McQuillan, J. (1996, August). The effects of print access on reading acquisition [Conference Presentation]. Whole Language Umbrella Conference, St. Paul, MN, USA.

The Effects of Print Access on Reading Acquisition

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Paper presented at the Whole Language Umbrella Conference, St. Paul, MN, August, 1996

Abstract

Most research of reading acquisition has focused on instructional and individual cognitive factors. Little attention has been paid to the role of access to texts as a critical component in explaining variations in literacy development. The effects of access to print and free reading on fourth graders in a large national sample were found to account for a high proportion of variance in reading achievement among states. These results highlight the importance of access in explaining differences in reading acquisition.

Over the past three decades, the debate over which factors contribute most significantly to reading acquisition among elementary age children has centered largely on questions of either pedagogical practice (1, 2) or individual cognitive processes (3, 4).. The research on instruction has focused, for example, on whether initial reading instruction should emphasized the teaching of phonics, or use a more "meaning-centered" curricula. Experimental psychologists have examined issues such as word recognition, phonological processing, and eye movements in attempting to understand reading acquisition and development. Many theorists and practitioners would acknowledge, however, that the amount of actual reading done is critical in determining how well all children read in terms of reading comprehension, vocabulary development, and other measures of literacy (5, 6, 7, 8).

Despite this general agreement on the importance of wide reading in literacy acquisition, relatively little attention has been paid to the effect of access on reading development, the extent to which the availability of reading materials influences how much and how well children read. This is perhaps because it has been assumed that there are no substantial differences in access to reading material among children. However, there is a growing body of evidence suggesting that access to print does indeed vary greatly among schoolchildren, and that there are large disparities in the amount of text children have available for them to read at home, at school, and in the community (9, 10). Several recent studies have suggested that these certain differences in access can explain a large portion of the variance in reading achievement scores among school districts, states, and countries.

Lance, Welborn, and Hamilton-Pennell (11) found at the state level that the access to books in school via the library was the most powerful predictor of academic achievement among several variables analyzed, including socio-economic status, per pupil expenditures, and teacher-student ratio. Krashen (12) found a similar relationship for elementary school students when examining data at the national level in the United States. Elley's (13) comparison of reading score and home environment and school and public library data from several countries came to the same conclusion that access to print was a significant and powerful correlate of reading achievement. The tie between access to books and reading scores supports numerous other studies (14) which have shown that self-selected, free reading contributes substantially and directly to literacy development.

There is also evidence suggesting that poverty contributes to reading achievement indirectly, via the number of books and print materials in the home and the community. In an analysis of a large national data set on American school children, Ortiz (15) found that students from low socio-economic status (SES) families had less reading materials at home and were exposed to less reading in the home compared with students from more highly educated families. Controlling for the level of SES, Ortiz also found that the impact of reading materials in the home and the extent of family reading was significant and substantial, suggesting that print environment is the critical variable affecting reading acquisition, not poverty per se. Okagaki, Frensch, and Gordon (16) similarly found that in a sample of low SES Latino youths high achieving students came from significantly more literate environments than their less successful peers.

The present study attempts to provide a more complete analysis of the effects of various measures of print access on literacy acquisition by examining state-level data drawn largely from a nationally representative sample, the 1992 National Assessment of Educational Progress (NAEP) reading test as administered by the U.S. Department of Education. Given the potential theoretical and empirical importance of teaching methods as noted by other researchers, it was also decided to include indicators of "code-focused' or phonics instruction as part of the possible factors affecting reading achievement. A path analysis is proposed to help account for the relationship between various measures of print access, amount of reading, instructional method, and reading achievement.

Drawing from the research on literacy acquisition discussed above, a set of seven constructs were hypothesized to influence reading achievement. Table 1 lists the sixteen measured variables that were selected to represent these constructs. All data were drawn from the NAEP Data Compendium Report (10) unless otherwise noted in Table 1. The NAEP is a biannual assessment of academic progress among a nationally representative sample of over 26,000 students in grades four, eight, and twelve. Only students in the fourth grade sample were used in this analysis, since specific information for other grade levels was unavailable for all of the factors of interest. Forty-one states plus the District of Columbia and Guam participated in the 1992 testing, but since data were not available on Guam for some of the variables, it was excluded from the analysis, resulting in a total sample of 42.

First, a correlational analysis was run on all sixteen variables. An exploratory factor analysis using principal components extraction and varimax rotation was conducted on those measured variables thought to be indicators of the relevant latent variables in order to see whether there was justification for the creation of composite scores among the variables in question. The six latent variables hypothesized were Poverty, Print at Home, School Library Quality, Public Library Quality, Free Reading, and Skills Instruction. Reading comprehension and Use of the Library, each having only one indicator, were excluded from the factor analysis.

Insert Table 1 about here

Following the exploratory factor analysis, composite scores of the variables were computed and reliabilities of the factors (Cronbach's alpha) were determined. Next, a path model was tested through a series of simultaneous multiple regression analyses to determine the beta weights and significance of the paths in the structural equations (17).. In addition, a goodness of fit test was calculated for the model as a whole. Finally, two hierarchical multiple regressions were run to test the contributions of various factors of the model to the amount of variance explained.

Table 1 shows the means and standard deviations of the sixteen variables, along with the reliability estimates of each of the hypothesized composite variables. Table 2 lists the correlations among the variables. Several of the relationships were significant. Most notable are the strongly positive correlations between Books in the Home and NAEP score, and the negative relationship between the measures of poverty (School Lunch and Children in Poverty) and books in the home, as well as the poverty indicators and NAEP score.

Insert Table 2, 3, 4, 5 and 6 and Figure 1 about here

Table 3 shows the results of the exploratory factor analysis. Caution must be taken in interpreting these results, given the small sample size relative to the number of variables analyzed (18). The factor analysis results reflect the predetermined number of six factors hypothesized to exist. The results were very close to what was expected by the theoretical considerations, with two exceptions: the poverty and phonics indicators loaded onto a single factor, and the Sustained Silent Reading (SSR) variable loaded on to its own factor (Factor 6). All other variables loaded on to distinct factors as anticipated. It was decided to separate the phonics and poverty variables into separate composite scores as originally proposed, since while related, the poverty of a state and its use of skills instruction are clearly two separate constructs. The SSR variable was added to the composite variable of free reading, justifiable again for theoretical reasons, since SSR is likely to contribute to the amount of pleasure reading done.*

Composite scores were created for each latent variable. Figure 1 shows a path model that was constructed based on previous research rationale outlined above, which indicates that poverty affects print environment in the home, which in turn affects the amount of free reading done and subsequent reading achievement. Library quality is also thought to affect use of the library, which in turn affects the amount of free reading done and consequently reading achievement. Finally, phonics instruction is thought to affect reading achievement directly. Beta weights are indicated in Figure 1, along with the disturbances/errors for each dependent variable (calculated from the square root of 1 - R squared (16). The alpha level of significance was .05. All the hypothesized paths were significant.

All of the path coefficients were positive except those between Poverty and Print at Home, and Phonics and Reading Achievement. The greater the level of poverty, the less amount of print in the home. The strongly negative path between phonics instruction and reading comprehension indicates that more skills instruction was related to lower reading scores in a state.

To calculate the relative amount of variance that each factor accounted for in the model, a hierarchical multiple regression was performed as suggested by Kerlinger and Pedhazur (16), entering the factors closest to the final dependent variable first. Results are shown in Table 6, Order A. In addition, to test the relative contributions of print versus home factors, another regression analysis (Order B) was run examining the effects of print access and use versus instructional method and poverty.

The total amount of variance accounted for was 85%. In Order A, free voluntary reading and skills accounted for 45% of the variance in NAEP reading scores, with library use and print at home adding a significant 36%. Poverty along with school and library quality added no significant increase in the variance explained. In Order B, print access via the library and free voluntary reading account for 61% of the variance, with print at home adding a significant 19%. The amount of skill use and poverty both contributed additional amounts of variance and, although the changes were significant, they were very small.

The goodness of fit for the model was tested by seeing whether the model accounted for a greater amount of variance than a simple simultaneous multiple regression of all the independent variables on reading comprehension--that is, greater than 85% (see Table 6) (19). The generalized squared multiple correlation was computed by the formula one minus the product of the squared residual path coefficients (1 - R squared) as determined by each regression equation in the model. The result of the test was .95, demonstrating that the model was able to account for more variance than the simple regression equation.

The results provide further support to the notion that print access has a strong and powerful effect on reading scores through the amount of free reading done by children, even without including instructional method in the analysis. The high amount of variance explained by the free reading factors alone--80%--speaks to the importance of pleasure reading in literacy acquisition and development. The relationships between poverty and print at home, and library quality, library use, and amount of reading are also consistent with previous research on libraries and their impact on reading achievement (12). The finding regarding the very negative impact of phonics instruction is more problematic, since it may be argued that poorer readers need more phonics instruction, and therefore the direction of the path from Phonics to Reading Comprehension is misleading. In any case, the increase in the amount of variance explained by this instructional factor was, although significant (Order B), rather small once all other factors were entered into the regression analysis.

Access to print does, then, seem to have a significant influence on reading acquisition among school children, at least as measured by the instruments used in NAEP standardized assessment. There are; however, important limitations to the analysis which make these findings only suggestive at this point. First, the path analysis technique itself is not strictly speaking able to demonstrate causality, and the small sample size of this study prevented us from using more sophisticated structural equation modeling techniques in testing the goodness of fit of the model to the data (20). Second, using the state as the level of analysis obscures other possible confounding variables that may affect student performance. Nevertheless, the results of the path model are substantially consistent

previous research on these relationships. One practical implication of these relationships is that schools can make substantial contributions to their student's literacy development by increasing access to print in the school library, particularly for those students who have no other source of reading materials at home or in the community.

Note

* It should be noted that the factor loading of SSR on the free reading factor was the second highest SSR loading on a factor (.351), and that SSR correlated very highly with the two other variables included in the composite, frequency of reading and books read. Also, the specification of the EFA to produce six factors and the loading of poverty and phonics variables onto a single factor meant that at least one other variable had to be loaded onto a distinct factor.

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Table 1
List of Variables Used in Analysis

Poverty

1. School Lunch: percentage of schools in the state with more than 75% of their students enrolled in free lunch programs.
2. Children in Poverty: The percentage of children 5-17 years-old in the state who live in families with income below the federal poverty line (21).

Print at Home

3. Books at Home: percentage of families having more than 25 books in the home.
4. Magazines: percentage of families subscribing to at least one magazine regularly.
5. Newspaper: percentage of families subscribing to a newspaper.

School Library Quality:

6. SL Books: the number of books per pupil in the school library (22).
7. SL Subscriptions: the number of magazine subscriptions per pupil in the school library (22).

Public Library Quality:

8. PL Books: the number of books per person in the public library (23).
9. PL Subscriptions: the number of magazine subscriptions per person in the public library. (23).

School and Public Library Use:

10. Library Use: the percentage of students who checked books out of the school or public library for their own enjoyment at least once in the last month.

Free Reading:

11. Books Read: the percentage of students who read at least one book for their own enjoyment in the last month.
12. Frequency: the percentage of students who read for fun on their own time at least once a month.
13. Sustained Silent Reading (SSR): the percentage of students who are provided time for reading books of their own choosing in school at least once a week (as reported by the student).

Skills:

14. Phonics: the percentage of teachers who place a heavy emphasis on phonics in reading instruction.
15. Decoding: the percentage of teachers who devote almost all of the instructional time to decoding skills.

Reading Comprehension:

16. NAEP Score: the median state NAEP 4th grade reading score.

Table 2
Means and Standard Deviations of Variables and Factor Reliability (N=42)

	Mean	SD	Reliability
POVERTY			.87
School Lunch	13.47	11.29	
Children in Poverty			
PRINT AT HOME			.93
Books at Home	87.74	5.89	
Magazines	62.67	6.50	
Newspapers	68.47	5.30	
SCHOOL LIBRARY			.78
SL Books	17.21	5.07	
SL Subscriptions	5.67	2.77	
PUBLIC LIBRARY			.65
PL Books	2.76	.94	
PL Subscriptions	7.34	2.97	
LIBRARY USE	84.53	2.81	n/a
FREE READING			.80
Books Read	92.81	1.95	
Frequency	87.35	2.38	
SSR	81.23	3.82	
SKILLS			.88
Phonics	13.70	6.40	
Decoding	19.9	8.92	
NAEP SCORE	215.65	9.77	n/a

Table 3
Intercorrelations Among Measured Variables (N = 42)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. School Lunch	1															
2. Children/Poverty	80	1														
3. 25 Books	-78	-71	1													
4. Magazines	-54	-60	86	1												
5. Newspaper	-42	-51	73	80	1											
6. SL Books	-36	-50	54	64	58	1										
7. SL Subscriptions	-20	-29	38	49	36	76	1									
8. PL Books	-25	-39	62	65	58	36	20	1								
9. PL Subscriptions	-30	-41	57	66	58	41	23	84	1							
10. Use Library	-66	-71	68	60	68	55	36	41	47	1						
11. Books Read	-54	-60	57	43	55	36	07	38	41	67	1					
12. Frequency Read	-26	-35	56	58	69	36	02	59	59	63	72	1				
13. SSR	-53	-57	71	56	60	42	27	47	49	62	62	58	1			
14. Phonics	77	70	57	-36	-30	-22	-08	-27	-30	-60	-51	-23	-40	1		
15. Decoding	79	72	70	-52	-34	-29	-13	-35	-42	-58	-62	37	-62	81	1	
16. NAEP Score	73	-73	87	81	70	49	38	62	58	70	42	41	58	-59	58	1

All correlations above .30 are significant at .05 alpha level.

Table 4
Factor Loadings of Variables

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Phonics	.9195	-.14045	-.0100	-.1282	-.0008	.0406
Decoding	.8497	-.2117	-.0438	-.1747	-.2261	-.3078
School Lunch	.8755	-.0129	-.1084	-.0693	-.3248	-.1557
Poverty	.7846	-.1518	-.2743	-.2151	-.2261	-.0686
PL Books	-.1411	.8870	.0977	.1725	.2364	.0962
PL Subscriptions	-.1837	.8856	.1589	.2046	.1432	.1076
SL Subscriptions	-.0577	.0807	.9396	-.1157	.1112	.1247
SL Books	-.1786	.1745	.8618	.2530	.2177	.0093
Books Read	-.4703	.1323	.0778	.8045	.0627	.1790
Frequency Read	-.0704	.4102	-.0032	.7767	.3441	.1605
Newspaper	-.1584	.3301	.2919	.4359	.6881	.1070
Magazines	-.3195	.4582	.3848	.1389	.6539	.1258
25 Books	-.5629	.3424	.2401	.1551	.5786	.3050
SSR	-.3492	.2389	.1804	.3518	.2166	.7646

Table 5
Intercorrelations Among Composite and Measured Variables in Path Analysis

	1	2	3	4	5	6	7	8
1. Poverty	1							
2. Print/home	-67	1						
3. Library Use	-72	70	1					
4. School Lib.	-39	59	51	1				
5. Public Lib.	-36	68	47	36	1			
6. Free Reading	-58	73	73	37	59	1		
7. Skills	83	-54	-62	-23	-39	-57	1	
8. Score	-77	86	70	47	61	57	-62	1

* = $p < .05$

Table 6
Hierarchical Multiple Regressions on Path Factors

Order A	Factor	R Square	R Square Change
	Free Reading	.45	---
	Skills		
	Library Use	.81	.36*
	Print at Home		
	School Library	.85	.04*
	Public Library		
	Poverty		
Order B			
	Free Reading	.61	---
	Library Use		
	School Library		
	Public Library		
	Print at Home	.80	.19*
	Skills	.82	.02*
	Poverty	.85	.03*

* $p < .05$

Figure 1

Path Analysis of 1992 4th Grade State NAEP Reading Scores

