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Poverty and Mathematics Performance of Texas Grade 3 Students: A Cause for Concern

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Abstract

In this investigation, the extent to which the mathematics performance of Texas Grade 3 students differed by their economic status (i.e., Not Poor, Moderately Poor, and Very Poor) was addressed. Three mathematics indicators (i.e., Approaches, Meets, and Masters Grade Level) from the 2015-2016 Texas state-mandated mathematics assessment were analyzed. Inferential statistical analyses revealed the presence of a clear stair step effect for all three measures of mathematics performance. As the poverty level of Texas Grade 3 students increased, their mathematics performance decreased. The higher the level of poverty, the fewer Grade 3 students were able to meet the passing standard on the Texas state-mandated mathematics assessment. Of note is that over than half of the Moderately Poor group and more than two thirds of the Very Poor group did not meet grade level standards in mathematics. Policy and practice implications were provided, along with recommendations for future research investigations.

Keywords: Economic status, mathematics performance, achievement gaps, poverty, elementary students, PEIMS, TEA, STAAR, Texas

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Introduction

In 2016, more than four out of 10 children under 18 years of age were from low-income families and slightly less than one out of five children were from poor families (National Center for Children in Poverty, 2018). In the Southern Region of the United States, the percentage of children from low-income families is four percentage points higher than the national average, at 45%. With respect to Texas, the National Center for Children in Poverty (2018) reported that almost one fourth of the children under 18 were from poor families.

With respect to poverty and mathematics achievement, Flores (2007) analyzed data for low-income, Black, and Hispanic students. Results of this investigation showed that achievement gaps were present in mathematics performance with respect tostudents' economic status. Poverty was negatively related to student mathematics performance. Regarding reasons for these achievement gaps, Flores (2007) contended that low-income students are not given the same opportunities (e.g., qualified teachers, low expectations, student funding)to learn mathematics as other students.

Concerning the State of Texas, Lee and Slate (2014) examined statewide reading and mathematics data to ascertain the relationship of economic status to student reading and mathematics performance. They documented the presence of statistically significant lower performance in reading and in mathematics for students in poverty than for their peers who were not poor. In a recent investigation, McGown (2016) analyzed the relationship of economic status to reading scores on the Texas state-mandated assessment, the State of Texas Assessment of Academic Readiness (STAAR). She established that statistically significant differences were present in the reading achievement of Texas Grade 3 students for all four school years by their economic status. A stair-step effect for reading performance was evident, in that students in the free lunch program had the poorest reading skills; students in the reduced price lunch had the next poorest reading skills; with students who were not poor having the best reading skills.

In another recent Texas study, Harris and Slate (2017) addressed the relationship of economic status and the reading performance of Grade 3 Black boys and girls. In their analysis of reading scores from the state-mandated assessment, they documented the presence of statistically significant differences for both Grade 3 Black boys and girls. Similar to McGown (2016), as the level of poverty increased, reading performance became poorer.

In the most recent study that was located, a doctoral dissertation, Harris (2018) addressed the relationship of economic status to the reading performance of Texas Grade 4 students for three school years. Congruent with McGown (2016) and Harris and Slate (2017), statistically significant differences were established in all three school years. As the level of poverty increased, Texas Grade 4 students had statistically significantly poorer reading skills. A stair-step effect was documented, with higher levels of poverty being associated with poorer reading skills. As the level of poverty increased, students were less proficient in reading.

Statement of the Problem

Reardon (2011) documented that the income achievement gap had grown over 40% from the 1940s until 2001.Burchinal et al. (2011) discussed how achievement gaps between White and Black students were present even when both White and Black students came from lower income families. Duncan and Magnuson (2005) contended that ethnic/racial gaps in achievement could be a function of socioeconomic status in that many of the gaps between White, Black, and Hispanic students could be explained by the limited resources present in the household. To date, previous researchers (Harris, 2018; Harris & Slate, 2017; McGown, 2016) have focused on reading achievement gaps of Texas elementary students in regard to gender, ethnicity/race, and economic status, and have not examinedmathematics performance as a function of the economic status of Texas Grade 3students.

Objective of the Study

In this investigation, the extent to which economic status was related to the mathematics performance of Texas Grade 3 boys and girls was addressed. Specifically analyzed herein was how economic status affects the mathematics performance of Texas Grade 3 boys and girls in three areas on the state-mandated assessment, the State of Texas Assessments of Academic Readiness (STAAR) Mathematics test. The three mathematics performance standards analyzed were: Approaches Grade Level, Meets Grade Level, and Master Grade Level.

Research Questions

Three research questionswere addressed in this study:

1. What is the effect of economic status on the mathematics performance at the Approaches Grade Level standard for Texas Grade 3 students?
2. What is the effect of economic status on the mathematics performance at the Meets Grade Level Standard for Texas Grade 3 students?
3. What is the effect of economic status at the Masters Grade Level standard for Texas Grade 3 students?

Significance of the Study

Recent evidence has been provided by researchers (e.g., Below et al., 2010; Conradi et al., 2016; Harris & Slate, 2017; McGown, 2016) of strong relationships between student poverty level and academic achievement. Much of the current research studies, however, have been about poverty and reading achievement. As such, only limited information is available about poverty and mathematics performance. The findings of this study might be utilized by administrators, teachers, and policymakers as they make decisions to improve mathematics achievement. In addition, awareness of economic gaps may provide reasoning as to why students from low economic backgrounds continue to struggle after elementary school.

Method

Research Design

A causal-comparative research design was present in this empirical study (Johnson & Christensen, 2017). A causal-comparative research design was present because both the independent variable of economic status and the dependent variables of mathematics performance had already occurred. Because data analyses were conducted on already existing data, or archival data, no variables could be manipulated (Johnson & Christensen, 2017).

Participants and Instrumentation

Participants in this study were Texas Grade 3 students who had been administered the STAAR Mathematics exam in the 2015-2016 school year. A request for archival data was made through the Texas Education Agency Public Education Information Management System. A Public Information Request was submitted to the Texas Education Agency for: (a) Grade 3 students, (b) student poverty level, and (c) STAAR mathematics performance level. For the purpose of this study, economically disadvantaged is defined by the Texas Education Agency (2015) as “a student who is eligible for free or reduced-priced meals under the national School Lunch and Child Nutrition Program” (para. 5). Poverty level was defined by the following, (a) Not Poor (i.e., students who were not eligible for the School Lunch and Child Nutrition Program);(b) Moderately Poor (i.e., students who were eligible for the reduced-priced lunch program), and (c) Very Poor (i.e., students who were eligible for the free lunch program).

Differentiated in the STAAR test are three levels of performance: (a) Approaches Grade Level, (b) Meets Grade Level, and (c) Masters Grade Level (Texas Education Agency, 2017). Students at the Approaches Grade Level are expected to be successful in the next grade level with specific academic interventions. Students at the Approaches

Grade Level performance have the ability to apply the tested knowledge and skills in familiar contexts (Texas Education Agency, 2017). Students in the Meets Grade Level performance indicator are expected to be successful in the next grade level with short-term academic interventions. Students in the Meets Grade Level are able to apply the tested knowledge and skills in familiar contexts and to think critically (Texas Education Agency, 2017). Students at the Masters Grade Level performance indicator should be successful in the next grade level with little, if any, academic interventions. Students at the Masters Grade Level performance are able to apply the tested knowledge and skills in familiar and unfamiliar contexts and to think critically.

Results

To ascertain whether economic status had an effect on the mathematics performance of Texas Grade 3 students, Pearson chi-square analyses were used. Pearson chi-square procedures were the appropriate statistical technique due to the nature of both the independent variable and the dependent variables. Because all variables were categorical data, Pearson chi-squares were the statistical procedure of choice (Slate & Rojas-LeBouef, 2011).

For the first research question, a statistically significant difference was revealed, $\chi^2(1) = 16733.33$, $p < .001$, Cramer's V of .29, a small effect size (Cohen, 1988).As the level of poverty increased from Not Poor to Moderately Poor to Very Poor, the percentage of Texas Grade 3 students who did not meet the Approaches Grade Level performance standard increased. The percentage of students who were Very Poor who did not meet this standard was almost four times more than students who were Not Poor and more than 50% more than students who were Moderately Poor. The percentage of students who were Moderately Poor and who did not meet this standard was more than twice the percentage of students who were Not Poor and who did not meet this standard. Accordingly, a stair-step effect was evident (Carpenter, Ramirez, & Severn, 2006). Descriptive statistics for this analysis are presented in Table 1.

Table 1
Descriptive Statistics for the Approaches Grade Level Standard by Texas Grade 3 Students' Economic Status

Economic Status	Met Standard *n* and %age	Did Not Meet Standard *n* and %age
Not Poor	(*n* = 81,660) 91.3%	(*n* = 7,755) 8.7%
Moderately Poor	(*n* = 1,287) 78.3%	(*n* = 357) 21.7%
Very Poor	(*n* = 74,475) 67.2%	(*n* = 36,292) 32.8%

With regard to the second research question, a statistically significant result was revealed, $\chi^2(1) = 25039.09$, $p < .001$, Cramer's V of .35, a moderate effect size (Cohen, 1988). Students who were Very Poor did not meet this standard at a rate more than two times higher than the rate of students who were Not Poor and slightly less than a quarter more than students who were Moderately Poor. The percentage of students who were Moderately Poor and who did not meet this standard was three quarters more than students who were Not Poor and did not meet this standard. Again, results were supportive of a stair-step effect (Carpenter et al., 2006). Table 2 contains the descriptive statistics for this analysis.

Table 2
Descriptive Statistics for the Meets Grade Level Standard by Texas Grade 3 Students' Economic Status

Economic Status	Met Standard *n* and %age	Did Not Meet Standard *n* and %age
Not Poor	(*n* = 59,255) 66.3%	(*n* = 30,160) 33.7%
Moderately Poor	(*n* = 720) 43.8%	(*n* = 924) 56.2%
Very Poor	(*n* = 34,100) 30.8%	(*n* = 76,667) 69.2%

Concerning the third research question, a statistically significant difference was yielded, $\chi^2(1) = 18276.56$, $p < .001$, Cramer's V of .30, a moderate effect size (Cohen, 1988).As the level of poverty increased from Not Poor to Moderately Poor to Very Poor, the percentage of Texas Grade 3 students who met the Masters Grade Level performance standard decreased. The percentage of students who were Very Poor who did meet this standard was one third the percentage who were Not Poor and slightly more than half of students who were Moderately Poor. The percentage of students who were Moderately Poor and who did meet this standard was less than half the percentage of students who were Not Poor and who did meet this standard. Similar to the results of the first two research questions, a stair step effect was present (Carpenter et al., 2006).Delineated in Table 3 are the descriptive statistics for this analysis.

Table 3
Descriptive Statistics for the Masters Grade Level Standard by Texas Grade 3 Students' Economic Status

Economic Status	Met Standard *n* and %age	Did Not Meet Standard *n* and %age
Not Poor	(*n* = 31,589) 35.3%	(*n* = 57,826) 64.7%
Moderately Poor	(*n* = 267) 16.2%	(*n* = 1,377) 83.8%
Very Poor	(*n* = 11,503) 10.4%	(*n* = 99,264) 89.6%

Discussion

The relationship of economic status to the mathematics performance of Texas 3 students was addressed in this statewide, empirical analysis. Inferential statistical analyses of the three mathematics standards revealed the presence of a stair-step effect (Carpenter et al., 2006), in that as poverty levels increased, student mathematics performance decreased. The percentage of Texas Grade 3 students who did not meet each performance standard increased as the level of poverty increased from Not Poor to Moderately Poor to Very Poor.

Previous researchers (e.g., David & Marchant, 2015) have stated that educational policy in the United States has accomplished little with respect to decreasing poverty gaps in academic achievement. Researchers (Harris, 2018; Harris & Slate, 2017; McGown, 2016) have established that Texas elementary school students in poverty have statistically significantly lower reading skills than their peers who were not in poverty. Findings from this study are congruent with these researchers regarding the effects of poverty on student achievement in mathematics.

In this Texas statewide analysis, student economic status consisted of three groups of students. The two groups of students in poverty were combined so that the total numbers and percentages of students in poverty would be examined. By combining the numbers in these two categories, 112,411 Texas Grade 3 students fit into the poverty guidelines, compared to 89,415 Grade 3 students who were not poor. Dividing these two numbers reveals that the percentage of Grade 3 students in Texas who were economically disadvantaged was 55.70%. Readers should understand that over half of the Grade 3 students in Texas were economically disadvantaged.

Policy and Practice Implications

Given the findings from this statewide investigation, suggestions for improving the mathematics performance for Texas Grade 3 students can be recommended. For legislators and policymakers, additional funding should be supplied to schools with high enrollment numbers of students who are economically disadvantaged. These monies could be used to provide early interventions to students who are economically disadvantaged to close the achievement gaps before students begin taking standardized tests.

In addition to implications for policymakers, practitioners (e.g., teachers, campus administrators, and district personnel) should begin to monitor students identified as economically disadvantaged before state testing begins. Supports should be implemented to ensure students from high poverty settings are being set up for success in mathematics. School districts should place an emphasis on placing their most experienced and qualified teachers at schools with high poverty enrollment numbers. These same schools should also be provided with additional support to provide interventions to students who are economically disadvantaged as early as possible.

Conclusion

In this Texas statewide investigation, the relationship of economic status with the mathematics performance of Grade 3 students was addressed. In all three mathematics standards, students who qualified for the free lunch program had the poorest mathematics performance. Students who qualified for the reduced-price lunch had the next poorest mathematics performance. Students who were not poor had the best mathematics performance. As such, these results on the effects of poverty on mathematics performance are commensurate with the results of other researchers (e.g., Burchinal et al., 2011; Conradi et al., 2016) who have examined the effects of poverty on reading performance.

Recommendations

Given findings obtained herein, several recommendations for future research investigations can be made. Researchers could examine: (a) What differences exist in student achievement of students who are economically disadvantaged as a function of school poverty percentage?; (b) What gender differences might be present in the mathematics performance of Texas Grade 3 boys and girls?; and (c) What differences exist in the mathematics performance of Texas Grade 3 students as a function of their ethnicity/race?

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