseis.ucla.edu/adept/pubs/lt822.html>.

Bothman, B. (2002), The past that archives keep: Memory, history, and the preservation of archival records, *Archivaria*, 51, 48-80.

Bournemouth University, Learning and Teaching Development Committee (2002), Guidance note on flexible learning, January 2002 updated July 2002, http://64.233.183.104/search?q=cache:MQyIAEuYKcJ:www.bournemouth.ac.uk/staff_development/supporting_documents/FlexibleLearningGuidelines1002.doc+Flexible+learning+definitions&hl=el&gl=gr&ct=clnk&cd=6&ie=UTF-8&inlang=el (τελευταία πρόσβαση: Ιούλιος του 2006).

Brown A. & Voltz Br. (2005), Elements of effective e-learning design, *International Review of Research in Open and Distance Learning*, 6 (1), <http://www.irrodl.org/index.php/irrodl/article/view/217/300>.

Cabot L., King F., Matthews-Morgan D. & Crit St. (2005), The Evolution of Collaborative

Learning Spaces: What We've Learned, *Closing session presentation from South-east Regional Conference*, August 24, http://www.educause.edu/serc05/Program/5378?product_code=SERC05/GS0.

Cantu A.(2000), Technology Integration in Pre-Service History Teacher Education, *Journal of the Association for History and Computing*, 3(2), <http://mcel.pacificu.edu/JAHC/JAHCIII2/K12/cantu.htm>.

Clifford, P. & Friesen, S. (2001), The Stewardship of the Intellect: Classroom Life, Innovation and Technology, in B. Barrell (ed.), *Technology, Teaching and Learning: Issues in the Integration of Technology*, Calgary, AB: Detselig Enterprises Ltd, 29-42.

Cohen D. (2004), History and the second decade of the web, *Rethinking History*, 8 (2), 293-301, <http://chnm.gmu.edu/resources/essays/essay.php?id=34>.

Di Blas N. & Poggi C.(2006), 3D for Cultural Heritage and Education: Evaluating the Impact, in J. Trant and D. Bearman (eds.), *Museums and the Web 2006: Proceedings*, Toronto: Archives & Museum Informatics, <http://www.archimuse.com/mw2006/papers/diblas/diblas.html>.

Evans J., McKemmish S. & Karuna B. (2005), Create Once, Use Many Times: The Clever Use of Recordkeeping Metadata for Multiple Archival Purposes, *Archival Science*, 5(1), 17-42, <http://www.ingentaconnect.com/content/klu/arcs/2005/00000005/00000001/00004625;jsessionid=1p9aywqkt4u3a.alice>

Fox-Turnbull, W. (2006), The Influences of Teacher Knowledge and Authentic Formative Assessment on Student Learning in Technology Education, *International Journal of Technology and Design Education*, 16(1), January, 53-77 [http://www.springerlink.de/\(uk0vjjydwwsyt45h5h4fl55\)/app/home/issue.asp?referrer=parent&backto=journal,3,47;linkingpublicationresults,1:102912,1](http://www.springerlink.de/(uk0vjjydwwsyt45h5h4fl55)/app/home/issue.asp?referrer=parent&backto=journal,3,47;linkingpublicationresults,1:102912,1).

Frydenberg J. (2002), Quality Standards in eLearning: A Matrix of Analysis, *International Review of Research in Open and Distance Learning*, 3 (2), <http://www.irrodl.org/index.php/irrodl/article/view/109/189>.

Gilliland- Swetland A., McKemmish S., Evans J., Rouche N. & Hofman H. (2004), Smart Metadata and the Archives of the Future, *ICA Wien 2004 - "Archives, Memory and Knowledge," XVth International Congress on Archives, Vienna, Austria*, http://www.wien2004.ica.org/imagesUpload/pres_387_GILLILAND_ROUCHE_Z_McK01.pdf(τελευταία πρόσβαση τον Ιούλιο του 2006).

Gilliland- Swetland A., Rouche N., Lindberg L. & Evans J. (2005), Towards a 21st Century Metadata Infrastructure Supporting the Creation, Preservation and Use of Trustworthy Records: Developing the InterPARES 2 Metadata Schema Registry, *Archival Science*, 5 (1), 43 – 78.

Giersch S., Butcher K. & Reeves T. (2003), Annotated Bibliography of Evaluating the Educational Impact of Digital Libraries National Science Digital Library, September, *NSF Grant No. 0127298*, http://64.233.183.104/search?q=cache:oAot7whMFpUJ:eduimpact.comm.nsdl.org/evalworkshop/eval_ann-bib_09-2903.doc+evaluative+work+has+been+done+to+date+on+Collaborative+Interactions+between+archives+and+schools&hl=el&gl=gr&ct=clnk&cd=4&ie=UTF-8&inlang=el (τελευταία πρόσβαση: Ιούλιος 2006).

Giouvanakis A., Samara H., Tarabanis K.& Bousiou-Makridou D. (2002), Exploring the strengths and limitations of learning styles towards the design of an adaptive web-based instructional system, *Proceedings of the World Conference on Educational Multimedia Hypermedia & Telecommunications*, Chesapeake, VA: AACE, 1707-1712, http://www.editlib.org/index.cfm?fuseaction=Reader.ViewAbstract&paper_id=9941

Gourlay S. (2000), Frameworks for knowledge: a contribution towards conceptual clarity for knowledge management, *Presentation for the Knowledge management: concepts and controversies Conference*, Warwick University, 10-11 February, <http://bprc.warwick.ac.uk/km013.pdf>(τελευταία πρόσβαση τον Ιούλιο του 2006).

Harvard's Open Collections Programs, "Women Working, 1800-1930", <http://ocp.hul.harvard.edu/ww/>(τελευταία πρόσβαση τον Ιούλιο του 2006).

Harvard's Open Collections Programs, "Immigration to the United States, 1789-1930 <http://ocp.hul.harvard.edu/ei> (τελευταία πρόσβαση τον Ιούλιο του 2006).

Hedstrom M. (2002), Archives, memory, and interfaces with the past, *Archival Science*, 2, 21-43.

Horsman P. (2000), Metadata and Archival Description. *European Union Archive Network*, http://www.euan.org/euan_meta.html/2004-04-20 (τελευταία πρόσβαση τον Ιούλιο του 2006).

Illinois Digital Cultural Heritage Community, <http://images.library.uiuc.edu/projects/dch> (τελευταία πρόσβαση τον Ιούλιο του 2006).

Korteweg L. & Trofanenko Br. (2002), Learning by design: Teachers/museums/technology, *Museums and the Web 2002*, <http://www.archimuse.com/mw2002/papers/korteweg/korteweg.html>.

Kouroumi Tr. (2004), Identity formation or historical knowledge transmission? The archival institutions in the information society and the new globality, *Proceedings of the 4th European Conference on e-learning, ECER 2004*, <http://www.ece.uth.gr/Synedria/OPENnet/conferences/ecer2004/> (τελευταία πρόσβαση τον Ιούλιο του 2006).

Kouroumi Tr. (2005), "Knowledge management technology: Facing the challenge of managing archives, *International Journal of Knowledge, Culture and Change Management*, 5 (4), 25-30, <http://ijm.cgpublisher.com/product/pub.28/prod.259>.

Lave J. & Wenger E. (1991), *Situated learning: Legitimate peripheral participation*, New York: Cambridge University Press.

Learning@Europe, www.learningateurope.net (τελευταία πρόσβαση τον Ιούλιο του 2006).

LinguaLinks Library, Version 4.0, published on CD-ROM by SIL International (1999), http://66.102.9.104/search?q=cache:CE2sW_Y5k7EJ:www.sil.org/lingualinks/literacy/ReferenceMaterials/GlossaryOfLiteracyTerms/WhatIsFormalEducation.htm+formal+education&hl=el&gl=gr&ct=clnk&cd=5&ie=UTF-8&inlang=el (τελευταία πρόσβαση: Ιούλιος του 2006).

Malhotra Y. (1997), Knowledge Management in Inquiring Organizations, *Proceedings of 3rd Americas Conference on Information Systems (Philosophy of Information Systems Mini-track)*, Indianapolis, IN, August 15-17, 293-295.

Mejias U. (2006), Teaching social software with social software, *Innovate*, 2 (5), <http://www.innovateonline.info/index.php?view=article&id=260>.

Mercier L. & Wykoff L. (2005), Engaging the public with digital primary sources: A tri-state online history database and learning centre, *First Monday*, 10 (6), http://firstmonday.org/issues/issue10_6/mercier/index.html

O'Brien L. (2005), E-Research: An Imperative for Strengthening Institutional Partnerships, *EDUCAUSE*, 40(6), <http://www.educause.edu/apps/er/erm05/erm0563.asp>

Oliver M. & Harvey J. (2002), What Does 'Impact' Mean in the Evaluation of Learning Technology? *Educational Technology & Society*, 5(3), 18-26, http://ifets.ieee.org/periodical/vol_3_2002/oliver.html

Piggott I. (2003), Joining hands: Opportunities for citizen-based services in the area of cultural memory, *Presentation for the TEL Final Conference, Vilnius, 24 September*, http://www.europeanlibrary.org/pdf/vilnius_tel_piggott_joining_hands.pdf (τελευταία πρόσβαση: Ιούλιος 2006).

Reeves Th. (1998), The Impact of Media and Technology in Schools, *A Research Report prepared for the Bertelsmann Foundation*, http://www.athensacademy.org/instruct/media_tech/reeves0.html (τελευταία πρόσβαση: Ιούλιος 2006).

Secrist B. (2005), Technology Across the Curriculum Programs: Keys to Success, *Proceedings of the EDUCAUSE Southeast Regional Conference*, Atlanta, June 6-8, http://www.educause.edu/SERC05/Program/5378?PRODUCT_CODE=SERC05/SESS08

Shulman S. (1987), Knowledge and teaching: Foundations of the new reform, *Harvard Educational Review* 57(1), 1-22.

Stiles M. (2002), Strategic and Pedagogic Requirements for Virtual Learning in the Context of Widening Participation, *At the Interface- Virtual Learning and Higher Education*, Inter-Disciplinary.Net, <http://www.inter-disciplinary.net/Stiles%20Paper.pdf>.

Stewart D. (2001), Reinterpreting the Learning Organisation, *The Learning Organization*, 8 (4), 141-152.

Thornton St. (2005), Teaching Social Studies That Matters: Curriculum for Active Learning, *New York: Teachers College Press, 144 pp.*

Wells G. (1994), *Changing schools from within: Creating communities of inquiries*. Toronto, Ontario: OISE Press; Portsmouth, New Hampshire: Heinemann <http://www.worldcatlibraries.org/wcpa/top3mset/0bc78e0c01e81ab3a19afeb4da09e526.html>