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ABSTRACT

This paper discusses scholarly communication and the emergence of electronic journals. Scholarly electronic journals are expanding their influence. Currently, about 70 peer-reviewed scholarly journals in education are freely available through the World Wide Web. Wider access to scholarship, new possibilities inherent in the electronic medium, and a shortened publishing lag are some of the issues relating to this expansion. The collision of the financial aspects of traditional print publishing with the ground rules of academic scholarship is also contributing to the progress of electronic dissemination of scholarship. Concerns about the quality of scholarly electronic communication are misplaced since the peer review can be even more rigorous with online journals than with traditional print publications. In addition to economic issues, there are a number of medium-specific technical features of electronic publication that offer a huge potential to revolutionize scholarly communication. (Contains 18 references.) (Author/AEF)

Scholarly Electronic Journals: Economic and Technical Issues

<http://ganesh.ed.asu.edu/research/aect2000ej/>

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Abstract
In this paper we discuss scholarly communication and the emergence of electronic journals. Scholarly electronic journals are expanding their influence. Currently, about 70 peer-reviewed scholarly journals in education are freely available through the World Wide Web (http://aera-cr.ed.asu.edu/links.html/). Wider access to scholarship, new possibilities inherent in the electronic medium, and a shortened publishing lag are some of the issues relating to this expansion. Also, the collision of the financial aspects of traditional print publishing with the ground rules of academic scholarship is contributing to the progress of electronic dissemination of scholarship. Concerns about the quality of scholarly electronic communication are misplaced, since the peer review can be even more rigorous with on-line journals than with traditional print publications (G. V Glass, 1994). In addition to economic issues, there are a number of medium-specific technical features of electronic publication that offer a huge potential to revolutionize scholarly communication.

Perspective
The authors represent a team of graduate students and scholars who are involved in editing and publishing peer-reviewed scholarly on-line journals at Arizona State University, Tempe, AZ. One of the authors has had extensive experience editing print journals dating back to 1968, and has edited and published an electronic scholarly journal for the last seven years.

Introduction

Scholarly publication is at the core of academic life. Changes in the nature of scholarly communication are certain to reverberate throughout academe. Since Gutenberg, technology has played a key role in shaping the nature of scholarly communication. In the 1970s, the advent of desktop publishing and the use of computers changed the nature of scholarly publication. Now, telecommunications technology is shaping the way we view the dissemination of scholarship. One could hardly overestimate the importance of these new media in advancing the cause of scholarship and science; surely Stephen Hawking did not. On December 26, 1999, on the Larry King Weekend telecast on CNN, Stephen Hawking was asked,

> "[KING] What, Professor Hawking, do you consider the most important discovery of this millennium?"
>
> and Hawking replied,
>
> "[HAWKING] I think the invention of printing was a breakthrough for the human race. It meant that information and discoveries could be disseminated widely and not just on a one to one basis by word of mouth or handwritten manuscript. It led to an ever increasing rate of scientific and technological development. This has now made printing almost obsolete and replaced it by the Internet."

The role of commercial publishers as the sole purveyors of scholarly work is being threatened. Commercial publishers were the first to see the potential and take advantage of the microcomputer revolution—the advent of desktop publishing in the 1970s. Their numbers expanded remarkably and their profits soon followed suit. Because the capital investment required to enter this arena was minimal, the industry has become flooded with small-time publishers eagerly hunting for manuscripts. The scale of publication was transformed radically on account of low production costs; 500 copies became a "break even" point for scholarly books priced at as much as 25cents/page. Quantity in number of titles came to replace quality. It appears to casual observers that very little peer review remains in the commercial publication of scholarly books. A very conservative estimate of 113 commercial publishers and 74 university presses in the U.S. that currently publish books on education can be found at <http://coe.asu.edu/edrev/publish.htm>. It is safe to say that in the year 2000, five or ten times (per capita) as many scholarly books will be published as had been published at a time—1950's—when to publish a book represented a significant investment in resources by a large publishing house. Traditional scholarly publishers have exercised a great degree of control over the publication process, based on financial considerations first and access considerations last. The degree to which the cost of print journals has risen has forced university libraries to cut back on their print acquisitions and examine new technologies.

Today, electronic mail and the World Wide Web have become essential tools of the academic. The relatively low cost of access to this technology in contrast with that of print communication has made scholarly electronic journals an affordable alternative. However, the sheer volume of information appearing on the Web has raised concerns about the quality of on-line resources (Dillner, 1999). We suggest that this concern about quality is misplaced. The emergence of electronic media has afforded scholars the opportunity to make available their research work to the public "free of charge," effectively changing the nature of scholarly communication. Previously marginalized populations now have access to what was once outside their reach. The dialogue between educationists, policy makers and the public is enhanced (G. V Glass, 1999b).

Technical issues of bandwidth, media type, and capabilities afforded by the new media in relation to the nature of electronic journals are worthy of examination. Effective use of videos and audio clips with text can easily alter the nature of the scholarly reports with regard to the validity of inferences in the research reports. The ability to make large data sets available at relatively low cost allows other scholars to run secondary analyses on primary data. However, this raises issues of bandwidth and the ability of electronic publishers to make use of appropriate technology. The affordances of this technology challenge scholars to prepare research reports that take full advantage of the media.

Electronic Scholarly Journals

Peer-reviewed electronic scholarly journals (ejournals) have at once become a novel, economically viable mode of scholarly communication and a challenge to traditional means of publishing research journals. The print journal has been in existence since the mid 17th century and, by its very nature, it has remained static and representative of one-way communication. Print journals are published at a certain moment in time, usually available as a subscription for a price, or included with membership to a scholarly society. Ejournals are only a decade old, with the ability to provide information that can be timelier, and access can be free. Although the reader is dependent on access to a computer, rapid distribution directly to the desktops of subscribers ensures timely delivery in geographically remote locations (Luther, 1997).

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. Conversations among researchers that occur in conferences at formal symposia and other informal forums allow for interactivity that is impossible to achieve in print media. Yet, absent the web, such interactions are restricted to a specific geographical location, time, and the confluence of people and

interests. Ejournals offer the opportunity to overcome these obstacles to include interactive exchanges that are not restricted by geographic distance and time. Steven Harnad of Princeton University, 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). While this challenge is yet to be realized, the new age of scholarly communications immediately promises wide access at low cost. Furthermore, if scholars' intention is to make their scholarship available to a wide audience, what better mode than the ejournal?

Greater Access to Scholarship

The great pleasure of this new world of electronic publication comes at least once a day to those who edit and publish scholarly ejournals. The same computers that "serve" out the publications also record the location (nation, for sure, sometimes the university or organization) of the recipient (the personal identity of the recipient is generally indeterminate, though not always). By scanning the daily access logs, one can see the locations of persons who visited the journal that day and downloaded articles. An established ejournal, *Education Policy Analysis Archives (EPAA)* <*http://epaa.asu.edu*>, shows the breadth of access to scholarly writings that is far greater than that of competing journals. The access logs for *EPAA* for February 14, 2000, revealed that people who visited the journal that day downloaded the following numbers of articles:

Location	Number of articles downloaded
US school districts	159
Canada	154
Spain	28
Sweden	22
New Zealand, (Aotearoa)	20
Argentina	19
Portugal	19
Brazil	18
Japan	17
United Kingdom	15
China	13
Singapore	12
Hong Kong	12
Netherlands	12
Taiwan	11
Mexico	11
Germany	10
Norway	10
Australia	10
France	9
Venezuela	8
Switzerland	8
Saudi Arabia	8
Romania	7
Turkey	6
South Africa	5
Colombia	4
Croatia (Hrvatska)	4
Egypt	2
Austria	2
Denmark	2
Peru	2
Philippines	2
Greece	1

Numbers like these are not simply gratifying, they are also very informative. The more than 642 articles downloaded far surpass the logs of any library access to a journal in education policy in a month. It is difficult to imagine this number of such individuals making their way to the stacks of the nearest university library to find a research article on education policy.

The connections from Argentina, Brazil, Croatia, Mexico, Peru, Philippines, Turkey, and Venezuela represent accesses to scholarly literature that has often been beyond the reach of these individuals, because commercial publishers charge libraries as much as $200 U.S. for journals of fewer than 300 pages. The journal, *EPAA*, competes for attention with three other journals in its field whose *combined* subscriptions total about 5,000. One article in *EPAA* has been downloaded 25,000 times since it appeared in 1995. A national survey of home schooling was published in the journal on March 23, 1999, and surpassed 9,500 downloads on August 1, 1999. On January 1, 2000, Linda Darling Hammond of Stanford University published a major report of research on teacher certification that was downloaded over 5,000 times in the first five weeks.

Commercial Interests

Publishers of commercial for-profit print journals charge different subscription rates to individuals and institutions. Due to the increase in cost for print materials, the subscription rates to these serials have risen dramatically. As a result, university libraries have had to re-examine the number of subscriptions their budgets could accommodate. Since 1986, the 121 members of the Association of Research Libraries (ARL) have spent 124% more to purchase 7% fewer serial titles (Walker, 1998). Each year libraries have been forced to cancel some subscriptions in order to continue receiving other journals. This, in turn, causes a reduction in the number of subscriptions and publishers are likely to increase prices to stay in the business, which continues the cyclic crisis.

Commercial publishers have long served as the principal providers of research scholarship. G. V Glass, (1999a), stated that scholarly publishers such as Elsevier, Springer, Kluwer, SAGE, and others, who publish literally thousands of books and journals each year, by some estimates earn profits approaching 40%. These publishers rely primarily on scholars to help with the review process, and these reviewers often present this service gratis. Most such publishers who offer electronic versions of their print journals also charge a subscription fee to access them. With the advent of web technologies, scholars and universities can take control of the publication process and disseminate research to all by providing free access.

Gene V Glass, editor of *Education Policy Analysis Archives (EPAA)* <*http://epaa.asu.edu/*>, at Arizona State University stated:

> "I have published for seven years, completely by myself—no secretary, no graduate assistant, no budget--a peer refereed journal in education policy analysis that anyone can access for free on the internet" (1999a).

Current Issues in Education (CIE) <http://cie.ed.asu.edu/> also published by the College of Education, at Arizona State University, since 1998, is supported with the salaries of two quarter-time graduate assistants and server space on one of the College's servers.

Limitations of Print Journals

Print journals are captive to the temporal, geographic constraints of the predictable paper publication medium. Scholars submit their research findings to publishers as written reports, which are then sent out for peer-review. The peer-review process may take anywhere from three weeks to six months. The author makes revisions based on recommendations, and returns the manuscript to the editor(s). After the article is finally accepted, it again takes from six to twelve months or more before the published version appears. The entire process from the author's initial submission to final acceptance and publication could take anywhere from a year to two years. Take for example, G. V Glass, 1998; the *Educational Researcher* received the manuscript on September 13, 1996; revision was received on April 7, 1998; accepted on May 1, 1998; and finally published in November 1998 (p. 37). In this instance it took two years from manuscript to print and begin dissemination. This however, does not represent the end of the delay, for this represents the beginning of scholarly discussion. In order for other scholars to read, review, begin exploring the ideas presented, and perhaps offer responses it could take another couple of years, by when the author could be doing something else. This brings to focus the simple question, why do scholars publish? It is posited that scholars publish to share their creative ideas with others in the field and generate exchanges with peers. The rate at which the print medium engenders scholarly communication is one important reason why ejournals are more practical than their counterpart. Thus ejournals are helping redefine how scholarship is disseminated.

The opportunity to create free access to scholarship via the Internet is unparalleled. Previously, researchers' access to scholarship was limited to those who could afford subscriptions to print publications. The relative affordability of publishing an e-journal opens access to all and allows for wider dissemination of knowledge. This represents the fundamental premise of ejournals; democratization of access to scholarship and promotion of a global community of researchers (Leavy & Ganesh, 2000).

Technological Affordances

The power of web technologies lies in their ability to redefine research reporting and transform the nature of scholarly communication in ways not feasible in traditional print media. Increasingly, the Internet provides enhanced opportunities for visual, audio and video interactivity. 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 print. Ejournals break the bonds of sequential physical publication. They can always be reformed to place related texts in close proximity. Additionally, the Internet delivers research data in a multiplicity of new formats. S. R. Glass, (1997), for example, in an analysis of autonomy in public and private schools, presents the entire data corpus comprising the full-text of thirty-seven interviews, providing verifiability 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 he or she had to take the word of the author without ready access to the data. McLean (1997), utilized this public record to re-analyze S. R. Glass's data, using strict interpretations of rules of qualitative research.

Similarly, limitations inherent in the use of summary statistics in research reports are an unavoidable reality due to space limitations imposed by the print medium. Russell and Haney (1997), include all of the raw data on which their analyses is based in two formats; text and spreadsheet. Dugan and Behrens' (1998), use of embedded frames affords the reader interactivity and, as with McLean (1997), allows the reader to assess criteria for establishing validity of the analyses by avoiding data reduction, and offers extensive detail afforded through the use of hypertext and frames. The employment of hypertext in this exemplar 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.

In the field of education research, these inroads 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, for example, provides early, albeit promising, use of Internet technology to analyze audio. Silbiger (1996), compared the music genres Passacaglia and Ciaccona 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 to the author's arguments and allows one to make evaluations of the music. It is speculated that the comprehension of interviews and conversations in classroom research may be augmented by actual audio passages with accompanying commentary and analysis. Moreover, if transcripts are also included, the reader can assess the quality of the transcription and analytic method (Middleton, 2000).

The challenge of using multimedia appropriately, powerfully, and not for its own sake, is demonstrated by Leshowitz (1999), who provided video clips to furnish readers a glimpse into the practices of a college classroom. The opportunity to witness the actual active-learning teaching methodology, student reactions, and changes in students' critical thinking skills that occurred during the course of the research study is afforded by providing a visual and auditory window into the reality of the classroom. While the choice of clips, and even the choice of what to video in the first place is arbitrary to some extent, judicious use of video has proven to be meaningful in this reporting context. Yet, these technologies imply that ejournals have to face the dilemma of making innovative use while also ensuring equity and access to the visual and hearing impaired. Publishers of ejournals themselves must be capable of applying modern technology and must facilitate these opportunities.

Writing for ejournals is challenging and scholars are yet to take full advantage of the capabilities that the medium offers. Features unique to the ejournal should not distract from the flow of the information, yet these features should be used judiciously to enhance the important issues related to the topic of the write-up (Cesarone, 1999).

Furthermore, web technologies have advanced to provide full-text search capabilities. Print journals also provide search aids, such as indexing; none, however, match the capabilities of ejournal search engines that facilitate searching with Boolean logic. Full-text searching of ejournals as they continue their growth will soon be a universal feature.

While most ejournals in education differ little from print publication, an exploration of why this new technology has yet to change the fundamental nature of scholarly reporting is necessary. Scholars may not have access to the power the medium offers and expertise in use of cutting edge technology may rest with a few.

Publishers of ejournals, while using the unique features of the medium, have to take special care to ensure that the material is easily downloadable for all readers, including those who are on a modem connection. Web usability experts have shown that users are reluctant to wait for little longer than a few seconds to download information.

Concerns that ejournals are ephemeral can be alleviated by advances in network technology that offer mirror sites, actually enabling a geographically distributed digital archive (Ganesh & Jennings, 1999). The Educational Resources Information Center (ERIC) Clearinghouse on Assessment and Evaluation abstracts articles appearing in the *Education Policy Analysis Archives* in the *Current Index to Journals in Education* and permanently archives the entire contents of the journal in *Resources in Education*.

Barriers to the Growth of Ejournals

Concerns about the quality of ejournals and their scholarship are largely misplaced. Perceptions that ejournals are less rigorous are far from real. Brand, (1999), who interviewed several scholars from various disciplines, reported that educationists associated rejection rates and age of the journal as indicators of quality. Whereas scientists favored peer review over nothing at all; if they had to choose between timely access and peer review, many would choose timely access. The factor of speed with which ejournals could obtain peer reviews was actually an issue of concern to educationists, while scientists believed that peer reviews could work with both print and ejournals. Educationists felt that if ejournals were published quickly, they would lack rigorous peer-review and publishing standards. Researchers in education thus valued the referred review-revision negotiation process.

Conclusion

A redefinition of scholarly communication will significantly impact publishers, scholars, and libraries. Our concept of "a scholarly journal" as established in the traditional world of print journals is under serious challenge due to recent advances in communication technology. Contemplation and clarification of what we value in scholarly publication, serious examination of the various aspects of electronic publishing and an understanding of their implications are necessary. The advantages and limitations of electronic journals for dissemination of scholarship should be clearly understood in order to apply available technologies to scholarly publication. Scholars can, and should, reclaim the publication of their works from commercial interests and make scholarly information freely accessible to the world.

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