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Print versus Electronic Journal Use in Three Sci/Tech Disciplines: What's Going On Here?

by

Tammy R. Siebenberg*

Information Literacy Coordinator

Harold B. Lee Library

Brigham Young University

tammy_siebenberg@byu.edu

Betty Galbraith

Owen Collection Development Manager

Owen Science and Engineering Library

Washington State University

bettyg@wsu.edu

Eileen E. Brady

Manager, Owen Collection Preservation and Access, and Security

Owen Science and Engineering Library

Washington State University

brady@wsu.edu

* Science/Engineering Librarian and Library Instruction Coordinator, Owen Science and Engineering Library, Washington State University, Pullman, Washington at the time of writing this paper.

Print versus Electronic Journal Use in Three Sci/Tech Disciplines: What's Going on Here?**ABSTRACT:**

In 2003, an evaluation of journal use statistics at Washington State University was undertaken to determine if the selection of electronic journals in Owen Science and Engineering Library was changing students' and researchers' choice of journals. Use statistics showed that most print journals were being used more than they were prior to the advent of electronic journals. Generally, electronic journals were used heavily and availability of electronic format greatly enhanced the total use of most titles. However, some electronic journals were used little or not at all while there was a substantial increase in the use of some print titles.

INTRODUCTION:

From all around the library world, we were hearing that people were changing from using paper journals to electronic journals (e-journals). According to one library assistant director "faculty are 'happy as can be' to dial into a university's subscription from their office, and students 'almost always prefer to read an electronic journal.' Students will stand in line for the

terminal rather than walk up one flight of stairs to get the paper copy.”¹ While we could find a few studies to support this,²⁻⁴ we undertook our own study to see if the "common wisdom" was accurate for our library. Were our patrons switching from the print journals they had used in the past to electronic titles (e-titles) regardless of the title, just because a title was available electronically?

In 2001, Washington State University's Owen Science and Engineering Library had approximately 2,700 titles in electronic format. Some of these duplicated paper titles in the collection, but many of the e-titles were titles we had acquired in package deals which were never before available in our library. We feared that we might be funneling our researchers and students to less "prestigious" journals by our selection of titles in electronic format (e-format).

We decided to look at the use statistics for titles we had in 1998, before we had e-journals online, and 2001, when we had a good mixture of electronic and paper journals. By 2001 we also had usage statistics, provided by the e-journal vendors, for many of the e-journals.

CONTEXT STATEMENT:

Washington State University (WSU) is a land grant institution with 11 libraries. Owen Science and Engineering Library (Owen) provides support to 4,000 faculty and students with majors in the hard sciences, agriculture, and engineering, as well as general undergraduate support for students in other majors.

ASSUMPTIONS:

Among the assumptions in the library profession is that patrons will shift from journals for which there is no e-format to ones that are available in e-format. If a journal is available electronically, its use increases at the expense of comparable journals available only in paper. If comparable journals become available in e-format, titles available only in paper will have a

decline in use in deference to the e-journals. In addition, when a paper journal also becomes available in e-format, use will shift from paper to electronic.

NEED:

Several things were occurring simultaneously in our library that precipitated this study of our users' choice of journals and formats. One: We were becoming heavily involved in “Big Package Purchases” and “Consortial Purchases” of e-journal titles. This meant we were picking up titles we previously could not afford or we would not have selected for our clientele if given a choice. Two: Our gate count had been dropping. In 2001, 30% fewer people entered Owen Library than did in 1997.⁵ Three: Dwindling resources forced us to consider any method to save on our journal purchases. This happened at a time when some publishers were starting to offer online-only (e-only) subscriptions at a reduced rate. Four: Many of our standard titles were not yet available online or electronic access (e-access) was an expensive add-on to the print. We needed to know if our choice of big packages was changing the titles our students and researchers were using. Should we instead be paying extra money to get e-access to the quality titles we already offered?

METHODOLOGY:

We decided to compare uses of titles in 1998, before we had e-journals, to uses of the same titles in 2001, when we had substantial numbers of e-journals available to our users and use statistics from the publishers. We decided not to use 2002 statistics in our study because by then budget cuts had forced us to cancel paper and shift to e-access, despite what our users might want. Embargoed (time-delayed e-access) titles were not an issue; there were none in the subject areas selected for our study.

Since we serve the science, technology, agriculture, and engineering needs of our campus, we felt that we should study applied and pure science areas. We looked at active title counts for the different disciplines and discovered that some were too disparate to permit valid comparisons of data. For example, Agriculture had 553 active titles while Environmental Science had 28. Our largest journal collections were in Agriculture (553 titles) and Biology (502 titles). However, we could not use Agriculture because the electronic use statistics (e-use statistics) were inflated by the many extension station and county extension personnel using the e-journals from distant research sites. No other disciplines exhibited this phenomenon. Some disciplines did not have usable statistics because the e-use statistics were not supplied by the publisher. In other cases we had too few titles which added e-access between 1998 and 2001 to draw valid conclusions from the data.

Finally we chose Chemistry (90 titles), Physics (121 titles), and Mechanical and Materials Engineering (105 titles). Even in these disciplines there were titles for which we had e-access but for which the publishers did not supply statistics. We recognized that these latter titles would skew the data and eliminated them from our study. This left 277 titles in our study.

JOURNAL USE STATISTICS

Continuous use statistics for our paper journals had been kept in Owen since 1993. These statistics were used to guide collection decisions. Each reshelving of a current issue or bound volume, whether checked out or used in-house, counted as one use. Clearly, we had no way of knowing how many articles in an issue or volume had been read or if only the table of contents had been perused. However, as pointed out by D. Blecic, et al., there is no way of knowing “that searchers read what they display” for e-format either.⁶ Signs were posted throughout the library asking patrons not to reshelve items because a journal use study was underway.

With the advent of e-journals, their use statistics were added to the database. Yearly paper and online use statistics were, and are, maintained in separate fields so librarians could track changes in usage patterns for each title. By using two full years of data, we hoped to minimize the inaccuracy inherent in using one or two months as was done in other studies.⁷

Online journal publishers were requested to supply the required use statistics. Even though we had e-use statistics from only 39% of the publishers, they accounted for over 99% of the e-titles to which we subscribed. For e-journals we chose to use access to full-text articles as our measure of use. While a comparison of print use statistics, flawed though they were, and e-use statistics may be decried as “mixing apples and oranges,” this method was deliberately chosen for two reasons. First, although we have always wanted to know how many articles have been read out of a journal, we have never been able to get anything but in-house issue or volume use counts. The full-text statistic is getting closer to filling our needs. Second, when print journals cease to exist, as some librarians believe, we would already be using the “best” use statistic from those offered by publishers. Recognizing these issues, we wanted to know if paper use statistics really dropped as radically as predicted.

DATA EVALUATION

A full explanation of the database and statistics collection process is available in "Journal Retention Decisions Incorporating Use-Statistics as a Measure of Value" by Betty Galbraith.⁸

We chose to look at several factors to see if use patterns between titles were changing and if these changes were indeed related to e-access. The basic questions were the following:

First: How did the use of print titles change between 1998 and 2001? How many titles without e-access had an increase, decrease, or the same use? How many print titles with e-access had an increase, decrease, or the same use? We first compared print use of titles in 1998 to print

use of those same titles in 2001. Using print-use to print-use evaluation compensated for the difference in the statistics we used for paper in-house use versus electronic full-text article access statistics from the publishers. We felt that looking at just paper usage would allow us to see whether paper use was really dropping as e-access was being added, and if the change related to whether or not that title also had e-access.

Second: How did the number of uses of titles change between 1998 and 2001, including both print and e-use statistics? We asked the same questions as above about increase, decrease, or the same uses. As we looked at this data, we expected to see that e-access would greatly increase the use of individual titles, but would this always be the case? Did titles for which there was no e-access also increase in use? Did we have e-titles that were not being used? In order to determine if there was a pattern related to e-access, we looked at total uses for each year in each category. Total uses were determined by adding paper uses for 2001 to e-use statistics we had for 2001. We then counted the number of titles that increased in use, decreased, or remained unchanged.

We realized that simply noting that a title increased or decreased in use did not take into account the number of uses of that title. A title might have increased from 1 use to 2 uses or from 100 uses to 200 uses, all of which represented a 100% increase in use. To better understand the data we had gathered, we calculated the sum of the uses of the titles. We also calculated the mean and median for each category to see how far afield our highs and lows were.⁹ In addition, we wanted to compare changes over time among the journals, so we calculated the percentage change.¹⁰ Thus, unlike the DeGroot/Dorsch six-month study, which showed “users accessing electronic versions more than ten times as often as the print versions,” our comparison of data

from 1998 and 2001 revealed that, in general, print use increased overall when e-access became available.¹¹

Since titles would be increasing and decreasing in use in widely varying amounts, some by as little as 1 use, some by as much as 100 uses, we decided to look at their rankings to see if titles changed in relative use between the years. We ranked the titles by use for 1998. Then we looked to see if the rankings changed in 2001. If they did change, how? How did the titles change in ranked use between 1998 and 2001, looking at only print access? Then how did the titles change in ranked use between 1998 and 2001, including both print and electronic statistics? This time new titles, acquired after 1998, were included in the mix, so we could see where the titles that had no print would fall within the rankings. Would they fall among the more heavily used or the less heavily used? Would they change the rankings of those titles that only had print access? Since most would change somewhat, we wondered if these changes really would tell us what we wanted to know. Therefore, we also looked at this information in rankings by groups of ten. How many titles changed but remained in their own group of ten in each year? How many went up or down—one group, two groups, three groups, etc.? How was this related to e-access? Changes in 2001 were measured against 1998, the baseline year.

RESULTS:

INDIVIDUAL SUBJECT AREAS

Chemistry

Our study looked at 85 Chemistry titles. Of those 85 we had 66 in paper in both 1998 and 2001. By 2001 we had added e-access to 61 of the paper titles, leaving 5 in paper only. We had also added 1 additional paper subscription (with e-access) as well as 18 online-only titles.

We compared print use in 1998 to print use in 2001 for paper-only titles and for titles in paper to which e-access had been added by 2001. Table 1 shows how the 66 paper titles changed.

	Increased	Decreased	Unchanged	Total
Print-only	4	0	1	5
Print with e-access	32	27	2	61
Total	36	27	3	66

None of the print-only titles dropped in use. Of the titles that had e-access, 44% dropped in print use while 52% of them increased in use. E-access did not always mean a drop in use of these print issues.

We then added the 2001 e-uses and noted the change in title use from 1998 to 2001.

These figures are shown in Table 2.

	Increased	Decreased	Unchanged	Total
Print-only	4	0	1	5
Print with e-access	60	1	0	61
Total	64	1	1	66

The availability of e-access resulted in a slight increase in the use of paper journals. Adding e-access to these titles did not automatically increase the use of every title; one actually decreased in use.

The number of uses varied widely from title to title. Tables 3, 6, 9, and 13 show the total number of uses for each category and year as collected in-house and received from vendors. The percentage of change in print uses from 1998 to 2001 and the percentage of change in total uses (print plus online uses) from 1998 to 2001 are also included. The numbers in parentheses

indicate the number of titles within the categories. (Note: Because there were no e-journals in 1998, 1998 print uses are the same as total uses.)

Table 3
USES OF CHEMISTRY TITLES
(by number of uses)

	Print uses 1998	Print uses 2001	Change in print uses	Percent change in print uses	E-uses 2001	Total uses 2001	Change in total uses	Percent change in total uses	Print uses as percent of 2001 total uses
<i>PRINT-ONLY (5)</i>	259	408	149	57.5%		408	149	57.5%	100.0%
<i>PRINT WITH E-ACCESS ADDED AFTER 1998 (61)</i>	3484	3255	-229	-6.6%	10790	14045	10561	303.1%	23.2%
<i>ALL PRINT (66)</i>	3743	3663	-80	-2.1%	10790	14453	10710	286.1%	25.3%
<i>ALL PRINT PLUS E-ONLY (85)</i>	3743	3714	-29	-0.8%	12312	16026	12283	328.2%	23.2%

Lack of e-access did not reduce uses for print-only Chemistry titles. In fact, print-only titles were used 57.5% more in 2001. When we added 61 titles with e-access to the Chemistry titles, we saw a slight decline of 2.1% in the uses of paper copies from 1998 to 2001. Nevertheless, 25.3% of the total 2001 uses of Chemistry journals available were paper uses. This is an impressive figure when you consider that 1 reshelving of an issue or volume equals 1 use for paper, and the viewing of 1 full-text article constituted 1 use for electronic.

Despite the addition of 18 online-only titles by 2001, print uses remained strong as a proportion of total uses. The 1 new title available in both print and electronic format was so heavily used that it made up for the drop in use of other paper titles, resulting in a decline of only 0.8%. This particular title was selected specifically for the Chemistry program while the 18 online-only titles came in packages. Some of these titles had very few uses. This may show that just because journals are available online, patrons do not necessarily use them in that format.¹² As expected, the addition of the new e-only titles resulted in an overall increase in total uses; as

shown in Table 3, the 66 titles available in print showed a 286.1% increase in use. When e-only titles were included in the calculations, the data show an increase of 328.2%.

Mechanical and Materials Engineering

There were 91 Mechanical and Materials Engineering (MME) titles in our study. Of those titles, 47 were in print in both 1998 and 2001. By 2001, 26 of our subscriptions remained in paper-only while 21 subscriptions were for both paper and e-access. We also added 1 paper-only subscription and 43 online-only subscriptions.

As with the Chemistry titles, we compared print uses in 1998 to print uses in 2001 for the 26 titles in paper only and the 21 titles in paper with e-access. Table 4 shows how the use of these 47 titles changed.

Table 4
CHANGE IN PRINT USES OF MME TITLES, 1998 AND 2001
(by number of titles)

	Increased	Decreased	Unchanged	Total
Print-only	11	11	4	26
Print with e-access	15	4	2	21
Total	26	15	6	47

In this discipline, our study showed that electronic availability resulted in an increase in the use of paper journals. As in the Chemistry study, e-access did not guarantee use of a title.

Table 5
CHANGE IN TOTAL USES OF MME TITLES, 1998 AND 2001
(by number of titles)

	Increased	Decreased	Unchanged	Total
Print-only	11	11	4	26
Print with e-access	21	0	0	21
Total	32	11	4	47

As shown in Table 5, the addition of e-access clearly increased the total use of all titles with e-access. At the same time, only 42% of the titles that lacked e-access dropped in print use.

Table 6 shows the number of uses for groups of MME titles along with the percentage of change in print uses from 1998 to 2001 and the percentage of change in total uses from 1998 to 2001. As expected, adding e-access increased total uses of MME journals, as it did with Chemistry journals.

	Print uses 1998	Print uses 2001	Change in print uses	Percent change in print uses	E-uses 2001	Total uses 2001	Change in total uses	Percent change in total uses	Print uses as percent of 2001 total uses
<i>PRINT-ONLY (26)</i>	365	412	47	12.9%		412	47	12.9%	100.0%
<i>PRINT WITH E-ACCESS ADDED AFTER 1998 (21)</i>	330	639	309	93.6%	1606	2245	1915	580.3%	28.5%
<i>ALL PRINT (47)</i>	695	1051	356	51.2%	1606	2657	1962	282.3%	39.6%
<i>ALL PRINT PLUS E-ONLY (91)</i>	695	1052	357	51.4%	3559	4611	3916	563.5%	22.8%

From 1998 to 2001, use of MME print-only journals increased 12.9%, showing that for this discipline e-access did not draw use away from important titles still available only in print. With the addition of e-access to print journals, print uses of all MME journals actually increased 51.2% and journals that were available in both formats saw print use nearly doubled, with an increase of 93.6%. While e-access more than doubled the uses of MME titles, overall print uses still accounted for 39.6% of all uses.

By 2001, 1 new print-only title and 43 online-only titles had been added to our collection. After adding in statistics for these additions, print uses dropped to 22.8% of total uses but still made up over one-fifth of the total uses of MME titles. Interestingly, the addition of new e-journals nearly doubled total uses of MME titles and the titles available in print showed a

282.3% increase in use. When the e-only titles were included in the calculations, the data show an increase of 563.5%.

Physics

We examined 101 Physics titles as part of our study, 67 of which were in paper in both 1998 and 2001. By 2001 we had added e-access to 56 of those 67 titles, leaving 11 as paper-only subscriptions. We also had added 1 new paper-only subscription, 2 new paper plus online subscriptions, and 31 online-only subscriptions.

Change in use of print copies of Physics journals from 1998 to 2001 is shown in Table 7.

Table 7
CHANGE IN PRINT USES OF PHYSICS TITLES, 1998 AND 2001
(by number of titles)

	Increased	Decreased	Unchanged	Total
Print-only	7	4	0	11
Print with e-access	30	25	1	56
Total	37	29	1	67

Lack of e-access did not cause print uses to drop for two-thirds of the print-only journals. Another way to look at it is that e-access did not insure that a title would change use in either format. This may reflect the findings of Bishop¹³ that e-journals are not used the first year they are available. Significantly, print use increased for over half of the titles that added e-access. The addition of e-use to print use in 2001 resulted in the changes in total use shown in Table 8.

Table 8
CHANGE IN TOTAL USES OF PHYSICS TITLES, 1998 AND 2001
(by number of titles)

	Increased	Decreased	Unchanged	Total
Print-only	7	4	0	11
Print with e-access	51	3	2	56
Total	58	7	2	67

As we see, titles with e-access increased in total use most of the time but in 9 of 67 instances this did not occur. This means 13% of titles with e-access either did not increase in use or dropped in use.

As with the other two subject areas we examined, the number of uses for individual titles spanned a wide range. Table 9 shows the number of print and e-uses for Physics titles during the study years. The percentage of change in print uses and percentage of change in total uses are also shown.

Table 9
USES OF PHYSICS TITLES
(by number of uses)

	Print uses 1998	Print uses 2001	Change in print uses	Percent change in print uses	E-uses 2001	Total uses 2001	Change in total uses	Percent change in total uses	Print uses as percent of 2001 total uses
<i>PRINT-ONLY (11)</i>	137	202	65	47.4%		202	65	47.4%	100.0%
<i>PRINT WITH E-ACCESS ADDED AFTER 1998 (56)</i>	1861	2587	726	39.0%	5473	8060	6199	333.1%	32.1%
<i>ALL PRINT (67)</i>	1998	2789	791	39.6%	5473	8262	6264	313.5%	33.8%
<i>ALL PRINT PLUS E-ONLY (101)</i>	1998	2799	801	40.1%	7390	10189	8191	410.0%	27.5%

Print use accounted for over one-third of all uses in this group of titles. From 1998 to 2001, use of the 67 print format Physics titles increased by 39.6%. Uses of print-only titles increased by nearly 50%.

Adding 34 new titles (only 1 of which was print-only) resulted in a print use share of 27.5%, a drop of 6.3%. This was far less of a change than one would expect after adding 50% more titles to the collection.

COMPARISONS

Although we cannot compare usage figures among the three disciplines because of differences in numbers of titles, we can compare percentages of change from Tables 3, 6, and 9, as shown in Table 10 below.

	Percent change in print uses of print-only titles	Percent change in print uses of print with e-access titles	Percent change in print uses of all print titles	Percent change in total uses of all print titles	Print uses as percent of 2001 total uses of all print titles
Chemistry	57.5%	-6.6%	-2.1%	286.1%	25.3%
MME	12.9%	93.6%	51.2%	282.3%	39.6%
Physics	47.4%	39.0%	39.6%	313.5%	33.8%

Between 1998 and 2001, print uses of print-only titles increased in all 3 disciplines. While the percentage of change in print uses for all Chemistry print titles dropped slightly, both MME and Physics showed substantial increases in print uses. As one would expect, the addition of e-access resulted in large increases in total use; nevertheless, paper uses in 2001 continued to account for more than 25% of all uses.

In addition to comparing the three subject groups, we were interested in comparing *all* print-only journals to *all* print with e-access journals without regard to subject area. These comparisons in print use are shown in Table 11.

	Increased	Decreased	Unchanged	Total
Print-only	22	15	5	42
Print with e-access	77	56	5	138
Total	99	71	10	180

Interestingly, for all 3 disciplines, 52% of the print-only titles increased in print use and 56% of the print with e-access titles increased in print use. This is only a 4% difference, which

may suggest that there is a value to the physical version of the journal which e-access does not possess. Perhaps clarity of graphics or other content of the print version which are not reproduced in the electronic, e.g., advertisements, job announcements, letters, or book reviews are valued by the users.

Table 12 compares the changes between print-only titles and print titles with e-access when total uses are considered.

	Increased	Decreased	Unchanged	Total
Print-only	22	15	5	42
Print with e-access	132	4	2	138
Total	154	19	7	180

In this case 95.6% of the print titles with e-access increased in use. However, not every title with e-access increased in use; 6 of 138 titles (4%) remained the same or dropped in use. The fact that some titles decreased or remained unchanged, and 16% of the titles in our study showed minimal use, in spite of having e-access supports Goodman's research, which showed that "mere availability did not result in their extensive use. This shows that the electronic format can be a delivery system for increasing appropriate use, not a way to encourage the patrons to use articles they do not need."¹⁴

Table 13 looks at actual uses of titles, in every format, in all 3 disciplines.

	Print uses 1998	Print uses 2001	Change in print uses	Percent change in print uses	E-uses 2001	Total uses 2001	Change in total uses	Percent change in total uses	Print uses as percent of 2001 total uses
<i>PRINT-ONLY (42)</i>	761	1022	261	34.3%		1022	261	34.3%	100.0%
<i>PRINT WITH E-ACCESS ADDED AFTER 1998 (138)</i>	5675	6481	806	14.2%	17869	24350	18675	329.1%	26.6%

<i>ALL PRINT (180)</i>	6436	7503	1067	16.6%	17869	25372	18936	294.2%	29.6%
<i>ALL PRINT PLUS E-ONLY (277)</i>	6436	7565	1129	17.5%	23261	30826	24390	379.0%	24.5%

Even with the addition of electronic access to print journals, the print versions accounted for nearly 30% of all uses. Print-only uses increased by 34.3%. All print titles (with and without e-access) showed an increase in use of 16.6% of print versions and an increase in total uses of 294.2%. Adding e-access nearly tripled the use of our journals in these subject areas.

As discussed above, following 1998 we added 2 new print-only titles, 3 print with e-access, and 92 new e-only titles to our collection. This brought us to 44 print-only titles, 141 print with e-access, and 92 e-only titles for a total of 277 titles. After adding the new titles to the calculations, the print versions still accounted for 24.5% of the journal uses.

While reviewing our data, we noted that 1 Chemistry, 1 MME, and 5 Physics e-only titles showed no uses in 2001. Eight other e-only titles had only 2 or 3 uses. This apparently answered our question of whether our faculty and students would use an electronic journal just because it was available. As noted in the analysis by title, it is reasonable to assume that they are selecting their sources for reasons other than electronic availability.

RESULTS OF RANKING EVALUATION

Evaluating ranking changes of the journals based on paper use in each year yielded no conclusive relationship between changes in ranking for titles that had e-access versus those that did not have e-access. Neither was the relationship changed when we looked at the changes between print use in 1998 and total use in 2001. No new insights were gained from this analysis.¹⁵

CONCLUSIONS:

The popular lore/common wisdom that people are changing from using print journals to electronic journals is not true across the board. This study suggests that users' migration from paper to e-use is dependent on the subject area. Hiller's 2001 study at the University of Washington showed a distinct difference in use by broad academic areas but did not go to the discipline/subject level used in this study.¹⁶ It may be worth noting that two of the studies¹⁷⁻¹⁸ reporting e-use as more than ten times the paper use were conducted at medical libraries where the time-sensitive nature of many queries may be a factor.¹⁹

Online availability *definitely* increased total use of journals. The Mechanical and Materials Engineering and the Physics subject areas experienced substantial increases in print uses. Because some titles with e-access declined in overall use, we can say that e-access does not guarantee that a title will be heavily used. It appears that quality and pertinence are still the dominant factors in journal selection by the library user. Although we had been cancelling titles every year during the period of this study, we do not believe this had an impact on our study because we were cancelling titles that had 6 or fewer uses per year.

Strikingly, although our gate-count dropped and e-access greatly increased, the use of print journals did not drop. Despite our assumptions that e-access and full text databases would cause use of paper to decrease, e-access actually appears to provide greater access to print. Perhaps this is because databases make it easier to find older articles not yet online in full-text and to find references to print-only articles from office and home computers.

There are several other factors that may have influenced the increased use of the print collection. Many articles from supplements or special issues are cited in databases but are available only in paper. These issues are difficult to identify from online searches. When these

issues are identified, they may draw users to look at the print versions. Other users have found that sometimes online images, such as plates and spectrographs, are not usable. Also, PDF quality in some journals is particularly poor.

Perhaps another factor is the growing concern among faculty members that students rely too heavily on electronic documents. We have noted that some are now giving assignments specifically designed to direct students to print. As one faculty member expressed it, “Print is the doorway through which students enter the field in its broadest context, and understand the scope of the field. Electronic is how they find specific bits of information.”²⁰

It appears that e-access increased paper use at Washington State University. However, results may vary from institution to institution. It would be important for each institution to do its own study to determine whether or not these findings apply to its collection.

1. Alison Buckholtz, "Electronic Genesis: E-journals in the Sciences," *Academe* 85, no. 5 (Sep/Oct 1999): 65-68.
2. Sandra L. DeGroot and Josephine L. Dorsch, "Online Journals: Impact on Print Journal Usage," *Bulletin of the Medical Library Association* 84, no. 4 (October 2001): 372-78.
3. David H. Morse and William A. Clintworth, "Comparing Patterns of Print and Electronic Journal Use in an Academic Health Science Library," *Issues in Science and Technology Librarianship* (Fall 2000). Available online at: <http://www.library.ucsb.edu/isl/00-fall/>.
4. Sally A. Rogers, "Electronic Journal Usage at Ohio State University," *College & Research Libraries* 62, no. 1 (January 2001): 25-34.
5. Part of this drop was due to the fact that the "English as a Second Language" program that had been housed in the library moved out of the building in early 2000.
6. Deborah D. Blecic, Joan B. Fiscella, and Stephen E. Wiberley, Jr., "The Measurement of Use of Web-based Information Resources: An Early Look at Vendor-supplied Data," *College & Research Libraries* 62, no. 9 (September 2001): 434-53.
7. Ibid.
8. Betty Galbraith, "Journal Retention Decisions Incorporating Use-Statistics as a Measure of Value," *Collection Management* 27, no. 1 (2002): 79-90.
9. The means and medians data are available upon request.
10. We used the formula $(B-A)/A$ where A is the number of uses in 1998 and B is the number of uses in 2001.
11. DeGroot and Dorsch, "Online Journals: Impact of Print Journal Usage," 373-78.
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14. Goodman, "A Year without Print at Princeton, and What We Plan Next," 43-50.
15. Statistics are available upon request.
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