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Elementary School Size and Student Progress Differences by Ethnicity/Race: A Multiyear, Texas Study

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ABSTRACT

In this investigation, the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the State of Texas reading and mathematics state-mandated assessments was examined for White, Black, and Hispanic students. Archival data available on the Texas Academic Performance Report were analyzed for the 2013–2014, 2014–2015, 2016–2017, and 2017–2018 school years. Inferential analyses revealed the presence of statistically significant differences, with below small to small effect sizes. Large-size schools had statistically significantly higher reading and mathematics progress rates than Small-size schools in 6 of the 9 analyses for White students. In 6 of the 9 analyses, school size was not related to student progress in reading or mathematics for Hispanic students. Small-size schools had statistically significantly higher progress rates in mathematics for Hispanic students than Moderate-size schools. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading and mathematics for Black students in 8 of the 9 analyses. Implications for policy and practice, as well as recommendations for research, are provided.

Keywords: Elementary, Ethnicity/Race, Mathematics, Reading, School size Student Achievement, Student Progress, STAAR.

INTRODUCTION

In a historic decision, Brown vs. Board of Education (1954), the Supreme Court ruled that segregation in public schools in the United States was unconstitutional. Since that time, efforts have been implemented to close achievement gaps among Asian, Whites, Black, and Hispanic students. In legislation such as the No Child Left Behind Act, currently reauthorized as Every Student Succeeds Act, schools were required to demonstrate that all students are proficient in the core subjects (United States Department of Education, 2018). Despite these historic decisions and federal mandates, large achievement gaps continue to persist.

Achievement gaps begin at an early age and increase as students' progress through school (Lockwood, 2007; Reardon & Galindo, 2009). Researchers (e.g., Chapin, 2006; Sonnenschein & Sun, 2017) have documented that Black and Hispanic students had lower reading and mathematics scores than White students when they began Kindergarten. After more than 15 years of implementation of the No Child Left Behind Act, Black and Hispanic students continue to perform poorly on reading and mathematics exams (National Assessment of Educational Progress [NAEP], 2018; Venzant-Chambers & Huggins, 2014). Although average scores for reading and for mathematics have improved for all ethnic/racial groups, the gaps between ethnic/racial groups remain relatively the same (NAEP, 2018).

Other factors that may influence ethnic/racial achievement gaps can include issues such as tracking, segregation, and teacher quality (Kotok, 2017; Williams, 2011). Schools often have courses set up on tracks to complete during high school, usually divided into remedial, general, and honors level coursework (Bromberg & Theokas, 2014). Once students begin one of these tracks, they are not likely to move into more advanced coursework (Bromberg & Theokas, 2014; Contreras, 2005). Black and Hispanic students are more likely than White students to participate in lower track courses even when the students of color have scored at a high percentile in other courses and exams (Bromberg & Theokas, 2014; Contreras, 2005). Another structural factor is that Black and Hispanic students are more likely to attend lower-income schools than White students (Goldsmith, 2011). Schools with a higher percentage of students in poverty have difficulty hiring and retaining quality teachers, obtaining resources, and have lower parental involvement (Carter & Welner, 2013) than schools with a lower percentage of students in poverty. These factors increase opportunity gaps for students of color. It is important for schools to continue to try and close these achievement gaps, as the repercussions reach beyond the classroom. Students who do not perform as well in mathematics and science can lead to missed opportunities in employment in engineering and technology careers (Mau, 2003; Mau & Li, 2018).

Another school factor that should be taken into consideration is school size, with respect to student enrollment. School leaders are faced with many decisions—which include addressing an increasing student population. In the State of Texas, student enrollment has increased by 67.4% in the last 30 years. Student enrollment from 2008 to 2018 increased from 4,671,493 to 5,399,682 students, a 15.6% increase (Texas Education Agency [TEA], 2018a). With this enrollment growth in Texas, educational leaders are faced with making decisions about how to address the needs of a larger student population. Decisions must be made about school size and whether to place additional students in current facilities or to build additional structures. Financially, having a larger number of students in fewer buildings can result in savings in operational costs as well as combining additional resources under one roof (Boser, 2013; Stanislaski, 2015). Savings can be experienced in the areas of personnel costs, supplies, and materials (Dodson & Garrett, 2004). This ability for large-size schools to operate a school at a lower cost per student than small-size schools is reflective of the economies of scale model (Werblow & Duesberry, 2009). In this model, large-size schools function with more economic efficiency giving them the ability to provide more resources, additional opportunities, higher-level courses, and a more diverse course selection (Werblow & Duesberry, 2009) than can be provided by small-size schools. Schools that save money in operating costs can redistribute those expenditures to instructional needs.

Though financial benefits are present for large-size schools, school leaders still need to address the achievement gaps previously described. Educational leaders strive to be fiscally responsible while at the same time meeting the instructional needs of all students. In state accountability systems, such as the one in Texas, each campus is assessed and rated to determine if those instructional needs are being met. The ratings are based on student achievement, student progress, and efforts to close achievement gaps (TEA, 2018c). Examining how schools of different student enrollment sizes perform on state assessments is important to school leaders. Thus, researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha, Slate, & Martinez-Garcia, 2013; Zoda, Combs, & Slate, 2011) have conducted studies in Texas schools and have provided evidence that students who attended Large-size schools performed at statistically significantly higher rates on state assessments than students who attended Small-size schools.

Evidence supporting the success of English Language Learners in Large-size school districts was documented by Barnes and Slate (2014). Data on the Texas Assessment of Knowledge and Skills (TAKS) English Language Arts, Mathematics, Science, Social Studies, and Writing tests were analyzed for the 2010–2011 school year for English Language Learners in Texas. In all five subject areas, English Language Learners in Large-size school districts (i.e., 10,000–203,066 students) had statistically significantly higher passing rates than English Language Learners in either in Moderate-size (i.e., 1,600–9,999 students) or in Small-size (28–1,599 students) school districts.

Additional success in Moderate-size schools and in Large-size schools was documented by Fitzgerald et al. (2013) in the 2008–2009, 2009–2010, and 2010–2011 school years. Fitzgerald et al. (2013) analyzed high school completion rates among White, Black, and Hispanic students in Texas enrolled in different size schools. In their multiyear study, Fitzgerald et al. (2013) defined the school sizes as Small (i.e., 327 students and below), Medium (i.e., 328–1,337 students), and Large (i.e., 1,338 students and higher). After conducting statistical analyses, Black and Hispanic students had the highest completion rates when enrolled in a Medium-size school for two of the three years, and Black students had the highest completion rates in Medium-size and Large-size schools in the third year studied. Readers should note that Black and Hispanic students who were enrolled in Small-size schools had statistically significantly lower completion rates than their peers in Large-size schools.

Hispanic students have also been documented as performing statistically significantly better in Large-size Schools (i.e., 1,000 or more students) than in Small-size Schools (i.e., 100–499 students). Riha et al. (2013), in a Texas statewide investigation, analyzed Grade 8 data on the TAKS Reading, Mathematics, Science, and Social Studies state assessments over a 5-year time period. Consistently in the 2005–2006 through the 2009–2010 school years, Grade 8 Hispanic students in Large-size schools had statistically significantly better performance on the TAKS Reading, Mathematics, Science, and Social Studies tests than Grade 8 Hispanic students in Small-size schools. Effect sizes ranged from small to moderate for these statistically significant differences.

In a study that is most relevant for this article, Zoda et al. (2011) conducted a 5-year, Texas statewide study for Grade 4 students on the TAKS Reading, Mathematics, and Writing assessments. Zoda et al. (2011) defined school size in four categories: Very Small (i.e., less than 400 students), Small (i.e., 400–799 students), Large (i.e., 800–1,199 students), and Very Large (i.e., 1,200 or more students). Data analyses for all students across the five years revealed statistically significant results for Reading, Mathematics, and Writing in 12 of the 15 analyses, with small effect sizes. When compared to students enrolled in Small or Very Small schools, students who were enrolled in Large-size elementary schools had statistically significantly higher passing rates on all three subjects.

Additional analyses by Zoda et al. (2011) was conducted to determine the degree to which school size differences were present for Black, Hispanic, and White students. For each of the five years, statistically significantly higher passing rates were present for Black students who were enrolled in Large and Very Large schools in each subject than for Black students who were enrolled in Small or Very Small schools. In addition, in four of the five years, statistically significantly higher passing rates were present for Hispanic students and White students who were enrolled in Large-size schools compared to their peers who were enrolled in Small-size schools or in Very Small-size schools, with small effect sizes. The larger the school size, the higher the passing rate was for Black, Hispanic, and White students.

In these investigations, researchers (Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) analyzed student achievement based on performance on state assessments. Although researchers have analyzed overall average grades or test scores when conducting studies on ethnic/racial achievement gaps (McKown, 2013), another measurement of student achievement is student progress. The State of Texas administers the State of Texas Assessments of Academic Readiness (STAAR) each year in the areas of Reading, Mathematics, Writing, Science, and Social Studies for Grades 3 through high school. During years that students have two consecutive years of data in the same subject, students are given a progress measure. Two consecutive years of STAAR results in the same subject are needed to calculate the progress the student has made from one year to the next. The progress measure is provided to show the amount of improvement, or progress, students have made in that subject area (Texas Education Agency, 2018d). A lack of literature is present in which researchers use student progress as a measure in their studies. As such, the effect of school size on student progress should be examined to determine if the ethnic/racial achievement gaps previously documented are also present with respect to student academic growth.

Statement of the Problem

School districts operate on funds from the state and from local property taxes. New facilities are funded through bond referendums, which the districts repay with revenue from property taxes. School districts receive a specified amount per student for each cent of tax effort to pay the principal of and interest on eligible bonds issued to construct, acquire, renovate, or improve an instructional facility (TEA, 2018b). With rising property taxes in Texas, community members expect district leaders to determine the most fiscally responsible approach to housing additional students. Decisions about building new schools or increasing the enrollment at current facilities must be considered.

In addition to being fiscally responsible, leaders must ensure that students are being educated fairly and equitably. Years of legislation such as the No Child Left Behind Act, currently reauthorized as the Every Student Succeeds

Act, requires schools to demonstrate that all students are proficient in the core subjects (United States Department of Education, 2018). The results are reported on the following ethnicity/races: Hispanic, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian/Other Pacific Islander, and White. Thus, school leaders must take into consideration the effect school size (i.e., student enrollment) has on student performance for the major ethnic/racial groups in Texas.

Purpose of the Study

The purpose of this study was to determine the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the State of Texas state-mandated assessments. Specifically examined was the reading progress and the mathematics progress of White, Black, and Hispanic students. For these three ethnic/racial groups, the reading progress and the mathematics progress measures were analyzed for five school years to determine the extent to which trends might be present.

Significance of the Study

The effect of school size on student achievement has been investigated for many years. Evidence for small-size schools has been documented by researchers in the past (e.g., Eberts, Kehoe, & Stone, 1984; Leithwood & Jantzi, 2009; Wendling & Cohen, 1981). In more recent research studies conducted in Texas, extensive evidence for large-size schools has been established (Barnes & Slate, 2014; Fitzgerald et al., 2013; Gilmore, 2007; Riha et al., 2013; Zoda et al., 2011). Although extensive research exists regarding school size and student achievement, no published articles were located regarding school size and the current Texas state-mandated assessment, the STAAR. In addition, student achievement on the STAAR test was examined using student progress rather than the traditional pass or fail measurement. Researchers should continue to conduct investigations on school size to add to the current literature in Texas supporting large-size schools. If trends toward large-size schools continue, educational leaders could use that information to make informed decisions regarding school size.

One overarching research question was addressed in this study: What is the difference in student progress in reading and mathematics of elementary school students as a function of school size (i.e., Small-size, Moderate-size, and Large-size)? Sub questions under this overarching research question were: (a) What is the difference in the reading progress measure as a function of elementary school size?; (b) What is the difference in the mathematics progress measure as a function of elementary school size?; (c) What trend is present on the reading progress measure and elementary school size across five school years?; and (d) What trend is present on the mathematics progress measure and elementary school size across five school years? Each research question was answered separately for White, Black, and Hispanic students. The first two research questions were repeated for the 2013–2014, 2014–2015, 2015–2016, 2016–2017, and 2017–2018 school years. The last two research questions involved results for all five school years.

RESEARCH METHOD

For this study, a nonexperimental, causal-comparative research design was conducted (Johnson & Christensen, 2017). The data used in this study were archival data from the Texas Academic Performance Report and reflected events that occurred in the past. As such, neither the independent variable nor the dependent variable could be manipulated in this study.

The original intention herein was to use elementary school size recoded into four sizes based on previous research by Zoda et al. (2011): Very Small-size (i.e., 50–399 students), Small-size (i.e., 400–799 students), Moderate-size (i.e., 800–1,199 students), and Large-size (i.e., 1,200 or greater students). Data frequency distributions were generated and examined for the four school sizes and very few schools were present that had 1,200 students or greater. Accordingly, school size was recoded into three categories: Small-size (i.e., 50–399 students), Moderate-size (i.e., 400–799 students), and Large-size (i.e., 800 or greater students). The dependent variables in this study consisted of the reading progress measure and the mathematics progress measure on the STAAR Reading and Mathematics assessments. These data were analyzed separately by the three major ethnic/racial groups (i.e., White, Hispanic, and Black) of students in Texas.

Participants and Instrumentation

Data for this study were archival datasets downloaded from the Texas Academic Performance Reports available on the Texas Education Agency website for the 2013–2014, 2014–2015, 2015–2016, 2016–2017, and 2017–2018 school years. Participants were Grade 4 and 5 students in Texas who received a progress measure result on the STAAR Reading assessment and Grade 4 and 5 students in Texas who received a progress measure on the STAAR Mathematics assessment for each school year analyzed. The progress measure provides information about the amount of improvement, or growth, a student has made from year to year. For each assessment, the progress is measured as a gain score, subtracting the prior year's score from the current year's score. Student results are categorized into three labels: Did Not Meet, Met, or Exceeded (TEA, 2018d). Students whose gain score was higher than the expected target are assigned the progress measure Exceeded

Progress. In contrast, students whose gain score was below the expected target are labeled Did Not Meet Progress. Students who make the expected amount of progress from one year to the next are assigned Met Progress. In this study, the school data, reported as the percentage of students who have met or exceeded student progress, were analyzed. During the 2014–2015 school year, mathematics progress rates were not reported. Revised mathematics TEKS were implemented in the classroom in the 2014–2015 school year. Accountability calculations excluded Mathematics for Grades 3–8. Therefore, the progress rate for mathematics was not analyzed for the 2014–2015 school year.

For the purpose of this study, elementary campuses were limited to campuses that are Kindergarten through Grade 5. Any campus that did not meet this configuration was eliminated. Campuses that were identified as charter schools were also eliminated. The independent variable of school size was identified by the number of students enrolled at each educational facility. Data frequency distributions were generated and examined for the three categories: Small-size (i.e., 50–399 students), Moderate-size (i.e., 400–799 students), and Large-size (i.e., 800 or greater students). Another frequency distribution was generated by ethnic/racial membership and revealed that the number of schools that had data on Asian students was insufficient for statistical analyses. As such, only the academic performance of White, Hispanic, and Black students could be examined.

RESULTS

For this investigation, an Analysis of Variance (ANOVA) procedure was calculated for each school year and for the three major ethnic/racial groups (i.e., White, Hispanic, and Black) in Texas to determine the extent to which differences were present in student progress in reading and mathematics as a function of school size for the 2013–2014, 2014–2015, 2015–2016, 2016–2017, and 2017–2018 school years, excluding mathematics in 2014–2015. Prior to conducting inferential statistical procedures to answer the research questions delineated above, checks for normality and Levene's Test of Error Variance were conducted. The majority of these assumptions were not met. Field (2009), however, contends that the parametric ANOVA procedure is sufficiently robust that these violations can be withstood. Accordingly, parametric ANOVA procedures were justified to address all of the research questions.

Reading Results for White Students for All Five School Years

With respect to the degree to which differences were present in the reading progress rates of White students as a function of elementary school size in the

2013–2014 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 1270) = 3.60$, $p = .03$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that differences were present between only one pairwise combination. Large-size schools had statistically significantly higher progress rates in reading for their White students than Small-size schools. Moderate-size schools had similar progress rates in reading of their White students as Small-size and Large-size elementary schools. Readers are directed to Table 1 for the descriptive statistics for this school year.

Table 1
Descriptive Statistics for Reading Progress Rates of White Students by Elementary School Size for the 2013–2014 Through the 2017–2018 School Year

School Size	*n* of schools	*M*	*SD*
2013–2014			
Small-size	167	63.98	8.77
Moderate-size	895	64.99	8.39
Large-size	211	66.23	7.04
2014–2015			
Small-size	187	67.20	10.63
Moderate-size	940	69.58	8.64
Large-size	235	72.20	8.70
2015–2016			
Small-size	186	67.01	8.88
Moderate-size	956	67.60	9.07
Large-size	248	69.00	8.06
2016–2017			
Small-size	204	70.57	10.49
Moderate-size	1,033	71.51	10.57
Large-size	255	73.30	8.32
2017–2018			
Small-size	218	68.11	10.06
Moderate-size	1,051	69.02	9.24
Large-size	269	71.05	6.93

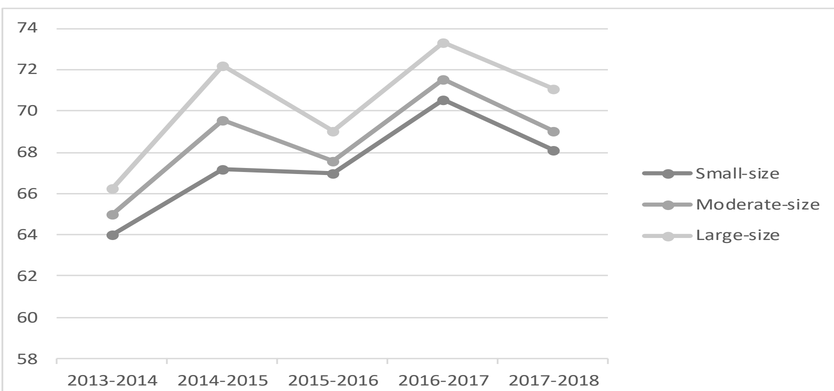
For the 2014–2015 school year, the parametric ANOVA revealed a statistically significant difference, $F\ (2, 1359) = 16.61$, $p < .001$, partial $n^2 = .02$, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that differences were present between all pairwise combinations. Large-size schools had statistically significantly higher progress rates in reading for their White students than Moderate-size schools and Small-size schools. Moderate-size elementary schools had statistically significantly higher progress rates in reading of their White students than Small-size schools. As school size increased, the reading progress rates of White students increased. Delineated in Table 1 are the descriptive statistics for this school year.

Concerning the 2015–2016 school year, a statistically significant difference was revealed, F (2, 1387) = 3.25, p = .04, partial n^2 = .01, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that although two pairs approached the conventional level, no pairs reached the conventional level of statistical significance. Large-size, Moderate-size, or Small-size schools had similar progress rates in reading for their White students. Descriptive statistics for this analysis are presented in Table 1.

With respect to the 2016–2017 school year, a statistically significant difference was revealed, F (2, 1460) = 10.73, p < .001, partial n^2 = .01, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that all pairwise comparisons of school sizes were statistically significantly different. Large-size schools had higher progress rates in reading for their White students than Moderate-size or Small-size schools. Moderate-size schools had higher progress rates in reading for their White students than Small-size schools. As school enrollment increased, so too did the reading progress rates of White students. Table 1 contains the descriptive statistics for this school year.

Figure 1

Reading progress rates by school size for White students across all five school years.



Regarding the 2017–2018 school year, the parametric ANOVA yielded a statistically significant difference, F (2, 1535) = 7.48, p = .001, partial n^2 = .01, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that differences were present for all but one pair of school sizes, Small-size and Moderate-size. This pair had similar progress rates in reading for their White students. Large-size schools had statistically significantly higher progress rates in reading for their White students than Moderate-size schools and Small-size schools. Delineated in Table 1 are the descriptive statistics for the 2017–2018 school year.

With respect to the trend present on the reading progress measure and elementary school size across five school years, a line graph was used to illustrate the trends across the five school years. Large-size schools tended to have higher progress rates in reading for their White students than Moderate-size and Small-size schools. Depicted in Figure 1 are the trends in reading progress rates for White students for the three school sizes in the 2013–2014 through 2017–2018 school years.

Reading Results for Hispanic Students for All Five School Years

Concerning the 2013–2014 school year for Hispanic students, a statistically significant difference was not revealed, $F(2, 2345) = 0.56$, $p = .57$. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their Hispanic students. Descriptive statistics for this analysis are presented in Table 2.

Table 2

Descriptive Statistics for Reading Progress Rates of Hispanic Students by Elementary School Size for the 2013–2014 Through the 2017–2018 School Year

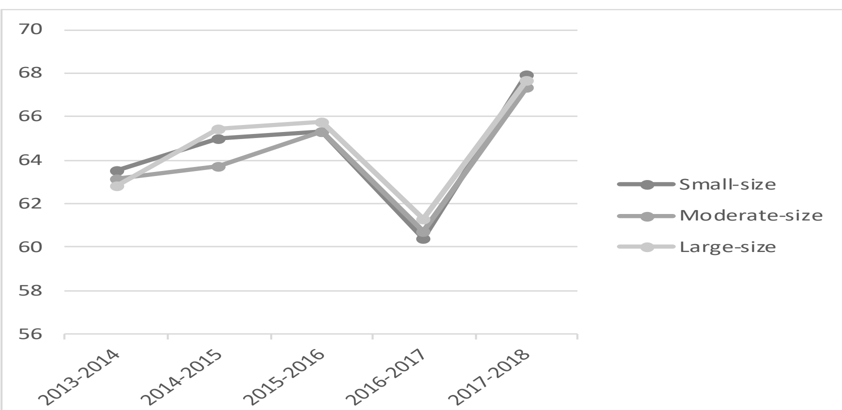
School Size	*n* of schools	*M*	*SD*
2013–2014			
Small-size	211	63.52	9.35
Moderate-size	1,755	63.17	7.72
Large-size	382	62.83	6.94
2014–2015			
Small-size	226	64.99	9.00
Moderate-size	1,772	63.75	7.96
Large-size	407	65.42	7.42
2015–2016			
Small-size	265	65.29	8.76
Moderate-size	1,857	65.29	7.90
Large-size	397	65.78	6.78
2016–2017			
Small-size	285	60.38	9.77
Moderate-size	1,894	60.72	8.33
Large-size	373	61.31	8.24
2017–2018			
Small-size	333	67.96	9.09
Moderate-size	1,918	67.36	7.91
Large-size	365	67.70	6.18

For the 2014–2015 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2402) = 8.58$, $p < .001$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffé's post hoc tests revealed that differences in progress rates in reading were present for only one pair, Large-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates in reading for their Hispanic students than Moderate-size schools. Similar progress rates in reading were present for Hispanic students in Moderate-size schools, Small-size schools, and Large-size schools. Delineated in Table 2 are the descriptive statistics for this school year.

With respect to the 2015–2016 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 2516) = 0.64$, $p = .53$. Small-size, Moderate-size, and Large-size schools had similar progress rates in reading for their Hispanic students. Readers are directed to Table 2 for the descriptive statistics for this school year. With respect to the 2016–2017 school year, a statistically significant difference was not yielded, $F(2, 2549) = 1.08$, $p = .34$. Small-size, Moderate-size, and Large-size schools had similar progress rates in reading for their Hispanic students. Table 2.2 contains the descriptive statistics for this school year. Regarding the 2017–2018 school year, a statistically significant difference was not yielded, $F(2, 2613) = 0.99$, $p = .37$. All three school sizes had similar progress rates in reading for their Hispanic students. Presented in Table 2 are the descriptive statistics for the 2017–2018 school year.

Figure 2

Reading progress rates by school size for Hispanic students across all five school years.



With respect to the trend present on the reading progress measure and elementary school size across five school years for Hispanic students, a line graph was used to illustrate the trends across the five school years. Large-size schools tended to have higher progress rates in reading for their Hispanic students than Moderate-size and Small-size schools in three of the five years. Depicted in Figure 2 are the trends in progress rates in reading for Hispanic students for the three school sizes in the 2013–2014 through 2017–2018 school years.

Reading Results for Black Students for All Five School Years

Regarding the 2013–2014 school year for Black students, a statistically significant difference was not yielded, F (2, 647) = 0.66, p = .52. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their Black students. Readers are directed to Table 3 for the descriptive statistics for this school year.

Table 3

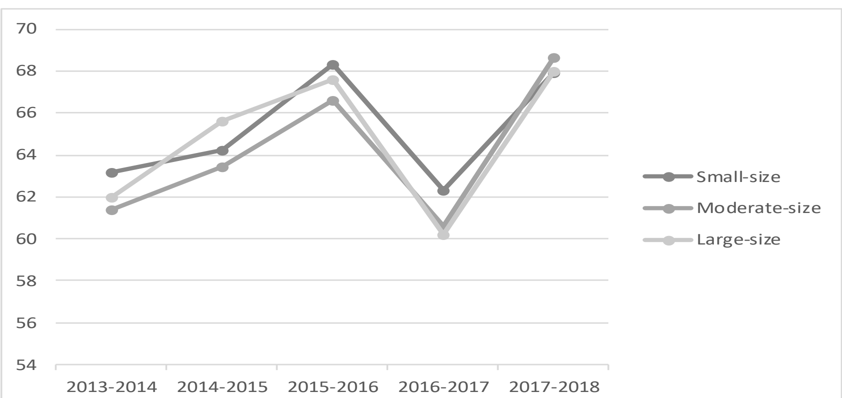
Descriptive Statistics for Reading Progress Rates of Black Students by Elementary School Size for the 2013–2014 Through the 2017–2018 School Year

School Size	*n* of schools	*M*	*SD*
2013–2014			
Small-size	37	63.19	13.58
Moderate-size	464	61.40	9.95
Large-size	149	62.01	9.67
2014–2015			
Small-size	34	64.24	12.35
Moderate-size	506	63.47	9.77
Large-size	176	65.62	9.50
2015–2016			
Small-size	46	68.30	9.88
Moderate-size	606	66.59	10.40
Large-size	201	67.57	8.61
2016–2017			
Small-size	55	62.29	11.29
Moderate-size	561	60.58	10.32
Large-size	181	60.19	10.16
2017–2018			
Small-size	72	67.93	11.62
Moderate-size	720	68.65	10.45
Large-size	216	68.02	9.49

For the 2014–2015 school year, a statistically significant difference was yielded, F (2, 713) = 3.14, p = .04, partial n^2 = .001, a below small effect size (Cohen, 1988). Scheffé's post hoc tests revealed that differences were present in progress rates in reading for Black students between Large-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates for their Black students in reading than Moderate-size schools. Across all other school size comparisons, the reading progress rate of Black students was similar. Delineated in Table 3 are the descriptive statistics for this school year.

Concerning the 2015–2016 school year, a statistically significant difference was not yielded, F (2, 850) = 1.20, p = .30. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their Black students. Descriptive statistics for this analysis are presented in Table 2.3. With respect to the 2016–2017 school year, a statistically significant difference was not revealed, F(2, 794) = 0.88, p = .42. Similar to the previous school year, Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their Black students. Readers are directed to Table 3 for the descriptive statistics for this school year. Regarding the 2017–2018 school year, a statistically significant difference was not yielded, F(2, 1005) = 0.41, p = .67. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their Black students. Table 3 contains the descriptive statistics for the 2017–2018 school year.

Figure 3
Reading progress rates by school size for Black students across all five school years.



With respect to the trend present on the reading progress measure and elementary school size across five school years, a line graph was used to illustrate the trends across the five school years. Small-size schools tended to have higher progress rates in reading for their Black students than Moderate-size and Small-size schools in three of the five years. Depicted in Figure 3 are the trends in progress rates in reading for Black students for the three school sizes in the 2013–2014 through 2017–2018 school years.

Mathematics Results for White Students for All Five School Years

With respect to the 2013–2014 school year, the parametric ANOVA did not reveal a statistically significant difference, F (2, 1469) = 2.35, p = .10. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their White students. Readers are directed to Table 4 for the descriptive statistics for this school year.

Table 4
Descriptive Statistics for Mathematics Progress Rates of White Students by Elementary School Size for the 2013–2014 Through the 2017–2018 School Year

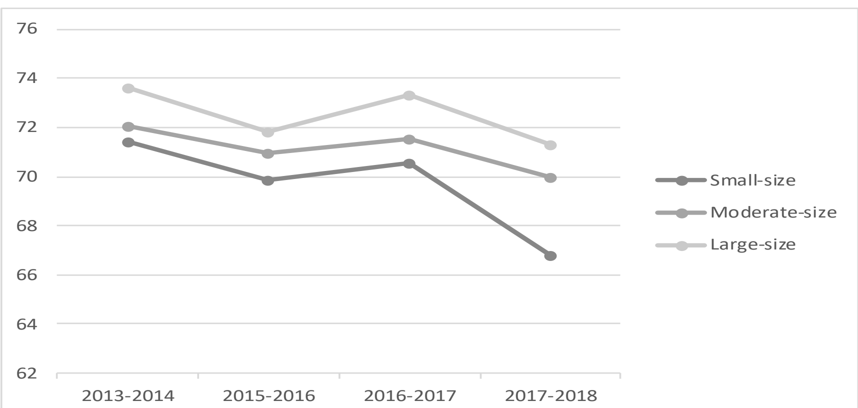
School Size	*n* of schools	*M*	*SD*
2013–2014			
Small-size	202	71.40	13.18
Moderate-size	1,022	72.06	11.60
Large-size	248	73.60	10.24
2014–2015			
Small-size	N/A	N/A	N/A
Moderate-size	N/A	N/A	N/A
Large-size	N/A	N/A	N/A
2015–2016			
Small-size	190	69.84	10.29
Moderate-size	943	70.94	10.72
Large-size	251	71.85	9.12
2016–2017			
Small-size	204	70.57	10.49
Moderate-size	1,033	71.51	10.57
Large-size	255	73.30	8.32
2017–2018			
Small-size	201	66.82	13.36
Moderate-size	1,012	70.00	10.64
Large-size	262	71.31	10.04

Concerning the 2015–2016 school year, a statistically significant difference was not yielded, F(2, 1381) = 2.03, p = .13. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their White students. Descriptive statistics for this analysis are presented in

Table 4. With respect to the 2016–2017 school year, a statistically significant difference was revealed, F (2, 1489) = 4.55, p = .01, partial n^2 = .01, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that differences were present for all but one pair of school sizes, Small-size and Moderate-size. This pair had similar progress rates in mathematics for their White students. Large-size schools had statistically significantly higher progress rates in mathematics for their White students than Moderate-size schools and Small-size schools. Delineated in Table 4 are the descriptive statistics for this school year.

Regarding the 2017–2018 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 1472) = 10.09$, $p < .001$, partial n^2 = .01, small effect size (Cohen, 1988). Scheffé's post hoc procedures revealed that differences were present for all but one pair of school sizes, Large-size and Moderate-size. This pair had similar progress rates in mathematics for their White students. Large-size schools had statistically significantly higher progress rates in mathematics for their White students than Small-size schools. Moderate-size schools had statistically significantly higher progress rates in mathematics for their White students than Small-size schools. Table 4 contains the descriptive statistics for the 2017–2018 school year.

Figure 4
Mathematics progress rates by school size for White students across all four school years.



With respect to the trend present on the mathematics progress measure and elementary school size across five school years, a line graph was used to illustrate the trends across the five school years. Large-size schools tended to have higher progress rates in mathematics for their White students than Moderate-size and Small-size schools. Depicted in Figure 4 are the trends in progress rates in mathematics for White students for the three school sizes in the 2013–2014 through 2017–2018 school years.

Mathematics Results for Hispanic Students for All Five School Years

Concerning the 2013–2014 school year, a statistically significant difference was revealed, F (2, 2508) = 3.51, p = .03, partial n^2 = .03, small effect size (Cohen, 1988). Scheffé's post hoc tests revealed that differences in progress rates in mathematics were present for only one pairwise comparison, Moderate-size and Small-size schools. Small-size schools had statistically significantly higher progress rates in mathematics for their Hispanic students than Moderate-size schools.

Table 5

Descriptive Statistics for Mathematics Progress Rates of Hispanic Students by Elementary School Size for the 2013–2014 Through the 2017–2018 School Year

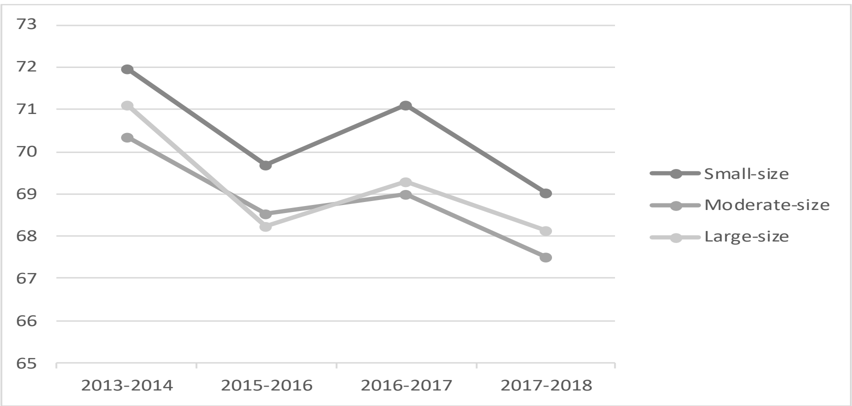
School Size	*n* of schools	*M*	*SD*
2013–2014			
Small-size	257	71.97	12.53
Moderate-size	1,864	70.34	9.92
Large-size	390	71.12	8.87
2014–2015			
Small-size	N/A	N/A	N/A
Moderate-size	N/A	N/A	N/A
Large-size	N/A	N/A	N/A
2015–2016			
Small-size	258	69.69	10.26
Moderate-size	1,835	68.54	9.10
Large-size	395	68.24	8.32
2016–2017			
Small-size	308	71.12	10.32
Moderate-size	1,908	68.99	9.78
Large-size	371	69.29	8.24
2017–2018			
Small-size	325	69.03	10.99
Moderate-size	1,893	67.51	9.92
Large-size	365	68.14	9.16

Large-size schools had similar progress rates in mathematics for their Hispanic students when compared to Moderate-size or Small-size schools. Descriptive statistics for this analysis are presented in Table 5.

With respect to the 2015–2016 school year, the parametric ANOVA did not reveal a statistically significant difference, F(2, 2485) = 2.17, p = .11. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their Hispanic students. Presented in Table 5 are the descriptive statistics for this school year. Concerning the 2016–2017 school year, a statistically significant difference was yielded, $F(2, 2584) = 6.46$, $p = .002$, partial $n^2 = .002$, below small effect size (Cohen, 1988). Scheffé's post hoc tests revealed that differences in progress rates in mathematics were present for all but one pairwise comparison, Large-size and Moderate-size schools. Large-size schools had similar progress rates in mathematics for their Hispanic students as Moderate-size schools. Small-size schools had statistically significantly higher progress rates in mathematics for their Hispanic students than either Large-size or Moderate-size schools. Readers are directed to Table 5 for the descriptive statistics for this school year.

Regarding the 2017–2018 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2580) = 3.48$, $p = .03$, partial $n^2 = .003$, a below small effect size (Cohen, 1988). Scheffé's post hoc tests revealed that differences in progress rates in mathematics were present for only one pairwise comparison, Small-size and Moderate-size schools. Small-size schools had statistically significantly higher progress rates in mathematics for their Hispanic students than Moderate-size schools. Table 5 contains the descriptive statistics for the 2017–2018 school year.

Figure 5
Mathematics progress rates by school size for Hispanic students across all four school years.



With respect to the trend present on the mathematics progress measure and elementary school size across five school years for Hispanic students, a line graph was used to illustrate the trends across the five school years. Small-size schools tended to have higher progress rates in mathematics for their Hispanic students than Moderate-size and Small-size schools. Depicted in

Figure 5 are the trends in progress rates in mathematics for Hispanic students for the three school sizes in the 2013–2014 through 2017–2018 school years.

Mathematics Results for Black Students for All Five School Years

Regarding the 2013–2014 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 931) = 0.32$, $p = .73$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their Black students. Readers are directed to Table 6 for the descriptive statistics for this school year.

Table 6
Descriptive Statistics for Mathematics Progress Rates of Black Students by Elementary School Size for the 2013–2014 Through the 2017–2018 School Year

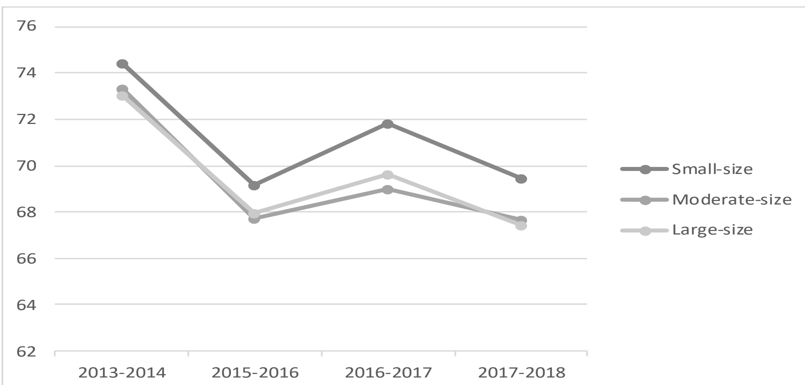
School Size	*n* of schools	*M*	*SD*
2013–2014			
Small-size	57	74.40	13.70
Moderate-size	671	73.30	11.89
Large-size	206	73.01	10.37
2014–2015			
Small-size	N/A	N/A	N/A
Moderate-size	N/A	N/A	N/A
Large-size	N/A	N/A	N/A
2015–2016			
Small-size	49	69.14	14.24
Moderate-size	541	67.70	12.85
Large-size	184	67.98	10.03
2016–2017			
Small-size	61	71.82	12.08
Moderate-size	639	69.00	11.62
Large-size	207	69.64	10.07
2017–2018			
Small-size	75	69.48	16.24
Moderate-size	648	67.65	11.63
Large-size	190	67.41	10.77

Concerning the 2015–2016 school year, a statistically significant difference was not yielded, $F(2, 771) = 0.32$, $p = .73$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their Black students. Descriptive statistics for this analysis are presented in Table 6. With respect to the 2016–2017 school year, a statistically significant difference was not revealed, $F(2, 904) = 1.84$, $p = .16$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their Black students. Readers are directed to Table 6 for the descriptive statistics for this school year. Regarding the 2017–2018 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 910) = 0.89$, $p = .41$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their Black students. Table 6 contains the descriptive statistics for the 2017–2018 school year.

With respect to the trend present on the mathematics progress measure and elementary school size across five school years for Black students, a line graph was used to illustrate the trends across the five school years. Small-size schools tended to have higher progress rates in mathematics for their Black students than Moderate-size and Small-size schools. Depicted in Figure 6 are the trends in progress rates in mathematics for Black students for the three school sizes in the 2013–2014 through 2017–2018 school years.

Figure 6

Mathematics progress rates by school size for Black students across all four school years.



DISCUSSION

In this investigation, the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the State of Texas state-mandated assessments was examined, specifically the reading progress and the mathematics progress of White, Black, and Hispanic students. Data were obtained from the Texas Academic Performance Reports for five school years (i.e. 2013–2014, 2014–2015, 2015–2016, 2016–2017, and 2017–2018). Inferential statistical procedures were used to determine if elementary school size contributed to the progress rates of students in Texas.

Five years of data were analyzed to determine the extent to which trends might be present.

Summary of Reading Results

Large-size schools had statistically significantly higher progress rates in reading for their White students in four of the five school years than either Moderate-size or Small-size schools. Moderate-size schools had statistically significantly higher progress rates in reading for their White students in two of the five years. Overall, as school size increased, so did student progress in reading for White students. All three school sizes had similar progress rates in reading for Hispanic students in four of the five school years. Data from only one school year revealed Large-size schools had statistically significantly higher progress rates in reading for their Hispanic students than Moderate-size schools. For Hispanic students in Texas, school size was not related to reading progress rates. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for Black students in four of the five school years. During one school year, Large-size schools had statistically significantly higher progress rates than Moderate-size schools. With the exception of the one school year, student enrollment was not related to the reading progress rates of Black students.

Summary of Mathematics Results

Large-size schools had statistically significantly higher progress rates in mathematics for their White students in two of the four school years than Small-size schools. Moderate-size schools had statistically significantly higher progress rates in mathematics for their White students than Small-size schools in one of those years. In two of the four years, similar progress rates in mathematics were present for White students for all three school sizes. In three of the four years, a statistically significant difference was present in the progress rate of Hispanic students in mathematics. In these three years, Small-size schools had a statistically significantly higher progress rate in mathematics for their Hispanic students than Moderate-size schools. Small-size schools tended to have higher progress rates in mathematics than Moderate-size or Large-size schools for Hispanic students in Texas. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for Black students in all four school years analyzed. School size was not related to student progress in mathematics for Black students.

Connections with Existing Literature

Current researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha, Slate, & Martinez-Garcia, 2013; Zoda et al., 2011) in Texas have provided evidence that Large-size schools had statistically significantly higher achievement rates on state assessments than students who attended Small-size schools. In this study, when analyzing results for the three school sizes for White students, results were congruent with current researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha, Slate, & Martinez-Garcia, 2013; Zoda et al., 2011). In contrast, Small-size schools had statistically significantly higher progress rates for their Hispanic students than Large-size schools. School size was not related to student progress in reading or mathematics for Black students. These findings are not congruent with the results of Zoda et al. (2011) in which Large and Very Large schools had statistically significantly higher passing rates in reading, mathematics, and writing for Black students than Small or Very Small schools.

Connections to Theoretical Framework

In this study, the economies of scale theory were utilized as the theoretical framework which economists describe as the ability to have higher production at a lower cost per output unit (Boser, 2013; Bowles & Bosworth, 2002). Many costs are associated with an educational setting, such as construction, maintenance and operations, transportation, and instructional opportunities. Large-size schools can save money in operating costs so that they are able to provide broader course selection, mentoring, and tutoring opportunities (Stanislaski, 2015; Werblow & Duesberry, 2009). Based on this theory, Large-size schools should have higher progress rates than Moderate-size, or Small-size schools. However, the results of this study did not strongly support this hypothesis for Hispanic or Black students, but did support Large-size schools for White students.

Implications for Policy and Practice

Based upon the results of this multiyear analysis, several implications for policy and for practice can be made. With respect to policy implications, Texas legislators should consider the effects that school size has on student progress. Although recent researchers in Texas (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha, Slate, & Martinez-Garcia, 2013; Zoda et al., 2011) support Large-size schools, the current study suggests that not all students achieved academic progress in Large-size schools. School leaders must demonstrate that all students, reported by the different ethnic/racial groups, are proficient in the core subjects (Texas Education Agency, 2018c;

United States Department of Education, 2018). In this study, school size was related to student achievement for White and for Hispanic students. Large-size schools were favored for White students, whereas Small-size schools were favored for Hispanic students. This information should be taken into consideration as school leaders make decisions about addressing increased student enrollment. Policymakers should not implement legislation regarding school size. The decisions regarding school size should be left to the individual school districts to make the best decision based on the school district's demographics.

Regarding practice implications, school district leaders can use this information to guide them in decisions to address increased student enrollment. Enrollment in Texas schools has increased by 67.4% in the last 30 years. Continued enrollment increases mean that school leaders must address building new schools or increasing enrollment on current campuses. Members of the community as well as school leaders are affected by the decision as it has the possibility of increasing property taxes. Often, the most cost-effective solution is to increase enrollment and consolidate resources under one roof (Stanislaski, 2015; Werblow & Duesberry, 2009). However, saving money cannot result in students being educated unfairly or inequitably. As school leaders make these decisions, they must ensure that the needs of all of their students are being met. Based on the results of this study, that could mean if school enrollment must be increased on their campuses, leaders should ensure that instructional supports are in place to address Hispanic students who did not make the same academic progress as White students in Large-size schools.

Recommendations for Future Research

Based on the results of this investigation, several recommendations can be made for future research. First, further examination of the student progress measure should be conducted. In this study, data analyzed were the reading and mathematics progress rates, which measures the amount of progress a student makes from one year to the next on the STAAR assessment. At the time of this research, no published articles were located in which the student progress measure was examined. Schools are responsible for demonstrating that all students are proficient in the core subjects. The progress measure is another tool for measuring that success. Research using the progress measure can be conducted to determine if opportunity gaps between ethnic/racial groups exist to a similar degree when using other achievement measures. Second, the purpose of this study was to determine the degree to which school size at elementary schools was related to student progress on the State of Texas state-mandated assessments. Additional research should be conducted examining student progress at the middle school and high school level. The third recommendation for future research is to extend the research to other states. It should be determined if the same results exist in states other than Texas. Finally, additional studies should be conducted on school size and additional measures of achievement. Only one measure was analyzed in this study. Additional measures may include passing rates on state or national assessments, attendance rates, graduation rates, and college readiness. Multiple measures of student success will allow for a more conclusive decision regarding the effect of school size on student achievement.

CONCLUSION

The purpose of this study was to determine the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the State of Texas state-mandated assessments, specifically the reading progress and the mathematics progress of White, Black, and Hispanic students. Statistically significant differences were revealed for students that supported both Large-size and Small-size schools. Consolidating schools may be the most cost-efficient solution for school leaders (Boser, 2013; Stanislaski, 2015). However, based on the results of this study, it may or may not be the best academic decision for all students. School leaders must make decisions that will support the academic achievement of all students while at the same time addressing increasing enrollment needs. Leaders that decide to increase enrollment in elementary school need to also ensure the academic needs of that schools' student population are not compromised.

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