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# SAT verbal scores and the library: Presdicting high school reading achievement in the United States.

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**ABSTRACT**

Several researchers have found the quality of school and public libraries is a significant predictor of academic achievement in elementary and secondary schools. This study analyzes the impact of libraries on one measure of reading proficiency at the high school level, the Scholastic Aptitude Test (SAT). In order to determine the relative importance of possible predictors of the average SAT-Verbal scores from each of the 50 states and the District of Columbia, per pupil expenditures, computer software holdings, teacher-to-student ratio, public library circulation, and books per student in the school library media center (SLMC) were entered into a multiple regression analysis. Only public library circulation and books per student in the SLMC were significant predictors of reading achievement.

Several studies have shown that library holdings have a direct and powerful impact on reading achievement scores. Lance, Welborn, and Hamilton-Pennell (1993) found that the quality of the school library was the most powerful predictor of academic achievement among several variables analyzed at the state level. Krashen (1995) found a similar relationship for elementary school students when examining data at the national level in the United States, and Elley's (1992) comparison of reading scores and library data from several countries came to the same conclusion. The tie between access to books and reading scores supports numerous other studies (see Krashen, 1993 for review) which have shown that self-selected free reading is an important factor in literacy development.

The present study seeks to expand and confirm previous findings on predicting reading comprehension scores (Krashen, 1995) by examining data from high school students in the United States, using the verbal section of the Scholastic Achievement Test (SAT) scores as a measure of reading achievement. In order to determine relative importance of possible causal variables in reading achievement, the impact of school library software holdings, books per pupil in the school library, public library circulation, overall per pupil expenditures and teacher-pupil ratio were examined.[1]

## METHOD

The following variables were selected for examination, with the 50 states and the District of Columbia (N=51) used as the units of analysis:

1. Scholastic Aptitude Test (SAT)-- Verbal Section: As a measure of reading comprehension and vocabulary knowledge, the mean score of each state from the verbal section of the SAT test from the year 1987-1988 was used, as reported in Snyder and Hoffman (1990). However, since a state's mean SAT score is very strongly and negatively related to the percentage of total high school students taking the exam (r = -.86), this percentage was used as a weighting variable in the analysis to control this source of bias in the scores.

2. Books per pupil in public schools: The most recent national data on school library holdings is from the school year 1985-1986 (Cahalan, Hernandez, & Williams, 1987; reanalyzed in White, 1990). Total number of books per pupil for White's "high school" category was used.

3. Per pupil expenditure in public schools: As a control for socio-economic status differences among states, per pupil spending was included for the year 1987-1988 as found in Snyder and Hoffman (1990).

4. Computer software: Due to the increased spending on computers by school library media centers (Cahalan, Hernandez, & Williams, 1987: Miller & Shontz, 1989), the average number of machine-readable titles in the high school library for 1985-1986 school year was included, as reported in White (1990).

5. Public library circulation: Krashen (1995) found that public library circulation by state was a significant predictor of elementary student reading scores. To test whether a similar relationship exists at the high school level, the per capita library circulation by state in the year 1989 as reported in Podolsky (1991) was included.

6. Teacher-pupil ratio: In order to provide some rough measure of classroom instructional quality, the teacher to pupil ratio for the school year 1987-1988 was included as given in Morgan (1990).

## RESULTS

Table 1. presents the means and standard deviations for the dependent and independent variables, and Table 2. provides the intercorrelations for all the variables. Three relationships were significant: SAT scores were positively correlated with both the number of books per student in the school library and the per capita public library circulation, while the number of books per pupil was negatively correlated to the teacher to pupil ratio. It appears that states that have less library holdings also have more crowded classrooms. No other significant correlations were observed.

**Table 1. Descriptive Statistics**

| *Variable* | *Mean* | *Standard Deviation* |
|---|---|---|
| SAT-Verbal | 451.82 | 30.14 |
| Books | 15.31 | 4.97 |
| Expenditure | 4231.04 | 1152.67 |
| Software | 42.11 | 59.64 |
| Public library | 5.81 | 1.79 |
| Teacher-pupil | 17.19 | 2.39 |

**Table 2. Intercorrelations Among the Variables**

| | *Books* | *Expenditures* | *Software* | *Public Library* | *Teacher-Pupil* |
|---|---|---|---|---|---|
| SAT-Verbal[1] | .29* | -.13 | .01 | .34* | -.11 |
| Books | | -.06 | -.10 | .10 | -.37** |
| Expenditure | | | -.04 | .17 | -.20 |
| Software | | | | .09 | .04 |
| Public Library | | | | | .01 |

1 = partial correlations controlling for percent of students taking the SAT by state. * = $p < .05$; ** = $p < .01$.

Table 3. shows the results of the multiple regression analysis, using the SAT-Verbal scores as the dependent variable (weighted by the percentage of students taking the exam by state), with all predictor variables entered simultaneously. Public library circulation was the only variable to meet the .05 alpha level for significance, although books per pupil came very close (p = .10). None of the other variable -- teacher-pupil ratio, computer software holdings, or per pupil expenditures -- were good predictors of SAT verbal performance. The amount of variance accounted by the combined variables was a modest 21%.[2]

**Table 3. Multiple Regression Analysis**

| *Predictor* | *b* | *beta* | *Standard error* | *t* | *p* |
|---|---|---|---|---|---|
| Books | 1.1500 | .2339 | .6946 | 1.65 | .10 |
| Expenditures | -.0032 | -.1705 | .0025 | -1.23 | .22 |
| Software | .0338 | .0732 | .0622 | .54 | .58 |
| Public library | 4.18 | .3227 | 1.7664 | 2.36 | .02 |
| Tchr./student | -1.0376 | -.1070 | 1.3555 | -0.75 | .45 |

$r^2 = .21$; adjusted $r^2 = .12$; $F = 2.44$, $p < .05$.

## DISCUSSION

The present study found that the school library quality and public library use were the most reliable predictors of reading achievement at the high school level in the United States, even when controlling for such factors as per pupil spending, classroom size, and amount of computer software available. It is consistent with other findings at the international, national, and state levels for both elementary and secondary students, and it supports a wider body of evidence that self-selected pleasure reading is a strong predictor of reading performance (Krashen, 1993).

The current findings differed somewhat from Krashen's (1995) analysis at the elementary level in terms of the importance of software. While the present analysis found no effects for software on reading scores, Krashen found that same variable trended toward significance in predicting National Assessment of Educational Progress (NAEP) scores for fourth graders in the United States. Lance et al. (1993), however, did not find any impact in their study at the state level for a school library computer factor (consisting of the number of computers in the school library and the number of uses made of them) for five of six grades examined, and a significantly negative impact for grade two. Analysis of the effect of computers on developing literacy have shown little to no impact in many other school settings (Krashen, forthcoming).

As in previous studies, school expenditures did not directly predict reading scores among high school students. Lance et al., in a more sophisticated path analysis, found that spending affects reading achievement only so far as it has an impact on the collections of the school library. A more detailed examination of the relationship between total spending and library expenditures is needed to confirm this finding at the national level. Similarly, class size as determined by teacher-student ratio did not by itself predict high school reading achievement. Again, Lance et al. found that such a relationship was mediated by the school library: teacher-student ratio was related to school library media center size, which in turn, predicted academic achievement. The significant correlation in the current study between teacher-student ratio and books per pupil supports Lance et al.'s finding, in that the larger the average classroom (larger the number of students per classroom), the fewer the number of books per student in the school library.

A separate multiple regression analysis was also conducted using the total number of books in the school library (from White, 1990) as a predictor of SAT scores (in place of the amount of computer software). Surprisingly, the total number of books turned out to be a significant and negative predictor of SAT reading scores (b = -.34). Krashen reports (personal communication, September 15, 1995) that there was a slightly negative but non-significant correlation between total number of school library books at the elementary level and NAEP scores (r = -.03). Lance et al. (1993), on the other hand, found that the total number of books was positively and significantly related to academic achievement. It appears, then, that in some cases, the number of books per student is the critical factor, and in other cases, the critical factor is the total number of books. Krashen (see Krashen and O'Brian in this issue of IMJ) has hypothesized that there may be a minimum threshold of total number of books and books per person before either measure will have an impact on reading scores.

## NOTES

1. Krashen (1995) found multicollinearity (high intercorrelation) among the variables used in his study, which, in addition to the use of only one measure per variable, indicates that replication is called for. The present study, by using a separate set of data points from previous years, seeks in part to confirm those findings.

2. Krashen (1995) found that his variables predicted 60% of the variance. The difference may be due to variable selection -- his use of a measure of library service in place of the current study's use of teacher-pupil ratio. It may also be that the SAT-Verbal section taps long-term literacy development that may be better accounted for by previous exposure to books or other factors than by current indicators such as those used here.

Also unlike in Krashen's analysis, there appeared to be little multicollinearity indicated among the independent variables. Nevertheless, to test for this potential problem, all the independent variables were regressed on one another, as in Krashen's study. The results indicated a very small amount of variance predicted by the other variables:

| *Dependent Variable* | $r^2$ |
|---|---|
| Teacher-pupil ratio | .19 |
| Books | .18 |
| Per pupil expenditure | .10 |
| Public library circulation | .06 |
| Software holdings | .02 |

## REFERENCES

Cahalan, M., E. Hernandez, and J. Williams. Statistics of Public and Private School Library Media Centers, 1985-1986 (with Historical Comparisons from 1958-1985). Washington D.C.: Center for Educational Statistics, U.S. Department of Education, 1987.

Elley, W. How in the World do Students Read? Hamburg, Germany: International Association of the Evaluation of Educational Achievement, 1992.

Krashen, S. The Power of Reading. Englewood, CO: Libraries Unlimited, 1993.

Krashen, S. "School Libraries, Public Libraries, and the NAEP Reading Scores." School Library Media Quarterly 23 (1995): 234-237.

Lance, K., L. Welborn, and C. Hamilton-Pennell. The Impact of School Library Media Centers on Academic Achievement. Castle Rock, CO: Hi Willow Research and Publishing, 1993.

Miller, M., and M. Shontz. "Expenditures for Resources in School Library Media Centers, FY 1988-89." School Library Journal 35 (1989): 31-40.

Morgan, F. State Profiles of Public Elementary and Secondary Education, 1987-1988. Washington, D.C.: Office of Educational Research and Improvement, U.S. Department of Education, 1990.

Podolsky, A. Public Libraries in 50 States and the District of Columbia: 1989. Washington D.C.: Office of Educational Research and Improvement, U.S. Department of Education, 1991.

Snyder, T., and C. Hoffman. Digest of Educational Statistics, 1990. Washington, D.C.: Office of Educational Research and Improvement, U.S. Department of Education, 1990.

White, H. "School Library Collections and Services: Ranking the States." School Library Media Quarterly 19 (1990): 13-26.

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