ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS: A TEXAS STATEWIDE, MULTIYEAR INVESTIGATION

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DEDICATION

This dissertation is dedicated to my supportive and loving family, all of who have made this endeavor possible. To my husband, Bobby, who has always encouraged me through any challenge I decide to face, I thank him for agreeing to take on this journey with me. Even if that meant he had to take on more responsibility, without complaint, so I could focus on my work. Knowing I had his support allowed me to dedicate the needed energy and time to accomplish this goal. To my children, Ashley, Rebecca, and Brock, I thank them for being proud of me and encouraging me as I continued my education. I hope my time spent toward my goals is an inspiration to them and to their futures. Finally, to my parents, they are the ones who instilled confidence and the work ethic required to chase after and accomplish the goals I set before me. Their support throughout the years has made this goal, as well as so many others, possible. To each of the above, I have the highest of appreciation for everything they have done to make this doctoral program successful. I love them all!

ABSTRACT

Busby, Amy C., *Elementary school size and differences in student progress: A Texas statewide, multiyear investigation*. Doctor of Education (Educational Leadership), December, 2019, Sam Houston State University, Huntsville, Texas.

Purpose

The purpose of this journal-ready dissertation was to determine the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the Texas state-mandated assessments for reading and for mathematics. In the first journal article, the effect of school size on student progress was examined for White, Hispanic, and Black students. In the second study, the extent to which school size was related to the student progress of students who were economically disadvantaged and of students who were at risk was ascertained. In the third investigation, the relationship between school size and student progress for boys and for girls was examined. In each of the three studies, five years of Texas statewide data were examined to ascertain the degree to which trends were present in student progress in reading and in mathematics as a function of their ethnicity/race, economic status, at risk status, and gender.

Method

For this study, a causal-comparative research design was present. Archival data from the Texas Academic Performance Report for the 2013-2014, 2014-2015, 2015-2016, 2016-2017, and 2017-2018 school years were analyzed. The independent variable was school size: Small-size (i.e., 50-399 students), Moderate-size (i.e., 400-799 students), and Large-size (i.e., 800 or greater students). Dependent variables were the reading progress measures and the mathematics progress measures on the STAAR Reading and

Mathematics assessments analyzed separately by ethnicity/race, economic status, at risk status, and gender.

Findings

Of the 35 statistical analyses conducted on the reading progress measures, 15 analyses had statistically significant differences in which reading progress rates were higher at Large-size schools; three analyses yielded better reading progress rates at Small-size schools; and 17 analyses did not reveal statistically significant results. Of the 28 statistical analyses on mathematics progress rates, 6 had statistically significant results in which mathematics progress rates were higher at Large-size schools; 8 analyses yielded higher mathematics progress rates at Small-size schools; and 14 analyses did not reveal statistically significant differences. Findings were inconsistent across ethnic/racial groups, economic status, at-risk status, and gender.

KEYWORDS*:* School size, Elementary, Student Achievement, STAAR, Student Progress, Reading, Mathematics, Ethnicity/Race, Economically Disadvantaged, At Risk, Gender

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CHAPTER I

INTRODUCTION

As public education in the United States has evolved over the last 60 years, legislation has been passed at both the federal and state level with intentions to guide schools on the quality of education. Public schools are required by federal statutes such as the Every Student Succeeds Act to demonstrate that all students are successful in the core subjects. In addition to such federal mandates, the State of Texas has implemented an accountability system based on academic achievement, student progress, and efforts to close achievement gaps (Texas Education Agency, 2018c). Based on these state assessment data, ratings are assigned to each school campus and to each school district. These ratings can affect public perceptions, as well as the implementation of state or federal interventions. As a result, student achievement is a high priority for school leaders.

Many factors can influence student achievement. One such factor that should be taken into consideration is school size, with respect to student enrollment. Student enrollment has increased by more than 65% over the last 30 years. In 2018, student enrollment in the State of Texas was 5,399,682 (Texas Education Agency, 2018a). Increasing student enrollment means school leaders must determine how to address a growing student population. School leaders have the choice of building additional schools or increasing the enrollment size at existing schools. Though financial considerations may influence the decision, school leaders remain responsible for student academic achievement. It is important for school leaders to understand how school size may affect student achievement.

Review of the Literature for School Size and Student Ethnicity/Race

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 the 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 among ethnic/racial groups of students 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 have 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, 2018; Venzant, Chambers, & Huggins, 2014). Although the average scores for mathematics and reading have improved for all ethnic/racial groups, the gaps between ethnic/racial groups remain relatively the same (National Assessment of Educational Progress, 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 are 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 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, 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 existing facilities or to build additional structures. Financially having 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 school campus is assessed and rated to determine if student instructional needs are being met. Ratings are based on student achievement, student progress, and efforts to close achievement gaps (Texas Education Agency, 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 et al., 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 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 who were enrolled in different size schools. In their multiyear study, Fitzgerald et al. (2013) defined 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 of data. 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 in all five subject areas 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 in all three subject areas 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) were 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 area 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 students in Grade 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 have used 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.

Review of the Literature for School Size and Student Economic and At Risk Status

School leaders are charged with providing all students with an equal education. Legislation such as the Every Student Succeeds Act (formerly the No Child Left Behind Act) requires that all students be provided educational opportunities so that they demonstrate proficiency in the core subject areas (United States Department of

Education, 2018). In addition to such federal mandates, state accountability systems can also place pressure on school leaders to meet the instructional needs of all students. In the Texas state accountability system, each school district and each school campus is evaluated based on student achievement, student progress, and efforts to close achievement gaps. Following these assessments, ratings are assigned to these school districts and school campuses (Texas Education Agency, 2018c). Student groups whose data are specifically analyzed include students in poverty and students determined to be at risk. Ratings assigned to each campus can affect the implementation of state and federal interventions, as well as public perceptions. Therefore, student achievement is a high priority for school leaders.

Clearly documented over the past 50 years is that poverty has detrimental effects on academic achievement (Coleman et al., 1966; Hegedus, 2018). In a study in which the relationship between poverty and a school's academic performance was examined, strong negative relationships between school poverty and student achievement were documented (Hegedus, 2018). Nearly half of a school's achievement performance could be explained by the percentage of students who were eligible for free and reduced lunch. Students in poverty had statistically significantly lower achievement scores than their peers from higher incomes. This lower academic achievement can be associated with students in poverty having less access to resources that support academic achievement. These resources can include access to quality teachers and exposure to opportunities at home (Burney & Beilke, 2008; Carter & Welner, 2013). Barriers preventing access to resources increases learning gaps between students in poverty and those students not in poverty.

Poverty levels in Texas are extremely high, with more than one half of Texas students identified as economically disadvantaged (Texas Education Agency, 2018a). Students in poverty lack availability of the resources mentioned above, which often leads to other academic difficulties. These difficulties may include not performing satisfactorily in core curriculums or on state assessments, lower reading levels, retention, or behavior issues that lead to suspensions, expulsions, or alternative placements. Along with more than one half of Texas public school students being in poverty, over half of Texas public school students are identified as being at-risk (Texas Education Agency, 2018a). Texas identifies 13 criteria, which include these difficulties, to define a student as at risk of dropping out of high school. Combine any of these at risk criteria with poverty, and that student only has a 25% chance of graduating from high school (Balfanz, 2011). Negative consequences have been clearly and extensively established for students who drop out of high school. Lower education levels are associated with lower incomes, higher crime rates, and poorer health (Carter & Welner, 2013). These conditions lead to future generations of students in the same predicament. Thus, educational leaders need to implement high quality instructional programs to address the high percentages in Texas of students who are at risk of dropping out and students who are economically disadvantaged.

In addition to ensuring a fair and equitable education, financially responsible decisions must be made by school leaders. One area that falls under this area is facility management. Enrollment in Texas schools has increased by nearly a million students from 2008 to 2018 (Texas Education Agency, 2018a). As such, school leaders are faced with the decision to build new schools or to increase the capacity at existing facilities.

Consolidating students in one facility instead of having multiple campuses with smaller enrollments can result in savings in operational costs, personnel costs, supplies, materials, and the combining of resources (Boser, 2013; Dodson & Garrett, 2004; Stanislaski, 2015). Reflected in the economies of scale model is that larger size schools can operate at a lower cost per student than small schools because they operate with more economic efficiency. Larger size schools can provide more resources, additional opportunities, higher level courses, and a more diverse course selection (Werblow & Duesberry, 2009) than can be provided by smaller size schools.

Because school leaders must provide a fair and equitable education for all students, while at the same time operate in a fiscally responsible way, examining how student enrollment affects performance on Texas state-mandated assessments is important. Recent studies in the State of Texas have been conducted by multiple researchers (e.g., Ambrose, 2017; Riha, Slate, & Martinez-Garcia, 2013; Rodriguez, 2016; Zoda, Combs, & Slate, 2011) who have provided evidence that students enrolled at Large-size schools had better levels of academic performance than students who were enrolled at Small-size schools.

Zoda et al. (2011), in a study most relevant to this article, examined Texas Assessment of Knowledge and Skills (TAKS) Reading, Mathematics, and Writing test score data on Grade 4 students. Four school sizes were present in their study: 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). During the 5-year study, inferential statistical analyses revealed statistically significant results for all students on the TAKS Reading, Mathematics, and Writing in 12 of the 15 analyses, with small effect sizes. Grade 4 students who were enrolled in Large-size elementary schools had statistically significantly higher passing rates in all three subject areas than students enrolled in either Small or Very Small schools.

Zoda et al. (2011) also revealed the presence of statistically significantly higher passing rates for Black students who were enrolled in Large and Very Large schools in each subject area than for Black students who were enrolled in either Small or Very Small schools. Similarly, Hispanic students and White students who were enrolled in Large-size schools had statistically significantly higher passing rates in four of the five years when compared to their peers who were enrolled in either Small-size or Very Small-size schools. As such, Zoda et al. (2011) clearly documented the presence of statistically significant differences in academic achievement for Black, Hispanic, and White students as a function of school size. The larger the elementary school size was, the higher passing rates were for Black, Hispanic, and White students.

In a similar study, but at the middle school level, Riha et al. (2013) examined Grade 8 TAKS Reading, Mathematics, Science, and Social Studies test score data from the 2005-2006 through the 2009-2010 school years. Extensive documentation was provided that Hispanic students performed statistically significantly better in Large-size middle schools (i.e., 1,000 or more students) than in Small-size middle schools (i.e., 100-499 students). During this 5-year period, Grade 8 Hispanic students who were enrolled in Large-size middle schools consistently had statistically significantly better performance in all four subject areas than Grade 8 Hispanic students who were enrolled in Small-size middle schools.

In a recent study conducted by Rodriguez (2016), TAKS Reading and Mathematics test scores were examined for English Language Learners who were economically disadvantaged for the 2008-2009 and 2009-2010 school years. English Language Learners who were economically disadvantaged and who were enrolled in Very Large-size (i.e., 2,100 or more students) schools had a 16-20 point higher average raw score than their counterparts who were enrolled in Moderate-size (i.e., 220-464 students) schools. Similarly, statistically significant differences on the TAKS Mathematics examination were 15-21 points higher for English Language Learners who were economically disadvantaged in Very Large-size schools than English Language Learners who were economically disadvantaged in Moderate-size schools. In both subject areas, the larger the school size, the higher the average raw score was in reading and in mathematics for English Language Learners.

The achievement of students who were economically disadvantaged was documented by Ambrose (2017), in which dropout rates, GED participation rates, and graduation rates as a function of school size was examined. In her research, school size was examined by three varieties of school groupings based on previous researchers and the Texas University Interscholastic League. Regarding dropout rates, students who were economically disadvantaged and who were enrolled in smaller size high schools had statistically significantly higher dropout rates than their peers who were enrolled in larger size high schools. No differences were established in GED participation rates as a function of school size. With respect to graduation rates, students in poverty who were enrolled in smaller size high schools had statistically significant lower graduation rates than students in poverty who were enrolled at either Moderate-size or Large-size high schools. Overall, students were more successful in schools with higher student enrollment than in schools with lower student enrollment.

In addition to pass or fail measures of student achievement, the State of Texas also reports on a student's progress, or amount of improvement from one year to the next. Student results are categorized into three labels: Did Not Meet, Met, or Exceeded (Texas Education Agency, 2018d). No studies were discovered in which the student progress measure has been analyzed. However, this measure offers an alternative way to measure schools' effectiveness. Researchers (e.g., Coleman et al., 1966; Hegedus, 2018) have demonstrated the presence of strong relationships between poverty and student achievement. Academic growth may be less dependent on environmental factors such as the demographics of the student and neighborhood, and, as a result, would reflect more on the academic efforts of the school (Hegedus, 2018; Reardon, 2016).

Review of the Literature for School Size and Student Gender

Over the last 30 years, student enrollment in Texas has increased 67.4%. From 2008 to 2018, enrollment increased 15.6% from 4,671,493 to 5.399.682 students (Texas Education Agency, 2018a). Larger student populations create situations in which school leaders must make decisions on how to address student enrollment growth. School leaders have a choice to place the additional students in existing facilities, or to build additional structures. When making these decisions, school leaders must make financially responsible decisions, and at the same time ensure that students continue to receive the best education possible.

Larger-size schools operating at a lower cost than small-size schools is indicative of the economies of scale model (Werblow & Duesberry, 2009). Savings exist in operational costs, supplies, and materials due to consolidating resources under one roof (Boser, 2013; Dodson & Garrett, 2004; Stanislaski, 2015). In this way, large-size schools function with more economic efficiency than smaller-size schools by providing the ability for more resources, additional opportunities, higher-level courses, and a more diverse course selection (Werblow & Duesberry, 2009). Savings in operating costs can be redistributed to instructional needs.

Although financial benefits exist for large-size schools, school leaders also need to address the academic needs of all students. In Texas, each campus is assessed and rated through the state accountability system. These ratings are based on student achievement, student progress, and efforts to close achievement gaps (Texas Education Agency, 2018c). Thus, it is important for school leaders to examine how schools of different enrollment sizes perform on state assessments.

The subject of school size has been investigated extensively. Researchers (e.g., Barnes & Slate, 2014; Eberts, Kehoe, & Stone, 1984; Fitzgerald et al., 2013; Leithwood & Jantzi, 2009; Riha, Slate, & Martinez-Garcia, 2013; Wendling & Cohen, 1981; Zoda et al., 2011) have documented extensive evidence for both large-size and small-size schools. In 2009, Leithwood and Janzti conducted a meta-analysis of studies on school size. They determined that students at small-size schools had higher achievement levels than students at large-size schools. This difference was critical to diverse and disadvantaged populations. However, recent researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al, 2013; Zoda et al., 2011) conducting studies in Texas have provided extensive evidence to the contrary. These researchers have documented that students in

Texas enrolled at large-size schools performed at statistically significantly higher rates on state assessments than students enrolled at small-size schools.

Barnes and Slate (2014) analyzed Texas Assessment of Knowledge and Skills (TAKS) English Language Arts, Mathematics, Science, Social Studies, and Writing assessments for English Language Learners in Texas from the 2010-2011 school year. 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. English Language Learners in large-size school districts had higher passing rates than English Language Learners who were enrolled in either small-size or moderate-size school districts.

Another study was conducted on school size in which Fitzgerald et al. (2013) documented success of Moderate-size and Large-size schools. Fitzgerald et al. (2013) analyzed Texas high school completion rates among White, Black, and Hispanics students by school size for the 2008-2009, 2009-2010, and 2010-2011 school years. School size was defined as Small (i.e., 327 students and below), Medium (i.e., 328-1,337 students), and Large (i.e., 1,338 students and higher). Black and Hispanic students who were enrolled in Small-size schools had statistically significantly lower completion rates than their peers in Large-size schools. 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.

In another Texas study, Riha et al. (2013) provided evidence that Hispanic students performed statistically significantly better in Large-size schools (i.e., 1,000 or more students) than in Small-size schools (i.e., 100-499 students). Data from the Grade 8 TAKS Reading, Mathematics, Science, and Social Studies state assessment were analyzed over a 5-year time period. Grade 8 Hispanic students in Large-size schools had statistically significantly better performance in all four subject areas than Grade 8 Hispanic students in Small-size schools in each of the school years from 2005-2006 through 2009-2010. Effect sizes ranged from small to moderate for these statistically significant differences.

In a study most relevant for this article, Zoda et al. (2011) conducted a Texas statewide study for Grade 4 students on the TAKS Reading, Mathematics, and Writing assessments over a period of five years. Statistically significant results with small effect sizes were present in 12 of the 15 analyses for in all three subject areas across the five years. In comparison to students enrolled in Small (i.e., 400-799 students) or Very Small schools (i.e., less than 400 students), students who were enrolled in Large-size (i.e., 800-1,199 students) elementary schools had statistically significantly higher passing rates in each subject.

Additional analyses by Zoda et al. (2011) was conducted to determine the degree to which school size differences were present for boys and for girls. For girls, all five years revealed statistically significant results for reading and mathematics, and three out of five years for writing. For boys, statistically significant results were present in all five years for mathematics and Writing, and three of the five years for reading. In all three subjects, students in larger size elementary schools had higher passing rates than students in smaller size elementary schools.

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, specifically passing rates. Passing rates indicate whether students achieved a score that indicates they met or exceeded the grade level standard (Texas Education Agency, 2018c). Another measurement of student achievement reported on the state assessment is student progress. In the State of Texas, Grades 3 through Grade 12 are administered assessments in the subject areas of Reading, Mathematics, Writing, Science, and Social Studies. When a student has two consecutive years of assessment data in the same subject, the student is given a progress measure. The progress measure is a calculation used to show how much growth a student has made from one year to the next in that subject (Texas Education Agency, 2018d). A lack of literature is present in which student progress is used by researchers for their data analyses. Therefore, student progress should be examined when determining the effect of school size on the academic achievement of boys and girls.

Statement of the Problem

Schools in Texas have experienced a 67.4% enrollment growth in the last 30 years. From 2008 to 2018, nearly a million new students enrolled in Texas public schools (Texas Education Agency, 2018a). With these increases in student enrollment, school leaders must decide how to address the additional students. Possible solutions are to increase the enrollment at existing facilities or to construct new buildings. If a district chooses to construct new buildings, the district must obtain the financial means to do so.

Bond referendums allow school districts to receive a specified amount per student for each cent of tax effort to pay the principal and interest on eligible bonds issued to construct, acquire, renovate, or improve instructional facilities (Texas Education Agency, 2018b). Bond referendums must also be voted on for approval because it affects property taxes. In Texas, property taxes have increased by 233% from 1996 to 2016 (Barro & Diamond, 2018). Therefore, constructing new facilities is an important decision not only to school leaders but also to members of the community.

In addition to addressing the increasing student enrollment, leaders must ensure that all students are being educated fairly and equitably. Public schools are required by legislation such as the Every Student Succeeds Act and state accountability systems to demonstrate that all students are proficient in the core subjects (Texas Education Agency, 2018c; United States Department of Education, 2018). Results are reported on the following ethnic/racial groups: Hispanic, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian/Other Pacific Islander, and White. In addition to ethnicity/race, results are also reported for students in poverty and students identified as at risk. More than one half of Texas students are identified as economically disadvantaged (Texas Education Agency, 2018a). In addition, in the 2017-2018 school year, 50.8% of students in Texas schools were considered as being at risk of dropping out or not meeting educational standards (Texas Education Agency, 2018e). The Texas Education Agency (2017) provides 13 criteria to determine if a student is at risk of dropping out. Students coded with at least one of these indicators, in addition to being identified as economically disadvantaged, have only a 25% chance of graduating from high school (Balfanz, 2011). Thus, school leaders must take into consideration the effect of school size (i.e., student enrollment) on student performance for all students.

Purpose of the Study

The purpose of this journal-ready dissertation was to determine the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the Texas state-mandated assessments for reading and for mathematics. In the first journal article, the effect of school size on student progress was examined for Asian, White, Black, and Hispanic students. In the second study, the extent to which school size was related to the student progress of students who were economically disadvantaged and of students who were at risk were ascertained. In the third investigation, the relationship between school size and student progress for boys and for girls was examined. In each of the three studies, five years of Texas statewide data were examined to ascertain the degree to which trends might be present in student progress in reading and in mathematics as a function of their ethnicity/race, economic status, at risk status, and gender.

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 documented (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.

Theoretical Framework

Effectiveness of large-size schools can be associated with the economies of scale theory. Economists describe economies of scale as the ability to have higher production at a lower cost per output unit (Boser, 2013; Bowles & Bosworth, 2002). This ability provides a competitive advantage to larger entities over smaller ones. Economies of scale often refers to a business setting. The concept is applicable in an education setting although definitions of costs and outputs can vary (Bowes & Bosworth, 2002). When evaluating school expenditures, evidence of economies of scale emerge.

Consolidating schools into large-size schools provide different levels of savings. Initial costs in design and construction are smaller for one larger building versus more than one building. The cost savings include savings in purchasing only one set of furnishings, one air conditioning and heating system, one commercial kitchen, one gymnasium, and one technology system for example (Boser, 2013; Stanislaski, 2015). Savings continue in maintenance and operational costs through the life cycle of the building. Additional savings can be yielded in transportation because services only have to be coordinated with one site (Stanislaski, 2015).

Economies of scale in an educational setting can also include the costs associated with instructional opportunities. Small schools must provide the same course offerings and academic opportunities as large-size schools. In addition, large-size schools have access to a broader course selection, mentoring, and tutoring opportunities by consolidating resources under one roof (Stanislaski, 2015; Werblow & Duesberry, 2009). Schools that save money in operating costs can redistribute those expenditures to instructional needs

Definition of Terms

The following terms used in this journal-ready dissertation are defined to assist the reader in understanding the context of the three articles.

Asian

An Asian person "has origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam" (Texas Education Agency, 2017-2018 Texas Education Data Standards, 2017, p. 4).

At risk

At risk is an indicator code for students who are "at risk" of dropping out of high school or not meeting educational standards. Schools are required to offer supplemental instruction to students who meet one or more of the 13 at risk criteria defined by the Texas Education Code (Texas Education Agency, 2017).

Black

An African American or Black person “has origins in any of the black racial groups of Africa” (Texas Education Agency, 2017-2018 Texas Education Data Standards, 2017, p. 4).

Did Not Meet Progress

This STAAR progress measure indicates the difference between the student’s current year score and the student’s previous year score (i.e., gain score) was below the expected target. This phrase of Did Not Meet Progress may also be labeled as Limited Progress (Texas Education Agency, 2018d).

Economically Disadvantaged

Students eligible for free or reduced-price lunch or eligible for other public assistance are considered economically disadvantaged. Eligibility guidelines, based on household size, for the free or reduced-price lunch is determined by the federal poverty guidelines set each July. The income guidelines for the 2018-2019 school year were set such that the poverty line for a family of four was an annual income of $25,100 (United States Department of Agriculture, 2018). If a student’s family falls within the income parameters set, the student is classified as economically disadvantaged for that school year (Texas Education Agency, 2018c).

Elementary Schools

Elementary schools in Texas consist of a variety of grade configurations, which may include Prekindergarten up to Grade 8. For the purpose of this study, elementary schools consisted of the grade configuration of K-5. This grade configuration was the most common for elementary schools in the State of Texas (National Center for Education Statistics, 2017).

Ethnicity/Race

Schools collect data on ethnicity and race for reporting purposes as required by the Texas Education Agency. The data are collected in two parts. The first question refers to a student's ethnicity, inquiring if the person is Hispanic/Latino or not. The second part of the question is asked to identify students as belonging to one or more of the following races: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian/Other Pacific Islander, and White (Texas Education Agency, 2017).

Exceeded Progress

This STAAR progress measure indicates that the difference between the student's current year score and the previous year score (i.e., gain score) was higher than the expected target. The student has demonstrated substantial progress over the course of the year. This phrase of Exceeded Progress may also be labeled as Accelerated Progress (Texas Education Agency, 2018d).

Hispanic

This label is an ethnic designation regardless of race. The person is a descendant of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin (Texas Education Agency, 2017).

Large-size School

A Large-size school was defined as an elementary school that had a student enrollment of more than 1,200 students (Zoda, Combs, & Slate, 2011).

Met Progress

This STAAR progress measure specifies the difference between the student's current year score and the previous year score (i.e., gain score) was at the expected target. Students who have Met Progress have maintained their respective academic achievement from the prior year. This phrase of Met Progress may also be labeled as Expected Progress (Texas Education Agency, 2018d).

Moderate-size School

A Moderate-size school in this journal-ready dissertation was defined as an elementary school that had a student enrollment of 800 students up to 1,199 students (Zoda et al., 2011).

Percentage Met or Exceeded Progress

This indicator is a data set reported on the Texas Academic Performance Report to calculate Index 2: Student Progress in the Texas accountability system. These data include the percentage of students who Met Progress or Exceeded Progress on the STAAR progress measure expectations (Texas Education Agency, 2018c).

Progress Measure

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 (Texas Education Agency, 2018d). Student progress provides an opportunity for school districts and school campuses to receive credit for improving student performance independent of the student's pass/fail status (Texas Education Agency, 2018c).

Small-size School

In this journal-ready dissertation, a Small-size school was an elementary school with a student enrollment of 400 students to 799 students (Zoda et al., 2011).

State of Texas Assessments of Academic Readiness (STAAR)

The STAAR test is an assessment program in the State of Texas that was first implemented in the 2011-2012 school year. It was created to measure student knowledge and application of the state-mandated curriculum. Students in Grades 3-8 and high school are administered assessments in the areas of Reading, Mathematics, Science, Social Studies, and Writing (Texas Education Agency, 2018c).

Very Small-size School

In this journal-ready dissertation, a Very Small-size school was defined as an elementary school that had a student enrollment of 50 to 399 students (Zoda et al., 2011).

White

A White person has origins in any "of the original peoples of Europe, the Middle East, or North Africa" (Texas Education Agency, 2017-2018 Texas Education Data Standards, 2017, p. 4).

Literature Review Search Procedures

For the purpose of this journal-ready dissertation, the literature regarding school size as it relates to academic achievement by ethnicity/race, economic status, at risk status, and gender was examined. The following phrases were used in the search for relevant literature: *school size, elementary, academic achievement, student progress, ethnicity/race, economically disadvantaged, poverty, at risk, and gender*. The searches were conducted through the EBSCO Host database for academic journals. Relevant articles were reviewed that pertained to school size and academic performance.

Key word searches for “school size” yielded 9,438 results, and by narrowing the search to include “elementary”, the search was reduced to 3,135 articles. Adding achievement to that search resulted in 932 articles. When “school size” and “academic achievement” were searched, 1,651 results displayed. A separate search was conducted for “student progress” and resulted in 21,605 articles. This number was reduced to 33 when “school size” was added. Key word searches for “school size” and “ethnicity/race” yielded 390 articles. “School size” and “economically disadvantaged” displayed 92 articles, whereas “school size” and “poverty” resulted in 424 articles. When using the key words “school size” and “gender”, 794 articles were displayed. Relevant articles were reviewed pertaining to their relationship to school size and academic achievement. Additionally, relevant articles were reviewed pertaining to student progress.

Delimitations

The three studies in this journal-ready dissertation were delimited to elementary schools that consisted of the grade configuration of K-5. This grade configuration was selected because it was the most common elementary school grade configuration in the State of Texas (National Center for Education Statistics, 2017). Charter school data were excluded from this study because of the differences between them and traditional public schools. Specifically examined in this journal-ready dissertation was the degree to which differences were present in student progress measures in reading and in mathematics as a function of elementary school size. Data were delimited to students in the State of Texas with a STAAR progress measure. This delimitation included only STAAR Reading and

Mathematics results for students in Grade 4 and Grade 5. Finally, the data consisted of five school years: 2013-2014, 2014-2015, 2015-2016, 2016-2017, and 2017-2018.

Limitations

In this journal-ready dissertation, the relationship of elementary school size with student progress was addressed. As a result, key limitations were present. First, the data analyses only included quantitative data in the three studies. Accordingly, other variables could not be eliminated as factors that contributed to student progress. Another limitation is that through the use of archival data, a causal-comparative research design was present. As such, cause and effect relationships could not be established. Thus, other variables other than school size might have contributed to any differences obtained in student progress. A third limitation includes variables of ethnicity/race, economic status, and at risk status that were self-reported at the school level. Although the State of Texas conducted audits, the possibility existed that inaccurate reporting might have occurred.

Assumptions

An assumption was made in this journal-ready dissertation that the student progress data acquired from the Texas Academic Performance Report were accurately reported. It was assumed that schools accurately collected and documented to the Texas Education Agency student ethnicity/race, economic status, at risk status, and gender. Any errors in such reporting could have resulted in inaccurate findings.

Procedures

Following approval of the journal-ready dissertation proposal by the dissertation committee, an application was submitted to Sam Houston State University's Institution Review Board. Upon approval from the Institutional Review Board, archival data from the Texas Academic Performance Reports for the 2013-2014, 2014-2015, 2015-2016, 2016-2017, and 2017-2018 school years were downloaded and analyzed. These data were available for public access on the Texas Education Agency website.

Organization of the Study

In this journal-ready dissertation, three journal-ready manuscripts were generated. In the first study, data were analyzed 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. Data were analyzed separately for each of the three major ethnic/racial groups (i.e., White, Hispanic, and Black) in Texas. For the second study, differences in student progress in reading and mathematics as it relates to school size for the 2013-2014, 2014-2015, 2015-2016, 2016-2017, and 2017-2018 school years were examined. In the second article, data were analyzed separately for students in poverty and students who were identified as being at risk. Similarly, in the third investigation data were analyzed to determine the extent to which differences were present in student progress in reading and mathematics as a function of school size for the same five school years. In the third article, data were analyzed separately for boys and for girls.

Five chapters comprise this journal-ready dissertation. Chapter I includes the background of the study, statement of the problem, purpose of this study, significance of the study, theoretical framework, definitions of terms, assumptions, delimitations, and limitations of the three research investigations. Chapter II is the first empirical research investigation. Chapter III includes the second empirical research study. The third empirical research investigation is in Chapter IV. Finally, a discussion of the research results of the three studies, implications for policy and practice, and recommendations for future research regarding school size complete Chapter V.

CHAPTER II

ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS BY ETHNICITY/RACE: A TEXAS MULTIYEAR STATEWIDE ANALYSIS

This dissertation follows the style and format of *Research in the Schools (RITS)*.

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, 2015-2016, 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: School size, Elementary, Student Achievement, STAAR, Student Progress, Reading, Mathematics, Ethnicity/Race

ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS BY ETHNICITY/RACE: A TEXAS MULTIYEAR STATEWIDE ANALYSIS

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 the Every Student Succeeds Act, schools are 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 have 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, 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 (National Assessment of Educational Progress, 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 are 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 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, 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 existing facilities or to build additional structures. Financially having 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 school campus is assessed and rated to determine if those instructional needs are being met. Ratings are based on student achievement, student progress, and efforts to close achievement gaps (Texas Education Agency, 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 in all four subjects 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 in all three subject areas 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 have used student progress as a measure in their studies. As such, the effect of school size on student progress should be examined to determine if 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 (Texas Education Agency, 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, require 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 ethnic/racial groups: 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 measures rather than the traditional pass or fail measurements. 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.

Research Questions

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)? Subquestions 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, Hispanic, and Black 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 across all five school years.

Method

Research Design

For this study, a nonexperimental, causal-comparative research design was conducted (Johnson & Christensen, 2017). 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 variables 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 (Texas Education Agency, 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, mathematics progress rate 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 the 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 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). Scheffe` 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 2.1 for the descriptive statistics for this school year.

Insert Table 2.1 about here

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). Scheffe` 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 2.1 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). Scheffe` post hoc procedures revealed that although two pairs approached the conventional level, no pairs reached the conventional level of statistical significance. Descriptive statistics for this analysis are presented in Table 2.1.

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). Scheffe` 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 2.1 contains the descriptive statistics for this school year.

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). Scheffe` 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 2.1 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 2.1 are the trends in reading progress rates for White students for the three school sizes in the 2013-2014 through 2017-2018 school years.

Insert Figure 2.1 about here

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 2.2.

Insert Table 2.2 about here

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). Scheffe` post hoc tests revealed that differences in progress rates in reading were present for only one pairwise comparison, 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 Hispanics students in Moderate-size schools, Small-size schools, and Large-size schools. Delineated in Table 2.2 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 2.2 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 2.2 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 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 2.2 are the trends in progress rates in reading for Hispanic students for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 2.2 about here

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 2.3 for the descriptive statistics for this school year.

Insert Table 2.3 about here

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). Scheffe` 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 the other school size comparisons, the reading progress rates of Black students were similar. Delineated in Table 2.3 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 2.3 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 2.3 contains 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. 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 2.3 are the trends in progress rates in reading for Black students for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 2.3 about here

Mathematics Results for White Students for All Four 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 2.4 for the descriptive statistics for this school year.

Insert Table 2.4 about here

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 2.4. 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). Scheffe` 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 2.4 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). Scheffe` 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 2.4 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 four school years, a line graph was used to illustrate the trends across the four 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 2.4 are the trends in progress rates in mathematics for White students for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 2.4 about here

Mathematics Results for Hispanic Students for All Four 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). Scheffe` 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. 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 2.5.

Insert Table 2.5 about here

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 2.5 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). Scheffe` 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 2.5 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). Scheffe` 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 2.5 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 four school years for Hispanic students, a line graph was used to illustrate the trends across the four school years. Small-size schools tended to have higher progress rates in mathematics for their Hispanic students than Moderate-size and Large-size schools. Depicted in Figure 2.5 are the trends in progress rates in mathematics for Hispanic students for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 2.5 about here

Mathematics Results for Black Students for All Four 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 2.6 for the descriptive statistics for this school year.

Insert Table 2.6 about here

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 2.6. 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 2.6 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 2.6 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 four school years for Black students, a line graph was used to illustrate the trends across the four school years. Small-size schools tended to have higher progress rates in mathematics for their Black students than Moderate-size and Large-size schools. Depicted in Figure 2.6 are the trends in progress rates in mathematics for Black students for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 2.6 about here

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 measures and the mathematics progress measures of White, Hispanic, and Black 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 was related to the progress rates of students in Texas. Five years of data were analyzed to determine the extent to which trends were 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 rates 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 et al., 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 et al., 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 was used 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, 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 of school size on student progress. Although recent researchers in Texas (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) support Large-size schools, results delineated herein may be interpreted to mean 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 had higher progress rates for White students, whereas Small-size schools had higher progress rates 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. 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 67.4% in the last 30 years. Continued enrollment increases means that school leaders must address building new schools or increasing enrollment on existing 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 upon the results of this investigation, several recommendations can be made for future research. First, further examination of the student progress measures 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 Texas state-mandated assessments. Additional research should be conducted on student progress at the middle school and high school level. A 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 more conclusive decisions 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 Texas state-mandated assessments, specifically the reading progress rates and the mathematics progress rates of White, Hispanic, and Black 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 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 is not compromised.

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Table 2.1

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

Table 2.2

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

Table 2.3

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

Table 2.4

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

Table 2.5

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

Table 2.6

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

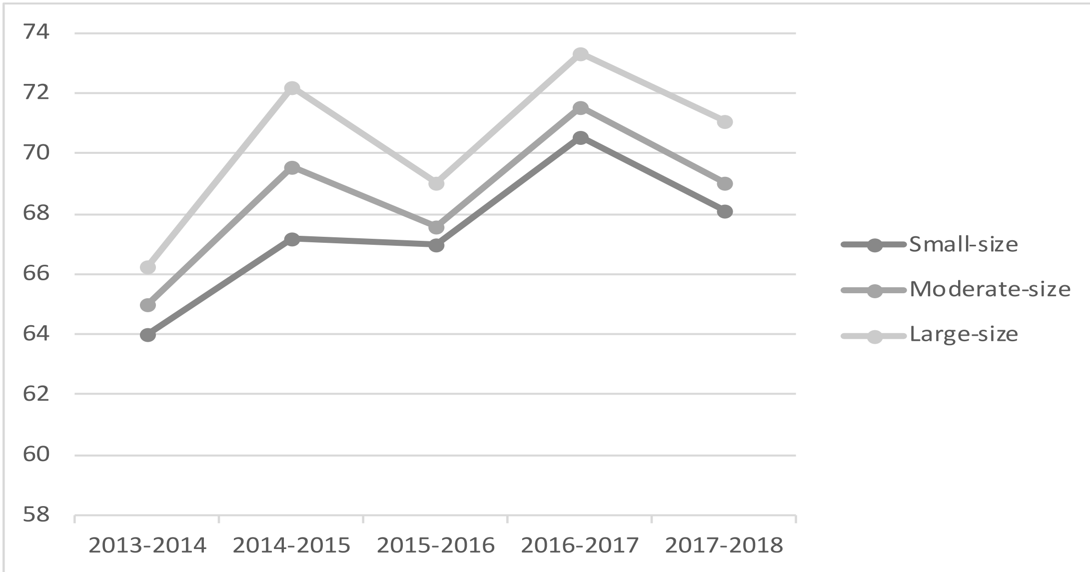

Figure 2.1. Reading progress rates by school size for White students across all five school years.

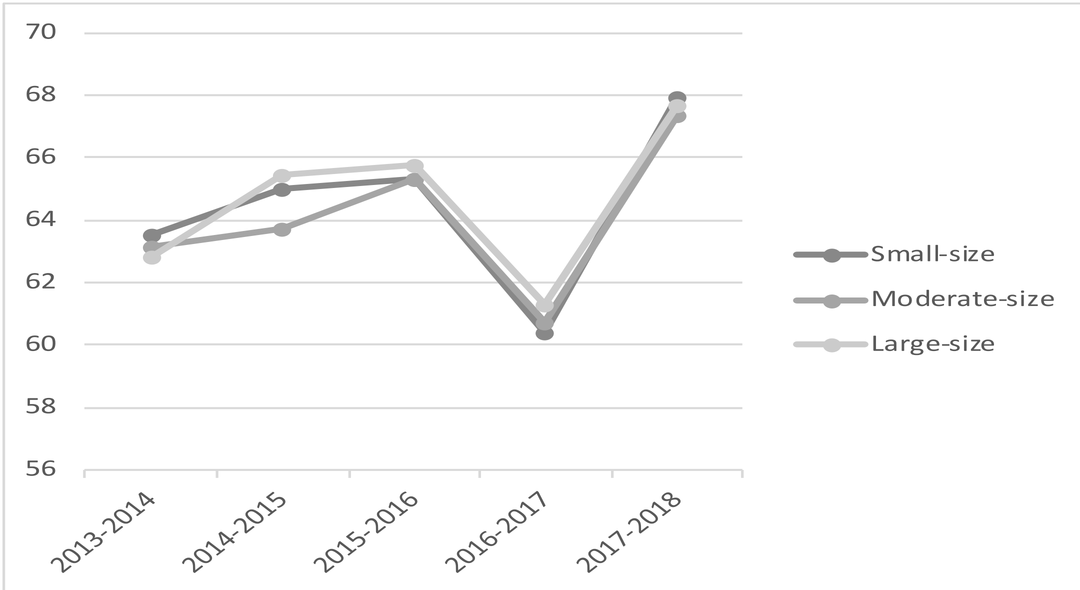

Figure 2.2. Reading progress rates by school size for Hispanic students across all five school years.

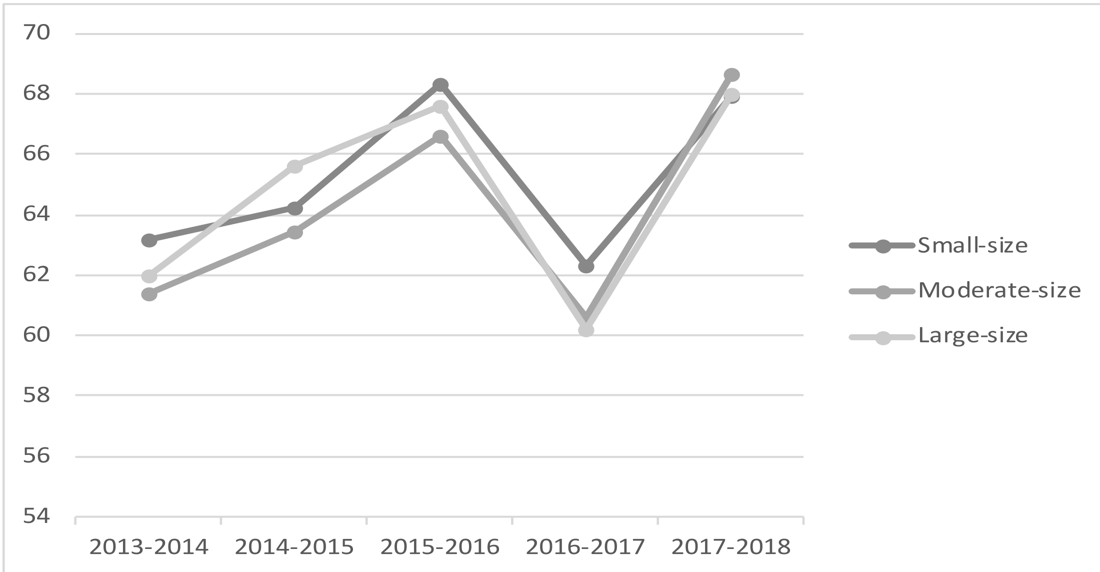

Figure 2.3. Reading progress rates by school size for Black students across all five school years.

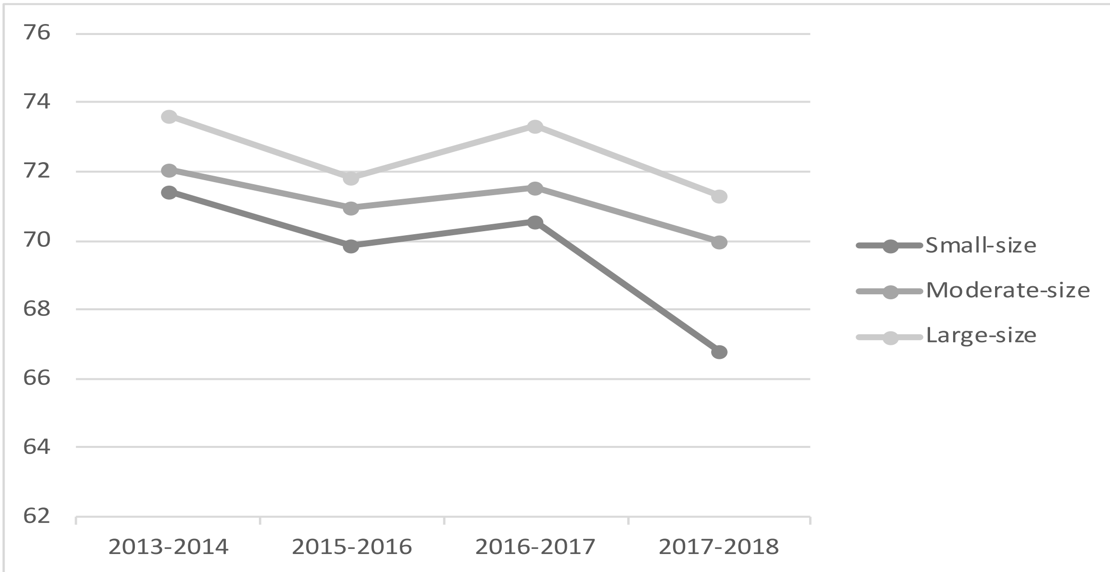

Figure 2.4. Mathematics progress rates by school size for White students across all four school years.

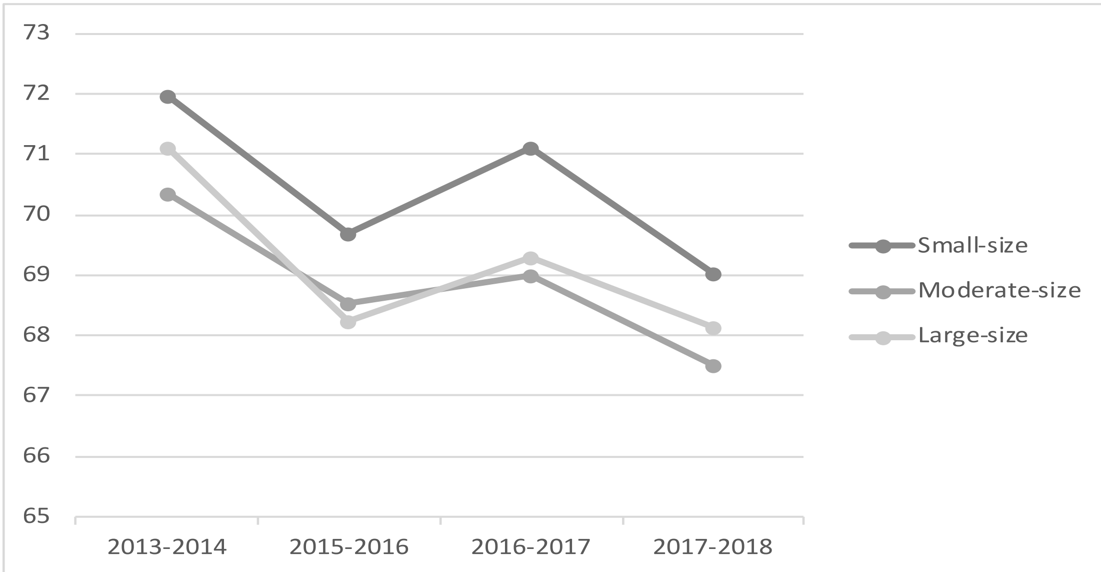

Figure 2.5. Mathematics progress rates by school size for Hispanic students across all four school years.

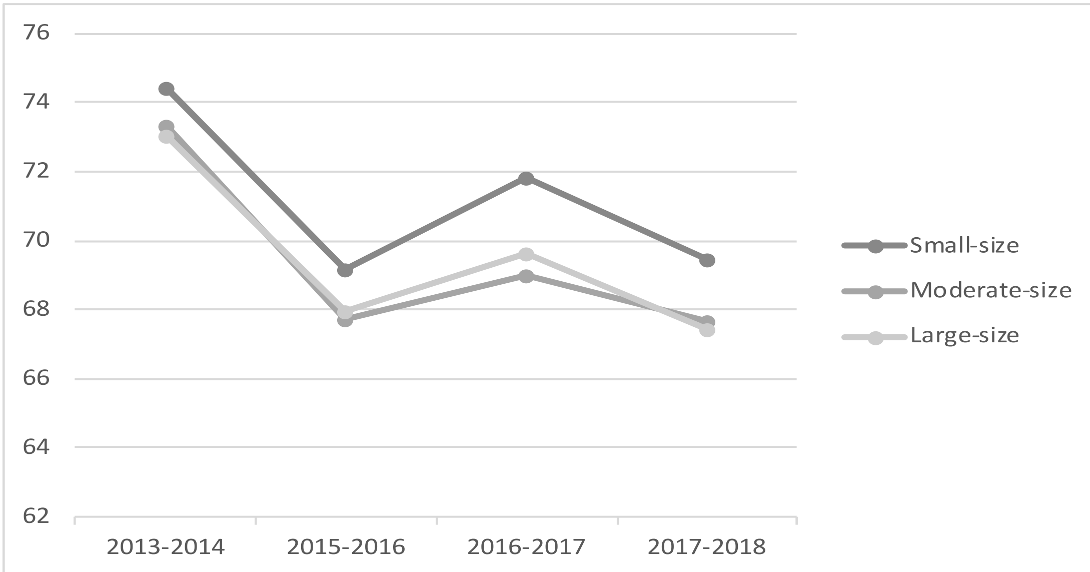

Figure 2.6. Mathematics progress rates by school size for Black students across all four school years.

CHAPTER III

ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS BY ECONOMIC AND AT RISK STATUS: A TEXAS MULTIYEAR, STATEWIDE ANALYSIS

This dissertation follows the style and format of *Research in the Schools (RITS)*.

Abstract

In this investigation, the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the Texas Reading and Mathematics assessments was examined for students who were economically disadvantaged and students who were at risk. Archival data available on the Texas Academic Performance Report were analyzed for the 2013-2014, 2014-2015, 2015-2016, 2016-2017, and 2017-2018 school years. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for students who were economically disadvantaged. Inferential analyses revealed the presence of statistically significant differences in reading, with below small to small effect sizes, for students who were at risk. Varied results existed for both Large-size and Small-size schools in reading for students who were at risk. Small-size schools had statistically significantly higher progress rates in reading and mathematics for both students who were economically disadvantaged and students who were at risk. Implications for policy and practice, as well as recommendations for research, are provided.

Keywords: School size, Elementary, Student Achievement, STAAR, Student Progress, Reading, Mathematics, Economically Disadvantaged, At Risk

ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS BY ECONOMIC AND AT RISK STATUS: A TEXAS MULTIYEAR, STATEWIDE ANALYSIS

School leaders are charged with providing all students with an equal education. Legislation such as the Every Student Succeeds Act (formerly the No Child Left Behind Act) requires that all students be provided educational opportunities so that they demonstrate proficiency in the core subject areas (United States Department of Education, 2018). In addition to such federal mandates, state accountability systems can also place pressure on school leaders to meet the instructional needs of all students. In the Texas state accountability system, each school district and each school campus is evaluated based on student achievement, student progress, and efforts to close achievement gaps. Following these assessments, ratings are assigned to these school districts and school campuses (Texas Education Agency, 2018b). Student groups whose data are specifically analyzed include students in poverty and students determined to be at risk. The ratings assigned to each campus can affect the implementation of state and federal interventions, as well as public perceptions. Accordingly, student achievement is a high priority for school leaders.

Clearly documented over the past 50 years is that poverty has detrimental effects on academic achievement (Coleman et al., 1966; Hegedus, 2018). In a study in which the relationship between poverty and a school's academic performance was examined, strong negative relationships were documented between school poverty and student achievement (Hegedus, 2018). Nearly half of a school's achievement performance could be explained by the percentage of students who were eligible for free and reduced lunch. Students in poverty had statistically significantly lower achievement scores than their peers from higher incomes. This lower academic achievement can be associated with students in poverty having less access to resources that support academic achievement. These resources can include access to quality teachers and exposure to opportunities at home (Burney & Beilke, 2008; Carter & Welner, 2013). Barriers preventing access to resources increases the learning gaps between students in poverty and those students not in poverty.

Poverty levels in Texas are extremely high, with more than one half of Texas students identified as economically disadvantaged (Texas Education Agency, 2018a). Students in poverty lack availability of the resources mentioned above, which often leads to other academic difficulties. These difficulties may include not performing satisfactorily in core curriculums or on state assessments, lower reading levels, retention, or behavior issues that lead to suspensions, expulsions, or alternative placements. Along with more than one half of Texas public school students being in poverty, over half of Texas public school students are identified as being at-risk (Texas Education Agency, 2018a). Texas identifies 13 criteria, which include these difficulties, to define a student as at risk of dropping out of high school. Combine any of these at risk criteria with poverty, and that student only has a 25% chance of graduating from high school (Balfanz, 2011). Negative consequences have been clearly and extensively established for students who drop out of high school. Lower education levels are associated with lower incomes, higher crime rates, and poorer health (Carter & Welner, 2013). These conditions lead to future generations of students in the same predicament. Thus, educational leaders need to implement high quality instructional programs to address the high percentages in Texas of students who are at risk of dropping out and students who are economically disadvantaged.

In addition to ensuring a fair and equitable education, financially responsible decisions must be made by school leaders. One area that falls under this area is facility management. Enrollment in Texas schools has increased by nearly a million students from 2008 to 2018 (Texas Education Agency, 2018a). As such, school leaders are faced with the decision to build new schools or to increase the capacity at existing facilities. Consolidating students in one facility instead of having multiple campuses with smaller enrollments can result in savings in operational costs, personnel costs, supplies, materials, and the combining of resources (Boser, 2013; Dodson & Garrett, 2004; Stanislaski, 2015). Reflected in the economies of scale model is that larger size schools can operate at a lower cost per student than small schools because they operate with more economic efficiency. Larger size schools can provide more resources, additional opportunities, higher level courses, and a more diverse course selection (Werblow & Duesberry, 2009) than can be provided by smaller size schools.

Because school leaders must provide a fair and equitable education for all students, while at the same time operate in a fiscally responsible way, examining how student enrollment affects performance on Texas state-mandated assessments is important. Recent studies in the State of Texas have been conducted by multiple researchers (e.g., Ambrose, 2017; Riha, Slate, & Martinez-Garcia, 2013; Rodriguez, 2016; Zoda, Combs, & Slate, 2011) who have provided evidence that students enrolled at Large-size schools had better levels of academic performance than students who were enrolled at Small-size schools.

Zoda et al. (2011), in a study most relevant to this article, examined Texas Assessment of Knowledge and Skills (TAKS) Reading, Mathematics, and Writing test score data on Grade 4 students. Four school sizes were present in their study: 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). During the 5-year study, inferential statistical analyses revealed statistically significant results for all students in all three subject areas in 12 of the 15 analyses, with small effect sizes. Grade 4 students who were enrolled in Large-size elementary schools had statistically significantly higher passing rates in all three subject areas than students enrolled in either Small or Very Small schools.

Zoda et al. (2011) also revealed the presence of statistically significantly higher passing rates for Black students who were enrolled in Large and Very Large schools in each subject area than for Black students who were enrolled in either Small or Very Small schools. Similarly, Hispanic students and White students who were enrolled in Large-size schools had statistically significantly higher passing rates in four of the five years when compared to their peers who were enrolled in either Small-size or Very Small-size schools. As such, Zoda et al. (2011) clearly documented the presence of statistically significant differences in academic achievement for Black, Hispanic, and White students as a function of school size. The larger the elementary school size was, the higher passing rates were for Black, Hispanic, and White students.

In a similar study, but at the middle school level, Riha et al. (2013) examined Grade 8 TAKS Reading, Mathematics, Science, and Social Studies test score data from the 2005-2006 through the 2009-2010 school years. Extensive documentation was provided that Hispanic students performed statistically significantly better in Large-size middle schools (i.e., 1,000 or more students) than in Small-size middle schools (i.e., 100-499 students). During this 5-year period, Grade 8 Hispanic students who were enrolled in Large-size middle schools consistently had statistically significantly better performance in all four subject areas than Grade 8 Hispanic students who were enrolled in Small-size middle schools.

In a recent study conducted by Rodriguez (2016), TAKS Reading and Mathematics test scores were examined for English Language Learners who were economically disadvantaged for the 2008-2009 and 2009-2010 school years. English Language Learners who were economically disadvantaged and who were enrolled in Very Large-size (i.e., 2,100 or more students) schools had a 16-20 point higher average raw score than their counterparts who were enrolled in Moderate-size (i.e., 220-464 students) schools. Similarly, statistically significant differences on the TAKS Mathematics examination were 15-21 points higher for English Language Learners who were economically disadvantaged in Very Large-size schools than English Language Learners who were economically disadvantaged in Moderate-size schools. In both subject areas, the larger the school size, the higher the average raw score was in reading and in mathematics for English Language Learners

The achievement of students who were economically disadvantaged was investigated by Ambrose (2017), in which dropout rates, GED participation rates, and graduation rates as a function of school size was examined. In her research, school size was examined by three varieties of school groupings based on previous researchers and the Texas University Interscholastic League. Regarding dropout rates, students who were economically disadvantaged and who were enrolled in smaller size high schools had statistically significantly higher dropout rates than their peers who were enrolled in larger size high schools. No differences were established in GED participation rates as a function of school size. With respect to graduation rates, students in poverty who were enrolled in smaller size high schools had statistically significant lower graduation rates than students in poverty who were enrolled at either Moderate-size or Large-size high schools. Overall, students were more successful in schools with higher student enrollment than in schools with lower student enrollment.

In addition to pass or fail measures of student achievement, the State of Texas also reports on a student's progress, or amount of improvement from one year to the next. Student results are categorized into three labels: Did Not Meet, Met, or Exceeded (Texas Education Agency, 2018c). No studies were discovered in which the student progress measure has been analyzed. However, this measure offers an alternative way to measure a school's effectiveness. Researchers (e.g., Coleman et al., 1966; Hegedus, 2018) have demonstrated the presence of strong relationships between poverty and student achievement. Academic growth may be less dependent on environmental factors such as the demographics of the student and neighborhood, and, as a result, would reflect more on the academic efforts of the school (Hegedus, 2018; Reardon, 2016).

Statement of the Problem

School leaders must ensure that students are being educated fairly and equitably. Legislation such 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), including students in poverty and students who are identified at risk. Enrollment in Texas schools increased by 15.6% from 2008 to 2018. In that same time period, the number of students identified as economically disadvantaged increased by 23%. More than one half of Texas students are economically disadvantaged (Texas Education Agency, 2018a). In addition, in the 2017-2018 school year, 50.8% of students in Texas schools were considered at risk of dropping out or not meeting educational standards (Texas Education Agency, 2018d). In the 2018 Comprehensive Biennial Report on Texas Public Schools (Texas Education Agency, 2019), students identified at risk had lower passing rates on the 2018 State of Texas Assessments of Academic Readiness (STAAR) Reading, Mathematics, Writing, Social Studies, and Science tests than students who were not at risk across all grade levels and student groups. In addition, students who were economically disadvantaged had lower passing rates across all tests in Grades 3-8 than students who were not economically disadvantaged. Students coded with at least one at risk indicator in addition to being identified as economically disadvantaged have only a 25% chance of graduating from high school (Balfanz, 2011). As such, school leaders need to consider how those decisions influence students in poverty or students who are at risk.

School leaders have to consider how to address the increasing student enrollment and resulting academic needs in Texas schools. School leaders can choose to increase the enrollment at each campus or to build additional campuses. To facilitate such decisions, school leaders must take into consideration the effect of school size (i.e., student enrollment) on the academic achievement of students in poverty and students who are identified at risk.

Purpose of the Study

The purpose of this study was to determine the extent to which student enrollment at elementary schools was related to student progress on the State of Texas state-mandated assessment. Student progress rates in reading and in mathematics were analyzed for two groups of students: students who were economically disadvantaged and students who were at risk. Five years of Texas statewide data were examined to ascertain the degree to which trends were present in student progress in reading and in mathematics for students in poverty and for students who were at risk.

Significance of the Study

The subject of school size has been investigated extensively. Former researchers (e.g., Eberts, Kehoe, & Stone, 1984; Leithwood & Jantzi, 2009; Wendling & Cohen, 1981) documented evidence for small-size schools. In contrast, recent researchers (e.g., Barnes & Slate, 2014; Gilmore, 2007; Riha et al., 2013; Zoda et al., 2011) provide an abundance of evidence in which large-size schools in Texas have higher student achievement. During the review of literature, no published articles were located regarding school size and the current Texas state-mandated assessment, the STAAR. In this investigation, student achievement was examined using student progress measures on the STAAR test rather than the traditional pass or fail measurements. Because school leaders continue to face decisions regarding student enrollment and school size, researchers should continue to conduct investigations on school size to add to the current literature in Texas supporting large-size schools. Educational leaders can benefit from current research regarding school size.

Research Questions

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., Very Small-size, Small-size, Moderate-size, and Large-size)? Subquestions 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 students who were economically disadvantaged and for students who were at risk. 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.

Method

Research Design

Present in this investigation was a nonexperimental, causal-comparative research design (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 variables could be manipulated in this study.

The independent variable in this study was 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). The dependent variables in this study consisted of the reading progress measure and the mathematics progress measure on the STAAR Reading and Mathematics assessments. Data were analyzed separately by students who were identified as economically disadvantaged and students who were identified at risk.

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 (Texas Education Agency, 2018c). 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 had met or exceeded student progress, were analyzed. During the 2014-2015 school year, mathematics progress rates were not reported. Revised TEKS for Mathematics were implemented in the classroom in the 2014-2015 school year. Accountability calculations excluded Mathematics for Grades 3-8. Therefore, mathematics progress rates were not analyzed for the 2014-2015 school year.

Data for this study were analyzed for students who were economically disadvantaged and students who were at risk. The Texas Education Agency (2018b) determines if a student is economically disadvantaged based on household size and income levels set by the federal poverty guidelines each July. For 2018-2019, a family of four whose annual income was below $25,100 were considered eligible for free or reduced priced lunch or other public assistance (United States Department of Agriculture, 2018). Students from families who meet the eligibility guidelines each year are identified economically disadvantaged.

The second group of student data analyzed in this study were students who were at risk. This indicator is a label for students who are at risk of not meeting educational standards or dropping out of high school. The Texas Education Agency identifies students as at risk if the student is under the age of 26 and meets one or more of the following criteria: (1) previously retained; (2) not maintaining at least a 70 in two or more core curriculums (grades Grade 7 through Grade 12) in the preceding or current school year; (3) did not perform satisfactorily on a required state assessment; (4) did not perform satisfactorily on a readiness assessment in Grades Prekindergarten through Grade 3; (5) is pregnant or is a parent; (6) has been placed in an alternative education program during the preceding or current school year; (7) has been expelled during the preceding or current school year; (8) is currently on parole, probation, deferred prosecution, or other conditional release; (9) was previously reported to have dropped out of school; (10) is an English Language Learner; (11) is in the custody of, or been referred to the Department of Protective and Regulatory Services; (12) is homeless; or (13) resided in a residential placement facility in the district, including a detention facility, substance abuse treatment facility, emergency shelter, psychiatric hospital, halfway house, or foster group home (Texas Education Agency, 2017).

For the purpose of this study, elementary campuses were limited to campuses that were Kindergarten through Grade 5. Any campus that did not meet this configuration was eliminated. Campuses that were 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 four school sizes: Very Small-size (50-399 students), Small-size (400-799 students), Moderate-size (800-1,199 students), and Large-size (1,200 or greater students). Because very few schools were present that had 1,200 students or greater, 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).

Results

For this investigation, an Analysis of Variance (ANOVA) procedure was calculated for each school year and for students in Texas who were economically disadvantaged and students who were at risk 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 the 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 All Five School Years for Students Who Were Economically Disadvantaged

With respect to the degree to which differences were present in the reading progress rates of students who were economically disadvantaged as a function of elementary school size in the 2013-2014 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 2442) = 1.98$, $p = .14$.. Large-size, Moderate-size, or Small-size schools had similar progress rates in reading for their students in poverty. Readers are directed to Table 3.1 for the descriptive statistics for this school year.

Insert Table 3.1 about here

For the 2014-2015 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 2466) = 6.35$, $p= .002$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present between only one pairwise combination, Large-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates in reading for their students who were economically disadvantaged than Moderate-size schools. Small-size schools had similar progress rates in reading for their students in poverty as Moderate-size and Large-size schools. Delineated in Table 3.1 are the descriptive statistics for this school year.

Concerning the 2015-2016 school year, a statistically significant difference was not revealed, $F(2, 2558) = 0.92$, $p = .40$. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their students who were economically disadvantaged. Descriptive statistics for this analysis are presented in Table 3.1. In the 2016-2017 school year, a statistically significant difference was not revealed, $F(2, 2606) = 0.52$, $p = .60$. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their students who were economically disadvantaged. Readers are directed to Table 3.1 for the descriptive statistics for this school year. Regarding the 2017-2018 school year, the parametric ANOVA did not yield a statistically significant difference, $F(2, 2661) = 0.75$, $p = .47$. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their students who were economically disadvantaged. Table 3.1 contains 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 had higher progress rates in reading for their students who were economically disadvantaged than Moderate-size and Small-size schools in three of the five years. Depicted in Figure 3.1 are the trends in reading progress rates for students who were economically disadvantaged for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 3.1 about here

Reading Results for All Five School Years for Students Who Were At Risk

Concerning the 2013-2014 school year, a statistically significant difference was revealed, $F(2, 2576) = 3.12$, $p = .04$, partial $n^2 = .01$, a below small effect size (Cohen, 1988). Scheffe` post hoc tests revealed that differences in progress rates in reading were present for only one pair, Moderate-size and Small-size schools. Small-size schools had statistically significantly higher progress rates in reading for their students who were at risk than Moderate-size schools. Similar progress rates in reading for students who were at risk were present for Moderate-size and Large-size schools and for Small-size and Large-size schools. Descriptive statistics for this analysis are presented in Table 3.2.

Insert Table 3.2 about here

For the 2014-2015 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2586) = 6.39$, $p = .002$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` 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 students who were at risk than Moderate-size schools. Similar progress rates in reading for students who were at risk were present in Moderate-size and Small-size schools and for

Large-size and Small-size schools. Delineated in Table 3.2 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, $F(2, 2669) = 1.65$, $p = .19$. Similar progress rates in reading for students who were at risk were present in Small-size, Moderate-size, and Large-size schools. Readers are directed to Table 3.2 for the descriptive statistics for this school year. In the 2016-2017 school year, a statistically significant difference was not yielded, $F(2, 2687) = 0.17$, $p = .85$. Similar progress rates in reading for students who were at risk were present across all three school sizes. Table 3.2 contains the descriptive statistics for this school year. For the 2017-2018 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2751) = 4.11$, $p = .02$, partial $n^2 = .003$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences in progress rates in reading were present for all but one pair, Large-size and Moderate-size schools. Large-size schools and Moderate-size schools had similar progress rates in reading for their students who were at risk. Small-size schools had statistically significantly higher progress rates in reading for their students who were at risk than Moderate-size schools and Large-size schools. Table 3.2 contains 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. Small-size schools tended to have higher progress rates in reading for their students who were at risk than Moderate-size and Large-size schools. For three of the school years, the difference in progress rates between Large-size and Small-size schools was less than a half of percentage point. Depicted in Figure 3.2 are the trends in reading progress rates for students who were at risk for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 3.2 about here

Mathematics Results for All Four School Years for Students Who Were Economically Disadvantaged

With respect to the 2013-2014 school year, a statistically significant difference was revealed, $F(2, 2543) = 4.62$, $p = .01$, partial $n^2 = .004$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present for one pair of school sizes, Small-size and Moderate-size. Small-size schools had statistically significantly higher progress rates in mathematics for their students who were economically disadvantaged than Moderate-size schools. Large-size and Moderate-size schools and Large-size and Small-size schools had similar progress rates in mathematics for their students who were economically disadvantaged. Readers are directed to Table 3.3 for the descriptive statistics for this school year.

Insert Table 3.3 about here

Concerning the 2015-2016 school year, a statistically significant difference was not revealed, $F(2, 2520) = 0.88$, $p = 42$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their students who were economically disadvantaged. Descriptive statistics for this analysis are presented in Table 3.3. In the 2016-2017 school year, a statistically significant difference was revealed, $F(2, 2615) = 4.65$, $p = .01$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present for one pair of school sizes, Small-size and Moderate-size. Small-size schools had statistically significantly higher progress rates in mathematics for their students who were economically disadvantaged than Moderate-size schools. Large-size schools had similar progress rates in mathematics for their students who were economically disadvantaged as Moderate-size and Small-size schools. Readers are directed to Table 3.3 for the descriptive statistics for this school year.

Regarding the 2017-2018 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 2638) = 0.91$, $p = .40$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for their students who were economically disadvantaged. Table 3.3 contains the descriptive statistics for this school year.

With respect to the trend present on the mathematics progress measure and elementary school size across four school years, a line graph was used to illustrate the trends across the four school years. Small-size schools tended to have higher progress rates in mathematics for their students who were economically disadvantaged than Moderate-size and Large-size schools. Depicted in Figure 3.3 are the trends in mathematics progress rates for students who were economically disadvantaged for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 3.3 about here

Mathematics Results for All Four School Years for Students Who Were At Risk

Concerning the 2013-2014 school year, a statistically significant difference was revealed, $F(2, 2630) = 7.28$, $p = .001$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` 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 students who were at risk than Moderate-size schools. Large-size schools had similar progress rates in mathematics for their students who were at risk as Moderate-size or Small-size schools. Descriptive statistics for this analysis are presented in Table 3.4.

Insert Table 3.4 about here

With respect to the 2015-2016 school year, a statistically significant difference was not revealed, $F(2, 2641) = 0.84$, $p = .43$. Similar progress rates in mathematics for students who were at risk were present in Small-size, Moderate-size, and Large-size schools. Readers are directed to Table 3.4 for the descriptive statistics for this school year. During the 2016-2017 school year, a statistically significant difference was revealed, $F(2, 2711) = 4.30$, $p = .01$, partial $n^2 = .003$, below small effect size (Cohen, 1988). Scheffe` 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 students who were at risk than Moderate-size schools. Large-size schools had similar progress rates in mathematics for their students who were at risk as Moderate size schools or Small-size schools. Delineated in Table 3.4 are the descriptive statistics for this school year.

Regarding the 2017-2018 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 2721) = 0.71$, $p = .49$. Small-size, Moderate-size, and Large-size schools had similar progress rates in mathematics for their students who were at risk. Table 3.4 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 four school years, a line graph was used to illustrate the trends across the four school years. Small-size schools tended to have higher progress rates in mathematics for their students who were at risk than Moderate-size and Large-size schools. Depicted in Figure 3.4 are the trends in mathematics progress rates for students who were at risk for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 3.4 about here

Discussion

In this investigation, the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the Texas state-mandated assessments was examined, specifically the reading progress rates and the mathematics progress rates of students who were economically disadvantaged and students who were at risk. 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 whether trends were present.

Summary of Reading Results

Large-size schools, Moderate-size schools, and Small-size schools had similar progress rates in reading for students who were economically disadvantaged in four of the five school years. In only one school year, Large-size schools had statistically significantly higher progress rates in reading then Moderate-size schools. Overall, school size was not related to the reading progress of students who were economically disadvantaged. For students who were at risk, results were varied. All three school sizes had similar progress rates in reading for students who were at risk in two of the five school years. In one school year, Large-size schools had statistically significantly higher progress rates in reading for their students who were at risk than Moderate-size schools. In two of the five years, Small-size schools had statistically significantly higher progress rates in reading for their students who were at risk than Moderate-size schools.

Summary of Mathematics Results

Large-size schools, Moderate-size schools, and Small-size schools had similar progress rates in mathematics for students who were economically disadvantaged in two of the four school years. In the other two school years, Small-size schools had statistically significantly higher progress rates in mathematics for their students who were economically disadvantaged than Moderate-size schools. For students who were at risk, Large-size schools, Moderate-size schools, and Small-size schools had similar progress rates in two of the four years. Small-size schools had statistically significantly higher progress rates in mathematics for students who were at risk than Moderate-size schools in two of the four years. When a statistically significant difference was present, Small-size schools had higher progress rates then Moderate-size schools for both students who were economically disadvantaged and students who were at risk.

Connections with Existing Literature

Results of this study were not congruent with current researchers in Texas on school size (e.g., Ambrose, 2017; Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha, Slate, & Martinez-Garcia, 2013; Rodriguez, 2016; Zoda et al., 2011). When examining students who were economically disadvantaged and high school size, Ambrose (2017) documented that students in poverty who were enrolled in smaller size high schools had statistically significantly higher dropout rates and lower graduation rates than their peers who were enrolled in larger size high schools. Rodriguez (2016) documented that English Language Learners who were economically disadvantaged had higher average raw scores on the TAKS Reading and Mathematics examinations than their peers in Moderate-size schools. In the current study, results were less conclusive. School size was not related to school progress in reading for students who were economically disadvantaged and had varied results in reading for students who were at risk. In contrasting results when a statistically significant difference was present, Small-size schools had higher progress rates then Moderate-size schools for both students who were economically disadvantaged and students who were at risk.

Connections to Theoretical Framework

The economies of scale theory was the theoretical framework present in this study. Economists indicate that larger size organizations can operate at a lower cost as they consolidate costs under one roof (Boser, 2013; Bowles & Bosworth, 2002). Based on this theory, Large-size schools can save money on operating costs, construction, and transportation. Saving money in these areas allows schools to reallocate the money to instructional costs such as broader course selection, mentoring, tutoring, and recruitment of teachers (Stanislaski, 2015; Werblow & Duesberry, 2009). Based on this information, Large-size schools should have higher progress rates than Moderate-size or Small-size schools. Results of this study were the opposite of this hypothesis as Small-size schools had higher progress rates in mathematics for their students who were economically disadvantaged and students who were at risk than Moderate-size or Large-size schools. In addition, school size was not related to school progress in reading for students who were economically disadvantaged and had varied results in reading for students who were at risk.

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 of school size on student progress for students who are economically disadvantaged and students who are at risk. State and federal legislation requires that schools document academic success in the core subjects for all students (Texas Education Agency, 2018c; United States Department of Education, 2018). In this study, school size made a difference in student progress in mathematics for students who were economically disadvantaged and students who were at risk. Based on this information, policymakers may want to consider enrollment size at schools with high populations of these students. Additional funding could be made available to schools with a high percentage of students who are economically disadvantaged and students who are at risk. The additional funding could be allocated to support school district efforts to have smaller size elementary schools or additional instructional supports.

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 grown 67.4% in the last 30 years. Continued enrollment increases means that school leaders must address building new schools or increasing enrollment on existing 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, as school enrollment increases, school leaders should ensure that instructional supports are in place to address the needs of students who are economically disadvantaged and students who are at risk.

Recommendations for Future Research

Based upon 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. Researchers can use the progress measure as a comparison to other achievement measures for students who were economically disadvantaged and students who were at risk. 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 Texas state-mandated assessments. Additional research should be conducted examining student progress at the middle school and high school level. A 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.

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 Texas state-mandated assessments, specifically the reading progress rates and the mathematics progress rates of students who were economically disadvantaged and students who were at risk. Statistically significant differences in mathematics progress rates were revealed supporting Small-size schools for students who were economically disadvantaged and students who were at risk. Consolidating schools may be the most cost-efficient solution for school leaders (Boser, 2013; Stanislaski, 2015). However, based on 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 who decide to increase enrollment in elementary schools need to also ensure the academic needs of that schools' student population are not compromised.

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Table 3.1

Descriptive Statistics for Reading Progress Rates for Students Who Were Economically Disadvantaged 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	286	62.74	8.70
Moderate-size	1,797	64.84	7.68
Large-size	362	61.63	6.74
2014-2015			
Small-size	298	63.40	9.34
Moderate-size	1793	62.45	7.43
Large-size	378	63.85	7.35
2015-2016			
Small-size	340	64.56	8.00
Moderate-size	1,851	64.25	7.41
Large-size	370	64.78	6.57
2016-2017			
Small-size	371	59.42	8.90
Moderate-size	1,894	59.18	7.79
Large-size	344	58.82	7.36
2017-2018			
Small-size	406	67.10	8.25
Moderate-size	1,913	66.71	7.23
Large-size	345	67.09	6.17

Table 3.2

Descriptive Statistics for Reading Progress Rates for Students Who Were At-Risk 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	284	66.63	8.94
Moderate-size	1,906	65.34	8.06
Large-size	389	65.51	7.75
2014-2015			
Small-size	292	65.76	10.82
Moderate-size	1892	64.59	8.04
Large-size	405	66.00	7.51
2015-2016			
Small-size	328	66.41	8.82
Moderate-size	1,946	65.77	7.91
Large-size	398	66.38	7.15
2016-2017			
Small-size	347	60.69	9.94
Moderate-size	1,971	60.54	8.17
Large-size	372	60.34	7.93
2017-2018			
Small-size	406	71.16	8.57
Moderate-size	1,982	70.03	7.72
Large-size	366	69.78	6.85

Table 3.3

Descriptive Statistics for Mathematics Progress Rates for Students Who Were Economically Disadvantaged 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	321	71.31	10.66
Moderate-size	1,855	69.66	10.08
Large-size	370	70.60	7.93
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	327	68.20	9.81
Moderate-size	1,831	67.62	9.26
Large-size	365	67.28	8.84
2016-2017			
Small-size	378	69.69	10.25
Moderate-size	1,889	68.07	9.64
Large-size	351	68.61	8.22
2017-2018			
Small-size	394	67.09	10.98
Moderate-size	1,906	66.72	9.54
Large-size	341	67.44	8.53

Table 3.4

Descriptive Statistics for Mathematics Progress Rates for Students Who Were At Risk 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	316	75.18	10.62
Moderate-size	1,927	73.07	9.91
Large-size	390	74.17	9.00
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	312	70.64	9.88
Moderate-size	1,932	70.15	9.40
Large-size	400	69.73	8.28
2016-2017			
Small-size	366	71.81	10.03
Moderate-size	1,974	70.29	9.34
Large-size	374	70.82	8.24
2017-2018			
Small-size	385	69.42	12.35
Moderate-size	1,975	69.09	9.41
Large-size	364	69.72	8.45

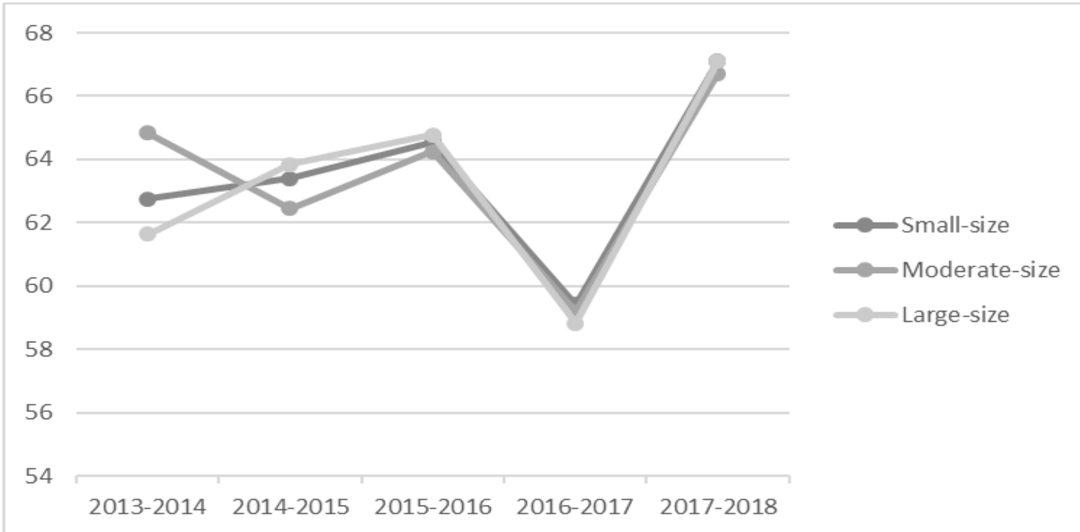

Figure 3.1. Reading progress rates by school size for students who were economically disadvantaged across all five school years.

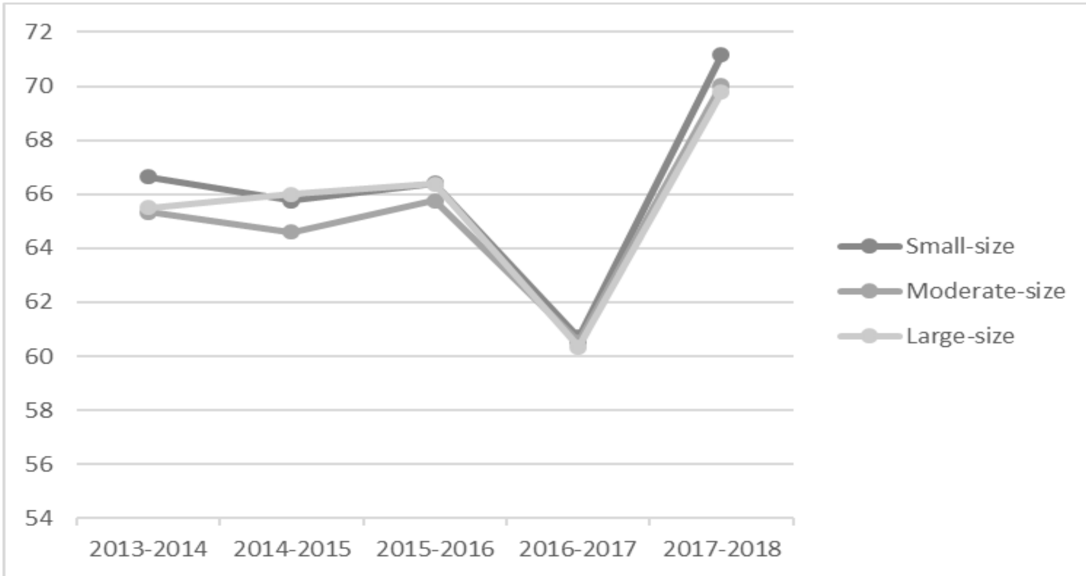

Figure 3.2. Reading progress rates by school size for students who were at risk across all five school years.

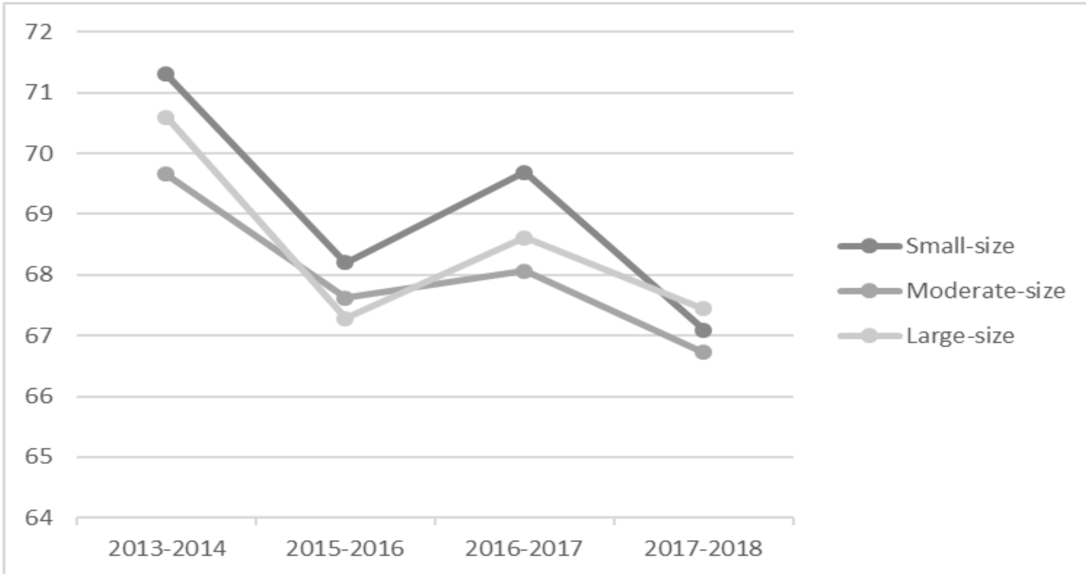

Figure 3.3. Mathematics progress rates by school size for students who were economically disadvantaged across all four school years.

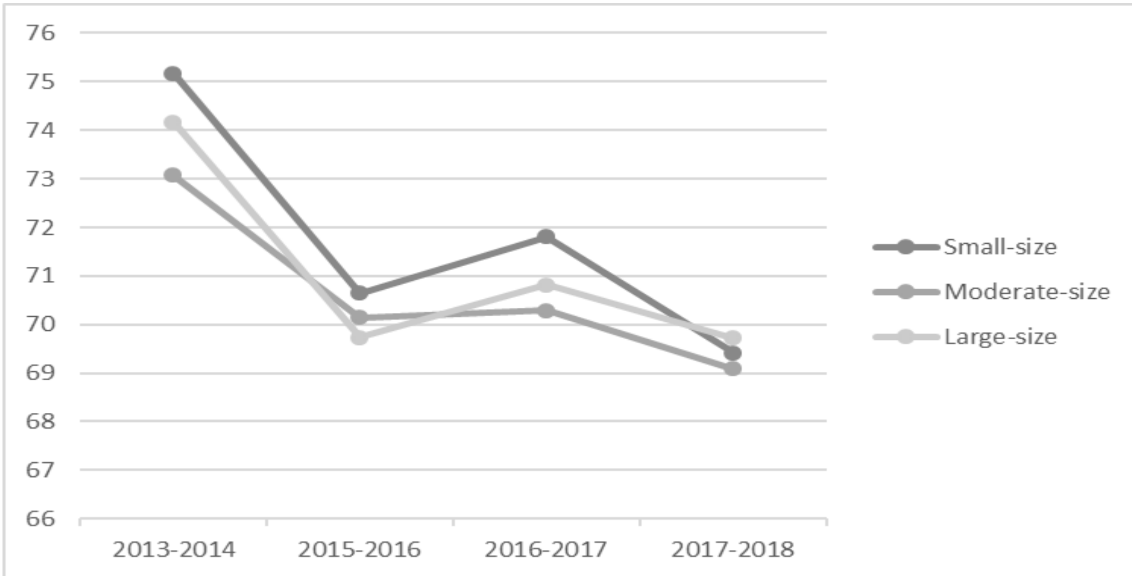

Figure 3.4. Mathematics progress rates by school size for students who were at risk across all four school years.

CHAPTER IV

ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS BY GENDER: A TEXAS MULTIYEAR STATEWIDE ANALYSIS

This dissertation follows the style and format of *Research in the Schools (RITS)*.

Abstract

In this investigation, the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress rates on the Texas Reading and Mathematics state-mandated assessments was examined for boys and for girls. Archival data available on the Texas Academic Performance Report were analyzed for the 2013-2014, 2014-2015, 2015-2016, 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 progress rates in reading than Small-size schools for boys and for girls. Large-size schools also had statistically significantly higher progress rates in mathematics for boys than Small-size schools. Results for progress rates in mathematics for girls was varied. Implications for policy and practice, as well as recommendations for future research, are provided.

Keywords: School size, Elementary, Student Achievement, STAAR, Student Progress, Reading, Mathematics, Gender

ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS BY GENDER: A TEXAS MULTIYEAR STATEWIDE ANALYSIS

Over the last 30 years, student enrollment in Texas has increased 67.4%. From 2008 to 2018, enrollment increased 15.6% from 4,671,493 to 5.399.682 students (Texas Education Agency, 2018a). Larger student populations create situations in which school leaders must make decisions on how to address student enrollment growth. School leaders have a choice to place the additional students in existing facilities, or to build additional structures. When making these decisions, school leaders must make financially responsible decisions, and at the same time ensure that students continue to receive the best education possible.

Larger-size schools operating at a lower cost than small-size schools is indicative of the economies of scale model (Werblow & Duesberry, 2009). Savings exist in operational costs, supplies, and materials due to consolidating resources under one roof (Boser, 2013; Dodson & Garrett, 2004; Stanislaski, 2015). In this way, large-size schools function with more economic efficiency than smaller-size schools by providing the ability for more resources, additional opportunities, higher-level courses, and a more diverse course selection (Werblow & Duesberry, 2009). Savings in operating costs can be redistributed to instructional needs.

Although financial benefits exist for large-size schools, school leaders also need to address the academic needs of all students. In Texas, each campus is assessed and rated through the state accountability system. These ratings are based on student achievement, student progress, and efforts to close achievement gaps (Texas Education

Agency, 2018c). Thus, it is important for school leaders to examine how schools of different enrollment sizes perform on state assessments.

The subject of school size has been investigated extensively. Researchers (e.g., Barnes & Slate, 2014; Eberts, Kehoe, & Stone, 1984; Fitzgerald et al., 2013; Leithwood & Jantzi, 2009; Riha, Slate, & Martinez-Garcia, 2013; Wendling & Cohen, 1981; Zoda et al., 2011) have documented extensive evidence for both large-size and small-size schools. In 2009, Leithwood and Janzti conducted a meta-analysis of studies on school size. They determined that students at small-size schools had higher achievement levels than students at large-size schools. This difference was critical to diverse and disadvantaged populations. However, recent researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) conducting studies in Texas have provided extensive evidence to the contrary. These researchers have documented that students in Texas enrolled at large-size schools performed at statistically significantly higher rates on state assessments than students enrolled at small-size schools.

Barnes and Slate (2014) analyzed Texas Assessment of Knowledge and Skills (TAKS) English Language Arts, Mathematics, Science, Social Studies, and Writing assessments for English Language Learners in Texas from the 2010-2011 school year. 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. English Language Learners in large-size school districts had higher passing rates than English Language Learners who were enrolled in either small-size or moderate-size school districts.

Another study was conducted on school size in which Fitzgerald et al. (2013) documented success of Moderate-size and Large-size schools. Fitzgerald et al. (2013) analyzed Texas high school completion rates among White, Black, and Hispanics students by school size for the 2008-2009, 2009-2010, and 2010-2011 school years. School size was defined as Small (i.e., 327 students and below), Medium (i.e., 328-1,337 students), and Large (i.e., 1,338 students and higher). Black and Hispanic students who were enrolled in Small-size schools had statistically significantly lower completion rates than their peers in Large-size schools. 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.

In another Texas study, Riha et al. (2013) provided evidence that Hispanic students performed statistically significantly better in Large-size schools (i.e., 1,000 or more students) than in Small-size schools (i.e., 100-499 students). Data from the Grade 8 TAKS Reading, Mathematics, Science, and Social Studies state assessment were analyzed over a 5-year time period. Grade 8 Hispanic students in Large-size schools had statistically significantly better performance in all four subject areas than Grade 8 Hispanic students in Small-size schools in each of the school years from 2005-2006 through 2009-2010. Effect sizes ranged from small to moderate for these statistically significant differences.

In a study most relevant for this article, Zoda et al. (2011) conducted a Texas statewide study for Grade 4 students on the TAKS Reading, Mathematics, and Writing assessments over a period of five years. Statistically significant results with small effect sizes were present in 12 of the 15 analyses in all three subject areas across the five years. In comparison to students enrolled in Small (i.e., 400-799 students) or Very Small schools (i.e., less than 400 students), students who were enrolled in Large-size (i.e., 800-1,199 students) elementary schools had statistically significantly higher passing rates in each subject.

Additional analyses by Zoda et al. (2011) was conducted to determine the degree to which school size differences were present for boys and for girls. For girls, all five years revealed statistically significant results for Reading and Mathematics, and three out of five years for Writing. For boys, statistically significant results were present in all five years for Mathematics and Writing, and three of the five years for Reading. In all three subjects, students in larger sized elementary schools had higher passing rates than students in smaller sized elementary schools.

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, specifically passing rates. Passing rates indicate whether students achieved a score that indicates they met or exceeded the grade level standard (Texas Education Agency, 2018c). Another measurement of student achievement reported on the state assessment is student progress. In the State of Texas, Grades 3 through high school are administered assessments in the subject areas of Reading, Mathematics, Writing, Science, and Social Studies. When a student has two consecutive years of assessment data in the same subject, the student is given a progress measure. The progress measure is a calculation used to show how much growth a student has made from one year to the next in that subject (Texas Education Agency, 2018d). A lack of literature is present in which student progress is used by researchers for their data analyses. Therefore, student progress should be examined when determining the effect of school size on the academic achievement of boys and girls.

Statement of the Problem

Schools in Texas have experienced a 67.4% enrollment growth in the last 30 years. From 2008 to 2018, nearly a million new students enrolled in Texas public schools (Texas Education Agency, 2018a). With these increases in student enrollment, school leaders must decide how to address the additional students. One solution is to have larger-size schools by increasing the enrollment at existing facilities. Another solution is to construct new buildings. If a district chooses to construct new buildings, the district must obtain the financial means to do so. Bond referendums allow school districts to receive a specified amount per student for each cent of tax effort to pay the principal and interest on eligible bonds issued to construct, acquire, renovate, or improve instructional facilities (Texas Education Agency, 2018b). Bond referendums must also be voted on for approval because of their effects on property taxes. In Texas, property taxes have increased by 233% from 1996 to 2016 (Barro & Diamond, 2018). Therefore, constructing new facilities is an important decision for school leaders as well as for members of the community.

Another factor to consider when addressing the increasing student enrollment is how school size is related to student achievement. School leaders are charged with providing a fair and equitable education to all students. Public schools are required by legislation such as the Every Student Succeeds Act and state accountability systems to demonstrate that all students are proficient in the core subjects (Texas Education Agency, 2018c; United States Department of Education, 2018). Negative public perceptions of the school district, as well as possible mandated interventions, can be placed on the schools as a result of poor student achievement. Therefore, it is important for school leaders to examine how school size (i.e., student enrollment) affects student achievement.

Purpose of the Study

The purpose of this study was to determine the extent to which student enrollment at elementary schools was related to student progress on the State of Texas state-mandated assessment. Specifically, the progress measures in reading and in mathematics were analyzed separately for boys and for girls. Results in both reading and in mathematics were analyzed over a 5-year time period to determine if any trends were present in the data.

Significance of the Study

Although extensive research has been conducted on school-size, the topic continues to be relevant for school leaders as different measures of student achievement are collected and analyzed. No current literature was discovered in which researchers addressed school size as it related to performance on the current Texas state-mandated assessment, the State of Texas Assessments of Academic Readiness (STAAR). This study was conducted using the student progress measures rather than the traditional pass or fail measurements on the STAAR test. In recent investigations conducted in Texas, researchers (e.g., Barnes & Slate, 2014; Gilmore, 2007; Riha et al., 2013) documented evidence for large-size schools. Educational leaders benefit from continued investigations on school size to determine if trends supporting large school-size in Texas continues. These results can assist school leaders when addressing increased enrollment in their own schools.

Research Questions

One overarching research question was addressed in this study: What is the difference in student progress rates in reading and mathematics of elementary school students as a function of school size (i.e., Very Small-size, Small-size, Moderate-size, and Large-size)? Subquestions 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 boys and girls. 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.

Method

Research Design

For this study, a nonexperimental, causal-comparative research design was present (Johnson & Christensen, 2017). Archival data from the Texas Academic Performance Report were analyzed and reflected events that occurred in the past.

Accordingly, neither the independent variable nor the dependent variables could be manipulated in this study.

The independent variable in this study was 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). Dependent variables in this study were the reading progress measure and the mathematics progress measure on the STAAR Reading and Mathematics assessments. These data were analyzed separately for boys and for girls.

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 boys and girls in Texas who received a progress measure result on the STAAR Reading assessment and Grade 4 and 5 boys and girls 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 (Texas Education Agency, 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, 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 TEKS for Mathematics were implemented in the classroom in the 2014-2015 school year. Accountability calculations excluded Mathematics for Grades 3-8. Therefore, mathematics progress rates were not analyzed for the 2014-2015 school year.

For the purpose of this study, elementary school campuses were limited to school campuses that are Kindergarten through Grade 5. Any campus that did not meet this configuration was eliminated. Charter schools were eliminated from analysis. 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 four school sizes: Very Small-size (50-399 students), Small-size (400-799 students), Moderate-size (800-1,199 students), and Large-size (1,200 or greater students). Because very few schools were present that had 1,200 students or greater, 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).

Results

For this investigation, an Analysis of Variance (ANOVA) procedure was calculated for each school year and for boys and girls 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 the 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 Boys for All Five School Years

With respect to the degree to which differences were present in the reading progress rates of boys as a function of elementary school size in the 2013-2014 school year, the parametric ANOVA did not reveal a statistically significant difference, $F(2, 2678) = 1.64$, $p = .19$. Large-size, Moderate-size, and Small-size schools had similar progress rates in reading for their boys. Readers are directed to Table 4.1 for the descriptive statistics for this school year.

Insert Table 4.1 about here

For the 2014-2015 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 2616) = 10.49$, $p < .001$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present between all but one pairwise combination, Large-size and Small-size schools. Small-size schools and Large-size schools had similar progress rates in reading for their boys. Large-size schools had statistically significantly higher progress rates in reading for their boys than Moderate-size schools. Small-size schools had statistically significantly higher progress rates in reading for their boys than Moderate-size schools. Delineated in Table 4.1 are the descriptive statistics for this school year.

Concerning the 2015-2016 school year, a statistically significant difference was revealed, $F(2, 2701) = 3.10$, $p = .04$, partial $n^2 = .002$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present between one pairwise combination, Large-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates in reading for their boys than Moderate-size schools. Large-size schools and Moderate-size schools had similar progress rates in reading for their boys as Small-size schools. Descriptive statistics for this analysis are presented in Table 4.1.

During the 2016-2017 school year, a statistically significant difference was revealed, $F(2, 2747) = 3.21$, $p = .04$, partial $n^2 = .002$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present between one pairwise combination, Large-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates in reading for their boys than Moderate-size schools. Large-size and Moderate-size schools had similar progress rates in reading for their boys as Small-size schools. Readers are directed to Table 4.1 for the descriptive statistics for this school year.

Regarding the 2017-2018 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2782) = 3.06$, $p = .05$, partial $n^2 = .002$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures were calculated and revealed that although one pair approached the conventional level, no pairs reached the conventional level of statistical significance. Table 4.1 contains 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 boys than Moderate-size and Small-size schools. Depicted in Figure 4.1 are the trends in reading progress rates for boys for the three school sizes in the 2013-2014 through 2017-2018 school years.

Insert Figure 4.1 about here

Reading Results for Girls All Five School Years

Concerning the 2013-2014 school year, a statistically significant difference was revealed, $F(2, 2678) = 4.66$, $p = .01$, partial $n^2 = .003$, a below small effect size (Cohen, 1988). Scheffe` post hoc tests revealed that differences in progress rates in reading were present for all but one pair, Moderate-size and Large-size schools. Large-size schools and Moderate-size schools had statistically significantly higher progress rates in reading for their girls than Small-size schools. Moderate-size and Large-size schools had similar progress rates in reading for girls. Descriptive statistics for this analysis are presented in Table 4.2.

Insert Table 4.2 about here

For the 2014-2015 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2702) = 15.94$, $p < .001$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` post hoc tests revealed that differences in progress rates in reading were present for all but one pair, Small-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates in reading for girls than Moderate-size or Small-size schools. Moderate-size and Small-size schools had similar progress rates in reading for girls. Delineated in Table 4.2 are the descriptive statistics for this school year.

With respect to the 2015-2016 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 2761) = 6.23$, $p = .002$, partial $n^2 = .004$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present between all but one pairwise combination, Large-size and Moderate-size schools. Large-size and Moderate-size schools had statistically significantly higher progress rates in reading for girls than Small-size schools. Large-size schools had similar progress rates in reading for girls as Moderate-size schools. Readers are directed to Table 4.2 for the descriptive statistics for this school year.

During the 2016-2017 school year, a statistically significant difference was yielded, $F(2, 2719) = 4.58$, $p = .01$, partial $n^2 = .003$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences in progress rates in reading were present for all but one pair, Moderate-size and Small-size schools. Moderate-size and Small-size schools had similar progress rates in reading for girls. Large-size schools had statistically significantly higher progress rates in reading for girls than Moderate-size schools and Small-size schools. Table 4.2 contains the descriptive statistics for this school year.

For the 2017-2018 school year, the parametric ANOVA yielded a statistically significant difference, $F(2, 2775) = 6.80$, $p = .001$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences in progress rates in reading were present for all but one pair, Moderate-size and Small-size schools. Moderate-size and Small-size schools had similar progress rates in reading for girls. Large-size schools had statistically significantly higher progress rates in reading for girls than Moderate-size schools and Small-size schools. Table 4.2 contains 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 girls than Moderate-size and Small-size schools. Depicted in Figure 4.2 are the trends in reading progress rates for girls for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 4.2 about here

Mathematics Results for Boys for All Four School Years

With respect to the 2013-2014 school year, a statistically significant difference was revealed, $F(2, 2678) = 3.48$, $p = .03$, partial $n^2 = .003$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present for one pair of school sizes, Large-size and Moderate-size. Large-size schools had statistically significantly higher progress rates in mathematics for boys than Moderate-size schools. Large-size and Small-size schools and Moderate-size and Small-size schools had similar progress rates in mathematics for boys. Readers are directed to Table 4.3 for the descriptive statistics for this school year.

Insert Table 4.3 about here

Concerning the 2015-2016 school year, a statistically significant difference was not revealed, $F(2, 2688) = 0.34$, $p = 72$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for boys. Descriptive statistics for this analysis are presented in Table 4.3. During the 2016-2017 school year, a statistically significant difference was revealed, $F(2, 2754) = 4.71$, $p = .01$, partial $n^2 = .003$, below small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present for one pair of school sizes, Large-size and Moderate-size. Large-size schools had statistically significantly higher progress rates in mathematics for boys than Moderate-size schools. Small-size schools had similar progress rates in mathematics for boys as Large-size and Moderate-size schools. Readers are directed to Table 4.3 for the descriptive statistics for this school year.

Regarding the 2017-2018 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 2754) = 6.98$, $p = .001$, partial $n^2 = .01$, small effect size (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present for all but one pair of school sizes, Moderate-size and Small-size. Moderate-size and Small-size schools had similar progress rates in mathematics for boys. Large-size schools had statistically significantly higher progress rates in mathematics for boys than Moderate-size schools or Small-size schools. Table 4.3 contains the descriptive statistics for this school year.

With respect to the trend present on the mathematics progress measure and elementary school size across four school years, a line graph was used to illustrate the trends across the four school years. Large-size schools tended to have higher progress rates in mathematics for their boys than Moderate-size and Small-size schools. Depicted in Figure 4.3 are the trends in mathematics progress rates for boys for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 4.3 about here

Mathematics Results for Girls for All Four School Years

Concerning the 2013-2014 school year, a statistically significant difference was not present, $F(2, 2678) = 2.04$, $p = .13$. Large-size, Moderate-size, and Small-size schools had similar progress rates in mathematics for girls. Descriptive statistics for this analysis are presented in Table 4.4.

Insert Table 4.4 about here

With respect to the 2015-2016 school year, a statistically significant difference was not revealed, $F(2, 2761) = 2.22$, $p = .11$. Small-size, Moderate-size, and Large-size schools had similar progress rates in mathematics for girls. Readers are directed to Table 4.4 for the descriptive statistics for this school year. During the 2016-2017 school year, a statistically significant difference was revealed, $F(2, 2741) = 4.97$, $p = .01$, partial $n^2 = .004$, below small effect size (Cohen, 1988). Scheffe` 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 girls than Moderate-size schools. Large-size schools had similar progress rates in mathematics for girls as Moderate size and Small-size schools. Delineated in Table 4.4 are the descriptive statistics for this school year.

Regarding the 2017-2018 school year, the parametric ANOVA revealed a statistically significant difference, $F(2, 2751) = 3.22$, $p = .04$, partial $n^2 = .002$, below small effect size (Cohen, 1988). Scheffe` post hoc tests revealed that differences in progress rates in mathematics were present for only one pairwise comparison, Large-size and Moderate-size schools. Large-size schools had statistically significantly higher progress rates in mathematics for girls than Moderate-size schools. Small-size schools had similar progress rates in mathematics for girls as Moderate-size and Large-size schools. Table 4.4 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 four school years, a line graph was used to illustrate the trends across the four school years. Large-size schools tended to have higher progress rates in mathematics for their girls than Moderate-size and Small-size schools in three of the four years. Depicted in Figure 4.4 are the trends in mathematics progress rates for girls for the three school sizes in the 2013-2014 through the 2017-2018 school years.

Insert Figure 4.4 about here

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 rates and the mathematics progress rates of boys and of girls. 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 reading progress rates for their boys in two of the five school years than Moderate-size schools. All three school sizes had similar reading progress rates for their boys in two of the five school years. Large-size schools had statistically significantly higher reading progress rates for their girls than Moderate-size or Small-size schools in all five school years. As school size increased, reading progress rates also increased. Overall, Large-size schools had higher progress rates in reading for their boys and their girls than Moderate-size or Small-size schools.

Summary of Mathematics Results

Large-size schools had statistically significantly higher mathematics progress rates for their boys in three of the four school years than Moderate-size schools. Large-size schools had statistically significantly higher mathematics progress rates for their boys than Small-size schools in one of those school years. In one of the four school years, similar mathematics progress rates were present for boys for all three school sizes. Schools size results varied for girls. In two of the four school years, Large-size schools, Moderate-size schools, and Small-size schools had similar mathematics progress rates. Small-size schools had statistically significantly higher mathematics progress rates for their girls than Moderate-size schools in one school year. Large-size schools had statistically significantly higher mathematics progress rates for their girls than Moderate-size or Small-size schools in another school year. Although Large-size schools had higher mathematics progress rates for their boys than Moderate-size or Small-size schools, the results were inconclusive for girls.

Connections with Existing Literature

Researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) conducting recent studies in Texas on school size provided evidence that supported Large-size schools. In these studies, Large-size schools had statistically significantly higher achievement rates on state assessments than students who attended Moderate-size or Small-size schools. The purpose of this study was to examine the relationship between school size and progress rates for boys and for girls. For reading progress rates, results were congruent with current researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011). As school size increased, reading progress rates for boys and for girls increased. Similar results were documented in mathematics progress rates for boys. Large-size schools had statistically significantly higher mathematics progress rates for their boys than Moderate-size or Small-size schools. Results for girls were less conclusive as different years resulted in different school sizes having higher mathematics progress rates for girls. These findings are in contrast to Zoda et al. (2011), in which girls enrolled in Large-size schools had statistically significantly higher mathematics passing rates than girls in smaller size schools.

Connections to Theoretical Framework

In this study, the economies of scale theory was 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). Based on this theory, Large-size schools should have higher progress rates than Moderate-size or Small-size schools. In this study, Large-size schools did have statistically significantly higher reading progress rates for their boys and for their girls. Large-size schools also had statistically significantly higher progress rates in mathematics for boys than Moderate-size or Small-size schools. In the economies of scales theory, Large-size schools would have more resources available such as broader course selections, mentoring availability, and tutoring opportunities (Stanislaski, 2015; Werblow & Duesberry, 2009). Consolidating schools to larger size campuses means more funds are available for these types of resources which could result in higher academic progress of the 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 how school districts address the increasing student enrollment. This study, along with recent researchers in Texas (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) support Large-size schools. Large-size schools were favored for boys and for girls in reading and for boys in mathematics. Reading results for girls was varied. This information should be taken into consideration as legislators make decisions about addressing increased student enrollment.

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 grown 67.4% in the last 30 years. Continued enrollment increases means that school leaders must address building new schools or increasing enrollment on existing 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). Based on the results of this study, increasing enrollment on school campuses would not compromise the academic progress of the boys and the girls at that school.

Recommendations for Future Research

Based upon 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 examine academic achievement further. 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 assessments. Additional research should be conducted examining student progress at the middle school and high school level. A 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 rates and the mathematics progress rates of boys and of girls. Statistically significant differences were revealed for students that supported Large-size schools. Consolidating schools may be the most cost efficient solution for school leaders (Boser, 2013; Stanislaski, 2015) and it may be the best academic solution as well. Further research in the area of school size and student progress will help leaders make the best decisions about addressing the size of elementary enrollment.

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Table 4.1

Descriptive Statistics for Reading Progress Rates for Boys 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	354	61.62	10.20
Moderate-size	1,937	61.93	7.94
Large-size	390	62.64	7.24
2014-2015			
Small-size	296	64.94	10.16
Moderate-size	1,914	63.19	8.39
Large-size	409	64.89	8.03
2015-2016			
Small-size	338	64.44	9.00
Moderate-size	1,966	64.21	7.68
Large-size	400	65.26	6.82
2016-2017			
Small-size	369	62.14	9.56
Moderate-size	2,006	61.67	8.49
Large-size	375	62.86	8.38
2017-2018			
Small-size	412	68.75	8.46
Moderate-size	2,006	68.34	7.59
Large-size	367	69.37	6.59

Table 4.2

Descriptive Statistics for Reading Progress Rates for Girls 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	354	62.79	10.51
Moderate-size	1,937	64.19	8.24
Large-size	390	64.47	7.15
2014-2015			
Small-size	368	65.30	10.17
Moderate-size	1,928	66.28	8.01
Large-size	409	68.47	7.83
2015-2016			
Small-size	390	66.52	9.84
Moderate-size	1,974	67.68	7.62
Large-size	400	68.47	6.86
2016-2017			
Small-size	346	61.62	9.41
Moderate-size	2,001	62.01	8.67
Large-size	375	63.38	8.66
2017-2018			
Small-size	405	67.01	9.46
Moderate-size	2,006	67.62	7.72
Large-size	367	69.02	6.82

Table 4.3

Descriptive Statistics for Mathematics Progress Rates for Boys 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	354	70.86	12.56
Moderate-size	1,937	70.58	9.82
Large-size	390	72.04	8.24
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	337	69.01	10.26
Moderate-size	1,954	68.86	9.29
Large-size	400	69.28	8.59
2016-2017			
Small-size	376	70.22	10.61
Moderate-size	2,006	69.30	9.58
Large-size	375	70.79	8.22
2017-2018			
Small-size	386	67.64	11.15
Moderate-size	2,004	67.66	9.63
Large-size	367	69.70	8.82

Table 4.4

Descriptive Statistics for Mathematics Progress Rates for Girls 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	354	71.06	12.80
Moderate-size	1,937	71.30	10.00
Large-size	390	72.37	8.34
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	390	68.26	12.26
Moderate-size	1,974	69.36	9.55
Large-size	400	69.50	8.49
2016-2017			
Small-size	369	71.67	10.50
Moderate-size	2,000	70.08	9.73
Large-size	375	70.99	8.35
2017-2018			
Small-size	387	69.32	11.12
Moderate-size	2,000	68.75	9.79
Large-size	367	70.12	8.60

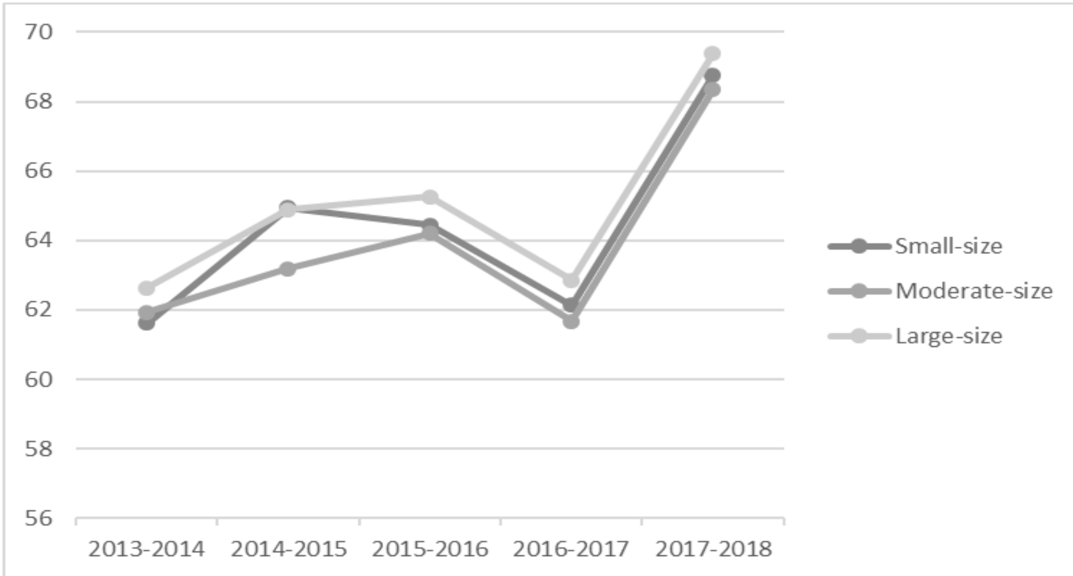

Figure 4.1. Reading progress rates by school size for boys across all five school years.

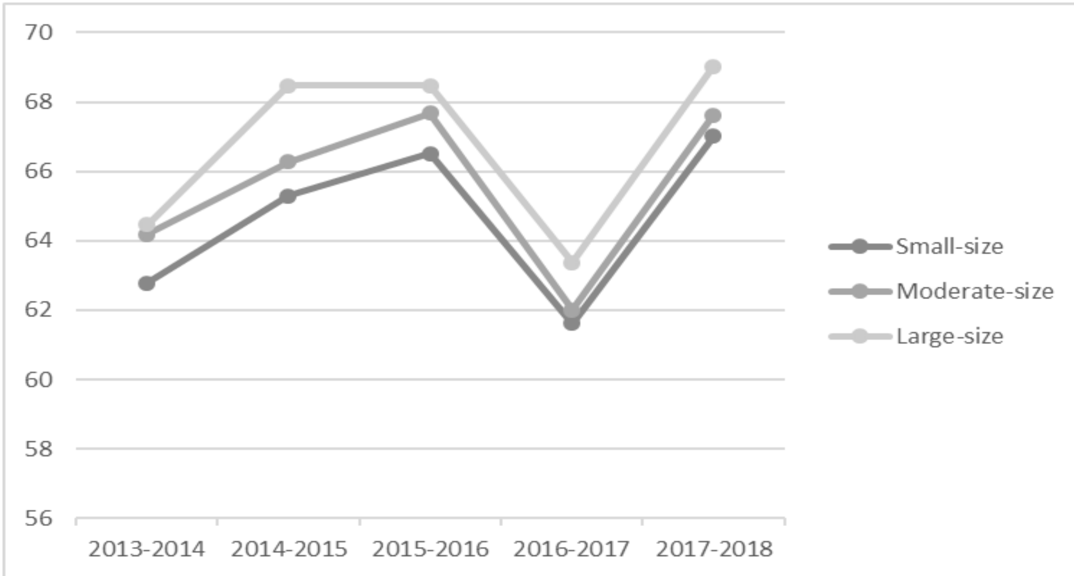

Figure 4.2. Reading progress rates by school size for girls across all five school years.

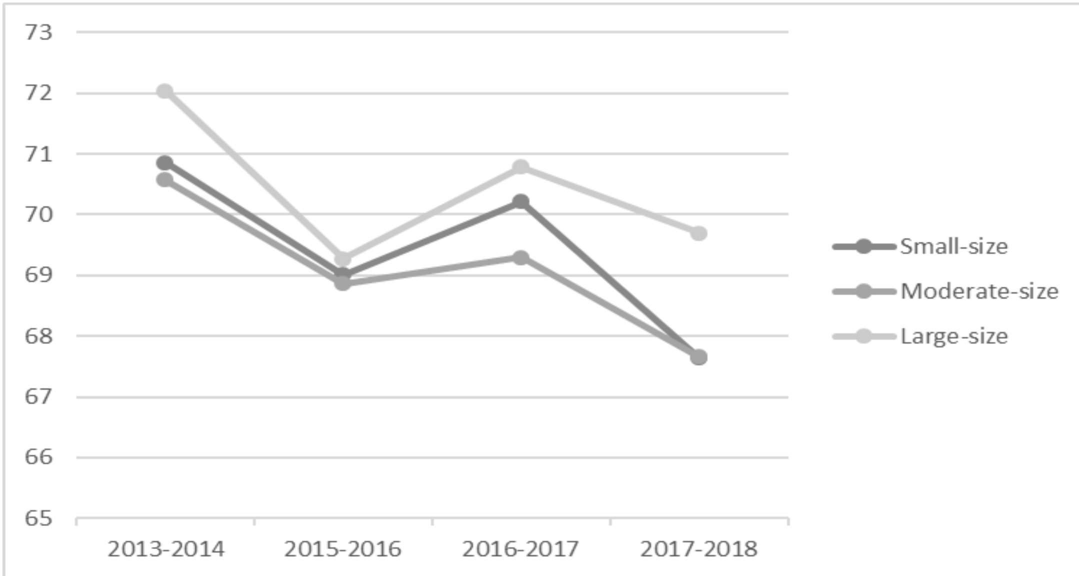

Figure 4.3. Mathematics progress rates by school size for boys across all four school years.

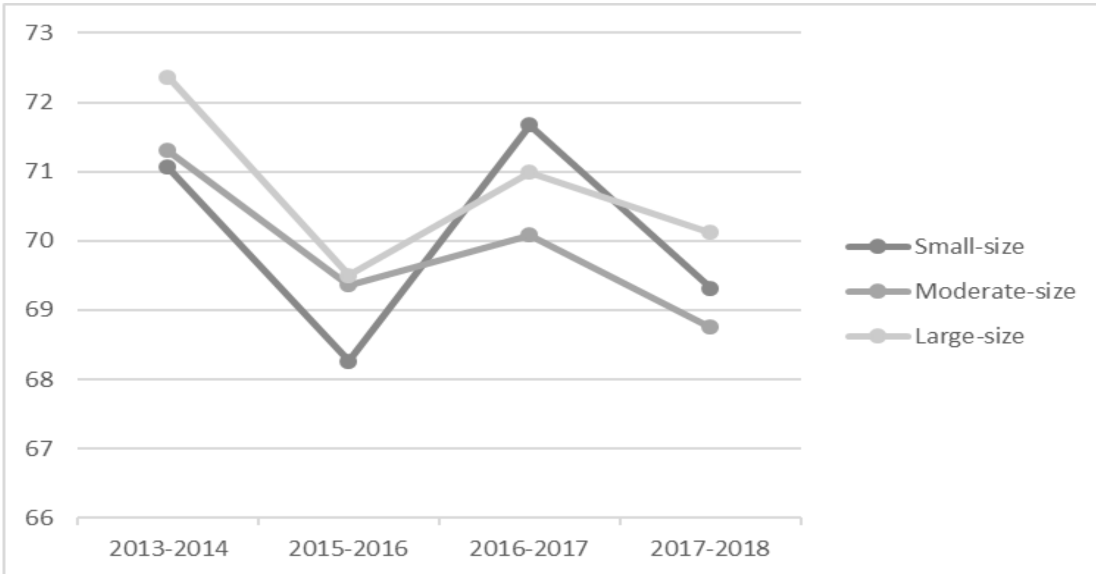

Figure 4.4. Mathematics progress rates by school size for girls across all four school years.

CHAPTER V

DISCUSSION

The purpose of this journal-ready dissertation was to determine the degree to which student enrollment (i.e., school size) at elementary schools was related to student progress on the Texas state-mandated assessments for reading and for mathematics. In the first journal article, the effect of school size on student progress was examined for White, Hispanic, and Black students. In the second study, the extent to which school size was related to the student progress of students who were economically disadvantaged and of students who were at risk was ascertained. In the third investigation, the relationship between school size and student progress for boys and for girls was examined. In each of the three studies, five years of Texas statewide data were examined to ascertain the degree to which trends were present in student progress in reading and in mathematics as a function of their ethnicity/race, economic status, at risk status, and gender. In this chapter, results across the three empirical studies will be summarized. Implications from these three studies for policy and practice will be provided, along with recommendations for future research.

Summary of Article One Results

In the first article, the effect of school size on student progress was examined for White, Hispanic, and Black students. For White students, statistically significant differences were present in reading in all five school years. In four of those years, Large-size schools had the highest reading progress rates for their White students. For Hispanic and Black students, statistically significant differences in reading were present in only one school year. In this school year, Large-size schools had the highest reading progress rates for their Hispanic and Black students. Delineated in Table 5.1 is the summary of the reading results.

Table 5.1

Summary of Reading Results for School Size by School Year and Ethnicity/Race

School Size	Outcome	Effect Size	Highest Progress Rates
White			
2013-2014	Significant	Small	Large
2014-2015	Significant	Small	Large
2015-2016	Significant	Small	N/A
2016-2017	Significant	Small	Large
2017-2018	Significant	Small	Large
Hispanic			
2013-2014	Not Significant	N/A	N/A
2014-2015	Significant	Small	Large
2015-2016	Not Significant	N/A	N/A
2016-2017	Not Significant	N/A	N/A
2017-2018	Not Significant	N/A	N/A
Black			
2013-2014	Not Significant	N/A	N/A
2014-2015	Significant	Below Small	Large
2015-2016	Not Significant	N/A	N/A
2016-2017	Not Significant	N/A	N/A
2017-2018	Not Significant	N/A	N/A

Mathematics progress rates were also examined. For White students, two of the four years had statistically significant differences in mathematics progress rates. Large-size schools had the highest mathematics progress rates for their White students. For Hispanic students, statistically significant differences were present in mathematics progress rates in three of the four years examined. Small-size schools had the highest mathematics progress rates for their Hispanic students. School size did not affect the mathematics progress rates of Black students. Readers are directed to Table 5.2 for the summary of the mathematics results.

Table 5.2

Summary of Mathematics Results for School Size by School Year and Ethnicity/Race

School Size	Outcome	Effect Size	Highest Progress Rates
White			
2013-2014	Not Significant	N/A	N/A
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Significant	Small	Large
2017-2018	Significant	Small	Large
Hispanic			
2013-2014	Significant	Small	Small
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Significant	Below Small	Small
2017-2018	Significant	Below Small	Small
Black			
2013-2014	Not Significant	N/A	N/A
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Not Significant	N/A	N/A
2017-2018	Not Significant	N/A	N/A

Summary of Article Two Results

In the second article, the effect of school size on student progress rates was examined for students who were economically disadvantaged and for students who were at risk. For students who were economically disadvantaged, statistically significant differences were present in reading progress rates for only one school year. Large-size schools had the highest reading progress rates for their students in poverty. With respect to students who were at risk, three school years had statistically significant differences in reading progress rates. In two of the school years, Small-size schools had the highest reading progress rates for their students who were at risk. In one school year, Large-size schools had the highest reading progress rates for their students who were at risk. Table 5.3 contains the summary of the reading results.

Table 5.3

Summary of Reading Results for School Size by School Year, Economic Status, and At Risk Status

School Size	Outcome	Effect Size	Highest Progress Rates
Economically Disadvantaged			
2013-2014	Not Significant	N/A	N/A
2014-2015	Significant	Small	Large
2015-2016	Not Significant	N/A	N/A
2016-2017	Not Significant	N/A	N/A
2017-2018	Not Significant	N/A	N/A
At Risk			
2013-2014	Significant	Below Small	Small
2014-2015	Significant	Small	Large
2015-2016	Not Significant	N/A	N/A
2016-2017	Not Significant	N/A	N/A
2017-2018	Significant	Below Small	Small

Mathematics progress rates were next examined. For students who were economically disadvantaged and for students who were at risk, statistically significant differences were revealed in two of the four school years. Small-size schools had the highest mathematics passing rates for students who were economically disadvantaged and for students who were at risk. Readers are directed to Table 5.4 for the summary of the mathematics results.

Table 5.4

Summary of Mathematics Results for School Size by School Year, Economic Status, and At Risk Status

School Size	Outcome	Effect Size	Highest Progress Rates
Economically Disadvantaged			
2013-2014	Significant	Below Small	Small
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Significant	Small	Small
2017-2018	Not Significant	N/A	N/A
At Risk			
2013-2014	Significant	Small	Small
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Significant	Below Small	Small
2017-2018	Not Significant	N/A	N/A

Summary of Article Three Results

In the third article, the effect of school size on student progress rates was examined for boys and for girls. Statistically significant differences were present in four of the five school years for boys and in all five school years for girls. Large-size schools had the highest reading passing rates for both boys and girls in all but one of those school years. Delineated in Table 5.5 is the summary of the reading progress rates.

Table 5.5

Summary of Reading Results for School Size by School Year and Gender

School Size	Outcome	Effect Size	Highest Progress Rates
Boys			
2013-2014	Not Significant	N/A	N/A
2014-2015	Significant	Small	Small
2015-2016	Significant	Below Small	Large
2016-2017	Significant	Below Small	Large
2017-2018	Significant	Below Small	N/A
Girls			
2013-2014	Significant	Below Small	Large
2014-2015	Significant	Small	Large
2015-2016	Significant	Below Small	Large
2016-2017	Significant	Below Small	Large
2017-2018	Significant	Small	Large

Mathematics progress rates were next examined. For boys, statistically significant differences were present in mathematics progress rates in three of the four school years examined. Large-size schools had the highest mathematics progress rates for their boys. Concerning girls, statistically significant differences were revealed in mathematics progress rates in two of the four school four years. Large-size schools had the highest mathematics progress rates for their girls in one school year, and Small-size schools had the highest mathematics progress rates for their girls in the other school year. Readers are directed to Table 5.6 for the summary of the mathematics results.

Table 5.6

Summary of Mathematics Results for School Size by School Year and Gender

School Size	Outcome	Effect Size	Highest Progress Rates
Boys			
2013-2014	Significant	Below Small	Large
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Significant	Below Small	Large
2017-2018	Significant	Small	Large
Girls			
2013-2014	Not Significant	N/A	N/A
2014-2015	N/A	N/A	N/A
2015-2016	Not Significant	N/A	N/A
2016-2017	Significant	Below Small	Small
2017-2018	Significant	Below Small	Large

Summary of Results Across All Three Articles

Overall, 35 statistical analyses were conducted to determine the effect of school size on reading progress rates. Of those 35 analyses, 15 had statistically significant results in which reading progress rates were better in Large-size schools than in either Small-size or Moderate size schools. Three of the analyses resulted in statistically significant results in which reading progress rates were better in Small-size schools than in either Moderate-size or Large-size schools. Seventeen statistical analyses of the reading progress rates did not yield statistically significant results.

Because of one school year in which data were not available for mathematics progress rates, only 28 inferential analyses were conducted to determine the effect of school size on mathematics progress rates. Six of these analyses yielded statistically significant results in which Large-size schools had higher mathematics progress rates than either Small-size or Moderate-size schools. Eight of the analyses resulted in statistically significant results in which Small-size schools had higher mathematics progress rates than either Moderate-size or Large-size schools. Half of the inferential analyses did not yield statistically significant results.

Connections to Theoretical Framework

In this study, economies of scale was the theoretical framework. Economists describe this theory as the ability to produce more at a lower cost per unit (Boser, 2013; Bowles & Bosworth, 2002). Based upon this theory, Large-size schools should have higher progress rates than Moderate-size or Small size schools. Schools should be able to produce better academic results because Large-size schools can save money on operating costs such as construction, maintenance, staff and transportation. These savings can be used to invest in instructional opportunities such as broader course selections, mentoring, and tutoring programs (Stanislaski, 2015; Werblow & Duesberry, 2009). In some cases, the results of the reading progress rates in this dissertation were generally congruent with this theory. In 16 of the analyses across the three studies, Large-size schools had higher reading progress rates than Small-size schools. With respect to mathematics progress rates, results were somewhat mixed in that Small-size schools had better results in some areas and Large-size schools had better results in other areas. Large-size schools tended to have better mathematics progress rates for White students, for boys, and for girls. Small-size schools tended to have better mathematics progress rates for Hispanic students, students who were economically disadvantaged, and students who were at risk. Based on the inconsistent results, the economies of scale theory was supported by the reading progress results but not by the mathematics progress results.

Implications for Policy for Practice

Based upon the results of this analysis, the following implications for policy and practice can be made. Regarding policy implications, Texas legislators should not pass any legislation dictating school size. Based on the results of the current study, not all students achieve the same academic progress in Large-size or Small-size schools. School leaders must demonstrate that all students are proficient in the core subjects (Texas Education Agency, 2018c; United States Department of Education, 2018). Implementing strict guidelines on school size would not address the needs of all students in Texas. Decisions regarding school size should be left to the discretion of individual school districts.

Implications for practice include school leaders using results of this study, and similar studies, to address the needs of their increasing study body. Student enrollment in Texas has increased by almost 70% in the last 30 years. Decisions will need to be made about building new schools or increasing the enrollment at existing schools. Schools that have a large population of Hispanic students, students who are economically disadvantaged, or students who are at risk, may want to consider having schools with lower enrollment. If school leaders make the decision to consolidate schools into larger sized campuses, then they must ensure that the academic needs of all students are being addressed in other ways.

Recommendations for Future Research

The results of this study add to the research available on the effects of school size and student achievement. Although, this topic has been studied extensively, current researchers in Texas (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013;

Zoda et al., 2011) had predominantly provided evidence that Large-size schools resulted in higher academic achievement for students. Results of this study were not congruent with current researchers (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) and therefore several recommendations can be made for future research. First, further examination of the student progress measure should be conducted. Data analyzed in this study were the reading and mathematics progress rates on the STAAR assessment. The progress rate is a measure of the amount of progress a student makes from one year to the next. At this of this study, no published articles were located in which the student progress measure was examined. Additional studies in which the researchers use the progress measure should be conducted. Second, data from the current study were only from elementary school campuses. Future studies should be conducted in which the progress measure, or other measures of academic success, are examined for middle school or high school levels. Finally, data used in this study only included Texas elementary schools. Additional studies should be conducted that include data from other states to determine if similar results are present in areas other than Texas.

Conclusion

The purpose of this study was to determine the effect of school size on student progress rates in reading and mathematics by ethnicity/race, economic status, at risk status, and by gender. Results were varied across the different student groups. Evidence existed in support of Large-size schools for White students, boys, and girls. Small-size schools had better results for Hispanic students, students who were economically disadvantaged, and students who were at risk. The results did not overwhelming support one school size over another. Instead, school size decisions should be made based on the demographics of the area being served. In addition, the results of this study were not congruent with current researchers in Texas (e.g., Barnes & Slate, 2014; Fitzgerald et al., 2013; Riha et al., 2013; Zoda et al., 2011) on school size. Although school size has been extensively investigated over the years, inconclusive and inconsistent results means this topic warrants continued research so that school leaders can make decisions that are best for all students.

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APPENDIX

Sam Houston
STATE UNIVERSITY
A Member of The Texas State University System

Date: Aug 5, 2019 8:37 AM CDT

TO: Amy Busby Cynthia Martinez-Garcia
FROM: SHSU IRB
PROJECT TITLE: ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS: A TEXAS STATEWIDE, MULTIYEAR INVESTIGATION
PROTOCOL #: IRB-2019-207
SUBMISSION TYPE: Initial
ACTION: No Human Subjects Research
DECISION DATE: August 2, 2019

This letter is provided in response to your IRB request regarding human subjects involvement in your proposed research titled, "ELEMENTARY SCHOOL SIZE AND DIFFERENCES IN STUDENT PROGRESS: A TEXAS STATEWIDE, MULTIYEAR INVESTIGATION (IRB #IRB-2019-207)."

This study does not appear to fit the regulatory definition of human subjects research. The Department of Health and Human Services (DHHS) regulations 45 CRF 46.102(D), defines research as "a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge." Thus, this study does not require IRB oversight as specified in DHHS regulations 45 CFR 46, subpart A.

This determination means that there are no restrictions on your research and you may proceed with your study without IRB oversight. If I need to provide further information, please let me know.

Sincerely,

Donna M. Desforges, Ph.D.
Chair, Committee for the Protection of Human Subjects
PHSC-IRB

VITA

Amy C. Busby

EDUCATIONAL HISTORY

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SCHOLARLY RESEARCH ACTIVITY

Publications

Busby, A. C., & Slate, J. R. (2018). Differences in campus ratings by school level in Texas public schools: A multiyear, statewide analysis. *Journal of Educational System, 2*(4), 21-24.

PRESENTATIONS

Busby, A. C. (2018, September). *Differences in Campus Ratings by School Level in Texas Public Schools*. Paper presented at the Texas Council of Professors of Educational Administration, Austin, TX.

RECOGNITIONS

2005-2006 Teacher of the Year for Rice Elementary, Conroe ISD