

School Libraries, Public Libraries, and the NAEP Reading Scores

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A multiple regression analysis utilizing data from forty-one states was performed. Significant predictors of NAEP reading comprehension test scores were the number of books per student in school library media centers and average circulation in public libraries. The amount of software in the school libraries was positively associated with reading scores, but not significantly. Surprisingly, increased library services was associated with lower reading scores.

The relationship between free reading and reading ability has been demonstrated in a wide variety of studies. Free reading, however, requires access to books; thus, it is no surprise to find positive correlation between access to books and reading ability.(1)

Children get a substantial percentage of books from libraries, both school and public, and some recent studies confirm that the quality of the library collection is a predictor of reading ability, both at the state level(2) and across countries.(3)

In this paper, the relationship between reading ability and library quality and use is probed for a single country, the United States, using states as a unit of analysis. In addition, because of the increasing investment by school libraries in computers and software,(4) the impact of software in school library media centers on reading is also investigated. Finally, it was of interest to determine whether those states that provided more school library services reported better reading scores.

Method

Fourth-grade scores on the 1992 NAEP Reading Comprehensive test were used as a measure of reading comprehension.(5) Scores from forty-one states were utilized, those for which complete data on other variables were available.

Data on elementary school library media centers were taken from White,(6) including the average number of books per student per state, the amount of software available (“machine-readable titles held”), and a measure of library service, which included the extent to which school library media centers provided services such as library skills instruction for students, inservices, reference assistance and technical assistance for teachers, and interlibrary loans. Service scores were calculated by listing twenty-two possible services a library could provide and scoring each 0 (never performed), 1 (occasionally performed), or 2 (routinely performed).

No data on children's use of public libraries were found; Chute,(7) however, reported data on average circulation per capita. This figure could represent a general interest in reading among the state's residents, the quality of the state's libraries, and, at least to some extent, children's use of the library.

To control the effect of financial resources, expenditures per pupil for each of the forty-one states (1989-1990) were included in the analysis.(8)

Results

Table 1 presents descriptive statistics and table 2 presents intercorrelations for all variables. Reading comprehension scores are positively correlated with the number of books per students in school library media centers ($p < .01$)(9) as well as with library use ($p < .01$). A modest positive correlation was found between software in school library media centers and reading ($p < .05$), and, surprisingly, a clear negative correlation was found between reading ability and library services ($p < .01$).

Table 1. Descriptive Statistics

Variable	Mean	Standard Deviation
RC: NAEP score	216.51	8.52
SL: Books	17.146	5.12
SL: Software	29.780	18.89
SL: Service	22.780	3.04
PL	5.839	1.89
Exp	4903.01	1476.50

NOTE: RC = scores on NAEP Reading Comprehension Test, fourth-graders; SL: Books = school library, number of books per child; SL: Software = school library, software available; SL Service = school library; services available; PL = public library, annual circulation per capita; Exp = expenditures per child.

Table 2. Intercorrelations among Variables

	SL: Books	SL: Software	SL: Service	PL	Exp.
RC	.495 ^a	.377 ^b	-.513 ^a	.559 ^a	.058
SL: Books		.423 ^a	-.035	.453 ^a	.205
SL: Software			.041	.315 ^b	.044

SL: Service				-.188	.051
PL					.090

$N = 41$; ^a $p < .01$; ^b $p < .05$

Table 3 presents the results of a multiple-regression analysis in which all predictors were entered simultaneously. The results are similar to the correlational data in table 2: both public library and school library variables are significant predictors of reading scores, while library services is a strong negative predictor. The effect of software was positive but fell short of statistical significance, while expenditures per student had no effect. The predictors accounted for a remarkable 60 percent of the variance among reading scores.

Table 3. Multiple-Regression Analysis

Predictor	b	beta	Stand. error	t	P
SL: Books	.4459	.2680	.2151	2.07	.046
SL: Software	.08659	.1929	.05403	1.59	.120
SL: Service	-1.2819	-.4566	.3073	-4.17	.0000
PL	1.3196	.2928	.5576	2.37	.024
Exp	-.000046	.0264	.0006309	-.07	.942

dependent variable = scores on NAEP RC test $r^2 = .602$; adjusted $r^2 = .545$; $s = 5.746$; $F = 10.59$; $p < .001$

Indicators of school library quality and public library use were significant predictors of reading comprehension scores. This supports, on a national level, previous findings at the state and international level, and is consistent with the many previous studies showing that free reading is a consistent predictor of reading ability and that libraries are a major source of reading for children.

The effect of software was positive and approached significance in the regression analysis. We have, however, no information about how the software was used, or whether it was used at all. In addition, Lance et al.(10) reported no impact of a school library computer factor (number of computers in the school library, number of instructional uses of computers) on reading comprehension scores for five of six grades investigated,(1,4,5,7,10) and found a negative relationship between the computing factor and reading scores for second-graders.

Expenditures for education did not affect reading comprehension test scores. Lance et al. also found that total school expenditures were not related to reading scores, but did report that money invested in the school library media center has an effect on collection size, which in turn affects reading test scores.(11) This suggests that for money to affect reading scores, it needs to be invested in the library.

The negative impact of library services is puzzling. It could mean that librarians who provide more services neglect more important aspects of the library: access to books. The negative relationship, however, could simply be a reflection of concern-librarians in states with low reading scores and less access to books may attempt to compensate by providing more services. This negative relationship, however, has not been reported elsewhere. Lance et al. reported that a factor labeled Library Media Specialist Role (hours per week for “media-endorsed staff hours and hours spent by...staff identifying materials for teacher-planned instructional units and collaborating with teachers in planning such units” [p. 60]), while not directly related to reading comprehension test scores, was related to the size of the library collection, which in turn was related to reading scores.(12)

The results of this study are thus not consistent with previous research in the areas of software and library services. They are, nonetheless, very consistent with research on reading and on the role of libraries, and provide indirect support for the hypothesis that it is reading that is largely responsible for literacy development.

Some caution is called for. The presence of some multicollinearity,(13) as well as the fact that only one measure for each of the variables was used, indicates that replication is in order. The fact that the findings on the effects of the library are so similar to those reported in other studies, however, gives them some credibility.

Acknowledgment

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References And Notes

1. Stephen Krashen, *The Power of Reading* (Englewood, Colo.: Libraries Unlimited, 1993).
2. Keith Lance, Lynda Wellborn, and Christine Hamilton--Pennell, *The Impact of School Library Media Centers on Academic Achievement* (Castle Rock, Colo.: Hi Willow, 1993).
3. Warwick Elley, *How in the World Do Students Read?* (Hamburg, Germany: International Assn. of the Evaluation of Educational Achievement, 1992).
4. Marilyn Miller and Marilyn Shontz, “Expenditures for Resources in School Library Media Centers, FY 1991-92,” *School Library Journal* 39 (Oct. 1993): 26-36.
5. Ina Mullis, Jay Campbell, and Alan Farstrup, *NAEP 1992 Reading Report Card for the Nation and the States*. Washington, D.C.: U.S. Dept. of Education, Office of Educational Research and Improvement, 1993.

6. Howard D. White, "School Library Collections and Services: Ranking the States," *SLMQ* 19 (Fall 1990): 13-26.
7. Adrienne Chute, *Public Libraries in the U.S.: 1990*. Washington, D.C.: U.S. Dept. of Education, Office of Educational Research and Improvement.
8. Mullis, Campbell, and Farstrup, *NAEP 1992 Reading Report Card*.
9. Inspection of the scatterplot for the correlation between books per student in school library media centers and reading scores revealed a hyperbolic relationship: high reading scores were possible with few books per student, but many books per student was consistently associated with a high reading score, suggesting that a good library will nearly always help, but that children may get books from other sources. A more linear relationship was found between the two variables by transforming the independent variable. Transforming x (books per student) into $-1/x$, for example, results in a correlation of .562, a modest improvement over the original .495. The original untransformed value was kept in the regression analysis for ease of interpretation.
10. Lance, Wellborn, and Hamilton-Pennell, *The Impact of School Library Centers on Academic Achievement*.
11. Ibid.
12. Ibid.
13. Because of the correlations among some of the predictors (table 2), a test of multicollinearity was performed; all independent variables were regressed on one another. The results confirmed the presence of some multicollinearity:
 $dep. variable = r^2$
SL: books = .643
SL: software = .418
SL: service = .052
PL = .261
exp = .043
This modest degree of multicollinearity could be reduced by eliminating some predictors and doing a new analysis. Barry and Feldman (1985) note, however, that the consequences of misspecification are more serious than the consequences of multicollinearity. Thus, a new analysis was not performed. Instead, as Barry and Feldman suggest, we "recognize its presence but live with its consequences" (p. 49). The consequences include the fact that parameter estimates may vary widely among samples. Thus, replication of these results with other samples is called for (William Barry and Stanley Feldman, *Multiple Regression in Practice*). (Newbury Park, Calif.: Sage, 1985).