Connecting with Classrooms through Computers

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Abstract

Museums find electronic publishing to be an increasingly useful tool for distributing information to a wide variety of audiences. Teachers find the Internet and CD-ROMs to be increasingly useful tools for bringing a wide variety of information into their classrooms. These tools represent an enormous opportunity to realize educational goals of museums and schools.

Yet, creating electronic content for educational use is not a straightforward process of converting existing printed materials into digital ones. And hypertext, virtual reality, and streamed audio are not used by knowledgeable electronic classroom teachers as passive information delivery devices replacing film strips and video. Digital materials, whatever their content, are manipulated, indexed and re-contextualized by teachers and students in the process of computer-based learning. In order for their digital information to have a maximum educational impact, museums should be aware of the profound changes that have occurred and continue to occur in the classroom of today and tomorrow. This paper will discuss these pedagogical changes and ways in which museums can organize their electronic publications to be useful for a variety of computer-based learning experiences.

Keywords

CD-ROM; Department of Education—grants; Education Reform; Educational technology; Museum Education; Primary and secondary schools ;World Wide Web

Introduction

In just the last five years the means by which museums transmit information about their collection has changed dramatically. Scholarly information can be now be found on CD-ROM, as well as paper-based, catalogues and museum visitors can browse a museum Web site, rather than their file cabinet, for information about museum hours and schedules. Though museum media has expanded to include the digital world, the nature of the digital information has remained relatively unchanged: many museum CD-ROMs look and act like books, and many museum Web sites can be recognized from their parent print publications.

This conservative approach to electronic content may be acceptable, and even desirable, for the general adult public who is comforted by familiar conventions. It is not, however, an optimal strategy for communicating with students and their teachers who expect information in ways that serve special electronic and pedagogical needs. For museums, the medium will never be equal to the message but electronic media does influence the content and construction of the message (apologies to Marshall McLuhan).

This paper will attempt to answer three important questions which museums are facing as they enter the digital age:

I. How do educational technologies support progressive classrooms?

II. Why do museum messages need to be recreated to suit the media?

III. What information structures complement electronic learning?

I. Educational Technologies and Progressive Classrooms

In The United States of America there has been much emphasis on reforming the primary and secondary school curriculi to accommodate social change—a change largely characterized by our progression from the machine age to the information age. The U.S. Department of Education (DOE), in describing this reform, asserts that the goal of education is no longer to train students to memorize facts and follow orders:

> We learn more when we are solving challenging problems in meaningful contexts. Our mastery of new knowledge becomes stronger when we actively collaborate with others to communicate our understanding of what we have learned[1].

Figure 1: Emanuel Gottlieb Leutze, Washington Crossing the Delaware, 1851. Oil on canvas. Gift of John S. Kennedy, 1897 (97.34). © 1992 The Metropolitan Museum of Art

In addition to prescribing the manner in which learning should occur, school reform also dictates the content of what students learn. Goals 2000[2], a national education initiative put forward by the Office of the U.S. President encourages teachers to present academic subjects in an inclusive program allowing students to see and make connections across such diverse disciplines as mathematics, history, science and art. For example, when using the painting of *George Washington Crossing the Delaware* (Figure 1) as an illustration of a historical event in the American Revolution, a history teacher would also discuss the composition of the painting, including the artist's creative interpretation of light and shadow at dawn.

The DOE, like many government officials, educators and business leaders, believes that technology will play a major role in achieving systematic school reform:

> The extent of learning and the effectiveness of teaching need no longer be limited by the amount of time in the classroom or by the resources of a particular school. Teachers and students can tap vast electronic libraries and museums with a wealth of texts, video images, music, arts, and languages. They can work with scientists and scholars around the globe who can help them use experimental research, primary historical documents, and authentic learning in real life settings to improve their understanding of physical phenomena and world events[3].

School reform needs computer and telecommunication technologies in order to effect the way information is discovered and discussed in the classroom. The World Wide Web is the most economic way a classroom in Tulsa, Oklahoma can use primary historical documents from the Smithsonian Institution on a regular basis. E-mail is the logical connection between classroom and scholar on opposing sides of the globe who want to collaborate on a research project. CD-ROM, or in the near future DVD, is the method of choice for sending large numbers of high-quality images for research and presentation puposes.

It is also important to note that the relationship of technology and school reform is a symbiotic one: not only does school reform need technology, but technology needs school reform. What good are 25 computers in a classroom, if students are only allowed to sit in rows and listen to a daily biology lecture? Why should students engage in international e-mail exchange if their Spanish teacher requires them to spend the bulk of their time studying for and taking vocabulary quizzes? How does a studio art teacher incorporate CD-ROM use into her 30-minute class period during which time students must also produce art and clean up? Unless these classrooms change the way teaching and learning occurs, technology is of no use.

There are many strong indications that these reforms will take place. On February 15, 1996 President Clinton announced the "Technology Literacy Challenge" consisting of four concrete goals:

- equipping all classrooms with modern computers,
- connecting all classrooms to the Internet,
- developing engaging software and networked learning content to help all students meet high standards,
- preparing all teachers to integrate these new technologies into the curriculum.

To put the challenge into effect, the DOE has given away millions of dollars to state agencies for state-wide technology plans and to education/business partnerships through the Technology Innovation Challenge Grant program[4]. Many other government agencies have similar programs supporting the use of technology in education[5]. These grants are competitive and highly desirable, often mobilizing whole cities to collaborate on the proposals.

In addition, this reform effort has not been overlooked by business leaders, especially those belonging to the computer and telecommunication industries. Many millions of corporate dollars in the form of in-kind and cash contributions have been given by companies to schools and communities who change their educational practices and involve technology in the process. For example, In the fall of 1994, IBM announced "Reinventing Education," a 25-million-dollar initiative "to fund fundamental school restructuring and broad -based systematic change to improve student performance." So far, eight school districts and two states have benefited from IBM's initiative, and more will receive help in the future[6]

This is only a short overview of how education and technology are moving in lock-step to effect school reform. It is a glimpse into the future of how educational work will change in the next decade or two and how the products of this work—the students—will have experiences and expectations quite different from our own. It seems likely that traditional information, —i.e., information single-mindedly chosen for general consumption describing definitive results—will not be sufficient for students of the information age. They will expect information to reflect multiple perspectives, to be linked to original sources and to generate many possible outcomes. At least, that is the hope of U.S. education and business leaders.

II. RECREATING MUSEUM MESSAGES

Popular educational theories suggest that holistic learning in which ideas are related across a broad spectrum is more meaningful to the learner and offers increased opportunities for that information to be retained.[7] As a result, in progressive classrooms cross-curricular and multicultural connections are highly valued. For example, high school math teachers are now encouraged to use scientific phenomena as explanations of algebraic theories and to practice the arts, such as recreating Islamic geometric patterns, in illustrating trigonometric equations. Elementary social studies classes might engage in the wholistic study of a country, such as China, and in the process learn about counting with an abacus, grow rice in makeshift paddies, and experiment with calligraphy. These experiences would then be compared with math, farming and art techniques from another culture.

It is important to note that these kinds of cross-cultural and multicultural connections have traditionally been the main subject of many museum education programs. After all, the mere placement of disparate objects in a single museum building implies out of the ordinary links and connections, which adds great educational value to the museum experience. Although this holistic thinking strategy

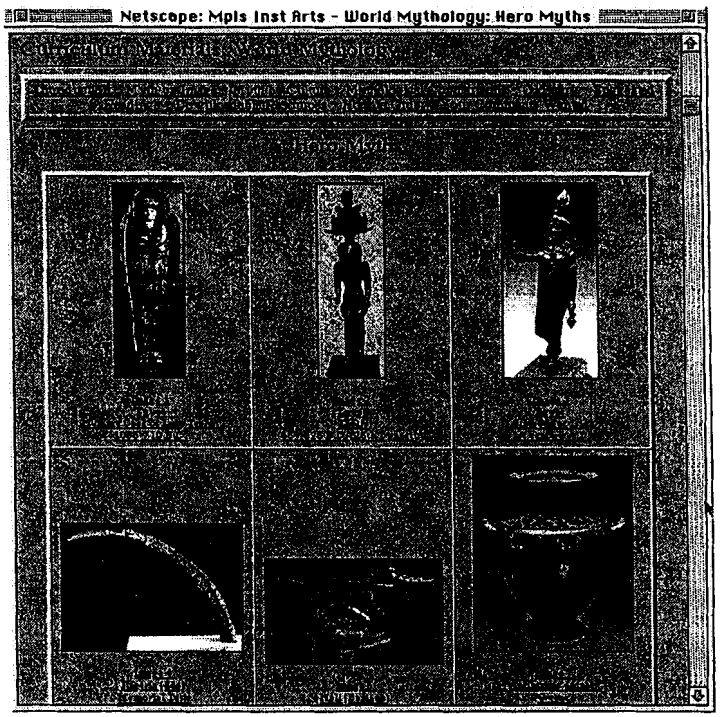

Figure 2: Page portion of The Minneapolis Institute of Art's Web site (http://www.artsMIA.org/mythology/index.html) showing a comparison of objects depicting mythological heroes. © 1997 The Minneapolis Institute of Art.

is not news to the museum educator, it has not been at the center of museum publications intended for use by teachers. Slide packets, annotated posters, and printed guides organized around collection or exhibition themes are now being rethought so that they connect directly with a variety of disciplines. For example, a teacher packet about "perceptions of light in 19th century France" would be useful to physics and history teachers as much as "Impressionism" has been to French and art teachers.

The Minneapolis Institute of the Arts (MIA) acknowledged this shift in content need when it published the World Mythology Curriculum Guide on their World Wide Web site.[8] Traditionally, an American museum-prepared package of materials about "mythology" contains images from ancient Greece and Rome, and mythological stories from the non-western world would be discussed in separate materials dedicated to that culture. Understanding that mythology is now taught in schools as a multicultural subject, the MIA educators selected twenty-four objects with mythological themes from all areas of the MIA collection and organized them into three categories—Myth by Image, Myth by Culture, Mythological Comparisons —complemented by a glossary. A teacher studying the Ancient Egypt can look under "Myth by Culture" to see and read about various Ancient Egyptian objects together, or under "Mythological Comparisons: Hero Myths" to compare stories about Egyptian leaders with those of Herakles from Ancient Greece and the Benin leader Ezomo Ehenua, among others (Figure 2). It is an easy and visually interesting way to learn about a people both as a separate community and as a member of a world-wide social fabric.

As result of these changes in how schools use information, many museums are taking a fresh look at how their educational materials are produced and packaged. The Metropolitan Museum of Art has recently been awarded a very generous grant to recreate teacher materials and training about its core collections in a way that correlates with American

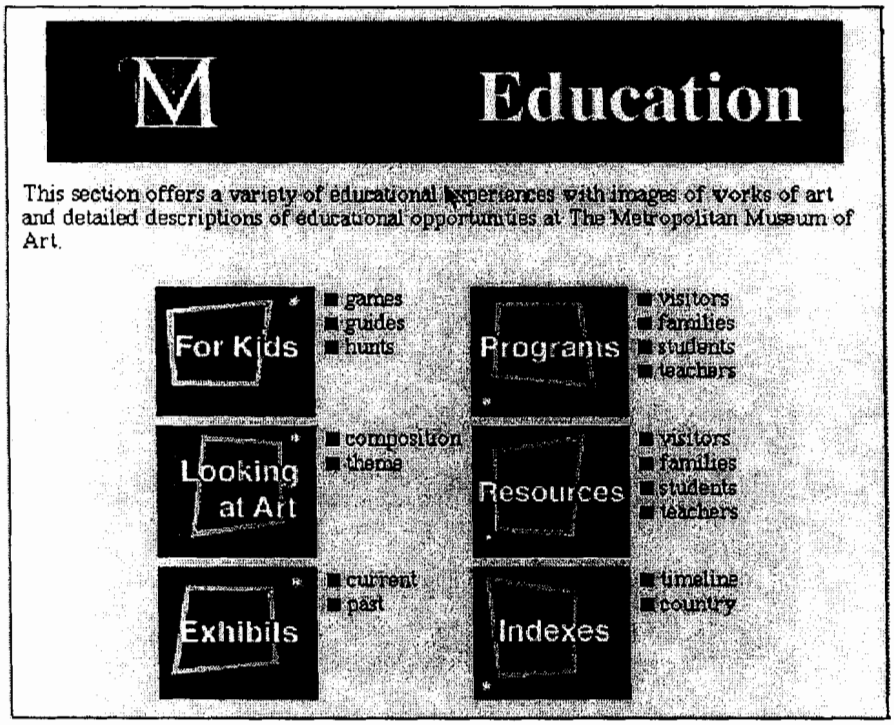

Figure 3: Main menu of Education section of The Metropolitan Museum of Art web site

primary and secondary curriculum objectives and standards.[9] Although the content will be adapted from existing materials, the information will be recreated to mirror the trend of teaching art across the curriculum rather than in isolation from other academic subjects. These resulting materials will be distributed in print for free to all New York City public schools as well as published in the Education section of the Met's World Wide Web site (Figure 3).[10]

Looking into the future of networked information, it seems apparent that content generation will require more than museums rethinking old information: it will require collaboration. In the perfect networked world, Museums would make their basic text and information available to schools, colleges and other institutions who can create in turn learning environments that serve a specific purpose as well as have wide-ranging appeal.

This is what the National Museum of American Art (NMAA) did when they made *Del Corazon* ("From the heart"),[11] an interactive Webzine that features Latino art from the collection of the museum and provides curricular activities developed by, and responsive to, the needs of the primary and secondary school learning community. *Del Corazon* is produced in collaboration with the Texas Education Network (TENET), a state-wide network of teachers who communicate electronically on a regular basis. TENET teachers interested in Latino subjects or in contact with Latino students worked with the NMAA collection in their classrooms to develop a product that the neither the NMAA nor TENET could produce on their own. This collaborative Webzine heralds a whole new direction of electronic content development with which museums will become increasingly involved in the future.

At first glance this new direction appears to challenge the authoritative voice that museums have characteristically assumed when discussing their collections. In fact, the opposite is true. In an Internet

world where anyone can be a creator and/or distributor of information, museums will be one of the few widely accepted authorities on which the world will depend for accurate information. The challenge lies in presenting information in a way that satisfies the variety of interests represented by a world full of information seekers. By mounting a Web magazine dedicated to a Latino audience and written in collaboration with Latino teachers, the NMAA is acknowledging that their collections are available for others to generate ideas with, and that the museum will lend legitimacy to those ideas. This open-handed act has the power to raise public awareness of, and cultural connection to, its collections which contain not just patriotic paintings painted by immigrant Europeans, but art objects produced by all Americans.

III. INFORMATION STRUCTURES THAT COMPLEMENT DIGITAL LEARNING

This new content direction has grave implications not only for how museums collect and organize their digital information but also for how the information is structured. In the world of hard copy, authors typically weave a cohesive narrative from a myriad of information threads. In the digital world, the cohesiveness of the narrative is frequently subordinated by the primary information threads which may be re-combined by the reader to create complementary, or divergent, narratives. Hypertext is one pervasive example of this whereby readers are encouraged to follow various information strands that can divert attention away from a main message.

Unfortunately, the models of electronic information organization are too few and too new. There is not yet a body of tried and true electronic examples upon which museums can base their next generation CD-ROMs and Web sites. There are however many museums who have forged ahead to invent pioneering electronic strategies, which can be grouped into four categories:

1. Databases
2. Classroom-relevant content
3. Digital tools
4. Digital communities

Databases that contain well-indexed and wide-ranging information are invaluable to wired classrooms. When the National Gallery of Art in Washington (NGA) mounted its Web site in January, 1997, the standards for art museum Web databases were raised considerably. The NGA Web site[12] has 100,000 searchable works of art in its flexible and user-friendly database, over 3,000 of which are illustrated with details and enlargements. Each NGA database item contains detailed descriptive information including provenance, location in museum, and other items of interest to both the general and scholarly public (Figure 4).

To find information in this database, students do not need to know specific names or titles of works. The NGA Web site has a robust index function which allows browsers to view the collection according to broad categories (painting, sculpture) or specific groupings (Italian Baroque), and offers a search of key words. This same kind of information flexibility can be built into CD-ROM products. For example, The National Museum of American Art, has recently transferred its enormous textual and image resources associated with its collection into an encyclopedic compendium of portfolios, libraries, gallery tours, databases, timelines, search tools and exhibitions—all in one CD-ROM disc.[13]

Many museums do not have their collection objects digitally organized and documented in sufficient numbers to mount a comprehensive electronic database. Nevertheless, they can serve the student population by producing **classroom-relevant content** which is structured in an open-ended way. As museum educators cannot always predict how information will be used in the classroom, information can be made available as primary source materials resembling "real world data," the interpretation of which requires evaluation and finding skills. The more relevant strands of information that can be associated with an object or group of objects, the richer the learning experience can become.

The *Voices and Images of California Art* CD-ROM produced by the San Francisco Museum of Modern Art (SFMOMA) is an organized collection of primary data resources— including interviews with artists, diaries, letters, critical reviews, and archival documents—all of which can be reviewed in their

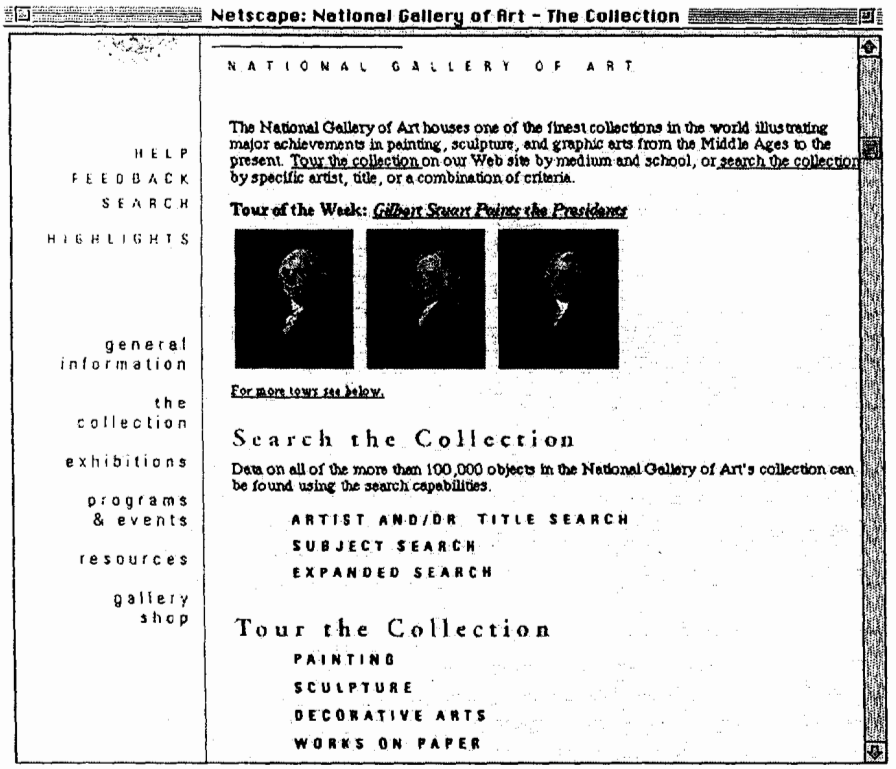

Figure 4: Portion of the Collections page of the National Gallery of Art's Web Site (http://www.nga.gov). © 1997 The National Gallery of Art.

original version (Figure 5). Reading and watching these primary documents, users draw their own conclusions about the artists' inspirations, as well as learn about the modern intellectual and social history of California. It is an important educational tool for progressive West Coast classrooms as it incorporates problem-solving and data analysis into the learning of a social studies subject. To publicize this important use of *Voices and Images*, SFMOMA has produced a teacher guide for integrating the CD-ROM into the classroom curriculum.[14]

One of the most powerful uses of the World Wide Web is its ability to overcome geographic boundaries. The Smithsonian Institution Traveling Exhibitions (SITES) used the World Wide Web to create an online companion for its traveling exhibition, *Ocean Planet*.[15] This comprehensive Web site offers an interactive floorplan of the exhibition (as it was installed in Washington D.C.), including all of the wall panels designs, text, graphics, video and audio. All of the teacher materials developed in conjunction with this exhibition are also posted in the on-line "Resource room." SITES built on the "floorplan" and "room" conventions of the actual exhibition to provide a familiar structure for the virtual one, so that teachers and students could easily find appropriate information. *Ocean Planet* on-line is a very cost effective way for the Smithsonian to disseminate classroom-relevant materials not only to teachers and students who would be visiting the exhibition in the next few years, but for anyone who needs a rich source of materials about oceanographic and marine science at any time.

Whereas producing electronic databases and content can be considered a natural evolution of a museum's publication function (i.e., printing words and images), producing **digital tools** is perhaps a bold step in a new direction. Digital tools can be described as frameworks for information that are customized and changed by individual users. Well-designed digital tools allow teachers and students to use

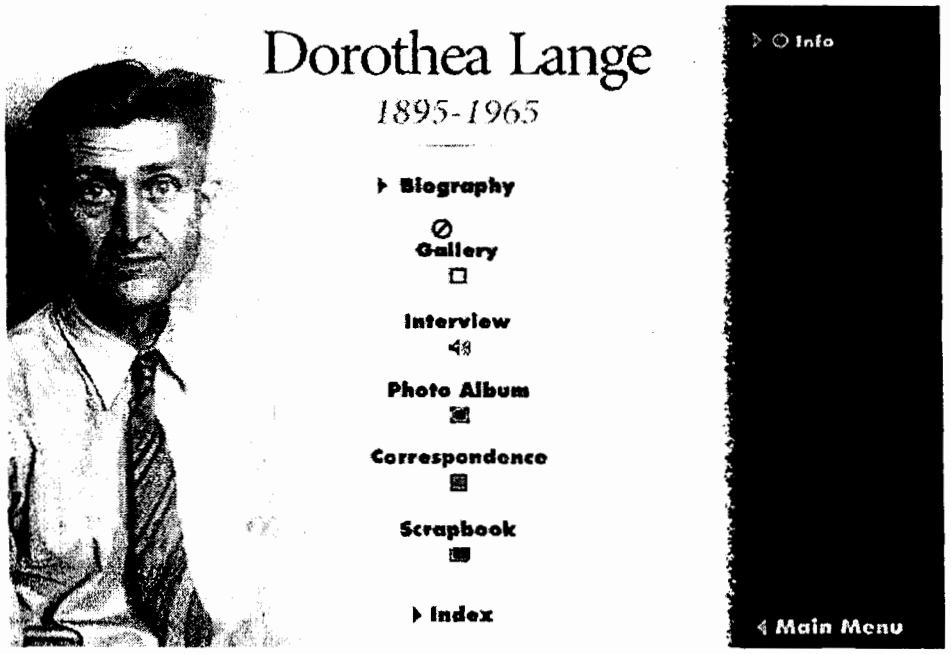

Figure 5: Contents screen from Voices and Images in California Art CD-ROM produced by The San Francisco Museum of Modern Art. © 1997 The San Francisco Museum of Modern Art

museum information resources to build an original educational experience, that according to current learning theories[16], will be memorable and significant to the learner because s/he was an active participant in its construction.

A simple example of a digital tool produced by The Metropolitan Museum of Art is a "notebook" program accompanying the database of select Museum objects on CD-ROM (Figure 6).[17] As users browse through the program, images and associated text can be saved to a notebook. Once activated, the notebook becomes a free-standing application that lives on the computer's hard drive. Text and images saved in the notebook can be added to, deleted or modified for the purpose of creating a personalized "tour," as well as exported to other applications, such as presentation programs or image editors, for further customization. As a result, teachers or students can manipulate the Museum information and bring it into a classroom context.

Simulations of real or historic events such as traveling through space or living in another historical period are becoming popular digital tools for some museums to make their subjects "come alive." "At Home in the Heartland" is a Web site containing a digital simulation of pioneer life in Illinois.[18] Students choose a historic personality to guide through a series of real life decisions: when to plant crops, how to avoid natural disasters, how much money to spend on a log cabin, etc,.... What distinguishes this rich learning experience from popular simulation computer games about cities and ants is that the dialogues students read are extracted from real historical documents and the situations they face are historically accurate. "At Home in the Heartland," a collaboration of The Illinois State Museum and the Illinois State Department of Education among others, is a state-wide effort to make the museum's collection more accessible to thousands of school children who live too far from Springfield to use the museum's "real" collections while studying Illinois history. Of course, in the process "At Home in the Heartland" has also opened opportunities for students all over the world to learn about Illinois history in an engaging and interactive way.

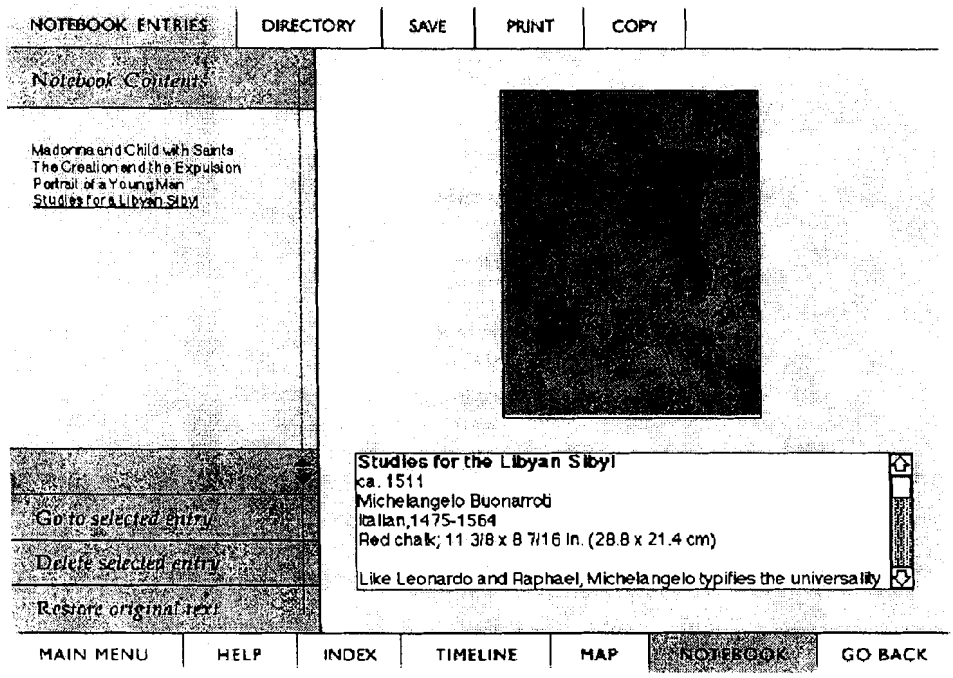

Figure 6: Notebook screen from* Masterpieces of The Metropolitan Museum of Art *CD-ROM, produced by of The Metropolitan Museum of Art. ©1997 The Metropolitan Museum of Art.

Digital communities can be as simple as exchanging e-mail with a colleague or as complex as a MUD (Multi-User Dimension). Unlike telephone calls, e-mail exchanges usually happens asynchronously, that is, the two people e-mailing each other are not on-line at the same time. List serves, in which groups of people with a common interest send each other e-mail and everyone receives all the same messages, is also an asynchronous digital community. As simple as these communities are to join and maintain, they are increasingly important, especially to teachers who might feel isolated in their professions or who like to keep up with current practices.

There are numerous listserves catering to teachers, but one of the most influential to art educators is ArtsEdNet Talk, produced and maintained by the Getty Institute for Education in the Arts, which has grown exponentially since it began in 1995 and now links hundreds of art teachers around the world who transmit 20 to 50 messages per day. ArtsEdNet Talk teachers exchange ideas on lesson plans, commiserate about their dwindling budgets, and discuss each others projects, and in the process, create a strong support body that has effected real changes in the art education profession. For example, it is widely believed by art educators that the presence of the ArtsEdNet Talk and accompanying Web site has been influential in getting school administrators to put computer equipment in art classrooms, a place for which technology has rarely been allocated.[19]

More complex digital communities are synchronous, that is, participants communicate with one another at the same time. MUDs, in which users send messages to each other under identities that are not necessarily their own, have not been widely used for educational purposes yet. However, videconferencing, which allows classrooms to experience live interactions with faraway experts, has become an increasingly popular tool for educational institutions. The growth in popularity is in part attributable to the decrease in cost of videconferencing technology and the increase in the availability of connectivity. For example, the CuSeeM^{e2}0 computer software allows colleagues

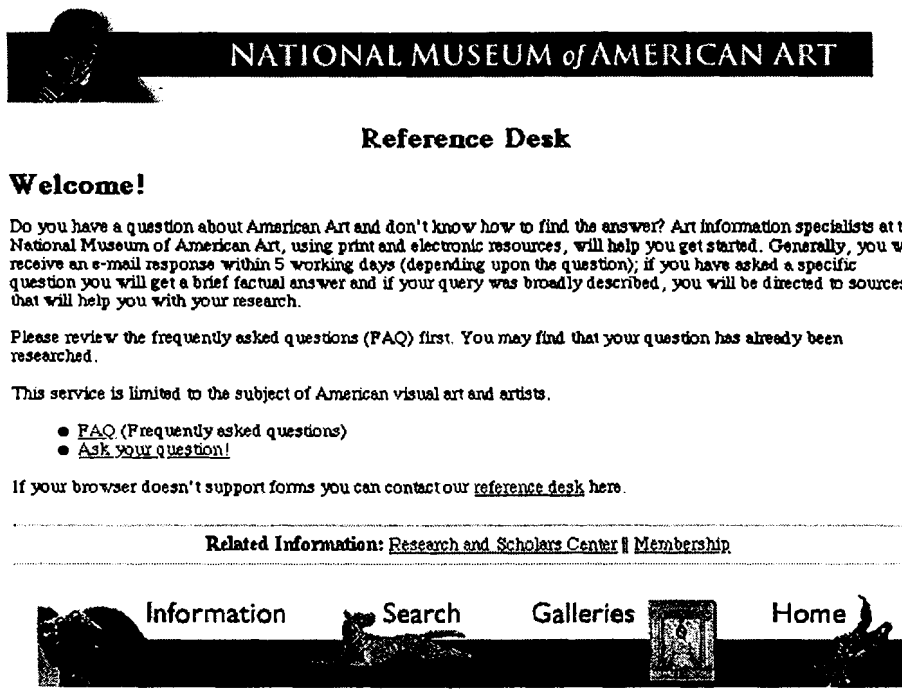

Figure 7: Reference page of The National Museum of American Art Web site (http://www.nmaa.si.edu), (c) 1997 The National Museum of American Art

around the world to see and hear each other via tiny video cameras that are mounted on their computer monitors and connected through phone lines to the Internet.

The Philadelphia Museum of Art conducts videoconferencing sessions with similarly equipped schools in Pennsylvania. With a combination of digital slides and live interaction, museum educators teach with the Museum's collection and respond to student's inquiries with the same attention and focus as if they were in a gallery. Although no one is suggesting that this electronic experience substitutes for a real museum visit, it does seem to serve an important pre-visit orientation and/or post-visit follow-up function that museum staff do not usually have the opportunity to carry out.[21]

It is this last category, digital community, that will have the most impact on the educational work of museums. Already museum Web sites are being swamped with e-mail inquiries that range from the sublime to the ridiculous, yet all of which demand responses. Some museums, like the National Museum of American Art, solicit these inquiries and maintain a "cyber" reference desk staff (Figure 7).[22] It is doubtful that many other museums will be able to accommodate this public service without major staffing changes and/or charging research fees. But the demand for these information services will grow and museum will discover that reaching out to individual students and teachers electronically will be as important to the future of a museum's educational mission as providing printed brochures or guiding school tours.

Even more time-consuming for museum staff is to plan and organize are the synchronous communal activities. American schools are raising millions of dollars for equipment and connectivity so that they can travel virtually to cultural institutions around the world. Yet, how many schools can be well-served by a single videoconference? How much time and resources are justified for museum staff to spend on a program if it serves only 25 students at a time? These are recurring and important questions whose answers hopefully lie not too far in the distant future.

IV. CLOSING REMARKS

Directly related to the success of museum's educational work in an electronic learning environment are the linked issues of audience and access. Global electronic networks, like the World Wide Web, allow the widest possible distribution of educational information. Equipped with a basic computer and a phone line, any earth-dweller can drive the global information highway. It seems likely that museums will become frustrated trying to satisfy this increasingly diverse public, even if language was the only hurdle to overcome. A more realistic strategy would be to collaborate with local interests to customize information according to their own needs—as the Smithsonian has attempted with the "Del Corazon" Webzine.

For this reason, among others, museums need to be attentive to the legal and economic contexts in which these digital learning environments operate. Intellectual access to images and text about museums collections are fundamental to the creation and dissemination of the educational activities outlined above. All of the projects described in this paper would be drastically affected by an elimination, or even a curtailing, of the ability of an institution to distribute, and individuals to use, electronic information for educational purposes. Museums need to lead the discussion of the fair use of copyrighted materials in a direction that acknowledges the future of education and educational information. If not, it is likely that commercial interests, ranging from textbook publishers to Hollywood producers, will overpower educational ones. As a result, museums participation in the education reform movement in particular, and international education in general, could be greatly compromised.[23]

REFERENCES

1 U.S. Department of Education "Technology Innovation Challenge Grants," 1997. For more information about DOE grants, see http:// www.ed.gov.

2 Goals 2000: Educate America Act (1994) is a U.S. Federal Government act helping communities across the country to raise academic standards, improve teaching, increase parental involvement and expand the use of technology in the classroom. For more information see http://www.ed.gov

3 U.S. Department of Education "Technology Innovation Challenge Grants," 1997.

4 U.S. Department of Education "Technology Innovation Challenge Grants," 1997.

5 For example, the U.S. Department of Commerce sponsors a "Telecommunications and Information Infrastructure Assistance Program" (TIIAP) whereby millions of dollars are given to projects that put more technology in schools.

6 See brochure "Reinventing Education" published and distributed by IBM, Armonk, NY.

7 These current learning theories include Howard Gardner's theory on multiple intelligences (Gardner, H. Multiple Intelligences: the theory in practice. New York, 1993).and work supported by organizations such as the Partnership for Family Involvement in Education, and the U.S. Department of Education (see DOE information booklet, "A Call to Action for American Education." or vitit http://www.ed.gov)

8 http://www.artsMIA.org/mythology/index.html

9 Sandra Priest Rose and Frederick Phineas Rose awarded the Metropolitan Museum of Art two million dollars to support a program of teacher training in art education for NYC public schools. The program will run for 5 years beginning fall, 1997 (Metropolitan Museum press release, 3/17/97)

10 http://www.metmuseum.org

11 http://www.nmaa.si.edu/webzine. "Del Corazon," a New Media Learning Environment Project of the National Museum of American Art, is made possible by a grant from the James Smithson Society.

12 http://www.nga.gov

13 The National Museum of American Art CD-ROM is availble through MacMillan Digital USA or can be ordered through the NMAA Web site at http://www.nmaa.si.edu/cdrom/index.html

14 The "Voices and Images of California Art" CD-ROM and teacher manual is available through the San Francisco Museum of Modern Art (http://www.sfmoma.org).

15 http://seawifs.gsfc.nasa.gov/ocean_planet.html

16 see footnote 7

17 "The Masterpieces of the Metropolitan Museum of Art" CD-ROM will be available Fall, 1997. Visit http://www.metmuseum.org for more information

18 http://www.museum.state.il.us/exhibits/athome/index.html

19 ArtsEdNet Talk and Web site are produced and maintained by the Getty Institute for Education in the Arts (http:// www. Getty.ArtsEdNet.edu)

20 CUSeeMe stands for a computer application developed by Cornell University which allows for two-way video and audio to be streamed simultaneously through the Internet. For more information visit http://cu-seeme.cornell.edu

21 For more information about this program see Rice, D. and Bradford, B. "CyberMuse: And now, The Virtual Field Trip," *Museum News*. Sept/October 1996.

22 http://www.nmaa.si.edu

23 For more information about fair use of copyrighted information read the United States Code Title 17(Copy right), Chapter 1, section 107 at http;//www.law.cornell.edu/usc/17/107.html. The comments of Peter Jaszi, law professor at Washington College of Law, about the current white paper on copyright can be read from the library of congress posting at http://lcweb.loc.gov/nac/nac30/jaszi-2.html.