The Relationship between Library Use and Academic Achievement of English and Spanish-Speaking Hispanic American Students

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The purpose of this study is to examine the relationship between school library use and academic achievement of Hispanic students. This study utilizes data from the base-year and the first follow-up of the Education Longitudinal Study: 2002/06. A series of hierarchical regression analysis is incorporated to examine the nature of associations among the variables in this research. The results indicate that Hispanic students' school library usage for class has a positive relationship with academic achievement, while their library usage for entertainment has a negative relationship with academic achievement. However, effect size of the students' library usage on academic achievement is greater for Spanish speaking Hispanic students than for English speaking Hispanic students. Implications for researchers and practice are discussed.

Background of the Study

While there are over 50 years of research on the contributions of public library services on student learning (Martinez, 2008), it is only in the recent decade that specific attention has been given on the relationship between school library quality and student achievement. Findings of studies (e.g., Lance, 2002; Langhorne, 2004; McCaffrey, 2005) consistently demonstrate that students in schools with well-resourced libraries learn more and perform higher on standardized tests than students in schools with under-resourced libraries. In addition, a longitudinal study from 2006 to 2009 based on a state's annual yearly progress data (Dow & McMahon-Lakin, 2012) reported that schools maintaining a more stable and higher leveled librarian performed academically higher than their counterparts.

A recent report (Barrett, 2010) summarizing more than sixty studies from sixteen states showed congruous evidence of positive relationship between the schools' availability of library media specialists and students' test scores in states' standardized assessments. Bearing different given titles, school librarians or library media specialists are performing essential roles to collaborate with classroom teachers and curriculum experts to develop students' critical thinking skills, acquire strategies in technology use, and enhance student academic achievement. In many studies, including those cited in the Scholastic Library Publishing 2006 report and the report by the U.S. Department of Education (2005), improved test scores were found to be associated directly or indirectly with various characteristics of library services, such as staffing availability, provision of training for teachers and students, collaboration with public libraries, electronic linkages and technology, offer of sufficient collections and resources, and usage of library. Hence, the availability of resources and instructions from school libraries is an indispensable requisite in students' learning. Subsequently, students' usage of these services is a critical indicator of the significance of library service. Although there have been enough cumulated studies for school library's impact on academic performance, little research has been conducted to examine the relationship between various types of students library use and academic achievement.

During the past six decades, education in the United States has focused on narrowing the achievement gap between majority students and minority students. Since the No Child Left Behind Act (NCLB) took effect, promotion of English proficiency and academic achievement for English language learners have been emphasized in US education (U.S. Department of Education, 2006). Since the Hispanic population is predicted to be 31% of the US population by

2060 (U.S. Census Bureau, 2012), the low academic achievement of Hispanic students calls attention to educational researchers. However, it is essential to differentiate the subgroups among the Hispanic students. Our study specifically focused on comparing the impact of school library services on the academic achievement of both the English and Spanish-speaking Hispanic students. Findings about the significance of library support should provide valuable information for future educational policies.

Besides addressing the gap in the existing body of knowledge in this area, we also attempted to further advance the related research methodology. Based on the current extensive reviews of school library research (Clyde, 2003), Wirkus (2005) concluded that approximately 65 percent of studies in school library research were action research studies with surveys or literature reviews. As these studies were based on macro level analysis (i.e., school level), some of them failed to control significant extraneous variables such as socioeconomic status. Affluent parents and school systems have the privilege to invest in more costly library services in terms of resources, staff, and equipment. Simultaneously, they also provide other necessary learning resources, directly influencing student achievement. Hence, without considering the influence of other factors, such as individual student variables, it is questionable to conclude that higher student achievement is due to better libraries. More rigorous methodology and analysis to estimate the effect size of the contribution of the library use (Lance & Hofschire, 2013) to Hispanic students' academic achievement were assumed in the present study.

To address the aforementioned issues, this study was designed to investigate the association between library use and academic achievement. The following research questions were formulated to direct the study.

Q 1. What is the effect size of library use on student achievement for different language groups of Hispanic?

Q 2. What is the pattern of the relationship between library use and student achievement for reading and mathematics?

Q 3. When socioeconomic status and gender are considered and added into the model, what is the relationship between library use and student achievement?

Q 4. When the variable of students' effort is added into the model, what is the relationship between library use and student achievement?

Methodology

Participants

This study utilized data from the base-year of the Education Longitudinal Study (ELS): 2002/06. The ELS (2002) is constructed to observe the development of a national sample of adolescents as they advance from the tenth grade to postsecondary education and/or the world of labor. For the purpose of the current project, 1,055 Hispanic students whose native language is English and 1,019 Hispanic students whose native language is Spanish were selected.

Table 1: Descriptions for the Variables

Variables	Description
Mathematics Standardized Test Score (MATH)	This mathematics standardized scores are transformations of the IRT theta (ability) estimates, rescaled to a mean of 50 and standard deviation of 10. For the current sample, this measure ranged from 20.53 (the lowest achievement) to 76.92 (the highest achievement) with a mean of 45.72.
Reading Standardized	This reading standardized scores are transformations of the IRT theta (ability)

Test Score
(READ)

estimates, rescaled to a mean of 50 and standard deviation of 10. For the current sample, this measure ranged from 22.69 (the lowest achievement) to 75.68 (the highest achievement) with a mean of 45.87.

Native
Language
(LANG)

This native language indicates Hispanic students' home language between English and Spanish. This is a dummy variable taking on the value 1 for English and 0 Spanish. However, this variable was not included in the multiple regression analysis.

Gender
(GENDER)

This variable indicates students' sex that valued 0 as girls and 1 as boys. For the current sample, there were 1,081 girls and 1,046 boys.

Socioeconomic
Status (SES)

This composite variable was constructed from parent questionnaire data when available and from imputation or student substitutions when not. This measure is based on five equally weighted, standardized components: father's/guardian's education, mother's/guardian's education, family income, father's/guardian's occupational prestige score, and mother's/guardian's occupational prestige score. For the current sample, this standardized score ranged from -1.97 (the lowest SES) to 1.80 (the highest SES) with a mean of -.37. It should be noted that the mean value of the total sample is .00.

Library Use

This measure indicates the overall library

for Class (LIBRARY1)	usage of the students for academic purposes. This composite variable was computed from four equally weighted, standardized items: to what extent the students (a) use school library for assignments, (b) use school library for in-school projects, (c) use school library for homework, and (d) use school library for research papers. The variable ranged from 1 (never) to 4 (often) with a Cronbach's Alpha of 0.86 (M= 2.23, SD= 0.82).
Library Use for Entertainment (LIBRARY2)	This measure indicates the overall library usage of the students for academic purposes. This composite variable was computed from four equally weighted, standardized items: to what extent the students (a) use school library for leisure reading, (b) use school library to read magazines/newspapers, (c) use school library to read books for fun, and (d) use school library for interests outside of school. The variable ranged from 1 (never) to 4 (often) with a Cronbach's Alpha of 0.85 (M= 1.71, SD= 0.75).
Library Staff Assistance (STAFF)	This measure indicates the overall library staff's performance based on the students' evaluation. This composite variable was computed from three equally weighted, standardized items: to what extent the library staff (a) is helpful with finding research resources, (b) is helpful with using database, and (c) is helpful with internet. The values of the variable are 1 (very

	helpful), 2 (helpful), and 3 (not helpful) with a Cronbach's Alpha of 0.87 (M= 1.88, SD= 0.58).
Library Reference Materials (MATERIAL)	This measure indicates how much useful the school library reference materials are. The values of the variable are 1 (very useful), 2 (useful), and 3 (not useful) with a mean of 1.81 and a standard deviation of .56.
Homework Hours in School (HWHOUR1)	This measure indicates how many hours a student spent on homework in school per week. The variable ranged from 1 (1 hour) to 21 (21 or more hours) with a mean of 4.55 and a standard deviation of 5.20.
Homework Hours out of School (HWHOUR2)	This measure indicates how many hours a student spent on homework out of school per week. The variable ranged from 1 (1 hour) to 21 (21 or more hours) with a mean of 5.50 and a standard deviation of 5.69.

Analytic Strategy

In order to accommodate the complex sampling design of the ELS, AM statistical software (i.e., AM version 0.06.04 Beta) was used for this study. Before performing the main analysis through hierarchical regression, a preliminary regression analysis with a dummy code for native language was conducted for each dependent variable.

As anticipated, English speaking Hispanic students outperformed Spanish speaking Hispanic students in mathematics (r^2=.024, $F_{1,2072}$=50.98, p<.001) and in reading

(r^2=.037, $F_{1,2072}$=80.15, p<.001). The effect size was greater in reading than in mathematics. However, the major research interest was not to determine the impact of native language on academic achievement. Thus, in order to monitor the variations in the patterns of the usage of library's impact on academic performance, a hierarchical regression was utilized for each native language group on reading and mathematics test scores.

Results

Results of the data analysis displayed in the four summary tables (i.e., Tables 2, 3, 4, and 5) were compared and interpreted concurrently. To respond to research questions 1 and 2 (What is the effect size of library use on student achievement for different language groups of Hispanic?; What is the pattern of the relationship between library use and student achievement for reading and mathematics?), the measures of strength of relationship (i.e., adjusted R^2) and the standardized coefficients (β) in the first step were compared across four hierarchical regression models. Only two among four variables of library usage are significant across the four models. Library1 (*library use for class*) has a positive relationship (β = .16, .23, .15, and .25 on the four regression models) with student test scores, while Library2 (*library use for entertainment*) has a negative relationship (β = -.16, -.19, -.19, and -.24 on the four regression models) with student standardized test scores. The patterns of significance on the individual variables are consistent across two native language groups (i.e., Spanish and English) and two subjects (reading and mathematics). However, other two library variables (i.e., library staff assistance and library reference materials) are not significant predictors for Hispanic students' academic achievement.

Regarding the effect size, the overall impact of library use on academic achievement is greater for Spanish speaking

students (adjusted R^2 = .04 in reading and .06 in mathematics) than for English speaking students (adjusted R^2 = .02 in reading and .03 in mathematics).   The result of the significance test (Schenker & Gentleman, 2001) for the two correlation coefficient between Spanish speaking and English speaking students showed a statistically significant difference for both reading (z=2.75; p<.01) and mathematics (z=2.0; p<.05).

This pattern is reflected in the comparison of the standardized coefficients for the significant library variables. For the variable of Library 1 (*library use for class*), the values of the standardized coefficients for Spanish speaking students are .23 in reading and .25 in mathematics, while the values for English speaking students are .16 in reading and .15 in mathematics. However, the results of the significance test for the two coefficients revealed a statistically significant difference for mathematics (z=2.37; p<.05) but not for reading (z=1.66; p>.05). For the variable of Library 2 (*library use for entertainment*), the values of the standardized coefficients for Spanish speaking students are -.19 in reading and -.24 in mathematics, while the values for English speaking students are -.16 in reading and -.19 in mathematics. However, the significance tests for two coefficients associated with students' library use for entertainment showed no statistical significances for either reading (z=0.7; p>.05) or mathematics (z=1.19; p>.05).

To respond to research question 3 (When socioeconomic status and gender are considered and added into the model, what is the relationship between library use and student achievement?), the 2nd step of the regression models was examined. The additional explained variance (i.e., ΔR^2) of academic achievement by the demographic variables, after considering the library use variables, has shown a consistent result (ΔR^2 = .10) across the four regression models. However, the standardized coefficients of gender on

reading test scores are not significant (β = .05 for English speaking students and -.03 for Spanish speaking students; p>.05), while those on mathematics test scores are significant (β = -.08 for English speaking student and -.13 for Spanish speaking students; p<.05 and p<.001, respectively). The negative sign of gender indicates that males perform better on mathematics than females, because females have a higher value in the dichotomous variable.

When the demographic variables entered into the model, the values of the standardized coefficients on the two variables for library usage were changed. However, those changes were minimal and the variables remained as significant predictors across all four regression models.

Lastly, to respond to research question 4 (When the variable of students' effort is added into the model, what is the relationship between library use and student achievement?), the 3rd step of the regression models was examined. The additional explained variance (i.e., ΔR^2) of academic achievement by the student effort variables, after considering the library usage and demographic variables, has shown similar results (ΔR^2 = .03 or .04) across the four regression models. Among the two variables for student efforts, the student effort for the homework done outside of school is significant (β = .20, .19, .22, and .18; p<.001 for all four models).

When the student effort variables entered into the model, the values of the standardized coefficients of the two variables for library usage were changed again. However, those changes were also minimal and the variables remained as significant predictors across all four regression models.

Conclusions and Recommendations

While recent studies on Hispanic students' academic achievement have examined various factors, including curriculum, type of programs, student engagement, school

experiences and parent involvement, this study contributes to our understanding of the specific association between school library usage and academic achievement. The findings have confirmed or clarified some of the impacts of library use that have been proved in prior studies (e.g., Lance, 2001). First, Hispanic students' school library usage for class assignments has a positive relationship with academic achievement, while their library usage for entertainment has a negative relationship with academic achievement. Second, the effect size of the students' library usage on academic achievement is greater for Spanish speaking (language minority) Hispanic students than for English speaking Hispanic students.

Third, with the consideration of the affected relations from other variables such as SES, gender, and student effort, Hispanic students' library usage shows a significant impact on their academic achievement. Fourth, although the strength of association is not substantial, gender is a significant predictor on mathematics achievement for Hispanic students.

Owing to the scarcity of previous empirical research to substantiate the generated theories, the nature of this study is exploratory rather than confirmatory. Hence, we would recommend a longitudinal study with tight control over significant extraneous factors to enhance and validate the grounded theories above.

Furthermore, this project showed that two library variables (i.e., library staff assistance and library reference materials), which were determined as important factors for students' achievement in previous studies (Baumbach, 2002; Boxter & Smalley, 2003; Burgin & Bracy, 2003; Craver, 1994; Dow & McMahon-Lakin, 2012; Smith, 2001), are actually not significant predictors for Hispanic students' academic achievement. Further study is required to examine whether this result is valid only on Hispanic students or externally valid on a more general population.

In conclusion, this study provides a preliminary set of guidelines for library use research for language minority students to enhance student achievement, closing the achievement gap, and strengthening their competency in college preparation courses. Through continuing improvement in the research design toward a more experimental direction, a strong causality will be determined, which will further support the value of school libraries.

Table 2. Summary of Hierarchical Regression Analysis for Variables predicting Reading achievement (English as Native Language)
Reading Standardized Scores

Predictor	β Step 1	β Step 2	β Step 3
Library1	.16***	.12**	.10*
Library2	-.16***	-.10*	-.09*
Staff	-.01	-.02	-.02
Material	-.02	-.02	-.01
Gender		.05	.04
SES		.32***	.29***
HWHour1			-.06
HWHour2			.20***
Adjusted R^2	.02 **	.12	.15
Δ R^2		.10***	.03***

* p < .05;** p < .01;   *** p < .001

Table 3. Summary of Hierarchical Regression Analysis for Variables predicting Reading achievement (Spanish as Native Language)
Reading Standardized Scores

Predictor	β Step 1	β Step 2	β Step 3
Library1	.23***	.19***	.18***
Library2	-.19***	-.16***	-.15***
Staff	-.00	-.01	-.01
Material	-.04	-.03	-.03
Gender		-.03	-.04
SES		.32***	.29***
HWHour1			-.06
HWHour2			.19***
Adjusted R^2	.04 **	.14	.17
Δ R^2			.03***
* p < .05;	** p < .01;	*** p< .001	

Table 4. Summary of Hierarchical Regression Analysis for Variables predicting Mathematics achievement (English as Native Language)
Mathematics Standardized Scores

Predictor	β Step 1	β Step 2	β Step 3
Library1	.15**	.12**	.10*
Library2	-.19***	-.13**	-.12**
Staff	-.01	-.01	-.02
Material	-.06	-.06	-.05
Gender		-.08*	-.10**
SES		.32***	.29***
HWHour1			-.05
HWHour2			.22***
Adjusted R^2	.03 **	.13	.17
Δ R^2		.10***	.04***
* p < .05;	** p < .01;	*** p < .001	

Table 5. Summary of Hierarchical Regression Analysis for Variables predicting Mathematics achievement (Spanish as Native Language)
Mathematics Standardized Scores

Predictor	β Step 1	β Step 2	β Step 3
Library1	.25***	.24***	.22***
Library2	-.24***	-.21***	-.21***
Staff	.01	.02	-.01
Material	.06	.06	.06
Gender		-.13***	-.14***
SES		.28***	.25***
HWHour1			-.05
HWHour2			.18***
Adjusted R^2	.06 ***	.15	.18
ΔR^2		.10***	.03***

* $p < .05$;   ** $p < .01$;   *** $p < .001$

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