Print Sources in an Electronic Age: A Vital Part of the Research Process for Undergraduate Students

by Juris Dilevko and Lisa Gottlieb

While undergraduates typically begin researching assignments and essays using online sources, books and print journals remain crucial components of submitted work because of their completeness, accuracy, permanent accessibility, and in-depth nature. Online sources may be convenient, but they have shortcomings that make print sources necessary for submitting high-quality assignments.

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As use of electronic resources by undergraduate students increases, academic librarians have expressed concern that undergraduates are no longer physically visiting libraries. As Scott Carlson summarizes, the statistics about library use all point in the same direction.[1] At the University of Idaho, "door counts and book circulation have decreased by more than 20% since 1997," but since 1999, the number of electronic articles that Idaho students retrieved went up by about 350%. Similarly, the Reese Library at Augusta State University in Georgia records that gate counts are down from 402,631 in 1992 through 1993 to 217,917 in the 2000 through 2001 academic year, but that "online traffic has increased dramatically." In fact, one Augusta State student "managed to get through two years of college . . . without ever borrowing a book from the library." Statistics gathered by the Association of Research Libraries (ARL) about the number of reference queries at member institutions point in the same direction.[2] The total number of reference queries among ARL members in 1995 was 21,001,676, with an average of 210,016 queries per each of the 100 reporting universities. In 2000, however, the total number of reference queries was 15,975,607, with an average of 150,713 queries per each of the 106 reporting institutions. Of the 20 universities in 1995 that reported the greatest number of reference queries, nineteen reported fewer reference transactions in 2000. For example, Wayne State University had 1,161,212 queries in 1995, but only 595,185 in 2000. University of California-Los Angeles had 564,973 queries in 1995, but only 279,868 in 2000.

To counteract the phenomenon of "the deserted library," librarians and administrators, following the lead of museums, are increasingly adopting so-called "post-object" strategies in the hope of attracting students to the library. These new approaches concentrate on providing experiences similar to those available at entertainment venues, in effect relegating a library's permanent collections to a secondary role. As Hilde Hein explains in the context of museums, the goal is "the achievement of an experience that is genuine, but undergoing such an experience does not depend on mediation by an authentic object."[3] Some academic libraries provide students with post-object experiences that emulate the casual, social atmosphere of the bookstore-café, using Barnes & Noble and Borders bookstores as models. The alterations at the library of Texas Christian University are one illustration of this: "Dead ahead of the main entrance, an espresso machine hisses and sputters as students line up for Starbucks lattes and Krispy Kreme doughnuts before heading off, snacks in hand, to the library's study areas. In the main reading room, students sprawl on couches and plush chairs, as a Mozart divertimento pipes in through speakers overhead."[4]

The approach recommended by Maureen Brunsdale seems to be just as popular.[5] Relying on the advice of Frank D'Andraia—"to succeed in the new information market, which stresses competition and consumer convenience, academic libraries must develop successful marketing plans that aggressively reach out to their customers"—Brunsdale suggests that academic libraries must adopt a private sector mindset aimed at "getting customers to buy a firm's products." Like firms, libraries have products; the task is

to identify these products and then sell them through aggressive marketing. As an example of this approach, Brunsdale discusses the way in which the library at Illinois State University participated in a campus-wide "Preview" event that revolved around the theme of traveling: "the library was transformed into a virtual cruise ship, complete with six decks, specializing in different subjects. Future students were given passports that highlighted the uses of their student ID . . . ."[6] But, as Thomas Mann observes, nowhere does Brunsdale mention books as a possible product that academic libraries could market.[7] For all intents and purposes, academic libraries have adopted what Mann labels as the "Internet Centered Model," where "provision of access to the Internet [serves] as our core function, with a couple of add-ons such as providing coffee bars, meeting rooms, and cultural programs tacked on to it just so that we can offer *some* justification for maintaining libraries as physical places" (original emphasis).[8]

As academic libraries struggle to find ways to remain physically relevant in an online environment and to attract undergraduates within their walls, the adoption of post-object roles may not be the only way to accomplish this goal. Indeed, post-object strategies may backfire insofar as the academic library cannot hope to keep up perpetually with other entertainment venues offering a range of ever-increasingly enticing and sophisticated leisure options for individuals in their late teens and early twenties. If the Borders bookstore chain decides to add waitstaff, strolling musicians, and concierge services as part of its regular coffee bar offerings, will academic libraries feel themselves compelled to follow, justifying their actions by recourse to the mantra about "competition and consumer convenience" lauded by Brunsdale? At the same time, Hein's point that "the displacement of objects by experiences . . . risks compromising the uniqueness of the museum's educational agency"[9] bears consideration by academic libraries as well. By promoting the library as yet another provider of seemingly ubiquitous Internet access and post-object experiences, academic libraries obscure the particular asset that defines the uniqueness of the institution's educational agency: the print collection. Therefore, could another approach to attracting students to the university or college library prove more fruitful and less detrimental in the long term?

Mann argues that academic libraries should, instead, adopt a "print centered model" that recognizes that "the book format is by far the best means that the human race has yet devised for communicating to itself knowledge and understanding, as opposed to unintegrated data and information."[10] Although it is, at first glance, convenient and seductive to have books online, Mann notes that, because screen displays are typically not read (for a variety of reasons) with as much attention as print formats, the act of digitizing book length texts "make[s] their intellectual content more difficult to absorb."[11] In addition, he warns that "doing keyword searches of [online] texts for particular passages is simply not the same as the much more important work of actually reading and absorbing their intellectual content as connected wholes."[12] Accordingly, academic libraries that are emphasizing the vast extent of their online resources are, in effect, telling students that "[t]hinking outside the box of what you can find through your home computer is neither desirable nor necessary" and that "you can rely for *all* of your requirements on the few sources we have seen fit to digitize for you" (original emphasis).[13] In addition, the increasing focus on teaching students to evaluate Internet sources conveys "a tacit permission that it is *acceptable* for them *to confine their searches entirely within the Internet*, as long as they are just think about what they are doing" (original emphasis).[14]

Undergraduates are necessarily caught in the middle of the "Internet centered model" and "print centered model" debate. But, as academic libraries increasingly move towards the Internet centered model, they may not have fully recognized the value of print sources as a means of attracting students within their physical walls. Very little is known about how undergraduates feel about using print books and print journals to complete their assignments in an online world. Are print sources obsolete, only to be used on the rarest of occasions? Or do they consider print books and print journals to be inherently valuable, and if so, in what terms is this value discussed? And, if undergraduates *do* value print sources for completing their university work, should academic libraries take this into account when positioning themselves within the university community as a whole?

Literature Review

While many academic libraries are convinced that they must market themselves primarily as post-object centers of digital texts to attract students, only a few studies have been conducted about how undergraduates balance the range of research sources at their disposal in the electronic world. David Rothenberg suggested that use of Web sources destroys student research papers, citing a "disturbing decline in both the quality of the writing and the originality of thoughts expressed."[15] Deborah Grimes and Carl Boening, in a study of community college students taking an English composition class, worried that an ever-increasing number of students were using unevaluated Internet resources at the expense of traditional print sources "because of the ease in locating and printing out the results and because of the perceived abundance of information compared to books and periodicals."[16] Mary Ann Gilette and Carol Videon, studying the citations of 47 students in a community college writing class, noted that 50% of students included citations to the online papers of other students.[17] Philip Davis and Suzanne Cohen, after conducting a citation analysis of undergraduate term papers from a large first-year microeconomics class, found that, while 30% of all citations were to books in 1996, book citations dropped to 19% of total citations in 1999.[18] In individual terms, students cited 3.5 books per bibliography in 1996, but only 2.2 books per bibliography in 1999. The median citation dropped from three to one, and "those who cited only one book cited the course textbook.[19] On the other hand, Kathy Fescemyer, after examining the citations of two classes of second- and third-year students at the University of Oklahoma on a mid-term geography exam covering such topics as African desertification, neocolonialism in Mozambique and the Comoros, and apartheid in South Africa, found that, on average, students used such print sources as encyclopedias, reference books, and journal articles at rates between 51% and 62%.[20]

The findings from these studies can be variously interpreted. There is concerted worry that students are using less-than-adequate Internet sources at an increasing rate, especially at community colleges and in large first-year university classes. Yet, when faced with an exam situation in their second or third year of university, students tend to gravitate toward print

sources, although they do not totally disregard online sources. In the late 1980s, Carol Kuhlthau suggested that students who took their work seriously and received better grades on essays were those students who began their work early, consulted a rich variety of sources, and took the time to browse shelves to forge intellectual connections and discover new ideas; conversely, students who described their research process for essays as the simple act of collecting information were the least successful.[21] Slightly updated, Kuhlthau's insight may be equally valid in the 2000s. It may well be the case that those students who take the time to consult print sources physically available at the library instead of settling for easily accessible online sources are the students who get the most out of their university careers, receive better grades, and truly enhance their long-term knowledge base, as opposed to their short-term store of information. If this is so, the academic library has an opportunity to increase its visibility and prestige by marketing itself not in a post-object role, but as a place that directly contributes to increased academic success.

Purpose

The purpose of this study was threefold. First, the study sought to determine the extent to which undergraduate students in a metropolitan university setting used print sources (books and journals) in their assignments and essays despite the convenient availability of electronic online resources. As a corollary, which type of sources did they consult first? If they used online sources as a starting point, did they then supplement online information with print materials, and if so, why? Second, the study presented a number of hypothetical scenarios in which undergraduates were asked to choose between two types of sources for possible use in their assignments or essays, where the choice was always between a print source and an online source. These scenarios were developed to gauge whether students would take the trouble to consult a "better" print source than a "more convenient" electronic source. Third, the study presented seven common problems associated with academically oriented online journals and asked students to indicate whether any of these issues would cause them to switch to print journals on a regular basis. Taken as a whole, the study attempted to measure the extent to which the research process of undergraduates has been affected by the prevalence of online information sources and the extent to which they physically made use of their university library as measured by their self-declared use of print books and print journals. In other words, do undergraduate students feel that print books and print journals have something to offer and, if so, what?

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Procedures

A Web-based survey of undergraduate library users was conducted during February through March 2001 at the University of Toronto (UT), the largest university in Canada. The University of Toronto, located in a large metropolitan area and offering a wide range of Bachelor's, Master's, and Doctoral/Medical degrees, enrolled 44,964 undergraduates during the academic year 2000 to 2001, of which 1,909 were part-time students. Including graduate students, the total UT student population was 55,127 in academic year 2000 to 2001. UT has a flagship downtown campus as well as two satellite campuses in outlying suburban areas. Because of its location in an urban area, a large percentage of its student population is commuter-based; however, a substantial number of undergraduate students live in residence in one of the constituent colleges of the university.

A survey consisting of 21 questions was placed on the Web server of the UT library system.[22] This survey can be categorized as an "intercept survey" using a probability sample from a narrowly defined target population.[23] According to Mick Couper, an intercept survey is not a self-selected Web survey that uses nonprobability approaches. While a self-selected Web survey uses "open invitations on portals, frequently visited Web sites, or (in some cases) dedicated survey sites," a probability-based intercept survey has a frame that is "narrowly defined as visitors to . . . [a particular] site, thus eliminating coverage problems."[24] The survey was pre-tested by two academic librarians and five undergraduate students; a number of important changes to question wording and order were made as a result of the pre-test. The survey was accessible to all UT students from public access locations on campus and remote login locations. Javascript code was placed on the "Resources" section of the UT library home page so that the first time any user clicked on the "e-journals" link, the survey would open in a second window. The undergraduate user could then choose to participate in the survey or decline to do so; graduate students, faculty, and administrative staff were explicitly told not to complete the survey.

To avoid a situation where a user would repeatedly be forced to decline the survey or fill it out a second time, a cookie was written to the first-time user's computer such that, when it subsequently connected to the "e-journals" page, the javascript would note the cookie and take the user directly to the "e-journals" page without opening the survey window. To allow adequate sampling of students at public access machines, a link to the survey was placed at the bottom of the "e-journals" page. To encourage participation, students were told that they would be eligible for a draw of three prizes of $100 each. Because the survey was not distributed in print format and was accessible only on the Web, students who do not typically use online resources to complete their assignments could not participate. Accordingly, the viewpoints of such students may be under-represented in this study.

A total of 394 undergraduates completed the survey. Two pieces of demographic information were sought: year of study and major area of study. Fifty-eight students (14.7%) were in their first year; 88 in second year (22.3%); 117 in third year (29.7%); and 131 were in their fourth year or more (33.2%). With regard to major areas of study, survey participants were allowed to describe themselves in any way they wished. For analytical purposes, however, their self-described areas of study were categorized into four broad disciplinary areas, as defined by the UT academic calendar: humanities; social sciences; life sciences; physical sciences. Students who said that their major area of study consisted of two or more disciplines were categorized according to their first-mentioned choice. Thus, 67 students were categorized as humanities majors (17%); 168 were life sciences majors (42.6%); 100 were social science majors (25.4%); and 42 were physical science majors

Table 1
Exclusive Use of Online Sources by Undergraduates in Assignments

	Yes, I Handed in an Assignment Where All or Mostly All Information Came from Online Sources (%)		Number of Assignments Handed in During the Previous Semester Where All or Mostly All Information Came from Online Sources (All Majors Combined) (%)
Humanities (n = 67)	18 (26.9)	One	38 (24.7)
Social Sciences (n = 100)	34 (34)	Two	48 (31.2)
Physical Sciences (n = 42)	19 (45.2)	Three or four	42 (27.3)
Life Sciences (n = 168)	81 (48.2)	Five to nine	19 (12.3)
No declared area of study (n = 17)	4 (23.5)	Ten or more	7 (4.5)
Total (n = 394)	156 (39.6)	Total (n = 154)*	154 (100)

*Two of the 156 individuals who answered "yes" to the first question displayed in this table did not provide information for the second question displayed in this table.

(10.7%). Seventeen students did not indicate a major area of study (4.3%). Based on the student undergraduate population given above, a sample size of 394 provides statistically accurate results 95% of the time with a confidence interval of ±5. The results obtained below may not be generalizable to broader populations beyond the UT undergraduate community, but they are suggestive of trends that may be present on other university campuses.

Results

As shown in Table 1, 39.6% of surveyed undergraduates (156) in all four broad disciplinary areas had, in the previous semester, submitted at least one assignment or essay where they "got all or mostly all of their information from electronic online resources of any kind." The lowest rate for this phenomenon was in the humanities (26.9%), while the highest rate was in the life sciences (48.2%). When these 156 students were further asked about the frequency with which they handed in assignments relying exclusively or almost exclusively on online sources (see Table 1), 24.7% of the students handed in one assignment of this kind, 31.2% submitted two assignments, 27.3% submitted three assignments, and 4.5% submitted 10 or more such assignments.

Students were also asked to think about *all* the written class assignments or essays for which they made use of one or more types of library sources during the Fall 2000 semester. Sources were broadly defined as anything that "provided you with actual content that you used to complete your assignments or essays." As shown in Table 2, while online resources of all types were used at least 75% of the time in their assignments and essays by 63.9% of undergraduates (153 + 99), 44.2% (102 + 72) used print book sources at least 75% of the time and 45.2% (92 + 86) used print journal sources at least 75% of the time in their written work. At the same time, while only 6.3% of undergraduates (25) used online resources less than 10% of the time, almost three times (74) as many undergraduates (18.8%) used print book sources less than 10% of the time. With regard to print journal sources, 14.5% of undergraduates (57) used these sources less than 10% of the time.

There were marked differences in use of sources among the four main disciplines (see Table 3). While 50.8% of undergraduates (20 + 14) in the humanities used online sources at least 75% of the time, the comparable figure for undergraduates in the life sciences is 73.2% (80 + 43). Similarly, while 58.2% of undergraduates in the humanities (29 + 10) used print book sources at least 75% of the time, undergraduates in the life sciences did so only 33.9% of the time (33 + 24). In the life sciences, 26.8% of students (45) used print books less than 10% of the time, while in the humanities only 7.5% of students (5) did so. In the social sciences, only 15% of students used print books less than 10% of the time; in the physical sciences, this figure was 9.5%. Again, there was a wide discrepancy in

Table 2
Types of Library Sources Used by Undergraduates When Completing Assignments and Essays (n = 394)

Use Level	Any Type of Online Sources (%)*	Print Book Sources (%)*	Print Journal Sources (%)*
90–100% of the time	153 (38.8)	102 (25.9)	92 (23.4)
75–89% of the time	99 (25.1)	72 (18.3)	86 (21.8)
50–74% of the time	69 (17.5)	71 (18)	80 (20.3)
10–49% of the time	47 (11.9)	65 (16.5)	68 (17.3)
Less than 10% of the time	25 (6.3)	74 (18.8)	57 (14.5)
No reply	1 (0)	10 (2.5)	11 (2.8)

*Percentage figures in this and all other tables may not add to 100% because of rounding.

Table 3
Undergraduate Use of Sources by Academic Discipline

Use Level	Humanities (n = 67)*			Social Sciences (n = 100)*			Physical Sciences (n = 42)*			Life Sciences (n = 168)*		
	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)
90–100%	20 (29.9)	29 (43.3)	13 (19.4)	34 (34)	28 (28)	24 (24)	12 (28.6)	6 (14.3)	5 (11.9)	80 (47.6)	33 (19.6)	48 (28.6)
75–89%	14 (20.9)	10 (14.9)	11 (16.4)	24 (24)	25 (25)	21 (21)	12 (28.6)	10 (23.8)	9 (21.4)	43 (25.6)	24 (14.3)	41 (24.4)
50–74%	16 (23.9)	12 (17.9)	9 (13.4)	24 (24)	18 (18)	24 (24)	6 (14.3)	7 (16.7)	11 (26.2)	22 (13.1)	32 (19)	34 (20.2)
10–49%	9 (13.4)	9 (13.4)	15 (22.4)	15 (15)	13 (13)	16 (16)	8 (19)	13 (31)	8 (19)	14 (8.3)	29 (17.3)	28 (16.7)
<10%	7 (10.4)	5 (7.5)	18 (26.9)	3 (3)	15 (15)	12 (12)	4 (9.5)	4 (9.5)	5 (11.9)	9 (5.4)	45 (26.8)	15 (8.9)
No reply	1 (1.5)	2 (3)	1 (1.5)	0	1 (1)	3 (3)	0	2 (4.8)	4 (9.5)	0	5 (3)	2 (1.2)

*17 students did not identify their major area of study and so were not included in this table.

print journal use among the four disciplines: life science students used print journals at least 75% of the time (48 + 41) at a greater rate (53%) than the other three disciplines (humanities at 35.8% [13 + 11]; social sciences at 45% [24 + 21]; and physical sciences at 33.3% [5 + 9]).

As students progressed through their years of study, use of online sources and print book sources remained about the same, with only slight variations (see Table 4). For example, 37.9% of first-year students (22) used online sources at least 90% of the time; the comparable figures for second-year, third-year, and fourth-year students were 39.8%, 41.9%, and 35.9%, respectively (35, 49, and 47 students). With regard to print books, 25.9% of first-year students (15) used online sources at least 90% of the time; the comparable figures for second-year, third-year, and fourth-year students were 26.1%, 24.8%, and 26.7%, respectively (23, 29, and 35 students). Looking at it another way, 60.4% of first-year students used print book sources at least 50% of the time (15 + 11 + 9 students); in fourth year, 64.9% of students used print book sources at least 50% of the time (35 + 20 + 30 students). However, as students moved from first-year to fourth-year status, they markedly increased their use of print journals. In their first year, only 13.8% of undergraduates (8) used print journal sources at least 90% of the time, and 48.2% of these students (8 + 10 + 10) had used print journals at least 50% of the time. By the time they reached their fourth year of study, 29.8% of undergraduates (39) had used print journal sources at least 90% of the time when completing assignments and essays, and 73.3% of these students (39 + 33 + 24) had used print journals at least 50% of the time.

When asked which sources they consulted *first* for all their assignments in the previous semester, 47% of undergraduates began with online sources 90% or more of the time; 20.1% began with print book sources 90% or more of the time; and 14.2% began with print journal sources 90% or more of the time (see Table 5). Nevertheless, 54.1% of undergraduates (79 + 67 + 67) stated that print book sources were their first stop for information at least 50% of time, and 47% (56 + 68 + 61) stated that they used print journals as their first source of information at least 50% of the time.

In the social sciences, physical sciences, and life sciences, students preferred online sources to print book and print journal sources as their first stop for information 75% or more of the time (see Table 6). In the life sciences, for instance, 77.3% of undergraduates consulted online sources first at least 75% of the time (98 + 32 students); in the social sciences, the comparable figure was 59% (40 + 19 students). In the humanities, print book sources were preferred (52.2%) as the first source for information (23 + 12 stu-

Table 4
Undergraduate Use of Sources by Year of Study

Use Level	First-year Students (n = 58)			Second-year Students (n = 88)			Third-year Students (n = 117)			Fourth-year Students (n = 131)		
	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)
90–100%	22 (37.9)	15 (25.9)	8 (13.8)	35 (39.8)	23 (26.1)	23 (26.1)	49 (41.9)	29 (24.8)	22 (18.8)	47 (35.9)	35 (26.7)	39 (29.8)
75–89%	14 (24.1)	11 (19)	10 (17.2)	18 (20.5)	17 (19.3)	22 (25)	30 (25.6)	24 (20.5)	21 (17.9)	37 (28.2)	20 (15.3)	33 (25.2)
50–74%	10 (17.2)	9 (15.5)	10 (17.2)	17 (19.3)	15 (17)	16 (18.2)	19 (16.2)	17 (14.5)	30 (25.6)	23 (17.6)	30 (22.9)	24 (18.3)
10–49%	3 (5.2)	10 (17.2)	9 (15.5)	11 (12.5)	17 (19.3)	13 (14.8)	16 (13.7)	21 (17.9)	22 (18.8)	17 (13)	17 (13)	24 (18.3)
<10%	9 (15.5)	11 (19)	18 (31)	7 (8)	11 (12.5)	12 (13.6)	3 (2.6)	25 (21.4)	17 (14.5)	6 (4.6)	27 (20.6)	10 (7.6)
No reply	0 (0)	2 (3.4)	3 (5.2)	0 (0)	5 (5.7)	2 (2.3)	0 (0)	1 (0.9)	5 (4.3)	1 (0.8)	2 (1.5)	1 (0.8)

Table 5
Types of Library Sources Consulted First by Undergraduates When Completing Assignments and Essays (n = 394)

Use Level	Any Type of Online Sources (%)*	Print Book Sources (%)*	Print Journal Sources (%)*
90–100% of the time	185 (47)	79 (20.1)	56 (14.2)
75–89% of the time	71 (18)	67 (17)	68 (17.3)
50–74% of the time	39 (9.9)	67 (17)	61 (15.5)
10–49% of the time	42 (10.7)	58 (14.7)	57 (14.5)
Less than 10% of the time	36 (9.1)	95 (24.1)	109 (27.7)
No reply	21 (5.3)	28 (7.1)	43 (10.9)

*Percentage figures in this and other tables may not add to 100% because of rounding.

dents) over online sources (46.2%) (21 + 10 students) and print journal sources (25.4%) (6 + 11 students) 75% or more of the time. Nevertheless, in the social sciences, 46% of students used print books as their first source of information at least 75% of the time (26 + 20 students) and 31% used print journals as their first source of information at least 75% of the time (11 + 20 students). Similarly, 25.6% of life sciences students used print books as their first source at least 75% of the time (19 + 24 students), and 39.2% of these students used print journals as their first source at least 75% of the time (34 + 32 students).

Undergraduates were also asked to think back to *all* the assignments they submitted in the previous semester and to recall whether they supplemented their research by using "traditional print books" or "traditional print journals" even when they "happened to find a lot of information on your subject while you were using electronic online resources of any kind." Overall, 57.1% of surveyed students (122 + 93) supplemented online sources with print books "always" or "frequently," and 49.6% of undergraduates (81 + 102) "always" or "frequently" supplemented online sources with print journals (see Table 7). Only 5.3% and 10.6% of students never supplemented online sources with print books or print journals, respectively. In the humanities and social sciences, only 4.5% and 3% of students never used print books, respectively; in the life sciences, only 6.5% of undergraduates never used print books. Similarly, only 7.9% of students in the life sciences and 10.2% in the social sciences never used print journals as supplementary material in their research.

Undergraduates in the humanities and the social sciences supplemented online sources with print sources (books and journals) at a great rate than their counterparts in the physical and life sciences (Table 7). In the humanities, 75.7% of students (35 + 15) used print books "always" or "frequently"; in the social sciences, 76% of students did so (43 + 33). Moreover, 51.1% of social sciences students (23 + 27) used print journals "always" or "frequently." Nonetheless, it is clear that students in the physical sciences and life sciences used print books and print journals "always" or "frequently" at substantial rates. For example, in the life sciences, 42.8% of students (35 + 37) always or nearly always supplemented online sources with print books, and 55.7% of students (39 + 53) always or nearly always supplemented online sources with print journals.

The survey also asked a number of questions about their future use of print sources, given certain hypothetical situations or scenarios. For example, nearly half the surveyed undergraduates (46.4%) could envision a future assignment where they would rely exclusively or almost exclusively on print sources of whatever kind (see Table 8). Again, students in the humanities led the way in this category

Table 6
Type of Sources Consulted First by Academic Discipline

	Humanities (n = 67)*			Social Sciences (n = 100)*			Physical Sciences (n = 42)*			Life Sciences (n = 168)*		
Use Level	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)	Online (%)	Print Book (%)	Print Jrnl. (%)
90–100%	21 (31.3)	23 (34.3)	6 (9)	40 (40)	26 (26)	11 (11)	17 (40.5)	6 (14.3)	3 (7.1)	98 (58.3)	19 (11.3)	34 (20.2)
75–89%	10 (14.9)	12 (17.9)	11 (16.4)	19 (19)	20 (20)	20 (20)	8 (19)	10 (23.8)	5 (11.9)	32 (19)	24 (14.3)	32 (19)
50–74%	10 (14.9)	9 (13.4)	13 (19.4)	8 (8)	17 (17)	18 (18)	8 (19)	7 (16.7)	6 (14.3)	12 (7.1)	32 (19)	22 (13.1)
10–49%	10 (14.9)	11 (16.4)	4 (6)	16 (16)	12 (12)	19 (19)	5 (11.9)	3 (7.1)	7 (16.7)	11 (6.5)	29 (17.3)	25 (14.9)
<10%	7 (10.4)	7 (10.4)	23 (34.3)	11 (11)	21 (21)	23 (23)	3 (7.1)	12 (28.6)	14 (33.3)	13 (7.7)	52 (31)	43 (25.6)
No reply	9 (13.4)	5 (7.5)	10 (14.9)	6 (6)	4 (4)	9 (9)	1 (2.4)	4 (9.5)	7 (16.7)	2 (1.2)	12 (7.1)	12 (7.1)

*17 students did not identify their major area of study and so were not included in this table.

Table 7
Supplementing Online Sources with Print Books and Print Journals

	Always (%)		Frequently, But Not Always (4 or More Times) (%)		Sometimes (2 or 3 Times) (%)		Rarely (Just Once) (%)		Never (%)	
	Print Books	Print Jrnls.	Print Books	Print Jrnls.	Print Books	Print Jrnls.	Print Books	Print Jrnls.	Print Books	Print Jrnls.
Humanities (n = 66, 64)*	35 (53)	12 (18.8)	15 (22.7)	10 (15.6)	9 (13.6)	24 (37.5)	4 (6.1)	7 (10.9)	3 (4.5)	11 (17.2)
Social Sciences (n = 100, 98)*	43 (43)	23 (23.5)	33 (33)	27 (27.6)	17 (17)	25 (25.5)	4 (4)	13 (13.3)	3 (3)	10 (10.2)
Physical Sciences (n = 42, 42)*	9 (21.4)	7 (16.7)	8 (19)	12 (28.6)	19 (45.2)	8 (19)	3 (7.1)	10 (23.8)	3 (7.1)	5 (11.9)
Life Sciences (n = 168, 165)*	35 (20.8)	39 (23.6)	37 (22)	53 (32.1)	48 (28.6)	36 (21.8)	37 (22)	24 (14.5)	11 (6.5)	13 (7.9)
Total (n = 376, 369)*	122 (32.4)	81 (22)	93 (24.7)	102 (27.6)	93 (24.7)	93 (25.2)	48 (12.8)	54 (14.6)	20 (5.3)	39 (10.6)

*The first N refers to the number of respondents who gave an answer about print books in each of the five frequency categories; the second N refers to the number of respondents who gave an answer about print journals in each of the five frequency categories. Percentages for each individual "print books" and "print journals" column are calculated based on these different Ns.

(58.2%), but students in the three other disciplinary areas could also envision such an assignment at rates of more than 40%. In addition, 33.2% of all students could envision a situation where they would prefer a print journal to an online journal, and 26% of all students could envision a situation where they would prefer a print newspaper to an online newspaper (Table 8).

Students were also asked to consider the following scenario and choose the type of source they would use: "You are using a journal index to get a list of articles on your topic. An academically-oriented print journal (which is held by the UT system) contains *exactly* the information you need. On the other hand, a *different* academically-oriented *electronic* journal (to which you have online access) has an article that is not exactly what you need, but is 'good enough' or 'close enough' for your purposes." As shown in Table 9, 74.5% of all students would choose the academically oriented print journal containing exactly the required information. While humanities students were more prone to make this choice (81.3%) than students in the other disciplines, social science and life science students were not far behind (74.5% and 74.7%, respectively).

The following scenario was also presented for the consideration of survey respondents (Table 9). "You are using a journal index to get a list of articles on your topic. An academically oriented *print* journal (which is held by the UT system) contains *exactly* the information you need. There are no academically oriented electronic journals available that have anything close to the information you need. Would you now use the print journal which has *exactly* the information you need, or would you hunt around on the Web until you find something/anything that appears to you to be 'good enough' or 'close enough' for your purposes?" Here, students were even more adamant that they would use the print journal containing exactly the required information than something they could find on the Web. Overall, 90.2% of students opted for the print journal, with no significant differences among the four broad disciplines.

When asked whether they would prefer an electronic book over the equivalent print book, 57.1% of undergraduates opted for the print version, ranging from 68.4% among physical science students to 49.1% among life science students (Table 9). Another scenario asked students to

Table 8
Undergraduate Views on Print Sources

	Yes, I Can Envision a Future Assignment Where I Would Rely Exclusively on Print Sources (%)	Yes, I Can Envision a Situation Where I Would Prefer a Print Journal to Its Electronic Equivalent (%)	Yes, I Can Envision a Situation Where I Would Prefer a Print Newspaper to Its Electronic Equivalent (%)
Humanities (n = 67, all 3 questions)	39 (58.2)	25 (37.3)	22 (32.8)
Social Sciences (n = 100, all 3 questions)	47 (47)	35 (35)	25 (25)
Physical Sciences (n = 42, all 3 questions)	17 (40.5)	14 (33.3)	12 (28.6)
Life Sciences (n = 168, all 3 questions)	72 (42.9)	51 (30.4)	39 (23.2)
Total (n = 377)	175 (46.4)	125 (33.2)	98 (26)

Table 9
Undergraduate Views on Substituting Online Sources for Print Sources

	Yes, I Would Use an "Exact" Print Journal Rather Than "Good Enough" Online Journal (%)	Yes, I Would Use an "Exact" Print Journal Rather Than "Good Enough" Web Find (%)	Yes, I Would Prefer a Print Book Over the Equivalent Electronic Book (%)	Yes, I Would Prefer an "Exact" Print Book to "Good Enough" Electronic Book (%)
Humanities (n = 64, 65, 63, 65)*	52 (81.3)	57 (87.7)	36 (57.1)	57 (87.7)
Social Sciences (n = 98, 97, 97, 97)*	73 (74.5)	89 (91.8)	64 (66)	83 (85.6)
Physical Sciences (n = 41, 39, 38, 39)*	26 (63.4)	34 (87.2)	26 (68.4)	33 (84.7)
Life Sciences (n = 166, 168, 163, 165)*	124 (74.7)	153 (91.1)	80 (49.1)	132 (80)
Total (n = 369, 369, 361, 366)*	275 (74.5)	333 (90.2)	206 (57.1)	305 (83.3)

*The four Ns refer to the number of respondents who either agreed or disagreed with each of the statements in the four columns. Percentages are calculated based on these different Ns.

consider the following choice: "A print book contains *exactly* the information you need. On the other hand, a *different* electronic book contains information that is not exactly what you need, but is 'good enough' or 'close enough' for your purposes. Would you use the print book or the electronic book?" In response to this hypothetical situation, undergraduates opted for the print book containing exactly the required information at a rate of 83.3%, with all four disciplines having rates of 80% or more (Table 9).

With regard to their continued use of electronic online journals in the future, undergraduates recognized the many problems associated with online journals, but observed that they would nevertheless continue to use them despite these problems (Table 10). For instance, while 60.6% of surveyed students (86 + 149) were bothered by the difficulty of reading e-journals on computer monitors, they stated that they would "stick with" online journals. Similarly, while 61.9% of undergraduates (143 + 97) were troubled because e-journals sometimes had incomplete volumes and missing issues, they would nonetheless "stick with" e-journals. Overall, the three main reasons that undergraduates gave for switching to print journals on a regular basis were: e-journals have incomplete volumes and missing issues (34%); the possibility that the needed e-journal will not always be there because long-term access and archiving issues have not been resolved (33.5%); and the fact that some things that are in the print journal (e.g., graphs, diagrams, and letters to the editor) are not in the online version (31.3%). And even though 51.5% of students (70 + 125) were troubled about the lack of standardized formats among e-journals, only 20.1% of all students thought that this was a sufficient reason to switch to print journals on a regular basis. Viewed from another perspective, only 4.1% of all students (16) were not bothered at all ("this does not matter to me" by the possibility of missing issues and volumes, only 13.7% of students (53) were not troubled by the possibility of missing information (i.e., graphs and diagrams), only 9.4% of students (36) were not concerned with long-term access and archiving issues, and only 18% of students (70) were not troubled that reading e-journals on computer monitors is difficult.

Discussion

As shown in Tables 1 and 2, undergraduates are significant users of online resources, going so far as to rely exclusively (or almost exclusively) on such resources for at least some of their assignments and essays. Still, they recognize that print book sources cannot be overlooked in the research process. For example, 71% of social science students used print books for their assignments at least 50% of the time (see Table 3) and 64.9% of fourth-year students used print book sources at least 50% of the time (see Table 4). Moreover, 54.1% of all students began their research process with print books at least 50% of the time (see Table 5).

Why do undergraduates make such extensive use of print books? Over and over again the following reasons appeared in their open-ended answers about why they chose to supplement online sources with print books. Books are "more reputable," "give more basic and well established facts," "give a thorough analysis of the specific topic," "generalize the subject at hand," and "supply good general overviews of topics and offer good background information that is often needed before the more detailed journal articles can be understood and used effectively." Books "increase grounds for referenceing [sic] and sound arguments." Books are perceived to be "more reliable" and "balanced," and are less prone to be written in "journal jargon." They give "good historical perspective on current trends" by including "in-depth" and "comprehensive" material, with the result that they are "usually better at explaining concepts more clearly, whereas in journals only a short explanation will be provided." In addition, because "material in electronic journal articles is [typically] based on theory that has been most extensively described in a book," books are necessary to "discuss theoretical foundations" of many topics. In fact, because books offer a wealth of historical and contextual information, they "can provide ideas and more references to research." Indeed, one student wrote that "I can get a better comprehensive understanding of a topic from books [since] I like to read up generally on something before deciding to write on it. Journal articles tend to be more specific, and they are excellent to use once I have an idea." Another student wrote that, after using journal articles, "sometimes print books are needed to fill in holes in my assignment or to strengthen the overall pre-

Table 10
Undergraduate Views on Their Use of E-journals in the Future

	This Does Not Matter to Me; I Will Keep Using E-journals Exclusively or Almost Exclusively (%)	This Bothers Me Somewhat, But I Will Stick With Using E-journals (%)	This Bothers Me a Lot, But I Will Stick With Using E-journals (%)	This Bothers Me So Much That I Use Print Journals on a Regular Basis (%)
Reading e-journals on computer monitors is difficult (n = 388)	70 (18)	149 (38.4)	86 (22.2)	83 (21.4)
E-journals sometimes have incomplete volumes and missing issues that I need (n = 388)	16 (4.1)	97 (25)	143 (36.9)	132 (34)
It is difficult to know the proper way to cite e-journals (n = 382)	137 (35.9)	125 (32.7)	63 (16.5)	57 (14.9)
Some things in the print journal are not in e-journal (n = 386)	53 (13.7)	129 (33.4)	83 (21.5)	121 (31.3)
The network is not dependable (n = 381)	98 (25.7)	121 (31.8)	85 (22.3)	77 (20.2)
There is a chance that the e-journal I need will not always be there (n = 382)	36 (9.4)	108 (28.3)	110 (28.8)	128 (33.5)
There is a lack of standardized formats among the e-journals that I use (n = 379)	108 (28.5)	125 (33)	70 (18.5)	76 (20.1)

sentation with more in-depth information." Still another student observed that, after making use of many journal articles on extremely specialized topics, he or she likes to use books "to ensure all the information coincided with each other, and one source wasn't completely different from others." The distinction made by these undergraduates between books and journals is worth remembering. Books, because of their historical and contextual scope, are invaluable generators of ideas—ideas that can then be investigated in greater detail through academic journal literature. If the order is reversed—if the study of journal literature comes before reading books—undergraduates may often be overwhelmed by the level of technical detail in journals and risk missing the forest for the trees.

"Why do undergraduates make such extensive use of print books?"

In general, books offer "focus" because "a lot of the time there is too much information online that is irrelevant." While "electronic resources offer breadth" and many "specific/technical details," books are much better at giving "substantive details" and the type of "pertinent general information" necessary to put such specific technical details into a broader intellectual context. As one student put it, books "tend to supply summaries of information that helps to put the information from journals into context." Another student made the following distinction: "print books give me a better background informations [sic] about my assignment but online sources can usually give me only the latest news." As well, books can be used to "verify information" found during Web searches, since such information is typically perceived to be of questionable reliability. In sum, books are necessary "just to have a broad base of knowledge" and "for a good unqualified understanding" of a given subject area.

In their open-ended responses about whether they could envision a situation where they would rely *exclusively* or *almost exclusively* on print materials to complete their assignments, undergraduates again mentioned that print materials are especially valuable in completing assignments that demand historical surveys about a given subject. For example, three students found that print was invaluable in writing papers "about the foundations of cognitive dissonance theory," about the history of medicine, and about aspects of the "history of biology, where the purpose is to trace the research back quite far." In a similar view, another student observed that print was especially useful for "analysis of different interpretations over decades and centuries." Perhaps the most interesting comment was from an undergraduate who wrote that he or she planned to rely on print "in future business courses, as class sizes get smaller." Although this student did not provide further explanation, it is interesting to note how she or he closely associates print sources with a classroom situation that has few

students where, presumably, more in-depth discussion of highly specialized topics occurs than is possible in classes with hundreds of students in large lecture halls.

"In their open-ended responses about whether they could envision a situation where they would rely *exclusively* or *almost exclusively* on print materials to complete their assignments, undergraduates again mentioned that print materials are especially valuable in completing assignments that demand historical surveys about a given subject."

Reasons for Using Print Periodical Sources

Print periodicals are also well-respected by undergraduates. As shown in Table 6, 52.3% of life science students use print journals at least 50% of the time; for social science students, the comparable figure is 49%. And, 55.7% of life science and 51.1% of social science students always or frequently supplement online sources with print journal sources (Table 7). Indeed, 33.2% of all surveyed undergraduates can envision a situation where they would prefer a print journal to its electronic equivalent; 26% would prefer a print newspaper to its electronic equivalent (Table 8). As shown in Table 10, students who use print journals on a regular basis worry, in decreasing order, that e-journals will have missing issues and volumes (34%), will not always be accessible (33.5%), and do not contain everything that is in the print version (31.3%). Overall, there is a consistent one third of undergraduates among all disciplines who are strong believers in the superiority of print journals.

In their open-ended responses to what type of situations would cause them to prefer print journals to equivalent electronic versions, numerous students cited eye strain from overmuch reading on computer screens and the high cost (relative to photocopying) of printing the electronic version for their personal use, whether from pay-per-page library terminals or home computers, where they themselves are responsible for supplying paper and toner. However, some of the most intriguing responses came from students who were concerned that reliance on online journals led to a mechanistic and linear research process, where only predetermined targeted and isolated information was sought. These students preferred print journals because, for example, they often contain "surprise information that you did not know was there; having just the article limits you to what was in the rest of the print journal. . . ." Other students wrote that print journals not only facilitate annotations and note-taking, but also allow for easier comparisons to be made among all gathered sources because print articles can be physically juxtaposed in a way that makes it "easy to flip back and forth between articles." As in the comments about print books, there was an association made between the amount of work demanded by a specific course and the value of print sources: "Th[e] type of extensive information in a[n] academically-oriented print journal would be useful for above average (in terms of context and difficulty) assignments." On the other hand, students who gravitated toward electronic journals seemed to have lives that were filled with other activities: "It is three a.m. and my assignment is due in six hours. It is a ten page exegesis of a passage in Finnegan's Wake. I have just finished watching six hours of television, having a nap, and drinking. . . ." Although this student is no doubt an extreme case, his or her response is emblematic of a persistent theme in many answers, namely, that online journals can save time. It is an another question entirely whether they contribute to in-depth analysis and exploration of related issues.

Choosing between Print and Online Sources in Hypothetical Situations

When faced with the choice between print sources containing exactly the information they need and online sources with "good enough" or "close enough" information, undergraduates overwhelmingly chose the print sources containing "exactly" the required information in three different situations (see Table 9). In opting for a print journal over an alternate online journal or a Web source, students not surprisingly stressed the need for accuracy and precision. Many students observed that, since they aspired to excellence in all their work, they would take the extra time to use "exact" print sources since "getting better information . . . can figure . . . in the academic outcome (marks)." As one student noted, "Truth is better than convenience." However, less obvious reasons also emerged. For instance, the print journal "may contain more ideas to my topic of interest not considered before." In addition, a number of undergraduates argued that using an "exact print source" actually saves time in relation to settling for "good enough" online sources: "you will end up doing less research if you get a complete source the first time around;" "print journals aren't sufficiently inconvenient that I'd willing to risk sacrificing grades;" and "saves you time in the long run if you're getting exactly what you need."

Still, 25.5% of students preferred the convenience of "good enough" online journal sources and 9.8% preferred the "good enough" Web find: the most commonly cited time reasons for such a choice were time pressures, efficiency, ease of access, and around-the-clock availability from any geographic location. One student admitted that when he/she needs material that is "not intensive . . . 'close enough' is sufficient." Another said that "as long as it really is good enough, why waste time and money running around?" A third student noted that he/she would "use 2 online articles [rather] than one perfect print article," and a fourth explained that because professors have "a tendency to award equal marks to papers that are good enough and the ones that have excellent references," he or she does "not want to take the time" to search "for the exact one." For a fifth student, the willingness to take the time to track down a print source depended on "if I'm desperate for marks." This last comment encapsulates the dilemma faced by many undergraduates. On the one hand, there is the implicit—and often grudging—recognition that using print sources most likely leads to better grades; on the other hand, there is the pressing reality of ever-increasing time constraints because of busy lives off campus. Accommodations and compromises are therefore inevitable. Yet, as one student who often takes time to find "proper" sources—print sources containing exactly the required information—so as to submit "successfully" completed assignments put it, "I came to university to learn, so I might as well."

Print books containing exactly the required information were not only preferred to "good enough" electronic books (83.3%), but they were also preferred to the equivalent electronic book, albeit by a much smaller margin (57.1%) (see Table 9). Lisa Guernsey reports that many university library systems are making large investments in digital book collections.[25] Yet the undergraduates surveyed in the present study were reticent about the advantages of electronic books, citing a number of reasons why they prefer print books. Print books provide "an overall view of the information" and allow "looking at many pages, not just one page at a time like on the computer screen." Print books are easier to highlight and annotate, to "mark pages" for future reference, and "to read between classes," whereas electronic books would be "a hassle" and expensive to print out. Many students made a point of differentiating online books from online journals. Whereas they find it convenient and relatively painless to read online journals, they thought that books were too long to be read online. Reading an e-book would be both tiring on the eyes ("I hate reading off computer screens" was a typical comment) and constraining because of the need to sit in front of a computer screen for prolonged periods of time. A print book, on the other hand, could be read anywhere, in the most mundane or strangest of situations—the portability factor. However, if a book were needed for only a limited amount of information (e.g., one section or one chapter) and if the text were searchable, the online version would be very useful because of perceived time savings. In addition, a number of undergraduates noted that, whereas only one student could have access to a print book at one time, online books could be accessed by many students simultaneously.

In general, undergraduates who wanted to read substantial portions of a relevant book over the course of many hours and days preferred the print version. On the other hand, undergraduates who wanted to find out whether a certain book—one of many possible choices—was indeed relevant for them, wanted merely to "skim for quotations," didn't have to "read the whole thing," or wanted "to cut and paste quotations directly into my essays . . . and continue typing the essay in the midst of my research," preferred electronic books over their print equivalents. The purpose of an undergraduate's research is therefore an important consideration in choosing a print book or the equivalent electronic version. An equally important factor is time, or the lack thereof. Often, undergraduates who expressed positive feelings towards e-books did so in terms of the potential time savings—"time is a very important element," "time is valuable," "time is very limited." Because they are rushed, they therefore have little choice but to adopt the research techniques—searching for relevant keywords, cutting and pasting—that digital books facilitate. To be sure, undergraduates who prefer print books are also time-pressed in their own ways. However, students who preferred print books seemed willing to make time to read their books in a myriad of locations—between classes, while eating, while riding a bus—whereas students who preferred electronic books wanted only to use quickly-found information contained in a digital book to just as quickly and efficiently complete an assignment. This difference in emphasis again raises questions about whether digital books really contribute to in-depth learning or merely enable undergraduates students to complete assignments so that they can move on to the next task in their ever-increasingly time-strapped lives.

Conclusion

This study examined use of print resources by undergraduate students at a large Canadian university in relation to their use of online resources. About one-third of surveyed undergraduates still prefer print journals to online journals because e-journals have missing volumes and issues, do not contain all the information (e.g., graphs, diagrams, and letters to the editor) found in print journals, and long-term access and archiving issues with online journals have not been resolved. Print books are viewed as vital because they provide needed contextual, theoretical, and conceptual information indispensable for understanding a given topic, help generate ideas that lead to further investigation, and offer balanced analyses of a wide range of issues. Furthermore, use of print books was typically associated with the production of high-quality work, whereas use of online sources was invariably associated with the need to just get things done quickly and easily.

"Use of print books was typically associated with the production of high-quality work, whereas use of online sources was invariably associated with the need to just get things done quickly and easily."

Undergraduates across various disciplines do value print books and print journals, and they make extensive use of them when confronted with essays and assignments in which they want to excel. They are keenly aware that, for essays and assignments in which context, insight, and analysis is required, the use of print sources is necessary. In light of these results, academic libraries that want to attract students within their walls might want to seriously consider emphasizing their print collections as marketing tools. At the same time, these results also indicate the limitations of current post-object approaches to increasing library use. Students valued print sources over electronic ones not only for their depth of treatment, but also because they can be read anywhere—including outside of the library—over the course of hours and days carved out of the student's own schedule. Undergraduates turn to the library as a source of print research materials in part because of the flexibility they bring to the research process, suggesting that the plush chairs and coffee bars of post-object approaches are irrelevant to how students actually use print resources. The unique value of the academic library is the connection between the educative experience of the student and the relevance and robustness of the library's print collection, rather than the post-object ambiance in which the collection is packaged.

Based on some of the comments of the undergraduates presented above, academic libraries could instead make the explicit connection between, on the one hand, using print books and journals for essays and assignments and, on the other hand, getting better grades for those essays and assignments. If academic libraries limit themselves to stressing digital texts in a post-object setting, they may be inadvertently contributing to shrinking "the range of options our culture itself will have in gaining access to its own deepest wellsprings of knowledge and un-

derstanding" and to discouraging "the pursuit of understanding rather than mere information."[26] Some undergraduates already understand the connection between, on the one hand, increased use of the print sources that are only physically available at the academic library and, on the other hand, increased academic success and real gains in knowledge. In this regard, undergraduates may have a better grasp of the true function of the academic library than the academic library itself.

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