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UNL Libraries Book Use by Broad Discipline (Social Sciences, Sciences, and Humanities): Circulations and Renewals: Books Acquired 2003/04 – 2007/08 via Approval Plan Selection, Librarian Firm Order, and ILL Patron-Driven Acquisition

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Introduction

On numerous occasions over the course of the UNL Libraries' continuing discussions concerning the allocation of collections monies, the UNL Libraries' liaison librarians have made a variety of assertions, arguments, and claims concerning their patrons and their patrons' needs. For example, the humanities librarians have repeatedly staked a claim to the humanities' being the "book" discipline and have made a variety of assertions concerning humanities patrons and humanities books that could be treated as testable hypothesis. For example:

1) Humanities patrons use books more than do other disciplines' patrons;
2) Humanities patrons use more books than do other disciplines' patrons;
3) Humanities books are used more than are other disciplines' books;
4) Humanities books' circulation is an inadequate and/or inaccurate measure of humanities' patrons' need for and/or use of their books because it does not account for in-house usage, for ILL requests for returnables, or for circulation renewals (Note: this last argument has been that humanities patrons use books for deeper scholarship and for longer periods, so some portion of their potential circulations will be transformed into and lost as renewals);
5) …and so forth.

It would be, of course, impossible to provide a complete and comprehensive analysis of collections usage that would address every issue and objection, but the authors hope here to address a few of the above points somewhat.

Unfortunately, we cannot address the points concerning humanities patrons using books more or using more books than do the patrons of the other disciplines. Not least because of privacy concerns, the UNL Libraries simply does not track their patrons in a way that would allow for those analyses. Likely, patrons' revealed preferences in this area could only be approached somewhat obliquely via citation analysis. For similar reasons, we cannot address the point concerning in-house usage by patron affiliation without arranging for data to be collected through direct observation and demographic interviews. The point concerning ILL borrowing of returnables might be addressable in future as the Delivery/ILL department collects a tremendous amount of data, but that data is not available for analysis at the moment.

The questions that we can somewhat address here involve the books themselves:

1) Was a greater percentage of any one discipline's books circulated over the interval? Renewed? Did it matter who selected the book?
2) Did any one discipline's books experience more circulations? More circulations-and-renewals?
3) Which variables, in future, might be useful for predictively modelling circulation and/or circulations-and-renewals?

The Dataset and Analysis

For a different and separate project, the lead author had assembled a dataset of print books selected/acquired during the 2003/04–2007/08 school years via the UNL Libraries' approval plans, via its librarians' firm ordering process, and via the then-nascent ILL PDA program.[1] For this project, bibliographic and item records were drawn for all ILL PDA books in Library of Congress (LC) subclasses in which both approval plan selections and librarian firm orders had also occurred. Equal LC subclass-matched random samples were then drawn from the pools of approval plan selections and librarian firm

orders (henceforth referred to as Order Type). The circulation and renewal counts for the books were collected via the catalog between roughly eight-to-thirteen years after they had been added to the UNL Libraries' collection (Average period of availability = 11.6 years) and roughly twelve years on average after the books had been published.

As a result, the data analyzed here cannot be treated as a strictly representative sample of the books collected during the period or, more importantly, of the collection itself. However, past research comparing librarians' and patrons' purchases of books/allocations of funds by subject at the LC subclass level does suggest that these two Order Types produced quite similar distributions and that the librarians tended to be almost inhumanly consistent in their purchasing by LC subclass over the interval (Tyler et al., 2014). Therefore, the greatest potential for sampling error would lie with the approval plans as a selector. However, as the purpose of this report is merely to add to the Libraries' knowledge concerning whether the books of the three disciplines, and to a lesser extent of the three order types, behaved differently where circulations and renewals are concerned, the samples assembled here should provide a pretty fair test.

For purposes of analysis, the books were grouped according to discipline (i.e., Social Sciences, Sciences, Humanities) and sub-discipline (i.e., Topic) and according to Order Type (Approvals, Librarians, Patrons). For more information on the composition of the samples, please see Table 1 on the next page.

Analyses on the data were performed as follows:

1) Proportional usage was calculated and presented by discipline and by Order Type (only Order Type was tested using a test for nominal data);
2) Differences in circulation and in circulation-and-renewal performance by discipline were tested for using the Type III Test of Fixed Effects (an omnibus F statistic test for main effects and interactions);
3) Select variables were analyzed for covariance (ANCOVA) to assess the nature of their relationships, and period of availability on the shelves (Years_Avail) was specifically analyzed as a predictive/nuisance variable.

Conclusions

The conclusions to be drawn from the analyses below are fairly straightforward. Despite the myriad of arguments advanced by the library liaisons for the disciplines, when the disciplines' books were analyzed after roughly a decade on the shelves, there was nothing to distinguish Social Sciences, Sciences, and Humanities books from one another where circulation or circulation-and-renewal were concerned. The practical implication for the UNL Libraries would be that, *ceteris paribus*, monograph funds should be divided between the disciplines so that they each may purchase a roughly equal number of books. Of course, if the distribution of patrons on campus were to change substantially or if compelling evidence were to be discovered from analyses of ILL requests, for example, then a modification of this conclusion would be warranted.

Concerning the potential covariants accompanying the data: it would appear that they have no practical effect on longer-term circulation or circulation-and-renewal, even when they appear to be statistically significant, so they can likely be ignored in future analyses.

Table 1: Composition of the Samples by Discipline and Topic (Grouped LC Subclasses)

<u>Topics with ILL PDA Purchases</u>	<u>Books per Order Type</u>
Social Sciences:	
Anthropology & Recreation (GF-GN, GT-GV)	29
Business & Economics (HB-HG)	106
Education (LB, LC, LD, LJ)	47
Geography & Environmental Sciences (G-GE)	9
Law (K, KB-KBU, KF-KFZ, KJ-KKZ, KL-KWX, KZ)	43
Military & Naval Sciences (U, UG)	5
Political Science (JA-JF, JK, JN-JQ, JV, JZ)	45
Psychology (BF)	46
Social Sciences (General) & Statistics (H-HA)	9
Sociology & Related Fields (HM-HX)	152
Books per Order Type	**491**
Total Social Sciences Books	**1,473**
Sciences:	
Agriculture (SB, SF)	10
Arts & Crafts (TT)	1
Building Construction (TH)	1
Chemical Technology & Manufacturing (TP, TS)	18
Dentistry (RK) Life Sciences (QH-QR) 55	1
Engineering & Technology (General) (T-TD, TN)	23
Engineering (Mechanical, Electrical, & Automotive [TJ-TL])	17
Life Sciences (QH-QR)	55
Medicine (Clinical & Internal) (RC-RD, RF-RJ)	81
Medicine (General, Public Health, & Pathology) (R-RB)	40
Physical Sciences (QB-QE)	34
Science (General) & Mathematics (Q-QA)	59
Therapeutics & Pharmacy (RM-RS)	3
Books per Order Type	**343**
Total Sciences Books	**1,029**
Humanities:	
Architecture (NA)	37
English Language & Literature (PE, PR, PS)	82
Fine Arts (N, NB-ND, NK-NX)	70
General Works, Biography, Library & Information Science (AZ, CT, Z-ZA)	21
History (CB-CC, CN, D-DA, DC-DG, DJK-DK, DR-DU, E, F)	166
Music (ML-MT)	22
Non-English Languages & Literatures (PA, PJ, PL, PQ, PT)	18
Philology, Linguistics, & Literature (General) (P, PN)	65
Philosophy (B-BD, BH-BJ)	44
Photography (TR)	19
Religions (BL-BP, BR-BX)	71
Books per Order Type	**615**
Total Humanities Books	**1,845**

Note: No PDA books were purchased in LC subclasses not listed, such as *GR – Folklore*, so they were not included in the study. A slightly different iteration of this table appears in Tyler et al., 2019.

Question 1: Proportional Usage

The first question that will be addressed is whether the broad disciplines produced different proportions of circulated/non-circulated books and of renewed/non-renewed books. For interest, the authors will also include proportions by Order Type within disciplines. The authors' findings are displayed in Table 2:

Table 2: Proportional Recorded Usage by Discipline & by Order Type[2]		
Disciplines	% Circulated – Non-Circulated	% Renewed – Non-Renewed
Social Sciences	84% - 16%	57% - 43%
Approvals	73% - 27%	47% - 53%
Librarians	78% - 22%	54% - 46%
Patrons	100% - 0%	71% - 29%
Sciences	85% - 15%	55% - 45%
Approvals	71% - 29%	38% - 62%
Librarians	83% - 17%	55% - 45%
Patrons	100% - 0%	71% - 29%
Humanities	86% - 14%	57% - 43%
Approvals	77% - 23%	45% - 55%
Librarians	80% - 20%	53% - 47%
Patrons	100% - 0%	72% - 28%
TOTALS	**85% - 15%**	**56% - 44%**
Note: All percentages rounded to the nearest integer.		

As can be seen from the above, in terms of percentages of titles circulated vs. non-circulated, there was nothing to choose from among the three broad disciplines.

If the UNL Libraries' experience with these books proves to be generalizable, it should happily put the lie to the common wisdom that 40%-55% of books in academic libraries never circulate over the course of their lifetimes. This popular and widely disseminated piece of dogma is likely a measurement artifact. If UNL's experience is general, it would obviously be irresponsible and self-defeating for academic librarians to continue to promulgate this particular bit of pernicious hogwash (Fry, 2015). The lead author suspects that this piece of common wisdom should be regarded as meeting Frankfurt's (2009) definition for 'information' that has no place in professional or scientific discourse.

The next point to be addressed is whether there was a notable effect by Order Type. A glance at the table above would suggest that there was a slight but persistent difference in performance between Approvals, Librarians, and Patrons. The lead author ran a quick analysis to see whether this apparent difference by nominal category might be real (χ^2 [4, 3,680] = 1.394, p = 0.8452 [Preacher, 2001])[3] and found that the difference in the counts of circulated books by Order Type was not significant.[4]

The same general conclusion made for circulations by discipline can be employed for renewals, as well. A bit more than half of the books of each discipline experienced at least one renewal over the interval in question, and a bit less than half did not. There was, again, an apparent difference in the data distribution by Order Type, but an analysis of the renewal counts revealed this apparent difference to be, once again, not statistically significant (χ^2 [4, 2,455] = 2.982, p = 0.5608 [Preacher, 2001]).

Thus, one may conclude that the percentages of books experiencing circulations and the percentages experiencing renewals did not meaningfully vary by discipline or by Order Type.

Question 2: Circulation and Circulation-and-Renewal

The second question that will be addressed is whether the broad disciplines produced different circulation counts or different circulation-and-renewal counts for the sampled books. The authors' findings for the two tests are displayed in Table 3:

Table 3: Tests for Differences in Circulation and Circulation-and-Renewal

Circulation: **Type III Tests of Fixed Effects**

Effect	Num. DF	Den. DF	F Value	Pr > F
Discipline	2	4,344	0.18	0.8337

DISCIPLINE Least Squares Means

Discipline	Estimate	S.E.	DF	t Value	Pr >|t|	Mean	S.E. Mean
Social Sci.	1.3452	0.02646	4,344	50.84	<.0001	3.8391	0.1016
Sciences	1.3223	0.03175	4,344	41.65	<.0001	3.7522	0.1191
Humanities	1.3284	0.02369	4,344	56.07	<.0001	3.7751	0.08944

Circ-and-Renewal: **Type III Tests of Fixed Effects**

Effect	Num. DF	Den. DF	F Value	Pr > F
Discipline	2	4344	0.43	0.6510

DISCIPLINE Least Squares Means

Discipline	Estimate	S.E.	DF	t Value	Pr >|t|	Mean	S.E. Mean
Social Sci.	1.9411	0.03085	4,344	62.91	<.0001	6.9667	0.2149
Sciences	1.9718	0.03686	4,344	53.50	<.0001	7.1837	0.2648
Humanities	1.9294	0.02758	4,344	69.94	<.0001	6.8851	0.1899

As can be seen from the above, the p-values tells us that there were no statistically significant differences in circulation or in circulation-and-renewal performance between the disciplines. The mean circulation and mean circulation-and-renewal numbers for the disciplines were statistically indistinguishable.

Thus, the humanities' librarians assertions – that their patrons use books more and/or use more books – may well be true (given the ratio of social sciences, sciences, and humanities patrons, they likely are true), but from the perspective of the books themselves, these arguments are moot. The answers to questions one and two suggest that book funds should be distributed so that each discipline receives monies sufficient to purchase roughly equal numbers of books. Of course, if the balance of patrons were to shift noticeably, the allocation of monies probably ought to shift to match.

Question 3: Variables for Future Analyses

The third question that will be addressed is which variables, of those collected, might be useful for future analyses. When this data was drawn, a handful of potentially useful variables were included in the draw: response variables Circulations (Circs) and Circulations-and-Renewals (Circ_Renew) and possible 'nuisance' variables Date of Publication (PubDate), Amount Paid in dollars (Paid), and Years of Availability on the shelf (Years_Avail). The analysis technique selected for examining these variables was analysis of covariance (ANCOVA), a general linear model that combines analysis of variance (ANOVA) and regression. ANCOVA evaluates whether the means of a dependent variable (i.e., Circs or Circ_Renew) remain equal across levels of a categorical independent variable (i.e., Discipline), while controlling for the effects of other continuous covariates (i.e., potential confounding or nuisance variables). In order to successfully run an ANCOVA, it is important that each covariate be highly correlated with the response variable, but not with each other (if there are multiple covariates). The results of the second author's analysis are displayed in Table 4:

Table 4: ANCOVA for Selected Variables			
(Pearson Correlation Coefficients; N=4,347; Prob > |r| Under H0: Rho=0)			
	Circ_Renew	PubDate	Paid	Years_Avail
Circs	0.86575	-0.08090	-0.01123	0.05366
p =	*<.0001*	*<.0001*	*0.4591*	*0.0004*
Circ_Renew		-0.06902	0.01790	0.04393
p =		*<.0001*	*0.2380*	*0.0038*
PubDate			-0.04353	-0.58276
p =			*0.0041*	*<.0001*
Paid				-0.00092
p =				*0.9515*

The table above shows the correlations between the continuous variables in the dataset. As one might expect, the two potential response variables were very strongly correlated. None of the potential nuisance covariates (PubDate, Paid, or Years_Avail) was highly correlated with either of the potential response variables (Circs or Circ_Renew). However, as one might expect, publication date and years of availability were strongly correlated, so we probably could only include one if we were to employ a model that includes covariates.

When we run the ANCOVA, there are statistically significant p values for the years of availability, whether we are running the analysis with Circs or Circ_Renewal as the response variable. However, we are inclined to suspect that this might be the result of our having more than 4,300 observations. As can be seen from the Least Square Means portions of the tables (see Table 5 and Table 6 below), there may not be any practical differences between the disciplines when we control for years of availability. One would have to decide, for example, whether there really is any practical difference between 2.9, 3.2, and 3.6 circulations.

Table 5: Tests for Differences in Circulation between Disciplines, Controlling for Years of Availability
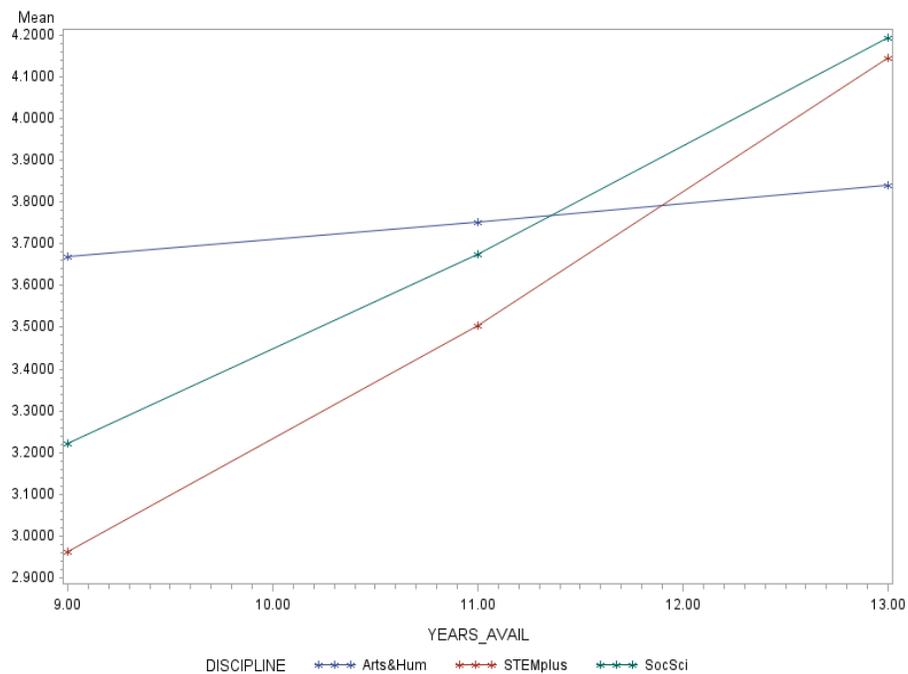
Circulations:

Type III Tests of Fixed Effects

Effect	Num. DF	Den. DF	F Value	Pr > F
Discipline	2	4,341	3.44	0.0320
Years_Avail	1	4,341	18.81	<0.0001
Yr_Avail*Disc	2	4,341	3.41	0.0333

DISCIPLINE Least Squares Means

Discipline	Years_Avail	Estimate	S.E.	DF	t Value	Pr >|t|	Mean	S.E. Mean
Social Sci.	9	1.1699	0.05969	4,341	19.60	<.0001	3.2215	0.1923
Sciences	9	1.0859	0.07713	4,341	14.08	<.0001	2.9621	0.2285
Humanities	9	1.2999	0.05124	4,341	25.37	<.0001	3.6688	0.1880
Social Sci.	11	1.3020	0.02933	4,341	44.40	<.0001	3.6768	0.1078
Sciences	11	1.2541	0.03734	4,341	33.59	<.0001	3.5046	0.1309
Humanities	11	1.3228	0.02526	4,341	52.38	<.0001	3.7538	0.09480
Social Sci.	13	1.4342	0.03848	4,341	37.28	<.0001	4.1964	0.1615
Sciences	13	1.4223	0.04423	4,341	32.16	<.0001	4.1465	0.1834
Humanities	13	1.3457	0.03635	4,341	37.02	<.0001	3.8408	0.1396

Mean Circ by Discipline and by Years of Availability

Note: Disciplines are listed as Arts&Hum, STEMplus, and SocSci in the accompanying graph.

Table 6: Tests for Differences in Circulation-and-Renewal between Disciplines, Controlling for Years of Availability

Circ_Renewal: **Type III Tests of Fixed Effects**

Effect	Num. DF	Den. DF	F Value	Pr > F
Discipline	2	4,341	3.13	0.0436
Years_Avail	1	4,341	9.95	0.0016
Yr_Avail*Disc	2	4,341	3.23	0.0397

DISCIPLINE Least Squares Means

Discipline	Years_Avail	Estimate	S.E.	DF	t Value	Pr >|t|	Mean	S.E. Mean
Social Sci.	9	1.7287	0.06891	4,341	25.09	<.0001	5.6332	0.3882
Sciences	9	1.8188	0.08673	4,341	20.97	<.0001	6.1647	0.5347
Humanities	9	1.9280	0.06013	4,341	32.06	<.0001	6.8759	0.4135
Social Sci.	11	1.8881	0.03403	4,341	55.48	<.0001	6.6066	0.2248
Sciences	11	1.9284	0.04263	4,341	45.24	<.0001	6.8788	0.2933
Humanities	11	1.9291	0.02944	4,341	65.53	<.0001	6.8833	0.2026
Social Sci.	13	2.0475	0.04496	4341	45.54	<.0001	7.7482	0.3484
Sciences	13	2.0380	0.05113	4341	39.86	<.0001	7.6756	0.3924
Humanities	13	1.9302	0.04270	4341	45.20	<.0001	6.8907	0.2943

Mean Circ_Renewal by Discipline and by Years of Availability
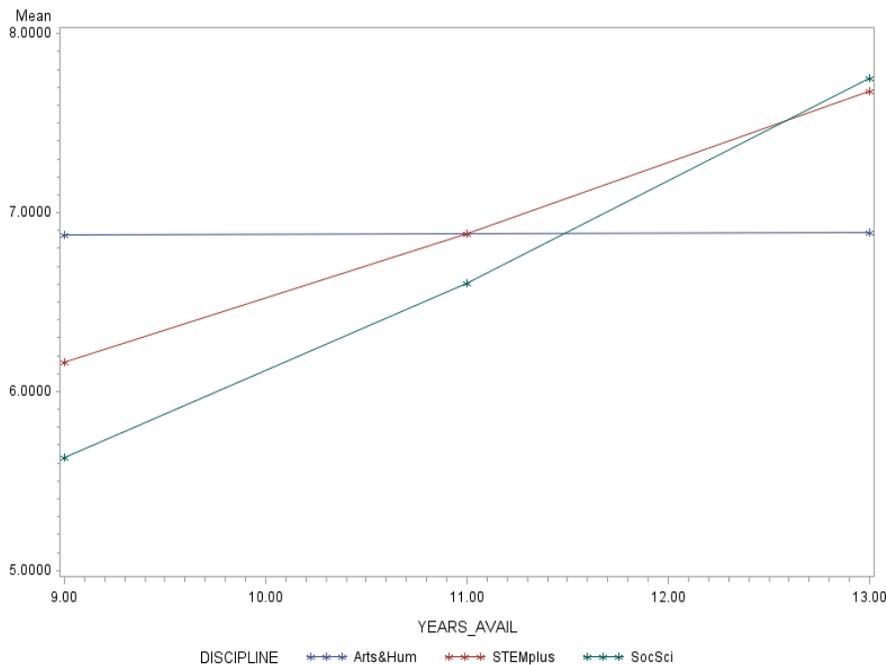
Note: Disciplines are listed as Arts&Hum, STEMplus, and SocSci in the accompanying graph.

Notes

1. The UNL Libraries' ILL PDA program was operated only for UNL students, staff, and faculty, and it conformed roughly to the function definition of a 'Purchase on Demand' program offered by Carrico, Leonard, and Gallagher (2016), albeit a lightly mediated one.

2. ILL PDA circulation numbers are likely slightly inaccurate. For the first three years of the program, circulations for requested items were collected manually, and items were credited with a circulation upon receipt. Thus, there may be a small error in the early data. If later data on books requested but not picked up by the requesting patron are indicative, roughly 30-33 ILL PDA books may have begun their lives on the shelves with a false circulation (Tyler et al., 2010).

3. Chi-square p values will be rounded to the nearest $1/10{,}000^{th}$ throughout.

4. Caution should be exercised when employing the chi-square test with large counts because the test can be quite sensitive to sample sizes (Healey, 2009). Thus, very large counts can produce positive results of questionable utility.

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