

Ejournals in Education: Just Generating Excitement or Living up to the Promise?

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Abstract

The Internet makes scholarly electronic journals an opportune global mode of communication for scholarly exchange, where national and international borders are erased. The American Educational Research Association Special Interest Group, Communications among Researchers (AERA SIG CR) lists over one hundred electronic journals in the field of education that are scholarly, peer-reviewed, full text and accessible without cost on the world wide web (see <http://aera-cr.ed.asu.edu/links.html>). Are these ejournals merely poor electronic imitations of print journals? Granted, the use of the Internet to publish peer-reviewed scholarship has the potential of democratizing access. But are such scholarly exchanges making effective use of the electronic medium? What innovative things can be done with new technology? How can electronic journals be preserved, used, and managed over time?

Introduction

In December, 1998, this author was offered the position of Editor of *Current Issues in Education (CIE)* (<http://cie.ed.asu.edu>), a scholarly, online journal at Arizona State University. The journal was to begin its second year of publication in January, 1999. After reading Glass (1998), ["The vision thing": Educational research and AERA in the 21st century—Part 4: The future of scholarly communications], the author decided to accept the offer, against the advice of colleagues. The fascination of editing a scholarly electronic journal to a beginner academic was tremendous. The potential to use the electronic medium innovatively and the opportunity to facilitate its effective use in scholarly communication justified setting aside any uncertainties. In spite of initial enthusiasm, the

journal remains to a large extent, largely an imitation of a print journal. Yet two articles, Dugan and Behrens (1998), and Leshowitz, DiCerbo, and Symington (1999), represent a departure from publishing articles that are just plain text. Dugan and Behrens (1998) used hypertext to facilitate instant and simultaneous access to multiple sources of information. The employment of frames allowed

access to the raw data in their statistical study, and the reader had access to a variety of alternative models of data analysis without interruption to reading. Leshowitz, DiCerbo, and Symington (1999) demonstrated the challenge of using multimedia appropriately, powerfully, and not for its own sake. They used video clips to provide readers a glimpse into the practices of a college

classroom. This fairly small number of articles in *CIE* that break ranks with the traditional scholarly communication is not trivial by any means—they represent the hope that ejournals in education will begin to push the envelope in scholarly communication in thoughtful yet innovative ways.

Ejournals in Education

A number of electronic journals in education have appeared in the last few years, an assessment of these ejournals with regard to their use of the unique features of the electronic medium and issues related to their preservation are the subjects of this paper.

The AERA Special Interest Group, Communications Among Researchers (AERA SIG CR) lists over one hundred electronic journals in the field of education that are scholarly, peer-reviewed, full text and accessible without cost on the world wide web (see <http://aera-cr.ed.asu.edu/links.html>). Table 1 below lists the quantity of these journals and country of publication in descending order. It is no surprise that 64% of the journals listed here are published in the United States of America. Researchers primarily located in the geographical area of North America helped compile this list. The predominance of the U.S. in this area may be attributed to access to the Internet that American universities have enjoyed since the early 1990s.

Table 1
Ejournals in Education and the country of publication.

Country	Number of Journals
USA	70
Australia	15
Canada	10
UK	5
Spain	3
Mexico	2
Argentina	1
Brazil	1
Germany	1
Italy	1
Portugal	1
Total	110

A quick survey of these journals indicates the following:

- Seventy or 64% of the journals are published in the United States of America.
- One hundred journals published in the United States of America, Australia, Canada, and United Kingdom are primarily published in the English language with two or three exceptions, which also publish some articles in Spanish or French.
- Eighty-seven (79%) of all journals listed provide articles in full-text html (hyper-text markup language) format, while 16 (15%) offer articles in full-text html and/or pdf (portable document format). Interestingly, 7 (6%) provide articles only in pdf.
- Two journals provide mirror-sites in other parts of the world.
- Two journals offer different screen formats such as wide screen and multiple screen formats.

The following refer to the one hundred journals published in the United States of America, Australia, Canada, and United Kingdom which primarily publish in the English language:

- 58% offer word search capability.
- 28% are also available as print journals.
- 42% have length limits specified in terms of words or number of double spaced pages for the submissions.
- 28% provide information on how to cite articles published in their journals.
- Five indicate that their online publications are indexed in databases. This number could perhaps increase if a careful assessment regarding indexing is made of the twenty-eight journals that are available as print journals with electronic versions as a complement or added value to their subscribers.

This information simply provides quick status records of these electronic journals with regard to arbitrary descriptors that I selected. A discussion on how ejournals in education are making use of the unique features offered by the electronic medium may be of additional interest here.

Unique Features of Electronic Media

Web technologies have advanced in numerous ways, which should spark a transformation of the nature of scholarly communication in ways not feasible in the traditional print medium. One such simple utility is to provide full-text search capabilities. Print journals also provide search aids, such as indexing; none, however,

matches the capabilities of ejournal search engines that facilitate searching the entire text of articles using Boolean logic. Full-text searching of ejournals as they continue their growth will soon be a universal feature. Fifty-eight percent of the English language ejournals provide readers with search capability.

Size Limitations vs. Access to Downloadable Data files

The potential to incorporate features that advance or surpass those traditionally used in print journals is yet to be realized by authors and publishers of ejournals. Web technology frees scholarly publications from size limitations imposed by the high cost of printing and mailing. Yet, forty-two percent of the English language ejournals surveyed, which are exclusively web-based, impose length limitations. One imposed a 1,000 to 3,000-word limit. Limited resources available to the publisher, scope of the journal, or target audience could be some of the factors influencing such size restrictions.

The Journal of Technology, Learning, and Assessment (JTLA), in its 2002 call for manuscripts refers to one of the journal's goals of providing access to primary data:

JTLA adheres to the principles of transparency in research. Authors submitting articles that present findings from original research are strongly encouraged to include the full data sets and the syntax used to analyze the data so that readers may replicate and/or extend analyses. When appropriate, authors are also encouraged to include any visual, audio, or software demonstrations required to convey one's point of view. [Accessed August 28, 2002, http://www.bc.edu/research/intasc/jtla/JTLA_submitting.shtml]

The Internet delivers research data in a multiplicity of new formats. For example, in an analysis of autonomy in public and private schools, Glass (1997) presents the entire data corpus comprising the full-text of thirty-seven interviews, providing erifiability of assertions and confirmation of analytic integrity between researcher and reader. This mode of delivery, by making the record of data public for critical examination, fundamentally alters

our mechanisms for establishing validity of reported research. The existence of the interview transcripts in their entirety allows the reader to function as a co-analyst with the researcher better and more critically than if one had to take the word of the author without ready access to the data. McLean (1997) utilized this public record to re-analyze Glass's data, using strict interpretations of rules of qualitative research.

Similarly, space limitations on quantitative research reports are an unavoidable reality imposed by the print medium. Russell and Haney (1997) included all of the raw data on which their analyses were based in two formats; text and Microsoft™ Excel spreadsheet. Dugan and Behrens (1998) afforded extensive detail through the use of hypertext and frames, allowing the reader to assess criteria for establishing validity of the analyses by avoiding data reduction. The employment of hypertext in the examples facilitates instant and simultaneous access to multiple sources of information. The employment of frames allows access to the raw data, and the reader access to a variety of alternative models of data analysis without interruption to reading.

Graphics, Audio and Video

Increasingly, the Internet provides enhanced opportunities for use of multimedia elements such as graphics, audio and video. Use of simple graphics alone could prove to be a challenge to publishers of ejournals. The *Canadian Journal of Educational Administration and Policy* (<http://www.umanitoba.ca/publications/cjeap/>), published at the University of Manitoba, Winnipeg, specifies in its "Notes for Contributors" the following: "Because of the limitations of electronic publication, authors are asked not to include charts, figures or tables in their papers." Whereas, the *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning* (<http://imej.wfu.edu>), published at Wake Forest University, North Carolina, has the following goals:

"to provide a peer-reviewed forum for innovations in computer-enhanced learning, to serve as a model and test-bed for an electronic journal with a high level of multimedia and interactivity, and to advance the acceptance of electronic publication as a legitimate and valuable form of academic discourse."

This journal makes extensive use of multimedia, requiring the use of an entire range of web software from Macromedia™ plug-ins to audio and video players. The journal supports the authors in preparation of multimedia elements, experts from the journal work with the authors. Extensive guidelines for submission of multimedia elements are provided as well. These two journals represent two extremes in the use of emerging web technologies.

In the field of education research, inroads to the use of multimedia elements are rare. It is useful, therefore, to examine how other fields have taken advantage of the multiple modes of data representation and information sharing afforded by web-based technologies. The *Journal of Seventeenth Century Music* (<http://www.sscm.harvard.edu/jscm>), for example, provides an early, albeit promising, use of Internet technology to analyze audio. Silbiger (1996) compared the music genres Passacaglia and Ciaconna with text accompanying the written music and actual audio samples of the music (MIDI files). The audio feature is unique to electronic journals and is an indispensable element in certain fields of study such as music. It provides readers with insights into the author's arguments and allows one to make evaluations of the music.

The comprehension of interviews, conversations in classroom research, and excerpts from field observation occasions may be enhanced by actual audio or video passages with accompanying commentary and analysis. Moreover, the inclusion of transcripts can allow the reader to assess the analytic methods and the ensuing assertions. (Middleton, 2000)

As evidenced by the two submissions that make innovative use of the electronic medium in four-and-a-half years of publication of *Current Issues in Education* (<http://cie.ed.asu.edu>), I surmise that writing for ejournals is challenging, and scholars have yet to take full advantage of the capabilities that the medium offers. Most importantly, features unique to the ejournal should not distract from the flow of the information; rather, these features should be used judiciously to enhance the important issues related to the topic being addressed by the scholars. (Cesarone, 1999) The use of multimedia elements must add to the message, not function only as a fascinating curiosity.

The challenge of using multimedia appropriately, powerfully, and not for its own sake, has to be thoughtfully considered and addressed by authors and publishers alike. Nonetheless, concerns regarding the use of these elements range from the fairly simple issue of time to download to the complex issues of copyright and ethics in use of participants' static or dynamic graphic images, especially with regard to minors in classroom research. In addition, these technologies imply that ejournals have to face the dilemma of making innovative use while also ensuring equity and access to the seeing and hearing impaired. Publishers of ejournals themselves must be capable of applying modern technology and must facilitate these opportunities.

Sequential Physical Publication and Scholarly Communication

Ejournals can help break the bonds of sequential physical publication. E-text can always be reformed to place related texts in close proximity. They also offer the opportunity to include interactive exchanges that are not restricted by geographic distance and time. Steven Harnad of Southampton University (U.K.), a leader in exploring new modes of scholarly communication, predicted about ejournals that they would "restore scholarly communication to a tempo much closer to the brain's natural potential while still retaining the rigor, discipline and permanence of the refereed written medium." (Harnad, 1991) The time lag in the ability of print publications to publish responses to research advances can range from several weeks to years. Electronic journals offer a variety of means for scholarly communication, ranging from listservs or other electronic discussion formats such as moderated or unmediated chat rooms, to simply allowing the posting of comments, which can be open or reviewed.

Reading Online (<http://www.readingonline.org>) a journal of the International Reading Association, USA, attempts to connect readers and authors by providing a discussion forum. While post-publication discussion forums are on the rise, the open pre-print discussions that are an integral part of the peer-review process are certainly unique. The *Journal of Interactive Media in Education (JIME)* (<http://www.jime.open.ac.uk>), published in the U.K., has extended the idea of scholarly exchange espoused by Harnad as evidenced by the schematic in Figure 1, reproduced from the

journal's website. The *JIME* uses two forms of review, closed and open, both of which utilize a threaded discussion format. The open-peer review during the "pre-print" phase raises interesting issues that I discuss later in this paper. This excerpt from the journal's website introduces several such issues:

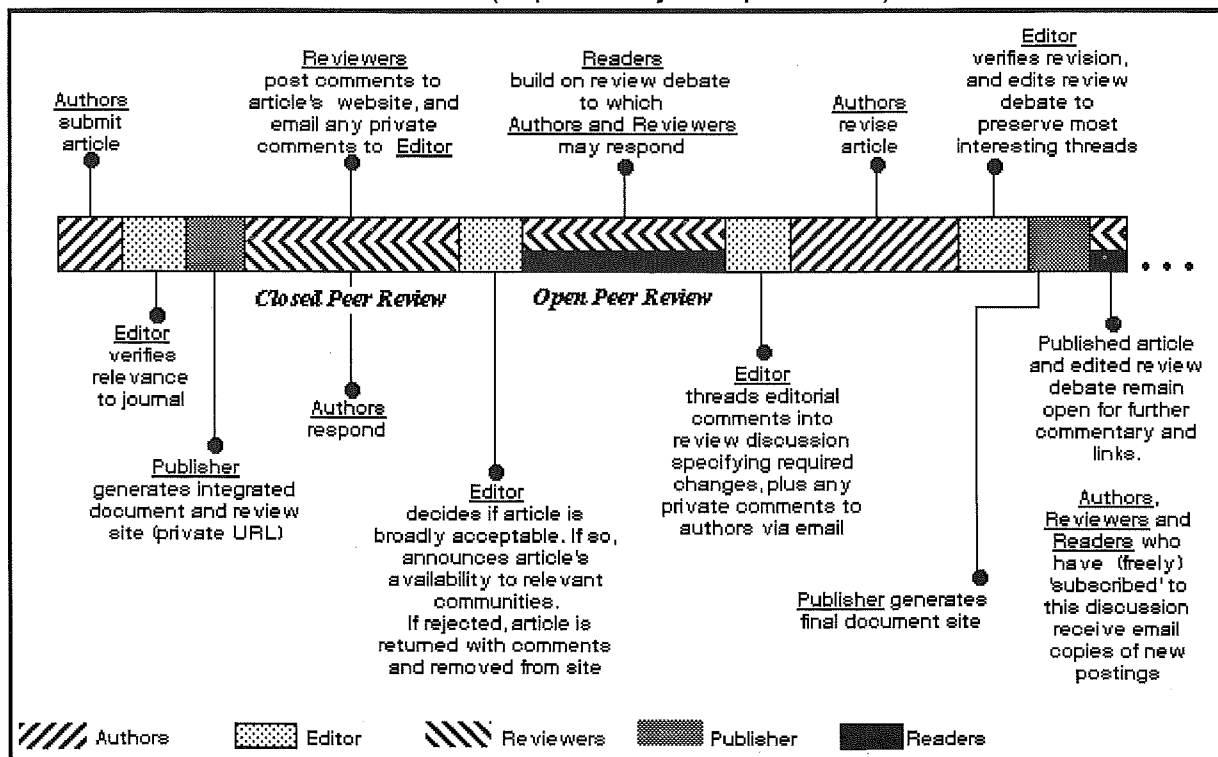
"In conventional journals, the point of publication is the beginning of scholarly debate. *JIME* brings this point forward by making submitted preprints accessible, but of course continues to support discussion about the revised, published article. . . . Thus, authors can post links to publications to point to subsequent work. Readers can post comments and links to point to work which has not been referenced, or did not exist when the article was written. Authors,

reviewers and anyone else who has subscribed to the article will receive email alerts to new postings to its discussion forum." [Accessed August 28, 2002, <http://www-jime.open.ac.uk>]

Such use of web technologies provides for scholarly exchange that hitherto was possible only in symposia such as the American Educational Research Association's annual meetings and other scholarly society meetings. Conversations among researchers that occur in conferences at formal symposia and other informal forums allow for interactivity that is impossible to achieve in print. The written word in print journals has allowed the dissemination of scholarship to many; however, this medium does not allow for exchanges between authors and readers of a kind akin to serious discussions. Yet, absent the web, such interactions are restricted to a specific geographical location, time, and the confluence of people and interests.

Figure 1
Lifecycle of a *Journal of Interactive Media in Education* submission.

Source: (<http://www-jime.open.ac.uk>)



Facilitating Electronic Peer-Review

Most ejournals facilitate the peer review process electronically. Email has certainly assisted in the exchange of information from authors to editors and reviewers. Submissions received by *Current Issues in Education* (<http://cie.ed.asu.edu>) are prepared as a website and placed on the journal's Intranet for reviewers. The *Journal of Interactive Media in Education (JIME)* (<http://www-jime.open.ac.uk>), as portrayed in Figure 1 above, facilitates the review process entirely on the web. Additionally, *JIME* has an interesting component, the open peer-review phase. The open peer-review occurs in a very unrestricted place—the World Wide Web.

Can reviewers during the open peer-review phase remain anonymous? The coat of anonymity at times provides reviewers opportunities to be impolite. This novice editor, as any experienced with many years of service can confirm, has had to edit out reviewer comments that border on personal attack. Without the cover of anonymity, could reviewers be expected to be polite? Publishers of *JMIE* offered the following with regard to issues related to authors, reviewers and readers:

“ . . . Another issue is that contributors to the public debate

may not wish to be identified for various reasons. While *JIME* prefers all comments to be signed, anonymous contributions are also permitted. The willingness of both authors and reviewers to engage in this process depends greatly upon the professionalism and netiquette exhibited by contributors to the debate.” [Accessed August 28, 2002, <http://www-jime.open.ac.uk>]

The American Educational Research Association's (AERA) Annual Meeting electronic proposal submission processing system on the World Wide Web (<http://www.klick.org/aera>) also assists program chairs in matching submissions with potential reviewers based on criteria that reviewers have specified. However, the reviewer names and affiliations are kept anonymous when the accepted proposals are made public. Scholarly journals and societies are yet to make progress at dissipating the shroud of anonymity.

Figure 2
A Pre-Print Publication and Corresponding Open Peer-Review
Source: <http://www-jime.open.ac.uk/>

The screenshot shows a web browser window displaying a pre-print publication page for the article "Affordances for learning in a non-linear narrative medium" by Diana Laurillard, Matthew Stratford, Rose Luckin, Lydia Plewman, and Jasia Taylor. The page is titled "Submission to Journal of Interactive Media in Education" and is marked as a "PrePrint Under Review".

The authors' affiliations are listed as follows:

- ¹Institute of Educational Technology, The Open University, Walton Hall, Milton Keynes, MK7 6AA (D.Laurillard, M.S.Stratford, J.Taylor) @open.ac.uk>
- ²School of Cognitive and Computing Sciences, University of Sussex at Brighton, Falmer, Brighton, BN1 9QH, UK <rose@ccsc.sussex.ac.uk>
- ³Scottish Council for Research in Education, 16 St. John Street, Edinburgh, EH3 6JR <Lydia.Plewman@scrc.ac.uk>

The abstract states: "Abstract: A multimedia CD makes an impressive resource for the scholar-researcher, but students unfamiliar with the subject-matter may not always work so effectively with such a resource. Without any narrative structure, how does the novice engage? This defines the

The right-hand side of the browser window shows the open peer-review section, titled "Reviewers". It lists several reviewers and their comments:

- Reviewers:** Wanda Beaman (U. Monash, AU), Nichel Crampes (Par. Scientifique George Besse, FR), Elizabeth Lichtenwalter (U. Technology Stony Brook, NY), Julia Linn (Columbia U. New York, USA), Jena Strout (Monash U. AU), Collaborative Knowledge Building Environment Researcher (U. Colorado, USA)
- Editor:** Gerry Stahl (Univ. Colorado Boulder)

The editor notes: "The author(s), reviewers, and anyone who has subscribed to this discussion, will be automatically alerted to new comments by e-mail."

The "Area for Debate" section shows a list of comments:

- Originality & Importance of Ideas (JIME Editor Gerry Stahl) (Univ. Colorado):** Re: Originality & Importance of Ideas (Margaret Beaman), 13 Aug 1999
- Originality & Importance of Ideas (Mel-Uwe Lose) (23 Aug 1999):** Re: Originality & Importance of Ideas (I like it with critical thinking) (Fernando Sarmiento)
- Originality & Importance of Ideas (Thomas Hiermann) (1 Sep 1999):** Re: Originality & Importance of Ideas (Anon.), 1 Sep 1999
- Originality & Importance of Ideas (Ray Levine) (4 Sep 1999):** A suggested structural framework for consideration (Scott Long)
- Summary of Reviewers' comments (Lydia Plewman) (16 Nov 1999):** Summary of Editor's comments (Gerry Stahl), 24 Mar 2000
- Clarity of Goals (JIME Editor Gerry Stahl) (Univ. Colorado Boulder) (16 Nov 1999):** Re: Clarity of Goals (Stephan Buller), 30 Aug 1999
- Clarity of Goals (Jeffrey Hovaville) (31 Aug 1999):**

An implementation of the pre-print and open-peer review is illustrated in Figure 2 above. This is a screen dump of the pre-print phase of an article from the *Journal of Interactive Media in Education (JIME)*, (<http://www-jime.open.ac.uk/99/laurillard/laurillard-t.html>). *JIME* utilizes a threaded discussion format. *Action Research International (ARI)*, Australia, (<http://www.scu.edu.au/schools/gcm/ar/ari/arihom.html>) uses the listserv format to facilitate open-peer review. Journal readers can provide feedback to authors who submit papers to this list. This excerpt from guidelines for authors, explains *ARI*'s concern regarding the open-peer review phase:

"You can then expect supportive and critical comment on your draft from the journal subscribers. Members of the editorial panel are also likely to comment. They have been encouraged not to treat this as an adversarial activity. They will do what they can to make this an exercise in striving towards high quality through mutual exploration and inquiry. We urge you to respond non-defensively in like manner."

[Accessed August 28, 2002, <http://www.scu.edu.au/schools/gcm/ar/ari/ari-auth.html>]

Why open peer-review? Why pre-print? For most scholars the formal submission of their work for peer-review is not the first time it has been opened up for peer examination. Informal discussions with colleagues, students, mentors, and others serve to elicit feedback regarding the various aspects of the work—ideas, theories, interpretations of phenomena, methods applied, results, clarity, presentation style, and so on. The final report benefits from this process. Open-peer review is an extension of this process. The traditional invited peer-review allows for the validation of ideas by experts. However, the closed peer-review adopted by most ejournals in education, limits the process to one specific time only and it is kept private. Pre-print and open peer-review can help create more productive scholars. Steven Harnad said about the republication phase:

" . . . after all, is the one in which most of the cognitive work is done. . . . This prepublication interaction is clearly continuous with the lapidary stage at which the manuscript—usually further revised in response to peer

review—is accepted and archived in print. Nor does it really end there, for of course the literature may respond to a contribution directly or indirectly for years to come, and there are even ways of soliciting post publication feedback in the form of 'open peer commentary'." (Harnad, 1990)

Thus the concept of open-peer review is extended beyond the pre-print phase to encompass scholarly exchanges over time.

Access to Publications in Multiple Formats

Another feature of ejournals is to provide for off-line access. One such journal is the *Australian Journal of Educational Technology* (<http://www.ascilite.org.au/ajet/ajet.html>), where archives are also available as zip files, each containing one volume, to facilitate "offline" reading. This facility makes use of easily available compression software to reduce the size of the downloadable files. Other techniques include providing articles in pdf (Adobe® Acrobat® portable document file, <http://www.adobe.com/products/acrobat/readstep.html>) format.

Finally, journals providing online discussions provide users the opportunity to view both the article and the related discussion. The *Journal of Interactive Media in Education (JIME)* (<http://www-jime.open.ac.uk>) offers users a choice between reading the article itself and the commentaries about the article. These two views can be either displayed in two separate windows (Overlapping Windows Interface), or in a large single window (Tiled Windows Interface). In the Overlapping Windows Interface, the user can switch between the two windows, one of which is partially visible. In the Tiled Windows Interface, if one has a large monitor both the article and the discussion can be viewed on one screen without interrupting the flow of either of the two.

Copyright, Authors, and the Ejournal Publishers

With increased access to scholarly communication, many individuals are concerned about copyright issues. Indeed copyright issues are severely contested in the legal and legislative world. In addition, scholarly communication is severely

commercialized. Typically, authors give commercial print publishers the copyright to their work in exchange for the opportunity to be published or in exchange for royalties. Authors seldom self-publish their scholarship. With the advent of scholarly ejournals, creators of scholarly works and their supporters—academic institutions and scholarly societies can seize control of the process of publication. Scholars generally author research reports with the intent of advancing the communication of research, both with peers and the public. Publishers of electronic journals have the unique opportunity to encourage the communication of scholarship and promote intellectual progress by ensuring the free-flow of information. Copying and using electronically published material is quite easy in comparison to the distribution of print material. The ownership of intellectual property and the relationship of electronically published material with other electronic and print publications, and access to the publication and long-term preservation of electronic material form an integral part of the complex set of issues related to scholarly communication via the Internet.

Preservation of Ejournals

The appeal of ejournals is enhanced by the power of using the electronic medium to envision information, which opens up possibilities not available with paper. The complex, dynamic, multidimensional world can be represented in rich visual experiences via the electronic medium. However, the creation of these new places, which offer a new type of experience, in a global digital space, raises issues related to their preservation, use, and management over time. What happens if the web server that hosts an ejournal goes down? How can continuous access to ejournals be offered? When ejournals begin to use services that are distributed over several different resources and servers, the concept of merely copying a single website to create an archive will not suffice. The global network spaces of ejournals can be fluid, complex, and spread over multiple environments. Publishers of ejournals are yet to fully grasp the meaning of fluid digital spaces in the context of global networks.

As ejournals in education spawn, it is important to note that even the basic indexing services available to print journals via sources such as the Educational Resources Information Center (ERIC) are not available to ejournals. Rudner (2000) presents arguments for changes to meet the

information needs of the 21st century. Indexing ejournals, creation of metadata sets of materials published in ejournals, are essential to the issue of preservation as they relate to retrieval of the preserved material.

Mirror Sites

What is a mirror site? *Ecommerce Webopedia* (<http://e-comm.webopedia.com>), a source for terms, definitions, and acronyms in electronic commerce offers the following definition: "A mirror site is a web site that is a replica of an already existing site, used to reduce network traffic (hits on a server) or improve the availability of the original site." Can mirror sites aid in preservation of access to ejournals? Mirror sites are forerunners of digital archives. They are located in different parts of the world and are exact copies of the original. This also allows the site to be up and running (at least on one of the mirror servers somewhere) at all times, providing redundancy in the event of any type of disaster. Technical problems and server crashes are more prevalent than natural disasters.

Linking is not the same as mirroring. Even if an ejournal is linked on many other web sites, if the web server (known as the primary server) hosting the ejournal, goes down and the site is not mirrored, access is lost. Mirroring an ejournal requires that another copy of the site exist on a web server at a different location, which is not associated or dependent upon the primary server. This will allow one to maintain a reliable web presence (to some degree) regardless of what happens to the primary server. Odds are very good that at any given point in time, that mirror websites will be operational if the primary server goes down. Ejournals with mirror sites can post a notice and link on their primary website for the URL of the mirrored locations, so that users can bookmark the mirror site's URL for immediate access when the primary server is out of service. Once mirror hosts are found, mirroring can be achieved using software.

Educational Technology & Society, USA, (<http://ifets.ieee.org/periodical/issues.html>) offers mirror sites in the Germany, and New Zealand. *Teaching English as a Second Language or Foreign Language (TESL-EJ)*, USA, (<http://www-writing.berkeley.edu/TESL-EJ>), offers mirror sites in Germany (http://www.zait.unibremen.de/wwwgast/tesl_ej), Japan (<http://www.kyoto-su.ac.jp/information/tesl>

ej), and Australia (<http://www.latrobe.edu.au/www/education/celia/tesl-ej>).

Examples of mirroring software include *Mirror* (<http://www.sunsite.org.uk/packages/mirror>), free software for both the Windows and Unix based operating systems and *Teleport Pro* (<http://www.tenmax.com/teleport/pro>), shareware software for the Windows operating system. There are commercial and as well as freeware-shareware software available for purposes of mirroring. It is important to note that mirroring is merely a tool in creating a copy of digital materials for alternative access. All the same, the idea of digital archives with regard to preservation necessitates specific attention to elements of the digital material, in addition to indexing (Willinsky & Wolfson, 2001) and preservation of the material over time (<http://www.diglib.org/preserve.htm>).

Digital Archives

As ejournals take advantage of the unique features of the electronic medium, the notion of an article as a single web page with plain text will begin to change. What is a digital document? Can it be seen? It is often not possible to get a feel for a digital document's span nor is it possible to just print it out. (Dempsey, 2000)

Consider, *Current Issues in Education's (CIE)* Leshowitz, DiCerbo, and Symington (1999) (<http://cie.ed.asu.edu/volume2/number5>), which incorporates video clips. While the document is served from the *CIE* server, the video clips are served from a separate server capable of serving real video. Users will need to have access to the Real Networks RealPlayer G2 software (<http://www.real.com>) in order to view the clips. Therefore, information could be distributed over multiple e-spaces.

Users may interact with programs and underlying data to view dynamically generated reports or graphs. Researchers at the University of South Carolina have created a web application entitled "Webstat." This free data analysis software tool is available at (<http://www.webstatsoftware.com>). The web-based application, written using Java™ (<http://www.javasoft.com>), allows the user to load data from a website by pasting the URL to a data set and creating basic summary statistics and graphics. With a little imagination, one can easily foresee the use of such technology in quantitative research reports to allow readers to verify for themselves the statistical computations used.

These examples barely begin to explore the notion of shared network spaces. Loosely defining digital preservation as the preservation of digital documents, it should be noted that digital preservation as with digital technology (in comparison with print) is quite fragile, and is dependent on two basic elements. The first is the storage medium, which is usually magnetic or optical, both of which are susceptible to decay. The second is the digital information, which is machine dependent; to be 'read' correctly it needs specific computer hardware and software both of which are prone to become outdated or unusable. (Lynch, 1999)

What is a digital document or a digital space? Do ejournals occupy multiple digital spaces? Who will define what digital preservation is? Who will decide what is to be preserved? Who will archive what needs to be preserved? What types of technologies are needed for digital preservation? Who will pay for it? These questions need to be addressed, if the scholarly work in ejournals is to be preserved for future generations. This begs the question whether a particular work is worth preserving.

The Digital Library Federation (<http://www.diglib.org>), a consortium of libraries and related agencies, has engaged in articulating the complex set of issues surrounding digital preservation by arriving at common minimum criteria for an archival repository of digital scholarly journals. Challenges related to digital archiving extend beyond the issues of the complex electronic medium. These challenges may encompass the various elements of an ejournal article; they essentially relate to retrieval issues as well. Merely archiving for the sake of preservation will not suffice; thoughtful consideration of how archived material will be accessible for use is equally important. With funding from the Andrew W. Mellon Foundation, a select few major libraries are exploring the design, creation, and implementation of a digital archive of electronic journals. Progress reports from grant funded institutions are available at the federation website. An initial review of these reports indicates the complexity and variety of issues inherent to the task at hand.

Conclusion

As ejournals in education grow, thoughtful and innovative uses of the electronic medium have to be contemplated. Imaginative elements have to be used for clarification, explanation, and illustration

and not merely as a curiosity. Publishers of ejournals have to work collaboratively with scholars to explore original uses for digital spaces, as scholars have yet to take advantage of the unique features offered by the electronic medium and the Internet. In the field of education, notions of traditional quality control of scholarly publication are beginning to change, albeit slowly. The radically new digital medium has allowed the likelihood of far-reaching changes in the nature of scholarly communication, challenging age-old notions of peer-review. Nevertheless, the preservation of scholarly work ensues to be a timeless challenge as in the days of Alexandria, the greatest research center and perhaps the first major scholarly archive of its day, later destroyed by war, invasion, and fire. (Ganesh, 1999) The preservation of ejournals in digital format is much more delicate than its print counterpart. Natural calamities are no longer a threat to the preservation of scholarly work in the new digital medium; rather, the very nature of digital media and the inherent complexity of shared global digital spaces are the challenges. The domain of scholarly electronic publishing is complex and multi-faceted, and raises many issues that need further consideration and action.

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What management issues do education information professionals confront?

- How are new professionals trained?
- What new skills do seasoned professionals need, and how will those needs be addressed?
- What efforts are being made for planning smooth transitions for personnel successions?
- What tasks truly require professional preparation?
- How are professional and paraprofessional staff coalesced?
- How does collaborative instruction impact other library services and staffing scheduling?
- How should serials be organized and retrieved?
- What impact do digital resources have upon management?
- How should wireless services be established and maintained? What attention should be made to technical support, costs, and equity of access?
- How should 24/7 services be managed? Should everyone be a 24/7 service provider?
- How can budgets be shifted to align with priorities in an unstable economy?
- What grantsmanship skills and efforts are successful? Why?

There's lots of grist for the *Education Libraries* mill. Please send relevant manuscripts to Dr. Farmer at lfarmer@csulb.edu by March 30, 2004.