

Transition to Electronic Resources in Undergraduate Social Science Research: A Study of Honors Theses Bibliographies, 1999–2005

Leslie Kriebel and Leslie Lapham

This citation analysis assesses use of print and electronic resources in advanced undergraduate research at Wellesley College. Using four years of social science honors theses bibliographies, the proportionate use of electronic versus print sources is determined. Consistent discipline-based patterns in resource use are identified to inform future instruction and digital collections policies. Findings reveal: (1) an explosion in use of nonperiodical, nonbook Web sources; (2) a rapid decline in the use of print journals; and (3) a persistent lack of use of e-books. The authors argue that greater emphasis on starting research with scholarly indexes and bibliographies is a fruitful corrective to recent overdependence on random Web searching and will also better ground students in solid research practices as transitions in the scholarly publishing world continue.



This study was conceived in response to a lack of hard data on the kinds of materials being used in student research at Wellesley College. We had a large body of anecdotal evidence, as well as aggregated use statistics on our electronic products. With larger and larger amounts of money being directed to electronic resources every year, in 2003, when we conceived this study, there was still no research providing information on precisely what materials students are accessing. Questions we had been asking included:

- Are students using periodical literature if it is available only in print?
- Are students using books in smaller proportions than they used to?
- How do social science disciplines as a whole use scholarly materials?
- Are there different use patterns among the disciplines within the social sciences?

In 2003 we knew the use of e-resources was increasing, but we did not know how quickly. To be able to respond better to numerous requests for library acquisition of electronic resources, we needed data on students' use of those resources.

Leslie Kriebel is a Visiting Assistant Professor at Wheaton College, Norton, MA, e-mail: kriebel_leslie@wheatonma.edu; Leslie Lapham is the Library Consultant at Serials Solutions, e-mail: llapham@gmail.com. They were employed at Wellesley College in Collections Management and Research and Instruction respectively, when this research was conducted. They are indebted to Clapp Library staff, Archives staff, and Mellon student interns for assistance rendered in this research.

A study that analyzed the contents of students' bibliographies seemed in order. Such a study could be useful for those in the library who, for example, instruct students on the breadth and availability of scholarly materials. It could also provide us with information on the research "behaviors" of different disciplines, such as the proportion of print versus electronic sources used and the proportion of books to periodicals to "other" kinds of resources used. By looking at several years of theses, we hoped to ascertain whether disciplinary patterns in research were consistent over time.

We chose to look at social science theses in part because the disciplines encompassed within that broad field of inquiry are quite varied and anecdotally known to use materials differently. Some of these disciplines use a great deal of scientific literature, and others rely quite heavily on humanities materials. Further, the social sciences seemed likely to be less impacted by the changes rocking the world of scientific scholarly communication but would likely experience a similar shake-up in the coming years. Finally, as studies of undergraduate social science research behavior seemed lacking in the Library Science literature, we thought that a social science project might be a welcome contribution.

From a collections management point of view, there was a clear interest in knowing more broadly just what sorts of materials had been accessed by social science students as well as by various disciplines. Our approach involved aggregation of data to one of the four disciplinary levels (as opposed to the individual thesis level). Obviously, this approach afforded larger numbers and facilitated some speculation about use trends in and across disciplines over time.

The study used all social science thesis bibliographies in each of four years (1999, 2001, 2003, 2005), which enabled us to focus both on research behavior by discipline and year and to make broader statements about resource use in the social

sciences as a whole. Senior honors theses were presumed to represent the highest levels of student scholarship at the college as well as the broadest possible use of materials due to the yearlong nature of these projects; these also undergo intense scrutiny by thesis advisors. It was generally agreed that term papers contrast with theses in the following ways: they are of varied quality, take less faculty input, and do not afford students much time to collect source materials. Our findings therefore offer insights into what our best researchers are using.

Literature Review

One area of application for citation analysis is "the study of the performance characteristics of information search and retrieval procedures."¹ The current study falls within this area in that we wanted to know how social science thesis students use scholarly materials. We also hoped to be able to identify any unique use patterns among the different disciplines within the social sciences. A few earlier studies² have used undergraduate social science bibliographies, and two studies draw samples from a wide range of disciplines, including the social sciences.³ Two studies sample only a single class and are therefore not comparative, so the opportunity to discuss patterns or trends is lost.⁴

Previous citation studies have tried to assess undergraduate use of electronic resources for a variety of reasons. Many of the older studies⁵ focused on assessing the impact of Library Instruction on student access to a wide array of materials—particularly electronic, as well as student familiarity with proper citation style. It is also not uncommon to find citation studies designed to inform collection management decisions⁶ or to assess the scholarly content and production of particular programs.⁷ Still other studies have tried to look carefully at the composition of student bibliographies to try to assess what is being sacrificed as the number of electronic resources and the Internet have expanded.⁸ Not surprisingly, these latter

studies indicate a decline in use of other formats as electronic availability increases. Davis & Cohen (2001) find a decline in use of books to be correlated with the increase in Web sources used, whereas Oppenheim and Smith (2001) find that periodical literature (presumably print) is being cited less as Web sources (of all types) are on the rise in student bibliographies. Seibenberg (2004) confirms the anecdotal wisdom that as electronic versions of periodicals become available use of print falls off. Only Davis and Cohen (2001), and later Davis (2002), confirm a general decline in the proportionate use of "scholarly" materials as the use of Web sources increases.

Some general findings emerge from this literature that helped to guide us in our inquiry. First, a number of studies indicate that undergraduate format preference is largely motivated by ease of access. In the mid-1990s, prior to widespread education about electronic resources, print was still preferred. This is made clear in Malone and Videon's surveys (1997) of students in 1996 who, in spite of broad Web access in the Library, still favored print journals. Just five years later, another study notes "ease of access" as a significant factor in explaining a decline in the use of books and a corresponding increase in the use of Web resources by Economics students, "many of whom work on their papers the night before they are due."⁹

Some studies make instructive distinctions between graduate and undergraduate research practices. One claims to have shown a "clear trend [in undergraduate bibliographies] towards citing Internet resources and away from journal articles."¹⁰ In their view, students are turning to the Web for the most current materials, which is a function formerly filled by periodical literature. Another study of graduate and research level use of periodical literature indicates that online access actually increases the use of all periodical lit-

erature—even the print.¹¹ Finally, thanks to Malone and Videon's study (1997), we were alerted to a problem that we would have to face, namely that of students citing print when electronic editions were used.¹² They found that students who had used e-journals tended to use the citation form for print journals, thus masking the actual use of e-journals. This finding enabled us to anticipate the same problem in our study and develop an *estimate* for electronic use.

Methodology

This study made use of four years of Wellesley social science honors theses bibliographies for the purpose of assessing the use, and growth of use, of electronic resources in student research at Wellesley. Specifically, the goals of this study were:

- to ascertain the proportion of electronic versus print sources used by honors theses students over a seven-year period (1999–2005) as a basis for assessing recent change;
- to collect statistics on electronic versus print resource use as a tool or guideline for approaches to selection in the near future;
- to establish a baseline for future comparative studies.

The project began in the fall of 2003 and was completed in fall 2006. All 98 social science honors thesis bibliographies from four years were collected and photocopied by Archives. Social science disciplines were determined to include those listed in table 1.

Our unit of analysis was the citation,¹³ which we consider in a variety of group-

TABLE 1
Total Number of Citations by Disciplinary Group

	1999	2001	2003	2005	TOTAL
Psychology	259	327	329	321	1,236
Economics	77	90	129	63	359
PS/IR	473	535	749	1,491	3,248
A/S/W	164	119	178	533	994
	973	1,071	1,385	2,408	5,837

ings: by bibliography, by discipline, by year. We coded each citation based on a variety of variables such as material type, date of publication, availability at Wellesley, and so on. This enabled us to characterize bibliographies from a given discipline or year based on the proportion of a type of citation. For example, in this study we will refer to the “proportionate use” of journal articles in a discipline in a given year. By this we mean the percent of all citations in all Economics theses in 2005 that were coded as “journal.” We also may refer to the “average proportionate use,” which takes the average proportion (of journal articles) *per bibliography* in a given discipline or year.

Although our method was informed by several other studies of bibliographies,¹⁴ we developed our own coding system and data collection instrument. Staff members were trained and worked with us in tandem to assign codes to all citations, and the data was entered into spreadsheets. In the process of this work, two uses of the data emerged characterized by two different sets of interests: those of bibliographic instructors who are interested in how research is conducted and how materials are found or accessed, and those of collections managers who are interested in which materials are being used and which are not and why.

Limits of the Study

One of the primary goals of this study was to put hard numbers behind hunches about the extent of electronic versus print source use at Wellesley. There were several issues that we had to address

from the start that affected our design, method, and findings. For example, due to small numbers of theses in some of the disciplines, we decided to combine several disciplines to make four disciplinary groups. We justified the two interdisciplinary categories based on the fact that student research in those disciplines tends to start with the same set of indexes and databases. These four groups are:

1. A/S/W (Anthropology, Sociology, and Women’s Studies)
2. PS/IR (Political Science and International Relations)
3. Economics
4. Psychology

We were further limited by the fact that our online catalog had made many changes since 1998 when the first thesis in the study was researched, and this prevented us from knowing exactly what resources were available at Wellesley between 1998 and 2001. Our comparative information on format use and availability across years was therefore limited to 2003, when we started the study, and 2005.

From the start we knew that we were working with imperfect information, because students were not in the habit of identifying sources as electronic. Students in all four years tended to cite the print format for periodicals when electronic formats had been used. In response to this we not only counted print periodicals as cited, but we created an estimate of likely e-periodical use; it was derived in the following way: For every print periodical citation, we conducted a catalog check to see whether a full-text online version

	Economics	A/S/W	Psychology	PS/IR	Social Science (median)
1999	26	41	43	55	43 (37)
2001	30	40	33	40	35 (35)
2003	43	45	55	50	49 (48)
2005	32	66	54	68	62 (66)
Avg.	32.75	48	46.25	53.25	47

was available at the college. If an online version for the periodical existed, we included the citation in a total e-periodical count as well as in a total print periodical count. The estimate therefore constitutes a "maximal possible" count of e-resource use. In this report, our estimates appear in parentheses or are cited as "*estimated*" as opposed to "*reported*."

Overall Findings

We see possible patterns across these four years that highlight the impact of electronic resources on student research. To summarize, although the size of social science thesis bibliographies varied widely, ranging from 10 to 311 citations, the average social science thesis bibliography consisted of approximately 47 citations (see table 2).¹⁵ Perhaps more interesting is the fact that, since 1999, the average size of social science thesis bibliographies has increased by 44 percent.

To understand the source of this growth in the number of citations, we divided thesis bibliographies into three categories of material types: Books, Periodicals, and "Other" materials. We found that the proportionate use of *books* has declined by 18 percent since 1999 and that there seems to have been a 17 percent decline in the proportionate use of *periodical literature* since 2001. The proportion of both *books and periodicals* used in 2005 was at an all-time low compared to all previous years (table 3). This was true in spite of the fact that 2005 theses had the largest *number* of periodical citations of all four years.¹⁶

We further found that there has been a steady increase (26%) in the proportionate use of "*Other*" materials over the course of the study¹⁷ and that, increasingly, the majority of "Other" materials seem to be Web sources (79% in 2005). "Other" is a miscellaneous category that includes a whole range of print and electronic materials such as: government documents, nonserial Web pages, CD-ROMS, interviews, pamphlets, unpublished manuscripts, and speeches.

TABLE 3
Proportionate Use Each Year of
Each Type of Material

	Books	Periodicals	Other materials*
1999	53%	37%	9%
2001	41%	45%	13%
2003	48%	32%	21%
2005	40%	28%	32%
Avg.	46%	36%	19%
*In 2005 "Other" consisted of 74% digital materials.			

Use Of Electronic Resources

For our purposes, the term "electronic resources" covers a wide spectrum of things, many of which fall into the "Other" category. The term *Electronic Resources* includes any resource available in an electronic format that was accessed and viewed by the student on a computer screen. It includes everything from e-journals to e-newspapers, e-books, library-owned CD-ROMS, to Web-based newscasts. We produced two different numbers for electronic resource use: the hard numbers, based on *reported* electronic use, and the *estimates* based on *likely* electronic use.

Over the course of the study, the *size* of the average social science bibliography has increased by 44 percent. At the same time, the total number of *reported electronic resources* used across the social sciences has increased twelve-fold (from 57 in 1999 to 702 in 2005). This means that, by 2005, an average bibliography *reported* use of 31 percent electronic resources. However, 31 percent is probably conservative when we take underreporting into consideration. *Estimates* suggest that, by 2005, 51 percent of the materials in social science bibliographies were probably electronic resources.

Preference for electronic materials is clear. Based on our estimates, starting in 2003, more *e-journals* were used than print journals. By 2005, we *estimated* that 94 percent of all journal articles used

were available electronically at Wellesley. Based on *estimated* use, between 1999 and 2005, *e-journals and e-newspapers* seem to have consistently accounted for about 60 percent of all electronic resources used in any given year.

At the same time, the proportion of resources that are *reported* as electronic periodicals has increased only slightly by 15 percent. Students are becoming less conscientious about reporting the formats used than they were in 2001.

Although the number of *reported* e-periodicals used is slightly rising in number, the number *and* proportion of “*Other*” electronic resources is increasing at a faster rate. The primary cause of the increased size of thesis bibliographies is therefore attributed to an explosion in use of nonperiodical Web resources. The use of *electronic “Other,”* which consists largely of nonperiodical Web sources, has increased almost four-fold in thesis research since 2001. In 2005, 79 percent of all materials used in the “*Other*” category were electronic.

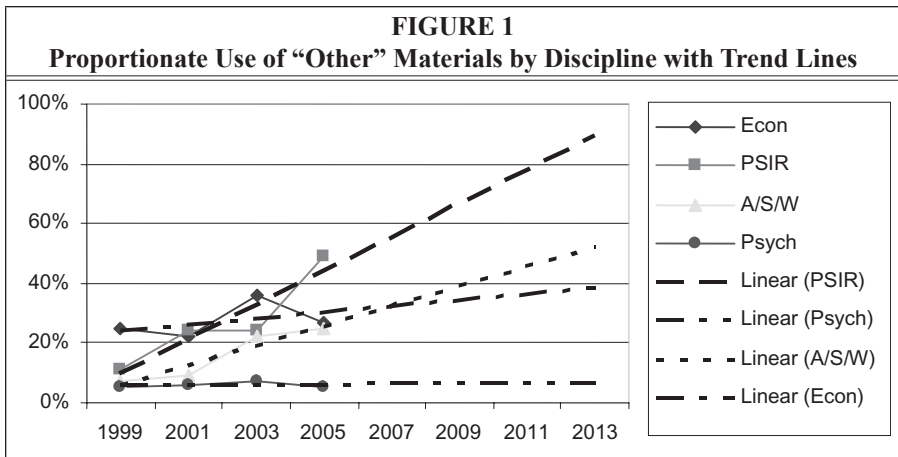
On the other hand, despite the fact that the library added thousands of *e-book* records to its catalog between 2003 and 2005, the number of e-books cited in 2005 was still quite low, at 1 percent. We *estimated* that 9 percent of all books used in the theses that year were available at Wellesley electronically.

Use of the Web

- The use of electronic resources increased in each discipline an average of 7 percent (*reported*; 19% *estimated*) from 2003 to 2005. Across the social sciences, the use of “*Other*” materials has dramatically increased since 1999; and, if the recent trend continues, “*Other*” materials are likely on average to comprise 40 percent of the social science thesis bibliography in just a few years (figure 1). In recent years, the majority of “*Other*” materials have been Web sites. In 2003 and 2005, we grouped and counted the Web sites used into four categories: educational, government, organization, and commercial. An overview of all the social science theses indicates that 63 percent of all Web resources used in 2005 were found on noncommercial sites; this is down by 9 percent from 2003. Use of commercial Web sites increased by 8 percent between 2003 and 2005.

Use of Newspapers

In 2005, social science theses used the largest total number of *newspapers* of any of the previous study years. The majority of newspapers in student thesis research seems to have been used for their currency, with 95%–100% of all articles having been published between 1990 and 2005, a 15-year spread. Trends suggest that 1990s articles may cease to constitute a significant proportion of the newspaper



literature used as early as 2007 and that pre-1990 articles have played a nearly insignificant role in these since 1999. The total number of newspaper articles used in 2005 social science theses reflected a 350 percent increase over the number used in 2003. Among the 159

newspaper articles used in 2005 theses, Wellesley owned 67 percent. Of these, 97 percent were available in electronic format, while 2 percent were available only in print or microform (figure 2). PS/IR is consistently the heaviest user of newspapers, with Economics also showing high use in some years.

Use of Journal Articles at Wellesley

In this study we were only able to summarize Wellesley availability of resources used in 2003 and 2005 theses due to the constantly changing nature of our collection and catalog. With regard to availability of *journal* literature, we found that, for the two years, 76 percent of the articles were available at Wellesley College in some format. In 2005, about three-quarters of all journal articles used in PS/IR (74%) and Psychology (81%) theses were

available at Wellesley. The biggest user of non-Wellesley-owned articles in 2005 was PS/IR; most of these were probably obtained via Interlibrary Loan or visits to other libraries. Psychology and PS/IR reflect a more or less constant use of non-Wellesley periodicals.

Journal Format Preferences

Between 2003 and 2005, we see that the use of journals available in *print only* has declined dramatically, while use of journals with *electronic* access increased from 71 percent to 94 percent. By 2005, a very small proportion (6%) of the journals used in social science theses was available exclusively in print format at Wellesley (figure 3). This suggests to us a tendency for students to rely on the electronically available content before going to print-only journals, and increasingly they are finding everything they think they need in the electronic format.

Based on simple comparisons, disciplines seem to vary less in use and preference for specific formats, all are shifting over to the use of electronic journals. By 2005, Psychology thesis writers used significantly fewer (only 8%, as opposed

FIGURE 2
Format of Cited Newspapers Available at Wellesley in 2003 and 2005

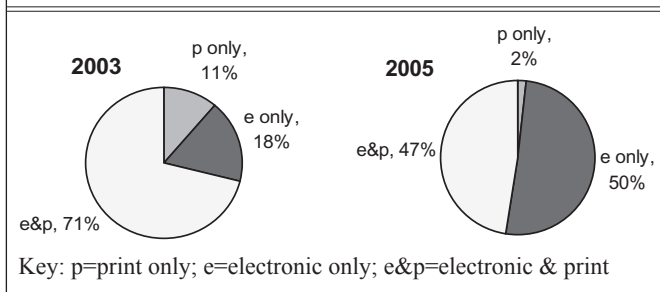
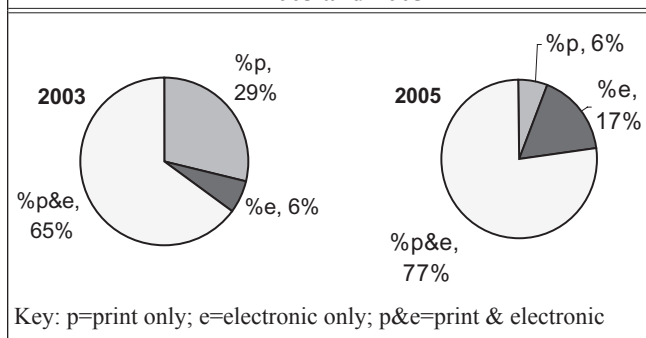


FIGURE 3
Format of Cited Journals Available at Wellesley in 2003 and 2005



to 42% in 2003) print-only journals. While in 2003, Psychology theses were noteworthy for their heavy use of print-only journals in a significant full-text environment. Economics theses alone maintained a fairly consistent ratio, for 2003 and 2005, between use of print only (averaging 17.5%) and electronic (averaging 83%) journals.

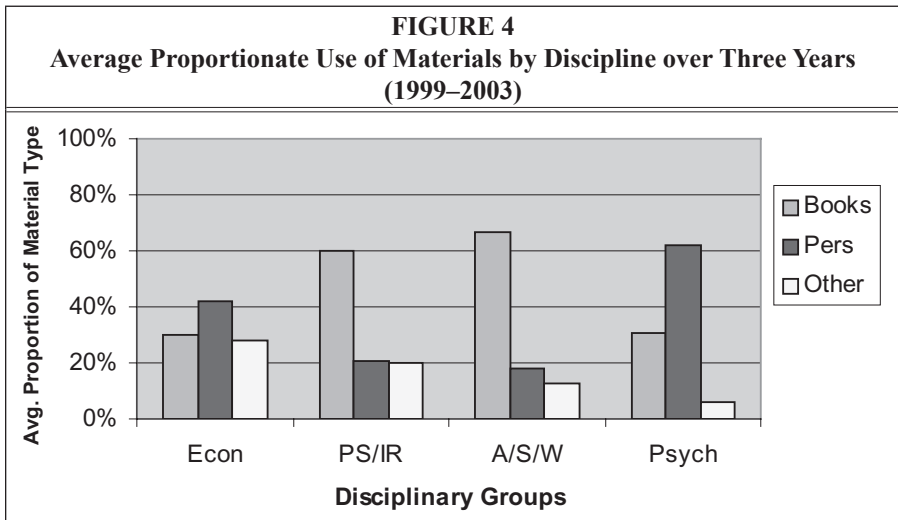
Journal Archives Use

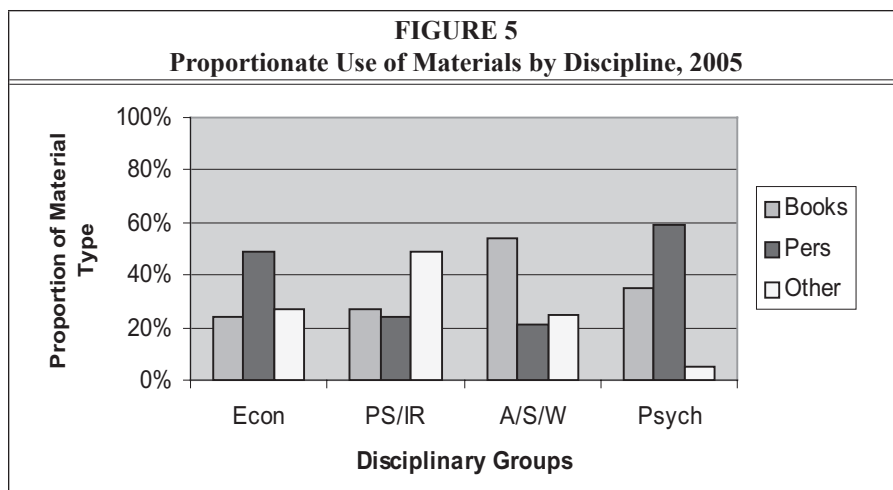
On average, 84 percent of the journal literature used each year in this study seems to have been published between 1980 and the 2000s, or within the 20 years prior to the writing of the thesis. This percentage has varied little over the years of the study, possibly suggesting that greater access to electronic archival holdings has not translated into wider use of the older literature in thesis research. The consistently highest users of older (pre-1980) literature are Psychology and PS/IR. Psychology seems to be the most consistent in its proportional use of the older literature, and PS/IR tends to use the largest total number of older articles in a given year. When we look at the pre-1980 literature by publication periods and consider the exact numbers of articles used, we get a better idea of the costs of having, or not having, journal archives. For example, an

average number of thirty-five 1970s articles per year were used in each of the four study years, suggesting that some thesis students may be adequately served by remote storage or document delivery. Our projections suggest that, if recent practices continue, pre-1990s journal literature will comprise less than 10 percent of all thesis social science research by 2012.

Results by Discipline

A comparison of the average use of materials by discipline over the four years studied may reveal patterns of use by disciplinary preference for material types. Whereas *books* have been the overall largest category of materials used in theses up to 2003, this is not the case for all disciplines: A/S/W and PS/IR have been the heaviest *book* users; Psychology and Economics tend to be proportionately the heaviest *periodicals* users; and Economics and PS/IR seem to make greatest use of the “*Other*” category, which is rapidly being dominated by Web resources. Figure 4 reflects an averaging of the three years, suggesting use patterns for each discipline. The 2005 data reflects consistent discipline-based patterns of use, with the exception of PS/IR, which has begun to favor “*Other*” resources (mostly Web) over books (see figure 5).





When we compare the two charts below, we can see that *book* use in all disciplinary categories is slightly down in 2005 from an average of earlier years, with the exception of PS/IR, where book use dropped by more than 50 percent in 2005, as well as in Psychology, where it returned to 1999 levels. By contrast, proportionate use of “*Other*” materials in PS/IR has increased dramatically since 1999. While a portion of the materials in the “*Other*” category are government documents, our data suggest that most of this increase is due to nonperiodical Web use.

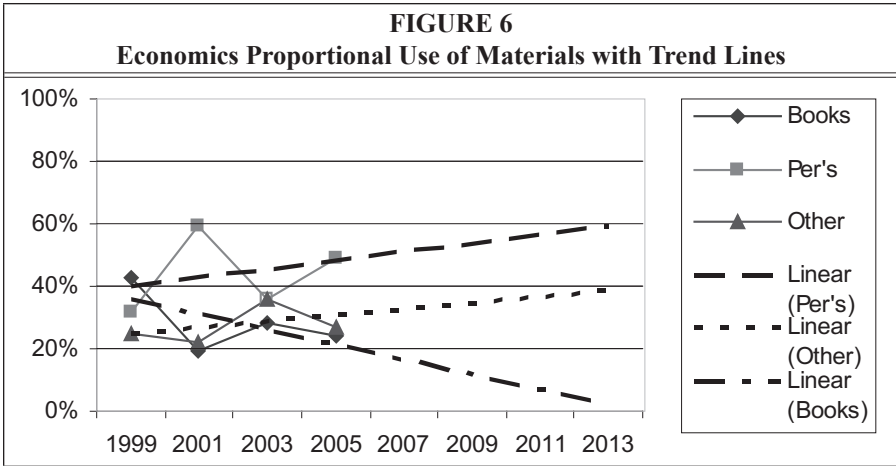
When linear trend lines are cautiously imposed on a graph reflecting each discipline’s average proportionate use of “*Other*” materials over the next five years (figure 1), we find that “*Other*” materials could characterize 50 percent to 90 percent of thesis bibliographies in the fields of A/S/W and PS/IR respectively. Both of these disciplinary groups were heavy users of books until recently (compare Book use for these disciplines in figures 3 and 4).

By looking at several years of theses, we seem to have identified some discipline-specific patterns that could aid us in our instructional and collecting efforts. Different disciplines favor different kinds of electronic resources and are adopting their use at different rates. Examples of different kinds of electronic resources

include: electronic books, journals, newspapers, and Web resources.

Economics

Generalizations about Economics honors theses are difficult, given small population sizes each year (1999=3; 2001=3; 2003=3; 2005=2). However, a few common characteristics seem to stand out. The Economics thesis student seems to compile the smallest social science bibliography and finds most of what she needs in the electronic and print collections at Wellesley. She relies very little on non-Wellesley resources. Economics theses tend to reflect proportionately high periodical use, moderately high use of materials in the “*Other*” category, increasing use of electronic resources, and high newspaper use. Approximately 81 percent of all periodical articles used in Economics theses in 2005 were available at Wellesley electronically. Even so, among the four disciplines, Economics theses on average used the largest number of print-only journals in 2005. Use of pre-1980s literature has been minimal and in steady decline for the four years studied. If recent trends continue, Economics theses may see a gradual increase in use of periodicals and “*Other*” materials over the next several years and significant decline in use of books. The fact that Economics theses are consistently the smallest among the four disciplinary categories also suggests that



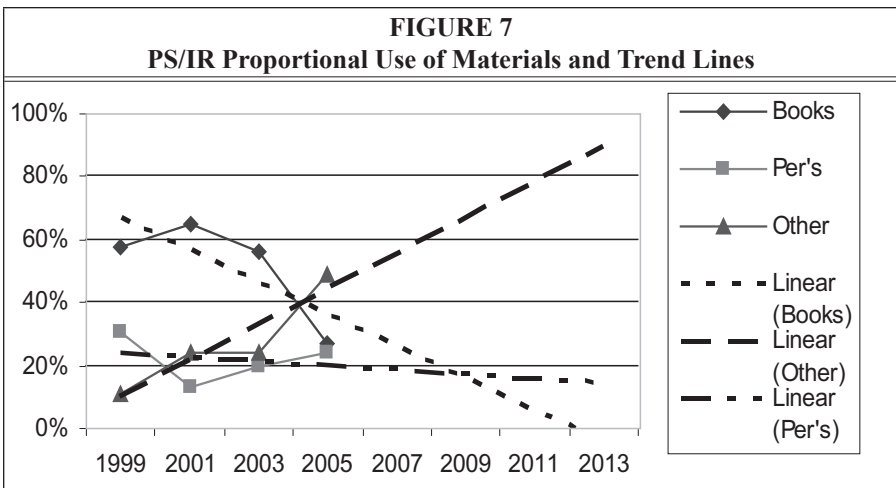
requirements for historical literature or materials with breadth or deep of specialization may be minimal.

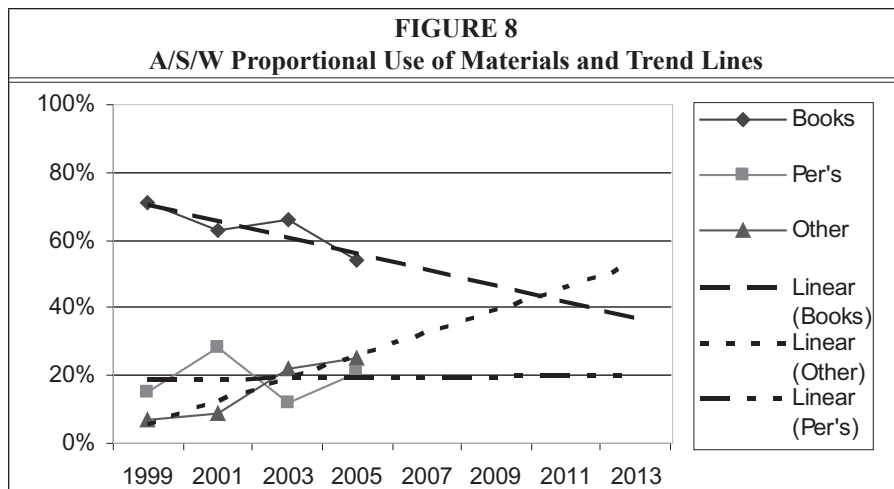
Political Science/International Relations

The Political Science/International Relations (PS/IR) thesis writer compiles the largest thesis bibliography of all the social sciences, with books and “Other” sources constituting the majority of the items used. Although a proportionately low user of journal literature compared to the other disciplines, she is the heaviest user of newspapers. PS/IR theses have consistently led all others in reported use of electronic resources. In the last two years of

the study, PS/IR thesis writers got approximately 88 percent of their journal articles at Wellesley, but they were also heavy users of non-Wellesley-owned journal articles, as well as pre-1980 journal literature.

By 2005, this disciplinary group seems to have made a dramatic transition from high book use to high “Other” materials use, although it remains to be seen if this is the beginning of a trend. The proportionate use of “Other” (government documents, nonbook, nonperiodical) materials in PS/IR theses has been increasing at a greater rate than in any other discipline. If recent trends remain the same, PS/IR will see a dramatic increase in use of





"Other" materials (constituting up to 90% of these bibliographies in 2013), and a rapid decline in books, with periodical use staying about the same. The size and large number of "Other" sources suggests that instruction on how to winnow down a large list of Web sources may be needed. This group can be characterized as a heavy user of books, "Other" materials (including government documents), pre-1980 journal literature, newspapers, and electronic resources in general.

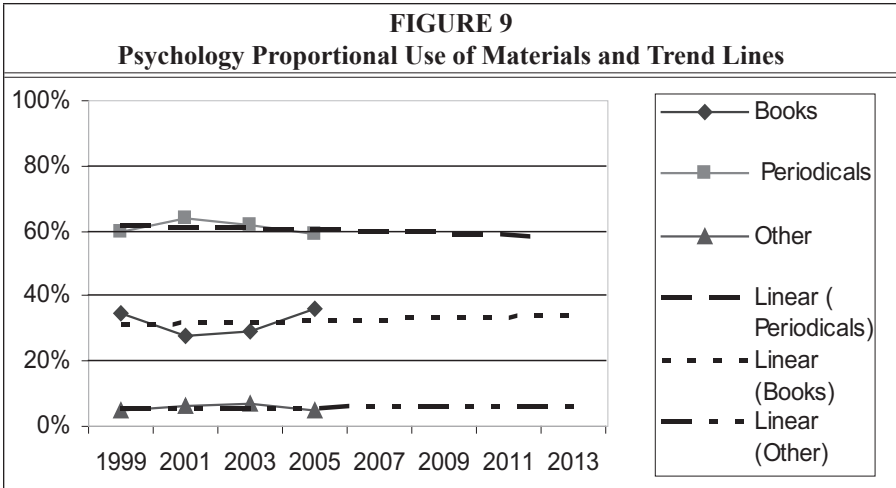
Anthropology/Sociology/Women's Studies

This multidisciplinary group can be characterized as being heavily dependent on books and full-text periodical literature. It tends to find its materials on campus and has less use for older and print journals. Use of electronic resources has been on the rise since 2003. Its use of "Other" materials has made more than a two-fold increase from 1999 to 2005. Its use of print-only journals at Wellesley has been low. Perhaps best explained by choice of thesis topics, use of pre-1980s journal literature has been on the decline after a 1999 high when A/S/W led all three other disciplinary groups. If recent trends continue, A/S/W will see a significant decline in use of books and an increase in use of "Other" materials. Periodicals use will stay about the same.

Psychology

Psychology thesis writers depend heavily on older as well as current journals and make very minimal use of nonperiodical Web resources, newspapers, and "Other" materials. Books consistently represent over 30 percent of all materials used. Psychology theses have always used the largest proportion of periodicals and the lowest proportion of "Other" materials of all the disciplines. Their use of electronic resources is high, but these are primarily electronic journals. Use of pre-1980s periodical literature appears to be relatively stable, averaging about 15 percent for the four years of the study. This averages out to be about 30 pre-1980s articles per year. Psychology's use of Wellesley-owned journal literature is strong (84% in both 2003 and 2005). In these two years, thesis students seem to have preferred electronic journals to print. Psychology theses rely on a core periodical literature: the majority of the most frequently cited journals among all the disciplines since 2001 have been one set of Psychology titles. If recent trends continue, Psychology theses will stay basically the same in their use of books, periodicals, and "Other" materials.

Bibliographic instruction is a key part of the training of all psychology students, and this is clear evidence in thesis bib-

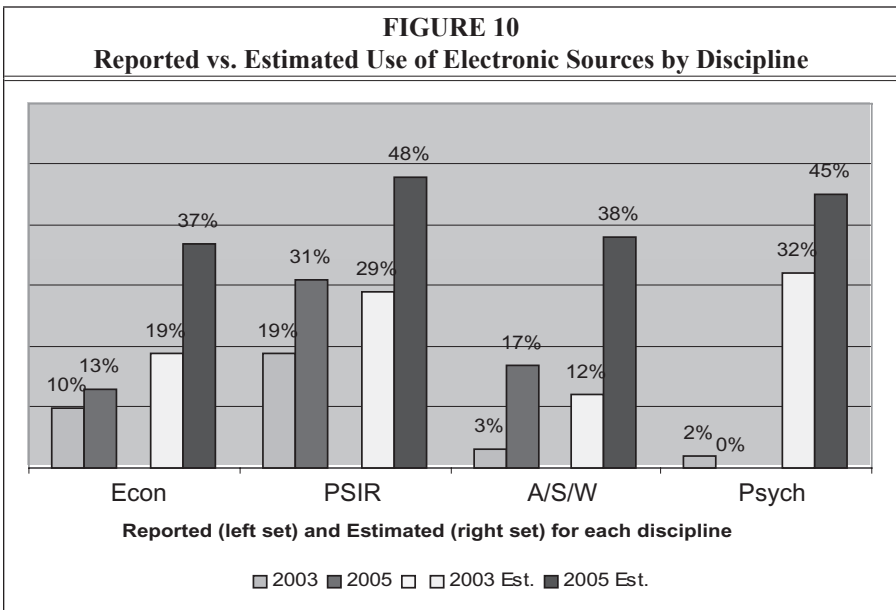


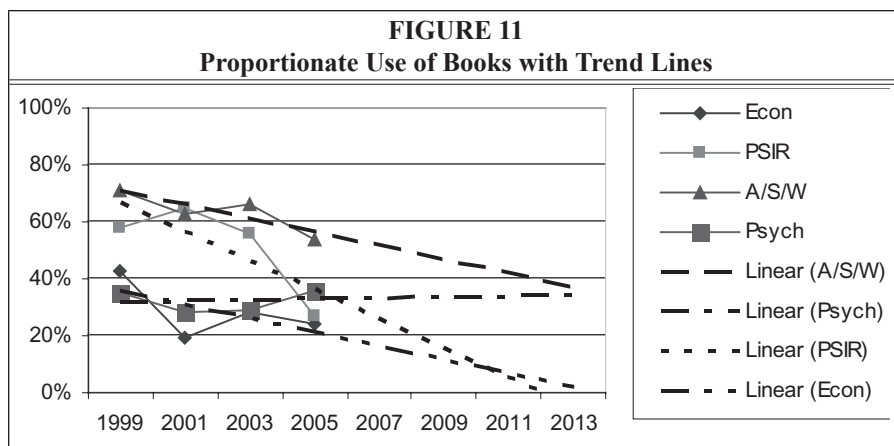
liographies. The lack of the use of Web or “Other” sources is attributed not to student aversion to the electronic environment but to the research requirements of the field. The consistent character of Psychology theses (that is, proportion of books, periodicals, “Other”) suggests an active research tradition that is in place directing students on where and how to start research and select appropriate materials. The teaching methods on doing

research in Psychology should be studied and emulated in other disciplines.

Use of Electronic Resources by Discipline

We wanted to consider how the disciplines vary in their use of electronic resources. Based on *reported* use alone, Psychology is barely impacted by the explosion in availability of “Other” resources, with PS/IR far outpacing other disciplinary groups





in their use (see figure 8). *Estimated* use, however, tells us that Psychology is, in fact, making considerable use of electronic resources such as e-journals, while PS/IR seems to be using a *combination* of Web and e-journals. This also seems to be true for the disciplinary category A/S/W. Most striking is the apparent change in PS/IR bibliographies between 2003 and 2005 during which the heavy use of books was transformed into a heavy use of “Other” (mostly Web) resources. In short, just as we found variation among disciplines in terms of preferences for *types* of materials, we also found some variation in the transition from print to electronic resources.

Implications for Collections

While use of periodicals in most of the disciplines may be in some decline or holding steady, books seem most in danger of losing ground to nonperiodical, nonmonographic Web sources. In every discipline except Psychology, books are bearing the brunt of this new resource. Books continue to represent the largest proportion of materials used in social science theses; but, since the beginning of the study in 1999, overall use of books has declined 18 percent. E-books do not seem to be picking up the slack, with estimated use of electronic books in 2005 under 10 percent, and reported use at about 1 percent. Current e-book collections simply do not compare to the

rich print collections at Wellesley, so we expect the transition to electronic books to be slow.

Since 1999, use of journal articles has declined 8 percent. In 2005, 6 percent of journal literature used by thesis students was available in print only, suggesting declining use of still sizable print collections. The disciplines have varied widely in the use of print articles. We expected these differences to lessen as the digital collection grew, and the overall differences between 2003 and 2005 bear this out. Unless students start their research with scholarly indexes and bibliographies, the use of print journals seems likely to drop off precipitously in the next five years.

Use of Older Literature

Use of *pre-1980 journal literature* is low, averaging about 17 percent of all articles used for each of the four years. Steady decline of use of older journal literature by A/S/W and Economics suggests that removal to remote storage, coupled with reliance on interlibrary loan, might seem warranted. On the other hand, use of pre-1980s journal literature in Psychology and PS/IR remains strong, so back files for core periodicals in these fields will be important to maintain or acquire electronically.

Thesis data from 2005 indicate that students will use print archives at Wellesley if electronic is not available but that they

prefer electronic access. Given overall increased electronic access to older literature, and the diminishing number of older articles used across the four years, we suspect that the use of older scholarly social science literature will continue to be minimal. In spite of an increase in electronic archives, the use of older journal literature (pre-1990) seems to be in rapid decline. If this reflects a trend, and if practices and availability remain steady, it is anticipated that *pre-1990* literature will constitute less than 20 percent of all the journal literature used in theses by as early as 2007. The need for libraries to house older periodicals seems to be diminishing, and the question of the cost/benefit of paying large amounts for electronic access to archives should be seriously weighed. It is not clear that increased electronic access to older literature alone will increase its use. Greater emphasis by faculty on the importance of literature reviews, as is routinely done in Psychology, might improve the use of older scholarly literature.

Preference for Format

Over the course of the study, electronic formats have become the dominant format in social science honors theses. In 2005, approximately 51 percent of all resources used were *estimated* to have been electronic (31% *reported*) and 94 percent of all journal articles used and owned by Wellesley were available electronically. Use of the print collection does seem to be declining even among Psychology thesis writers, who had the highest use of print journals among the social science disciplines in 2003. Similarly, almost exclusive use of electronic journals by A/S/W and PS/IR suggests that some consideration could be given to canceling print or going electronic-only on many print titles in these fields. Unlike the other disciplinary groups, the Economics bibliographies for 2003 and 2005 reflect a consistent distribution of print-only and electronic journal use. Because Economics relies heavily on the Wellesley

collection, this pattern may suggest that either Wellesley's core subscriptions in Economics are not readily available in electronic format or current pricing on e-journals is still too high.

Non-Wellesley-owned Periodicals

In our review of periodicals used but *not owned* by Wellesley, our primary concern was whether our collections had inadvertently excluded key publishers or databases. We did not find this to be the case. Not surprisingly, in 2005, 21 percent of the non-Wellesley journals used were from Psychology—the discipline using the largest number of journal articles in the social sciences. Other titles on this list are foreign published, highly specialized, and generally out of scope for this library. We were therefore satisfied that the library provides access to a good core of social science journals for an advanced undergraduate institution.

Web Resources as Fast Growing Category—How to Manage

Since 1999, there has been a notable increase in the use of "Other" materials. Approximately 79 percent of these were Web-based sources in 2005. Based on projected trends, the use of "Other" materials could become the largest category of materials in the social science thesis in four or five years. As we have shown above, the impact of the Web on student choice of materials seems to vary by discipline. In the case of PS/IR, books seem to have been forfeited, whereas in A/S/W, periodicals seem to have lost some ground. There was little or no impact of "Other" materials on Psychology use patterns and minimal impact on Economics by 2005.

Overall, increased use of electronic and Web-based resources may have a narrowing effect on the type and range of materials that students are obtaining for research, in terms of steering them away from:

- literature that is not yet digitized;
- older periodical literature; and
- scholarly books.

Lack of awareness of how to do scholarly searching on the Web may result in random selection of nonscholarly sources as opposed to informed selections. A focus and reliance on scholarly indexes will enable students to better navigate future transitions in formats, such as the likely disaggregation of scholarly journals and edited books.

Academic librarians who have always worked hard to broaden students' bibliographic horizons find themselves needing to reign in and focus students on locally subscribed high-quality print and electronic indexes and full-text resources. The method and message of starting with indexes and bibliographies is the same, it is just the medium that is in flux. It would appear that renewed attention could fruitfully be given to online scholarly indexes and bibliographies as the starting place for student research projects. This would not only offer students a good introduction to the use of indexing and subject headings in research, but it would train them in taking the time to fully assess the literature (past and present) on a given subject from which they could make educated selections. It might cause more students to use interlibrary loan, archived journal literature, and books; and, in some disciplines, it might be an opportunity to direct students toward what faculty might consider the "core" journal and book collections again. As linking technology improves and the Web grows, a return to indexes and bibliographies seems more and more crucial. Students also clearly need classes on use of online bibliographic tools and Web searching. Such classes should assist students in making intelligent use of browsers such as the academic *Google Scholar* in research, compiling accurate bibliographies as they do their searching, building their own portals or research Web pages on their topics as they go.

The alternative is that students will continue to make more random selections of materials in the topic area based on ease of access and not quality of content.

This suggests that undergraduates may be getting overwhelmed by too much information and that they don't know how to narrow or sort through large hit lists—a problem formerly plaguing young graduate students. When faced with time constraints and costs, we all make the most expedient choices—students are no exception. Librarians and faculty need to acknowledge this behavior and find new ways to foster good research habits early in students' college careers. Further research is needed to assess:

- Are students using commercial sites for primary or secondary source material?
- What is the scholarly integrity of the secondary material offered on the sites they access?
- Are students paying ("pay-per-view") for access?

In conclusion, unlike previous studies, this study of social science theses exclusively has identified what seem to be some consistent discipline-based patterns in undergraduate resource use. Some of these patterns are reflected in earlier studies of the social science literature conducted by H. Small and D. Crane in 1979,¹⁸ and A.J. Nederhof et al (1989).¹⁹ This study further suggests future trends that should be useful in thoughtfully shaping instruction and collection policies, particularly with regard to the purchase of electronic archives and electronic resources. The question remains as to whether the differences that we have identified among the disciplines will blur over time, and what impact the Web will have on use of print books. This study also seems to support the assertion of earlier studies that students are drawn to resources based on ease of access. Ours not only supports this thesis but also offers a rare longitudinal perspective on migration from print at an important period in information resource evolution. Already we are seeing a more or less uniform transition by all disciplines away from print to electronic periodicals.

Notes

1. B.C. Peritz, "On the Objectives of Citation Analysis: Problems of Theory and Method," *Journal of the American Society for Information Science*, 43, no. 6 (1992): 448–51. [Attributed to P. Zunde, "Structural Models of Complex Information Sources," *Information Storage Retrieval* 7 (1971): 1–18.]

2. Philip M. Davis and Suzanne A. Cohen, "The Effect of the Web on Undergraduate Citation Behavior 1996–1999," *Journal of the American Society for Information Science and Technology* 52, no. 4 (2001): 309–14; Philip M. Davis, "The Effect of the Web on Undergraduate Citation Behavior: A 2000 Update," *College & Research Libraries* 63, no. 1 (2002): 53–60; Margaret J. Sylvia, "Citation Analysis as an Unobtrusive Method for Journal Collection Evaluation Using Psychology Student Research Bibliographies at St. Mary's University," *Collection Building* 17, no. 1 (1998): 20–28.

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4. Malone and Videon, "Assessing Undergraduate Use of Electronic Resources"; Karen Hovde, "Check the Citation: Library Instruction and Student Paper Bibliographies," *Research Strategies* 17, no. 1 (1999): 3–9.

5. Virginia E. Young and Linda G. Ackerson, "Evaluation of Student Research Paper Bibliographies: Refining Evaluation Criteria," *Research Strategies* 13, no. 2 (1995): 80–93; Malone and Videon, "Assessing Undergraduate Use of Electronic Resources"; Hovde, "Check the Citation."

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7. Eric George Ackermann, "Developing Comparative Bibliometric Indicators for Evaluating the Research Performance of Four Academic Nutrition Departments, 1992–1996: An Exploratory Study," Master of Science Thesis, Univ. of Tennessee–Knoxville (2000); Holly Heller-Ross, "Assessing Outcomes with Nursing Research Assignments and Citation Analysis of Student Bibliographies," *The Reference Librarian* 77 (2002): 121–40.

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9. Davis and Cohen, "The Effect of the Web on Undergraduate Citation Behavior," 313.

10. Oppenheim and Smith, "Student Citation Practices," 303.

11. Seibenberg et al, "Print versus Electronic Journal Use," 436–37.

12. Malone and Videon, "Assessing Undergraduate Use of Electronic Resources," 154.

13. Total number of citations for the four years was N=5,837. From Economics (n=359); A/S/W (n=994); Psych (n=1,236); PS/IR (n=3,248).

14. Davis and Cohen, "The Effect of the Web on Undergraduate Citation Behavior"; Davis, "The Effect of the Web: 2000 Update"; Oppenheim and Smith, "Student Citation Practices"; Hovde, "Check the Citation"; Sylvia, "Citation Analysis."

15. This is based on the average number of citations per bibliography without each year's outliers. Calculations that exclude the outlier cases bring the average in each year closer to the median.

16. In 2005, the total number of periodical citations (journals, newspapers) across all bibliographies was at an all-time high (n=660), reflecting a 69% increase over 2003 (n=391), 2001 (n=317) and 1999 (n=289).

17. Bibliographies written in 2001 consistently had low book and high periodical use, which we attribute to rapid expansion of the World Wide Web in that year, and possibly the introduction of a number of full-text databases at the college between 2000 and 2001. By 2005, book to periodical ratios resembled those in 1999 and 2003, further reflecting the aberration of 2001 data.

18. H. Small and D. Crane, "Specialties and Disciplines in Science and Social Science: An Examination of Their Structure Using Citation Indexes," *Scientometrics* 1, no. 5–6 (1979): 445–61.

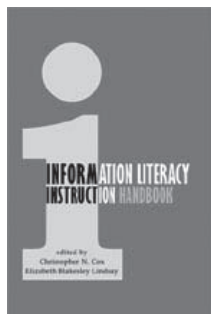
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