DIFFERENCES IN THE MATHEMATICS PERFORMANCE OF TEXAS GRADE 4 BOYS AND GIRLS ENROLLED IN SPECIAL EDUCATION AS A FUNCTION OF THEIR ECONOMIC STATUS AND ETHNICITY/RACE: A MULTIYEAR STATEWIDE INVESTIGATION

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by

Alexis N. Taylor

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DEDICATION

I dedicate my dissertation to my beloved mother, Gwendolyn V. Taylor-Benton, and my heavenly angels, my grandmothers, Doris M. Pickens-Taylor, and Dorothy D. Hodge. I am beyond grateful for my number one fan, my mother, who has been by my side from birth. My mother made it known from day one that failure is never an option and "I can do all things through Christ who strengthens me" Philippians 4:13. I thank her for always encouraging me to go the extra mile and to not ever give up on anything my heart may desire. I will never depart from her saying, "Giving up is the birth of regret." I wholeheartedly appreciate my mother's everlasting encouragement, ceaseless prayers, unconditional love, and genuine support, which enables me to feel unlimited and powerful. She has a prayer for every situation. Without my mother, there would be no me, and I adore and love her endlessly.

I thank God for allowing me to establish an extraordinary bond with the most phenomenal and finest women whom I have ever known, my Grandma (Doris) and Momma Dear (Dorothy). Although they graced the Earth with their presence for a short period of time, they significantly influenced the woman I have become today. Grandma and Momma Dear were highly educated, loving, and resilient women who instilled in me the importance of perseverance and tenacity. I am thankful for my circle of strong women who always make me feel like I can accomplish the impossible and conquer the world.

ABSTRACT

Taylor, Alexis N., *Differences in the mathematics performance of Texas Grade 4 boys and girls enrolled in special education as a function of their economic status and ethnicity/race: A multiyear statewide investigation.* Doctor of Education (Educational Leadership), May, 2021, Sam Houston State University, Huntsville, Texas.

Purpose

The purpose of this journal-ready dissertation was to determine the degree to which the economic status and ethnicity/race of Texas Grade 4 boys and girls in special education are related to their mathematics performance on Texas state-mandated assessment. In the first article, the purpose was to ascertain the effect of the economic status (i.e., Poor and Not Poor) of boys in special education on their mathematics performance on the Texas state-mandated assessment. In the second article, the purpose was to examine the mathematics performance of Grade 4 boys in special education as a function of their ethnicity/race (i.e., Black, Hispanic, and White). In the third article, the purpose was to investigate the extent to which the economic status (i.e., Poor and Not Poor) related to the mathematics performance of Grade 4 girls in special education. In all three articles, the extent to which trends might be present in the Reporting Categories (i.e., Reporting Category I: understand numerical representations and relationships, Reporting Category II: computations and algebraic relationships, Reporting Category III: geometry and measurements, and Reporting Category IV: data analysis and personal financial literature) and mathematics performance levels: (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level) was examined across three school years (i.e., 2015-2016, 2016-2017, 2017-2018).

Method

A causal-comparative research design was present for all three studies. Archival data were collected through a Public Information Request form for the 2015-2016, 2016-2017, and 2017-2018 school years obtained from the Texas Education Agency.

Findings

Grade 4 boys in special education who were Poor had statistically significantly lower mathematics performance than their peers who were Not Poor. A clear stair-step effect existed with respect to the ethnicity/race of Grade 4 boys in special education. White boys had the highest test scores, followed by Hispanic boys. Black boys had the lowest mathematics test scores. Grade 4 girls in special education, regardless of their economic status, had similar mathematics test scores. The results for all three school years were commensurate with the existing research literature. Implications for policy and for practice, as well as recommendations for future research, were provided.

KEY WORDS: Special education; Mathematics performance; Economic status; Economically disadvantaged; Phase-In standards; Poverty; Disabilities; Reporting categories; Academic achievement; Ethnicity; Race; STAAR Mathematics

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difference. And now, I am privileged to captivate the minds of thousands of students with special needs, leaving no student left behind.

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CHAPTER I

INTRODUCTION

In 2011, public school education budgets decreased by more than five billion dollars (Marder & Villanuevan, 2017). As a result of these budget cuts, spending on special education, and intervention resources for struggling learners were nearly depleted (Marder & Villanuevan, 2017). In addition to budget cuts, during the 2011-2012 school year, the State of Texas Assessments of Academic Readiness (STAAR) tests were launched, and minimum scores needed by students to pass increased. In 2015, the Every Student Succeeds Act was implemented and emphasized holding school districts accountable for providing high-quality education to all subpopulations and ensuring those students have the opportunity to experience academic success. As public education budgets decreased, the accountability of public educators has increased.

Despite financial concerns and increased accountability, educators are still held accountable for providing students a high-quality education. The Texas Education Agency is required to monitor and hold local school districts accountable for providing students who struggle on the test, interventions, and supports that remediate their learning. Nevertheless, students who have exceptional needs, students who are economically disadvantaged, and students of color continue to receive low-quality education, continue to be deprived of a free appropriate public education, and continue to have academic achievement gaps (Ravitch, 2013). In this journal-ready dissertation, the degree to which differences might exist in the mathematics performance of Texas Grade 4 boys and girls who are enrolled in special education as a function of their economic status, ethnicity/race, and academic performance over multiple school years were examined.

Literature Review on Mathematics and Economic Status

In the United States, the average percentage of children who live in poverty is 29% (National Center for Children in Poverty, 2019). This percentage reflects over 7,000,000 children who were negatively influenced by poverty (National Center for Children in Poverty, 2019) in the United States. Moreover, this percentage means that about 1 in 5 children lived in poverty in the United States.

As it relates to the state of interest in this article, Texas, since the 2001-2002 school year, over one-half of the student population in Texas had lived in poverty (Texas Education Agency, 2003). The percentage of students who were economically disadvantaged increased to almost 60% in the 2015-2016 school year. In the most recent school year of data available, 2018-2019, almost 61% of Texas public school students were disadvantaged (Texas Education Agency, 2019).

Of note is that in recently published articles, these percentages were substantially higher. Taylor and Slate (2020), in a Texas statewide analysis of the mathematics performance of Grade 4 boys and girls in special education, documented an average of 81.36% of boys and 77.48% of girls were economically disadvantaged. Economic status is relevant because students in poverty enter school with low academic skills compared to their peers who are Not Poor (Portia, Elizabeth, & Levine, 2019). Tran, Luchters, and Fisher (2017) documented that children from economically disadvantaged backgrounds were likely not to grow at the same pace as their peers who were not in poverty. These discrepancies translated into long-term effects on educational achievement and income in adulthood. Lee, Park, and Ginsburg (2016) explained that students who were from low-income families had a high chance of struggling in mathematics that affected their long-term well-being. Poverty has a detrimental effect on children's ability to gain skills and contribute to society (National Center for Children in Poverty, 2019). Children who experienced economic inadequacies usually resided in neighborhoods and attended schools with limited resources required for high academic performance (Taylor & Slate, 2020). Children growing up in poverty often faced undefeatable conditions that, over time, hindered academic performance (Taylor & Slate, 2020).

Concerning the academic achievement area of focus in this investigation, poverty has a critical influence on student achievement in mathematics (Davenport & Slate, 2019; Taylor & Slate, 2020). Taylor and Slate (2020) analyzed the 2015-2016 data on the State of Texas Assessment of Academic Readiness (STAAR) Mathematics test by the economic status of students who were enrolled in special education. Three STAAR Mathematics Phase-In Standards were examined with respect to whether students who were in special education met the state-mandated mathematics standards. Economic status in Taylor and Slate (2020) consisted of two categories: (a) students who qualified for the Federal free lunch program (i.e., Poor students) and (b) students who did not qualify for the Federal free lunch program (i.e., Not Poor students).

Taylor and Slate (2020) established the presence of statistically significant relationships between student poverty and poor mathematics performance. On all three STAAR Mathematics Phase-In Standards, students in special education who were in the Poor group had statistically significantly lower passing rates than their peers in special education who were in the Not Poor group. An average of 35.03% fewer boys in the Poor group met the state-mandated performance level in mathematics than their peers in the Not Poor group. For girls, an average of 16.73% fewer girls in the Poor group met the state-mandated performance level in mathematics than their peers in the Not Poor group. Effect sizes for these statistically significant differences were small to moderate in nature.

Similarly, Davenport and Slate (2019), in a Texas statewide investigation, analyzed STAAR Mathematics performance by the economic status of Grade 3 students. In the Davenport and Slate (2019) research study, economic status was categorized into three groups, Not Poor, Moderately Poor, and Very Poor. Students who qualified for free lunch were defined as Very Poor, students who qualified for reduced-lunch were considered to be Moderately Poor, and students not eligible for either plan were classified as Not Poor. Davenport and Slate (2019) documented statistically significant decreases in student mathematics success as poverty rates increased. Effect sizes for these statistically significant differences ranged from small to moderate. On all three STAAR Mathematics Phase-In Standards, Grade 3 students who were in the Very Poor group had lower passing rates than their peers who were in the Moderately Poor and in the Not Poor group. Similarly, Grade 3 students who were in the Moderately Poor group had lower passing rates in mathematics than their peers who were in the Poor group. Effect sizes for these statistically significant differences ranged from small to moderate.

Parallel to Davenport and Slate (2019) research, Pariseau (2019) conducted a multiyear investigation on the reading achievement of Grade 4 boys and girls who were in special education. In particular, he focused on the extent to which student economic status (i.e., Not Poor, Moderately Poor, and Extremely Poor) was related to their reading performance on the Grade 4 STAAR Reading test. He examined two types of measurements on the Grade 4 STAAR Reading test, the number of questions answered correctly on the test and the percentages of participants who met the standards for the three Reading Reporting Categories (i.e., Reporting Category 1: Understanding and analysis across genres, Reporting Category 2: Understanding and analysis of literary texts, and Reporting Category 3: Understanding and analysis of informational text). For Grade 4 boys who were in special education, statistically significant differences were established in all the inferential statistical analyses by student economic status. In all four school years (i.e., 2014-2015, 2015-2016, 2016-2017, and 2017-2018) of data analyzed, boys in the Poor group performed statistically significantly lower than boys from the Not Poor group. Regarding the STAAR Reading Phase-In 1, 2, and 3 Standards, by student economic status, the same trends were present in all four years in that lower proportions of boys who were identified as Poor met this standard than boys who were Not Poor.

Literature Review on Mathematics Performance by Student Ethnicity/Race

Since 1954, racial segregation in public schools has been illegal. As a result of the Supreme Court ruling from Brown v. Board of Education, segregated education services were considered unequal in providing learning opportunities for students (American Psychological Association, 2012). Although more than 60 years have passed since that constitutional ruling, ethnic and racial inequalities still exist in public schools (American Psychological Association, 2012; Harris, 2018; McGown, 2016; Pariseau, 2019). For instance, on the National Assessment of Academic Achievement Mathematics test, only 41% of Grade 4 students in the United States were at or above proficient level (The Nation's Report Card, 2019). According to the Nation's Report Card (2019), within that percentage, 20% were Black, 27% were Hispanic, 52% were White, and 70% were

Asian. Such percentages are consistent with previous researchers (e. g., Harris, 2018; McGown, 2016; Schleeter, 2017; Pariseau, 2019) who have reported the highest mathematics test scores for Asian students, followed by White students, Hispanic students, and then Black students in mathematics. Documented by these researchers was a gap of 32% between White and Black students as well as a gap of 25% between White and Hispanic students.

Between 2009 and 2019, the White-Black achievement gap and the White-Hispanic achievement gap decreased by three and four percentage points, respectively (The Nation's Report Card, 2019). About 33% of Grade 8 students in the United States were at or above proficient in the National Assessment of Academic Achievement Mathematics (The Nation's Report Card, 2019). Within the 33% of Grade 8 students who were proficient, 14% were Black, 20% were Hispanic, 44% were White, and 64% were Asian. In Grade 8, the achievement gap between White-Black and White-Hispanic was almost similar to the achievement gaps for Grade 4 students (The Nation's Report Card, 2019.

As it relates to Texas, the state of interest for this investigation, Rojas-LeBouef (2010) examined the degree to which disparities were present in academic achievement between Hispanic and White students. She analyzed 16 years of Texas statewide data, particularly Grade 5 Texas Assessment of Academic Skills and the Texas Assessment of Knowledge and Skills Reading and Mathematics assessments. Rojas-LeBouef (2010), in a total of 60 statistical analyses, documented the presence of 43 large effect sizes, 15 moderate effect sizes, and two small effect sizes. She established that White students consistently outperformed Hispanic students on both Texas state-mandated reading and mathematics assessments in all 16 years of data analyzed. Although Hispanic students' academic performance increased, the achievement gap remained because White students also increased their test performance (Rojas-LeBouef, 2010).

In a recent investigation, McGown (2016) analyzed data on the current Texas state-mandated assessment, the State of Texas Assessments of Academic Readiness (STAAR) Reading tests for three school years (i.e., 2012-2013, 2013-2014, 2014-2015). McGown (2016) recognized the presence of statistically significant ethnic/racial differences in reading. Concerning the three STAAR Reading Reporting Categories, Black students had the lowest reading performance, with Hispanic students performing only slightly better. Asian students had the highest reading performance, followed by White students (McGown, 2016). In all of the Grade 3 STAAR Reading measures, a stairstep effect was present, in that Asian students had the best performance, followed by White, Hispanic, and then Black students. McGown's (2016) results were commensurate both with the results of Rojas-LeBouef (2010) on Texas students and with national results.

In another study on the current Texas state-mandated assessments, Schleeter (2017) analyzed the Grade 3 reading performance of English Language Learners by their ethnicity/race. Similar to McGown (2016), the same three school years (i.e., 2012-2013, 2013-2014, 2014-2015) were examined. Commensurate with Rojas-LeBouef (2010) and McGown (2016), statistically significant gaps were present for Asian, Black, Hispanic, and White English Language Learners. Asian English Language Learners outperformed White English Language Learners, followed by Black English Language Learners, and then Hispanic English Language Learners for all three school years (Schleeter, 2017). In regard to the STAAR Reading Met Standard measures, Hispanic English Language Learners performed statistically significantly lower on 11 of the 12 comparisons. In one school year, Black English Language Learners had a statistically significant lowest reading performance on the Grade 3 STAAR assessment. Concerning the Grade 3 STAAR Reading Reporting Categories, Asian English Language Learners had the best performance in all three Reporting Categories. White, Hispanic, and Black English Language Learners had similar reading test scores.

Similar to Schleeter (2017), Harris (2018) examined the presence of ethnic/racial differences in the reading performance of Texas Grade 4 students. She investigated three years of data (i.e., 2012-2013, 2013-2014, 2014-2015) from the state-mandated reading assessment to ascertain whether ethnic/racial (i.e., Asian, Black, Hispanic, and White) differences were present. Concerning the three Grade 4 STAAR Reading Reporting Categories, Black students had the most deficient performance, with Hispanic students performing slightly better. The highest reading performances were by Asian and White students (Harris, 2018). In the three reading categories, Asian students had the highest reading test scores, followed by White students, Hispanic students, and then Black students in all three years. Harris (2018) established that Black students had the lowest passing rates on the STAAR Level II Final Satisfactory Performance Standard in reading. Harris (2018) provided results that were consistent with Rojas-LeBouef (2010), McGown (2016), and Schleeter (2017) in that a stairstep effect was clearly present in student reading performance. Asian students had the best reading test scores, followed by White students, Hispanic students, and then Black students.

In the most recent publication that could be located, Pariseau (2019) analyzed the extent to which ethnic/racial differences were present in the Grade 4 reading performance of boys who were enrolled in special education. As for performance indicators, two sets of measurements on the Grade 4 STAAR Reading exam were examined. The first set of measurements consisted of the number of test items that were correctly answered (i.e., Reporting Category 1: Understanding and analysis across genres, Reporting Category 2: Understanding and analysis of literary texts, and Reporting Category 3: Understanding and analysis of informational text). The second set of indicators was the percentage of boys who achieved the three levels of state performance standards.

Pariseau (2019) established the presence of statistically significant racial/ethnic differences in the reading performance of boys. In all four years of data that were examined, Black and Hispanic boys had statistically significantly lower reading scores than White boys in all three of the STAAR Reading Reporting Categories. Moreover, for the STAAR Reading Phase-In 1, 2, and 3 Standards by student ethnicity/race, the same pattern existed in all four years. For the Phase-In 1 Standard, 46.35% of White boys met the standard compared to only 15.23% of Hispanic boys, an achievement gap of 31.12%. Concerning the comparison of White boys to Black boys, an achievement gap of 34.32% was present. Regarding the Phase-In 2 Standard, 27.8% of White boys met this standard, whereas only 2.43% of Black boys did, resulting in an achievement gap of 25.37%. Similar results were observed for the achievement gap between White boys and Hispanic boys, with the gap being 24.57%. On the Phase-In 3 Standard, the achievement gaps were 13.3% between White boys and Hispanic boys and 13.5% between White boys and Black boys. Regardless of the specific STAAR Reading measure, Black boys had the poorest performance, with Hispanic boys performing only slightly better in all four school years of data analyzed.

One important contribution from Pariseau (2019) was his observation that substantially more boys were enrolled in special education who had taken the STAAR exam than girls. Pariseau (2019) documented that almost four times as many boys enrolled in special education had taken the Grade 4 STAAR Reading test in the 2014-2015 school year. In the 2015-2016 school year, more than seven times as many boys enrolled in special education than girls participated in the Texas STAAR Grade 4 Reading test. For the 2016-2017 and 2017-2018 school year, 1 to 6 times more boys were enrolled in special education. They had more test results than girls for Grade 4 Reading Texas standardized assessment. For all four years, more boys than girls were in special education and participated in Grade 4 Reading STAAR exams. As such, only data on boys who were enrolled in special education and participated in Grade 4 STAAR Mathematics assessment was addressed in the second article.

Literature Review on Mathematics Performance and the Economic Status of Girls

According to the National Center for Children in Poverty (2019), in the United States, the average percentage of children who reside in poverty is 29%. In the United States, this percentage defines over 7,000,000 children who are adversely influenced by poverty (National Center for Children in Poverty, 2019). Additionally, this percentage indicates that nearly 1 in 5 children in the United States lives in poverty.

Regarding the State of Texas, over 50% of Texas's student population reside in poverty since the 2001-2002 school year (Texas Education Agency, 2003). In the 2015-2016 school year, the percentage of students who were living in poverty increased to about 60%. Almost 61% of Texas public school students were economically disadvantaged in the most current school year, 2018-2019 (Texas Education Agency, 2019).

In current published articles, researchers have documented the presence of even larger percentages of students in poverty. Taylor and Slate (2020), in a Texas longitudinal study of the mathematics achievement of Grade 4 students in special education, established that an average of 77.48% of girls was economically disadvantaged. Economic status is important as students in poverty start school with poorer academic skills relative to their high-income peers (Portia, Elizabeth, & Levine, 2019). Tran, Luchters, and Fisher (2017) reported that children from financially disadvantaged families did not develop at the same rate as their peers who were not in financially disadvantaged families. Such disparities result in long-term effects on educational attainment and adult income. Students from financially disadvantaged families have a high probability rate of struggling in mathematics than do their peers who are not from financially disadvantaged families (Lee, Park, & Ginsburg, 2016). Poverty has a negative effect on children's ability to develop skills and contribute to society (National Center for Children in Poverty, 2019). Moreover, children growing up in poverty constantly confront uncontrolled circumstances that, over time, hamper academic success (Taylor & Slate, 2020).

In terms of academic achievement, poverty has detrimental effects on student achievement in mathematics (Davenport & Slate, 2019; Taylor & Slate, 2020). Taylor and Slate (2020) examined 2015-2016 data on the State of Texas Assessment of Academic Readiness (STAAR) Mathematics test to determine the effect of poverty for boys and girls in special education. Three STAAR Mathematics Phase-In Standards were analyzed. Economic status consisted of two categories: (a) students who qualified for the Federal Free Lunch Program (i.e., Poor students) and (b) students who did not qualify for the Federal Free Lunch Program (i.e., Not Poor students) (Taylor & Slate, 2020).

Taylor and Slate (2020) documented the presence of statistically significant relationships between student poverty and low performance in mathematics. For all three STAAR Mathematics Phase-In Standards, students in special education who were in the Poor Group had statistically significantly lower passing rates than their peers in special education who were in the Not Poor Group. For girls, an average of 16.73% fewer girls in the Poor group met the state-mandated performance level in mathematics than girls in the Not Poor group. Effect sizes for these statistically significant differences were small to moderate in nature.

Similarly, Davenport and Slate (2019) analyzed STAAR Mathematics performance by the economic status of Grade 3 students in a Texas statewide investigation. In their study, they defined economic status as Not Poor, Moderately Poor, or Very Poor. Children who were eligible for the federal free lunch program were described as Very Poor, students who were eligible for the federal reduced-price lunch were classified as Moderately Poor, and students who did not qualify for either federal program were categorized as Not Poor. Davenport and Slate (2019) established the presence of statistically significantly lower test scores in mathematics as poverty levels increased. Grade 3 students who were in the Poor group had statistically significantly lower passing rates than their peers who were in the Moderately Poor group and their peers who were in the Not Poor group on all three STAAR Mathematics Phase-In

Standards. Similarly, Grade 3 students who were in the Moderately Poor group had statistically significantly lower passing rates in mathematics than their peers who were in the Not Poor group. Effect sizes ranged from small to moderate for these statistically significant differences.

Concurrent with the Davenport and Slate (2019) study, Pariseau (2019) conducted a multi-year study on the reading achievement of Grade 4 students in special education. He specifically focused on the extent to which student economic status (i.e., Not Poor, Moderately Poor, and Extremely Poor) was related to their reading achievement on the Grade 4 STAAR Reading exam. He analyzed two sets of reading variables on the Grade 4 STAAR test: (a) the number of questions answered correctly on the exam, and (b) the proportions of participants who met the criteria for the three Reading Reporting Categories (i.e., Reporting Category 1: Understanding and analysis across genres, Reporting Category 2: Understanding and analysis of literary texts, and Reporting Category 3: Understanding and analysis of informational text). Statistically significant differences were established in all the inferential statistical analyses by student economic status, for Grade 4 girls in special education. Girls in the Poor group performed statistically significantly lower than girls in the Poor group in all four years of analyzed data. With respect to the STAAR Reading Phase-In 1, 2, and 3 Standards, by student economic status, the same patterns were established in all four years. Statistically significantly higher percentages of girls who were in the Poor group did not meet these criteria than their peers who were in the Not Poor group.

Furthermore, Pariseau (2019) examined the degree to which ethnic/racial disparities were present in the Grade 4 reading achievement of girls enrolled in special education. The same two sets of measurements previously discussed were analyzed. Pariseau (2019) established the existence of statistically significant racial/ethnic disparities in reading performance. In all three of the STAAR Reading Reporting Categories, White girls had statistically significantly higher reading scores than Black and Hispanic girls in all four years examined. Moreover, the same trend existed in all four years for the STAAR Reading Phase-In 1, 2, and 3 Standards by student ethnicity/race. For the Phase-In 1 Standard, 28.85% of White girls met the standard compared to 10.48% of Hispanic girls, an achievement gap of 18.37%. Regarding the comparison of White girls to Black girls, an achievement gap of 25.52% was present. Concerning the Phase-In 2 Standard, 18.03% of White girls met this standard, whereas only 1.68% of Black girls did, reflective an achievement gap of 16.35%. Similar results were present for the achievement gap between White girls and Hispanic girls, with an achievement gap of 14.93%. On the Phase-In 3 Standard, the achievement gaps were 11.33% between White girls and Hispanic girls and 12.08% between White girls and Black girls. In all four school years of data analyzed, regardless of the specific STAAR Reading measure, Black girls had the lowest performance, with Hispanic girls performing only slightly better.

Statement of the Problem

Students from low-income families "are at greater risk for mathematics education and achievement, and these factors, in turn, may impact their long-term well-being" (Lee et al., 2016, p. 1). Students who are economically disadvantaged are less likely to have access to highly qualified teachers and are more likely to encounter low expectations than their peers who are Not Poor (Lee et al., 2016). Though relationships between poverty and mathematics achievement have been documented in the past, these relationships on the new Texas state-mandated mathematics assessment have not been established. With respect to students in special education, no published studies were located about their mathematics performance on the new Texas state-mandated mathematics assessment and their economic status. In fact, only one study (Pariseau, 2019) was located about students who were in special education and the effect of their economic status and ethnic/racial background on their reading performance.

In 1954, the Brown vs. Board of Education historical ruling promoted integration and established the civil rights movement in American. Due to the Brown vs. Board of Education case, schools were authorized to offer an equal opportunity for all students to have access to education. In 1990, the Individuals with Disabilities Education Act was created to ensure that students be diagnosed with a disability were provided admission to a free and appropriate public education. In 2001, the No Child Left Behind Act was introduced to public education as a federal law that provides monetary assistance to schools to provide services for students in poverty. Despite these mandates, students from various ethnic/racial backgrounds continue to perform poorly in school. In 2015, former-President Obama signed the Every Student Succeeds Act, which promoted the importance of preparing all students for academic success in college and careers. In the area of mathematics, White, Hispanic, and Black students have underperformed Asian students for decades (The Nations Report Card, 2015). Despite the increased accountability made by federal legislative actions, disparities in academic achievement by student ethnicity/race continue to exist (American Psychological Association, 2012; Wei et al., 2013).

Of note to this journal-ready dissertation are several researchers (Rojas-LeBouef, 2010; McGown, 2016; Harris, 2018; Pariseau, 2019) who have documented the presence of similar ethnic/racial disparity gaps for the past two decades in the State of Texas. The content and grade level gaps in the literature need to be addressed to provide practical perspectives and educate educational policymakers about ways to resolve possible inequalities within their ethnically/racially diverse special education populations. Therefore, focused upon in this journal-ready dissertation was the mathematics performance of Grade 3 boys and girls enrolled in special education to determine the degree to which ethnic/racial differences and economic differences might be present.

Purpose of the Study

The overall purpose of this journal-ready dissertation was to determine the degree to which the economic status and ethnicity/race of Texas Grade 4 boys and girls in special education are related to their mathematics performance on Texas state-mandated assessment. In the first article, the purpose was to ascertain the effect of the economic status (i.e., Poor and Not Poor) of boys in special education on their mathematics performance on the Texas state-mandated assessment. In the second article, the purpose was to examine the mathematics performance of Grade 4 boys in special education as a function of their ethnicity/race (i.e., Black, Hispanic, and White). In the third article, the purpose was to investigate the extent to which the economic status (i.e., Poor and Not Poor) was related to the mathematics performance of Grade 4 girls in special education. In all three articles, the extent to which trends might be present in the Reporting Categories (i.e., Reporting Category I: understand numerical representations and relationships, Reporting Category II: computations and algebraic relationships, Reporting

Category III: geometry and measurements, and Reporting Category IV: data analysis and personal financial literature) and mathematics performance levels: (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level) was examined across three school years (i.e., 2015-2016, 2016-2017, 2017-2018).

Significance of the Study

Several researchers (Harris, 2018; McGown, 2016; Pariseau, 2019; Schleeter, 2017; Thoron & Myers, 2011) have published empirical articles on the relationship between student economic status, ethnicity/race, and reading performance. As of the time of this journal-ready dissertation being conducted, no published articles could be located in which researchers had examined the relationship between the mathematics performance of Texas Grade 4 students in special education, economic status, and ethnicity/race, as measured by the Texas state-mandated STAAR exam. The only related study was conducted by Pariseau (2019), who analyzed the reading performance of Texas Grade 4 students in special education as a function of their economic status and ethnicity/race.

As such, this journal-ready dissertation is an extension of Pariseau's (2019) research to the area of mathematics. In investigating the mathematics performance of Grade 4 boys and girls by their economic status and ethnicity/race, further information can be provided to stakeholders. Because of the lack of research in mathematics on learning disabilities, teachers have little guidance on designing specially designed lessons properly and preparing instructional methods for students who find mathematics difficult. It is vital that practitioners and educators understand the relationships between student ethnicity/race, economic status, and mathematics performance.

Definition of Terms

In this journal-ready dissertation, the key terms for the three research investigations are provided for the reader below.

Black

Black is defined as a person who is not Hispanic and who has descendants from Africa (Texas Education Agency, 2018a).

Economic Status

Economic status is a label used to differentiate between students who are not living in poverty and students who are living in poverty. Students' participation in the free or reduced-lunch program is used to determine the student's economic status code in the Texas Education Agency Public Information Management System (Texas Education Agency, 2016). Family income determines if the student qualifies for the free or reduced-lunch program. In respect to this journal-ready dissertation, students who meet the requirements for the federal free-lunch program and reduced-lunch program were placed into the Poor category, and students who do not meet the requirements for the federal free and reduced-lunch program were categorized as being in the Not Poor group.

Ethnicity/Race

Ethnicity refers to common cultural practices, perspectives, and distinctions that distinguish one group from another. For instance, ethnicity defines whether or not a person is of Hispanic origin (United States Census Bureau, 2017). Conversely, race defines "a person's self-identification with one or more social groups" (United States Census Bureau, 2017, p. 1). For example, race refers to a person being American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Another Pacific Islander, and White.

Hispanic

Hispanic is defined as a person who has descendants of Central or South American, Cuban, Mexican, Puerto Rican, or other Spanish culture or origin (Texas Education Agency, 2018a).

Not Poor

Students who are classified as Not Poor do not qualify for the Federal free or reduced-lunch program in this journal-ready dissertation. According to Burney and Beilke (2008), families who earn incomes above 185% of the Federal poverty line do not qualify for the Federal free or reduced-lunch program.

Performance Reporting Categories

Assessed by the STAAR Mathematics test are three categories for performance. For the Approaches Grade Level Category, the performance in this category indicates that students are likely to succeed in the next grade or course (Texas Education Agency, 2017). However, the student must receive targeted academic intervention to experience academic progress. Students in this category generally demonstrate the ability to apply Grade 4 assessed knowledge and skills in familiar contexts of Mathematics (Texas Education Agency, 2017).

In the Meets Grade Level Category: Performance in this category indicates that students have a high probability of academic success in the next grade or course (Texas Education Agency, 2017). However, the students may still need some type of short-term and targeted academic intervention. Students in this category generally demonstrate the ability to think critically and apply Grade 4 assessed knowledge and skills in familiar contexts of Mathematics.

In the Masters Grade Level Category: Performance in this category indicates that students are expected to succeed in the next grade or course. Students who perform within this category need very little to no academic intervention (Texas Education Agency, 2017). Students in this category demonstrate the ability to think critically and apply the assessed knowledge and skills in varied contexts, both familiar and unfamiliar (Texas Education Agency, 2017).

Phase-In Standards

Three Phase-In Standards were created by the Texas Education Agency (2014). The three Phase-In Standards measure the students' satisfactory performance on the STAAR assessment. The criteria for meeting the STAAR Satisfactory requirements consist of a student meeting a minimum scaled score. Over a 5-year period of time, the minimum scaled scores have increased. The STAAR Grade 4 Mathematics assessment for the 2014-2015 school year (i.e., Phase-In 1) required a scaled score of 1347 for a Satisfactory performance designation, for 2015-2016 through 2017-2018 (i.e., Phase-In 2), a minimum scaled score of 1388 was required. The minimum required scale score was 1444 for the 2018-2019 (i.e., Phase-In 3) school year.

Poor

Students who are classified as Poor qualify for the Federal free lunch program and reduced-lunch program in this journal-ready dissertation. Families who earn an income of 130% or less than the Federal poverty line meets the requirements for the Federal free-lunch program (Burney & Beilke, 2008). Students who qualify for the Federal reduced-lunch program in this journal-ready dissertation. Families who earn incomes between 131% to 185% of the Federal poverty line meet the requirements for the Federal reduced-lunch program (Burney & Beilke, 2008).

Public Education Information Management System

The Public Education Information Management System is a centralized digital collection of data obtained and authorized as mandated by the Texas Education Code by districts of the public schools. Annually, the Texas Education Agency establishes data standards that cover a wide range of variables, including personal, economic, and organizational information, student academic and demographic performance (Public Education Information Management System Data Standards 2018).

Mathematics Reporting Categories

Assessed by the STAAR Mathematics test are four Reporting Categories for academic performance. Measured in the STAAR Mathematics Reporting Category I is the student's ability to understand numerical representations and relationships. The STAAR Mathematics Reporting Category II measures the student's ability to understand computations and algebraic relationships. Measured in the STAAR Mathematics Reporting Category III is the student's ability to understand geometry and measurement. Assessed in the STAAR Mathematics Reporting Category IV is the student's ability to understand data analysis and personal financial literature.

Special Education

According to the Texas Education Agency (2017), to be eligible to receive special education services, students must be diagnosed with a disability that affects their academic performance and functionality. Eligibility determination is provided by a licensed specialist in school psychology, an educational diagnostician, or other appropriately certified or licensed practitioner with experience and training in the area of the disability. The student's admission, review, and dismissal committee determine and develops the student's individualized education program.

State of Texas Assessment of Academic Readiness (STAAR)

In 2012, The State of Texas Assessments of Academic Readiness (STAAR) assessment was introduced to the public school district in the State of Texas. The STAAR assessment is a standardized assessment that monitors students' academic achievement on the Texas Essential Knowledge and Skill curriculum standards. Students who are in Grades 3-8 take the STAAR assessments. The assessments target the following content areas: Reading, Writing, Science, Social Studies, and Mathematics. Also, students who are in high school and who are enrolled in Algebra I, English I and II, United States History, and Biology courses are required to take the STAAR exams. (Texas Education Agency, 2018c).

Texas Education Agency

The Texas Education Agency is led by the Education Commissioner, who operates in partnership with the State Board of Education. The Texas Education Agency also collaborates with 20 Regional Education Service Centers to lead and assist Texas ' public primary and secondary schools and districts (Texas Education Agency, 2018b, para. 1, 6 & 8). The Texas Education Agency manages 1,200 districts and billions of dollars in public schools through its mandate to provide services, leadership, and support to help fulfill the educational needs of children who reside in the State of Texas (Texas Education Agency, 2018b, para 1 & 3).

White

According to Texas Education Agency (2018), White is “a non-Hispanic person having origins in any of the original peoples of Europe, North Africa, or the Middle East” (p. 4).

Procedures

Initial approval of this journal-ready dissertation was requested from the researcher's dissertation committee. Following the approval of the doctoral dissertation committee, further approval was sought from the Institutional Review Board of Sam Houston State University. Upon receipt of the approval, archival data that had previously been collected from the Texas Education Agency Public Education Information Management System for Grade 4 boys and girls in special education who had taken the STAAR Mathematics test in the 2015-2016, 2016-2017, and 2017-2018 school years were examined.

Literature Review Search Procedures

For this journal-ready dissertation, the literature concerning mathematics achievement of boys who were enrolled in special education and the relationships of economic status and race/ethnicity were examined. The EBSCO Host electronic database was used to review academic peer-reviewed articles that were published between 2009-2020. The literature search was limited to articles in English. The following keywords were used to search for relevant literature: *mathematics performance, special education, disabilities, poverty, economic disadvantage, and ethnicity/race*.

Delimitations

For this journal-ready dissertation, only the mathematics performance of Texas Grade 4 boys and girls in special education was examined. The first delimitation is that only three school years of STAAR data (i.e., 2015-2016, 2016-2017, 2017-2018) were analyzed. As such, the extent to which results might be generalizable over time is limited. The second delimitation is in relation to the definitions of poverty, which were defined by the Federal free and reduced-lunch program. The final delimitation herein is that data were analyzed on only the four major ethnic/racial groups in Texas (i.e., Black, Hispanic, and White).

Limitations

For this journal-ready dissertation, only the mathematics achievement of Texas Grade 4 boys and girls in special education was analyzed. A limitation present is that the variables (i.e., academic performance, ethnicity/race, poverty status, and special education) of importance in this dissertation were coded through the Public Education Information Management System by local public school districts in Texas. As such, errors may exist. Such errors, if present, could influence the accuracy and reliability of results findings. Factors other than the ones of economic status, ethnicity/race, and gender influence mathematics achievement. Furthermore, Grade 4 is the second grade level that students participate in the Texas state-mandated assessment. As such, their familiarity with standardized tests of a high-stake nature is limited. Finally, archival data were used for this causal-comparative study. Therefore, no conclusive determination of cause and effect relations can be made.

Assumptions

For this journal-ready dissertation, the assumption was made that the achievement data, special education status, gender, economic status, and ethnicity/race were accurately reported to the Texas Education Agency Public Education Information Management System by school campus personnel. Also assumed was consistency in the manner in which Texas school districts collected and reported student data. Correspondingly, any alterations to these assumptions may lead to inaccurate data and conflicting conclusions.

Organization of the Study

This journal-ready dissertation consists of three research studies. In the first article, the degree to which differences might be present in the mathematics performance of Texas Grade 4 boys enrolled in special education as a function of their economic status (i.e., Poor and Not Poor) for 2015-2016, 2016-2017, and the 2017-2018 school years were addressed. In the second article, the extent to which differences might exist in the mathematics performance of Texas Grade 4 boys enrolled in special education as a function of their ethnicity/race (i.e., Black, Hispanic, and White) for the same three school years were examined. In the last article, the focus was placed on the degree to which differences might be present in the mathematics performance of Texas Grade 4 girls in special education as a function of their economic status (i.e., Poor and Not Poor) and ethnicity/race (i.e., Black, Hispanic, and White) for three school years.

This journal-ready dissertation entails five chapters. Chapter I include the background of the study, the statement of the problem, the purpose of the study, the significance of the study, definitions of terms, delimitations, limitations, assumptions, and a framework of the three research studies. In Chapter II, the contextual information for the first article, including mathematics achievement for students in special education by their economic status, was discussed. The background information for the second article concerning the mathematics achievement for students in special education by their ethnicity/race was examined in Chapter III. In regard to Chapter IV, in the third article, the mathematics achievement of girls in special education was examined with respect to their economic status for three school years. The results of the three studies were discussed in Chapter V.

CHAPTER II

DIFFERENCES IN MATHEMATICS PERFORMANCE BY THE ECONOMIC STATUS OF TEXAS GRADE 4 BOYS ENROLLED IN SPECIAL EDUCATION: A MULTIYEAR STATEWIDE INVESTIGATION

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

Abstract

The degree to which the economic status (i.e., Poor and Not Poor) of Texas Grade 4 boys in special education was related to their mathematics achievement was addressed herein. Statewide archival data were obtained from the Texas Education Agency Public Education Information Management System for the 2015-2016, 2016-2017, and 2017-2018 school years for Grade 4 boys in special education. Inferential analyses revealed the presence of statistically significant differences in mathematics achievement by the economic status of Grade 4 boys in special education. Grade 4 boys who were in special education and who were economically disadvantaged consistently had lower mathematics test performance than Grade 4 boys who were in special education and who were not economically disadvantaged. Results in all three school years were congruent with existing research literature in that poverty has detrimental effects on student mathematics performance. Recommendations for future research, as well as implications for policy and practice, were discussed.

Key Words: Special education; STAAR; Mathematics performance; Poverty; Economic status; STAAR Mathematics test; Reporting categories; Phase-In standards; Grade level standards

DIFFERENCES IN MATHEMATICS PERFORMANCE BY THE ECONOMIC STATUS OF TEXAS GRADE 4 BOYS ENROLLED IN SPECIAL EDUCATION: A MULTIYEAR STATEWIDE INVESTIGATION

In the United States, the average percentage of children who live in poverty is 29% (National Center for Children in Poverty, 2019). This percentage reflects over 7,000,000 children who are negatively influenced by poverty (National Center for Children in Poverty, 2019) in the United States. Moreover, this percentage means that about 1 in 5 children lives in poverty.

As it relates to the state of interest in this article, Texas, since the 2001-2002 school year, over half of the student population in Texas live in poverty (Texas Education Agency, 2003). The percentage of students who were economically disadvantaged increased to almost 60% in the 2015-2016 school year. In the most recent school year of data available, 2018-2019, almost 61% of Texas public school students were economically disadvantaged (Texas Education Agency, 2019).

Of note is in that in recently published articles, these percentages were substantially higher. Taylor and Slate (2020), in a Texas statewide analysis of the mathematics performance of Grade 4 boys and girls in special education, documented an average of 81.36% of boys were economically disadvantaged. Economic status is relevant because students in poverty enter school with low academic skills compared to their peers who are Not Poor (Portia, Elizabeth, & Levine, 2019). Tran, Luchters, and Fisher (2017) documented that children from economically disadvantaged backgrounds were likely not to grow at the same pace as their peers who were not in poverty. These discrepancies translated into long-term effects on educational achievement and income in adulthood. Lee, Park, and Ginsburg (2016) explained that students from low-income families have a high chance of struggling in mathematics that will affect their long-term well-being. Poverty has a detrimental effect on children's ability to gain skills to contribute to society (National Center for Children in Poverty, 2019). Children who experienced economic inadequacies usually resided in neighborhoods and attended schools with limited resources required for high academic performance (Taylor & Slate, 2020). Children growing up in poverty often faced undefeatable conditions that, over time, hindered academic performance (Taylor & Slate, 2020).

Concerning the academic achievement area of focus in this investigation, poverty has a critical influence on student achievement in mathematics (Davenport & Slate, 2019; Taylor & Slate, 2020). Taylor and Slate (2020) analyzed 2015-2016 data on the State of Texas Assessment of Academic Readiness (STAAR) Mathematics test by the economic status of students who were enrolled in special education. Three STAAR Mathematics Phase-In Standards were examined with respect to whether students who were in special education met the state-mandated mathematics standards. Economic status in Taylor and Slate (2020) consisted of two categories: (a) students who qualified for the Federal free lunch program (i.e., Poor students) and (b) students who did not qualify for the Federal free lunch program (i.e., Not Poor students).

Taylor and Slate (2020) established the presence of statistically significant relationships between student poverty and poor mathematics performance. On all three STAAR Mathematics Phase-In Standards, students in special education who were in the Poor group had statistically significantly lower passing rates than their peers in special education who were in the Not Poor group. An average of 35.03% fewer boys in the Poor group met the state-mandated performance level in mathematics than their peers in the Not Poor group.

Similarly, Davenport and Slate (2019), in a Texas statewide investigation, analyzed STAAR Mathematics performance by the economic status of Grade 3 students. In the Davenport and Slate (2019) research study, economic status was categorized into three groups, Not Poor, Moderately Poor, and Very Poor. Students who qualified for a free lunch were defined as Very Poor, students who qualified for reduced lunch were considered to be Moderately Poor, and students not eligible for either plan were classified as Not Poor. Davenport and Slate (2019) documented statistically significant decreases in student mathematics success as poverty rates increased. Effect sizes for these statistically significant differences ranged from small to moderate. On all three STAAR Mathematics Phase-In Standards, Grade 3 students who were in the Very Poor group had lower passing rates than their peers who were in the Moderately Poor and in the Not Poor group. Likewise, Grade 3 students who were in the Moderately Poor group had lower passing rates in mathematics than their peers who were in the Poor group. Effect sizes for these statistically significant differences ranged from small to moderate.

Parallel to Davenport and Slate (2019) research, Pariseau (2019) conducted a multiyear investigation on the reading achievement of Grade 4 boys and girls who were in special education. In particular, he focused on the extent to which student economic status (i.e., Not Poor, Moderately Poor, and Extremely Poor) was related to their reading performance on the Grade 4 STAAR Reading test. He examined two types of measurements on the Grade 4 STAAR Reading test, the number of questions answered correctly on the test and the percentages of participants who met the standards for the three Reading Reporting Categories (i.e., Reporting Category 1: Understanding and analysis across genres, Reporting Category 2: Understanding and analysis of literary texts, and Reporting Category 3: Understanding and analysis of informational text). For Grade 4 boys who were in special education, statistically significant differences were established in all the inferential statistical analyses by student economic status. In all four school years (i.e., 2014-2015, 2015-2016, 2016-2017, and 2017-2018) of data analyzed, boys in the Poor group performed statistically significantly lower than their peers from the Not Poor group. Regarding the STAAR Reading Phase-In 1, 2, and 3 Standards, by student economic status, the same trends were present in all four years in that lower proportions of boys who were identified as Poor met this standard than boys who were Not Poor.

Statement of the Problem

Students from low-income families "are at greater risk for mathematics education and achievement, and these factors, in turn, may impact their long-term well-being" (Lee et al., 2016, p. 1). Students who are economically disadvantaged are less likely to have access to highly qualified teachers and more likely to encounter low expectations than are their peers who are Not Poor. Though relationships between poverty and mathematics achievement have been documented in the past, these relationships on the new Texas state-mandated mathematics assessment have not been established. With respect to students in special education, no published studies were located about their mathematics performance on the new Texas state-mandated mathematics assessment and their economic status. Only one study (Pariseau, 2019) was located about students who were in special education and the effect of their economic status on their academic performance.

Pariseau (2019) focused on reading performance and not on the mathematics performance of students in special education.

Purpose of the Study

The purposes of this study were to determine the degree to which student economic status was related to the mathematics performance of Texas Grade 4 boys who were enrolled in special education. In this study, the first purpose was to ascertain the effect of student economic status (i.e., Poor and Not Poor) on mathematics performance in four areas (i.e., Reporting Category I: understand numerical representations and relationships, Reporting Category II: computations and algebraic relationships, Reporting Category III: geometry and measurements, and Reporting Category IV: data analysis and personal financial literature) on the Texas state-mandated assessment. The second purpose of this study was to determine the effect of student economic status on mathematics performance in three areas: (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level). The third purpose was to ascertain the extent to which trends were present in the Reporting Categories and Phase-In Standards across three years (i.e., 2015-2016, 2016-2017, 2017-2018) by the economic status of Grade 4 boys in special education.

Significance of the Study

Most published research studies involve a focus on reading disabilities (e.g., Pariseau, 2019) rather than disabilities in mathematics. Nevertheless, students who are diagnosed with learning disabilities in mathematics continue to be a growing concern (Jiménez-Fernández, 2016). Because of the lack of research in mathematics on learning disabilities, teachers have little guidance on properly designing specially designed lessons and preparing instructional methods for students who find mathematics difficult. It is vital that practitioners and educators understand the relationships between student poverty and mathematics performance. Few research studies exist regarding mathematics performance by the economic status of Texas Grade 4 boys enrolled in special education. As of the time of this research study being conducted, no researchers had examined the relationship between the mathematics performance of Texas Grade 4 boys in special education and economic status as measured by the Texas state-mandated STAAR exam. The only related study was conducted by Pariseau (2019), who analyzed the reading performance of Texas Grade 4 boys in special education as a function of their economic status. As such, this investigation is an extension of Pariseau's research into the area of mathematics. In investigating the mathematics performance of Grade 4 boys by their economic status, further information can be provided to stakeholders. Policymakers and school officials were informed on how to educate students who are in special education and poverty.

Research Questions

In this study, the following overarching research question was addressed: What is the effect of economic status (i.e., Poor and Not Poor) on the mathematics performance of Texas Grade 4 boys in special education? Specific subquestions under this overarching research question were: (a) What is the effect of economic status on the ability to understand numerical representations and relationships (i.e., STAAR Mathematics Reporting Category I) of Texas Grade 4 boys in special education?; (b) What is the effect of economic status on the ability to understand computations and algebraic relationships (i.e., STAAR Mathematics Reporting Category II) of Texas Grade 4 boys in special education?; (c) What is the effect of economic status on the ability to understand geometry and measurement (i.e., STAAR Mathematics Reporting Category III) of Texas Grade 4 boys in special education?; (d) What is the effect of economic status on the ability to understand data analysis and personal financial literature (i.e., STAAR Mathematics Reporting Category IV) of Texas Grade 4 boys in special education?; (e) What is the effect of economic status on the Approaches Grade Level performance of Texas Grade 4 boys in special education?; (f) What is the effect of economic status on the Meets Grade Level performance of Texas Grade 4 boys in special education?; (g) What is the effect of economic status on the Masters Grade Level performance of Texas Grade 4 boys in special education?; (h) What trend is present across the STAAR Mathematics Reporting Categories I, II, III, and IV by the economic status of Grade 4 boys across three school years of data?; and (i) What trend is present across the STAAR Mathematics Phase-In performance standards by the economic status of Grade 4 boys across three school years of data? The first nine research questions were answered separately for each of the three school years (i.e., 2015-2016, 2016-2017, and 2017-2018) of school data analyzed herein. The last two research questions involved comparisons across all three school years. These research questions were answered solely for boys due to the gender disproportionality documented to be present in special education and the likelihood that this disproportionality could skew the overall results (National Center for Education Statistics, 2019a).

Method

Research Design

For this empirical investigation, the research design was non-experimental, quantitative, causal comparative (Johnson & Christensen, 2020). Causal comparative designs are used to find relationships between independent and dependent variables after actions have already taken place (Johnson & Christensen, 2020). In this investigation, a state archival dataset of the overall mathematics performance of Grade 4 boys in special education were analyzed to determine the effect of economic status on student achievement in mathematics. The independent variable in this research study was student degree of economic disadvantage (i.e., Poor and Not Poor), and the dependent variables were the four STAAR Mathematics Reporting Categories (i.e., Reporting Category I, Reporting Category II, Reporting Category III, and Reporting Category IV) and the three STAAR Mathematics Phase-In Standards (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level) for Grade 4 boys who were enrolled in special education.

Participants and Instrumentation

The data that were analyzed herein were previously obtained from the Texas Education Agency Public Education Information Management System database for the Grade 4 STAAR Mathematics exam that was administered in the 2015-2016, 2016-2017, and 2017-2018 school years. A Public Information Request was previously submitted to and fulfilled by the Texas Education Agency to obtain the data. Datasets requested and obtained were for: (a) Grade 4 boys, (b) STAAR Mathematics Performance Level

Standards, (c) STAAR Mathematics Reporting Categories, (d) special education status, and (e) student economic status for three years of data.

In Texas, the overrepresentation of boys in special education is apparent in enrollment data. At the national level with public schools, gender disproportionality exists with students in special education. According to the National Center for Education Statistics (2019a), 17% of boys are enrolled in special education, compared to only 9% of girls. Given this gender disproportionality, data on only the mathematics performance of boys were analyzed in this study.

For this article, the economic status referred to two groups of boys (e.g., Poor and Not Poor). Students who met the requirements for the free lunch program (i.e., family income of 130% or less of the Federal poverty threshold) were identified as Poor (Burney & Beilke, 2008). As well as students who met the requirements for the reduced-lunch program (i.e., household income between 131% to 185% of the Federal poverty threshold). Students who disqualify for a free or reduced-lunch program (i.e., household income of more than 185% of the Federal poverty threshold) were identified as Not Poor.

Assessed by the STAAR Mathematics test are four Reporting Categories for academic performance. Measured in the STAAR Mathematics Reporting Category I, is student ability to understand numerical representations and relationships. Assessed in the STAAR Mathematics Reporting Category II is student ability to understand computations and algebraic relationships. Measured in the STAAR Mathematics Reporting Category III is student ability to understand geometry and measurement. Assessed in the STAAR Mathematics Reporting Category IV is student ability to understand data analysis and personal financial literature.

In addition to data analyses of the four STAAR Mathematics Reporting Categories, mathematics performance on the STAAR Phase-In Standards was examined as well. Assessed by the STAAR Mathematics test are three categories for performance. In the Approaches Grade Level Category: Performance in this category indicates that students are likely to succeed in the next grade or course (Texas Education Agency, 2017). However, students have to receive targeted academic intervention to experience academic progress. Students in this category generally demonstrate the ability to apply Grade 4 assessed knowledge and skills in familiar contexts of Mathematics (Texas Education Agency, 2017).

In the Meets Grade Level Category: Performance in this category indicates that students have a high probability of academic success in the next grade or course (Texas Education Agency, 2017). Students may still need some type of short-term and targeted academic intervention. Students in this category generally demonstrate the ability to think critically and apply Grade 4 assessed knowledge and skills in familiar contexts of Mathematics. In the Masters Grade Level Category: Performance in this category indicates that students are expected to succeed in the next grade or course. Students who perform within this category need very little to no academic intervention (Texas Education Agency, 2017). Students in this category demonstrate the ability to think critically and apply the assessed knowledge and skills in varied contexts, both familiar and unfamiliar (Texas Education Agency, 2017).

According to the Texas Education Agency (2017), to be eligible to receive special education services, students must be diagnosed with a disability that affects their academic performance and functionality. Eligibility determination is provided by a licensed specialist or licensed practitioner with experience and training in the area of the disability. The student's admission, review, and dismissal committee determine and develops the student's individualized education program.

Results

With respect to the STAAR Mathematics Reporting Categories, multivariate analysis of variance procedures (MANOVAs) were conducted. Before conducting MANOVA procedures to address the first four research questions previously presented, its underlying assumptions (i.e., data normality, Box's Test of Equality of Covariance, and the Levene's Test of Equality of Error Variance) were checked. Despite some of these assumptions not being met, the MANOVA is sufficiently robust to be able to withstand these violations (Field, 2009). Starting with the 2015-2016 school year and ending with the 2017-2018 school year, the results will be described in chronological order.

Overall Results for Boys Across All Three School Years

The MANOVA yielded a statistically significant difference in overall mathematics performance by the economic status (i.e., Poor and Not Poor) of Grade 4 boys in special education for the 2015-2016 school year, Wilks' $\Lambda = .81$, $p < .001$, partial $\eta^2 = .19$, large effect size (Cohen, 1988). With respect to the 2016-2017 school year, a statistically significant difference was revealed in overall mathematics performance, Wilks' $\Lambda = .91$, $p < .001$, partial $\eta^2 = .10$, moderate effect size (Cohen, 1988). Concerning the 2017-2018 school year, a statistically significant difference was not present, Wilks' $\Lambda = .99$, $p = .19$. Effect sizes were large and moderate for the first two school years, with similar mathematics performance present in the 2017-2018 school year.

Results for Mathematics Reporting Category I for Boys Across All Three School Years

To determine whether statistically significant differences were present for the STAAR Mathematics Reporting Category I by student economic status, univariate follow-up analysis of variance (ANOVA) procedures were calculated for each school year. With respect to the 2015-2016 school year, a statistically significant difference was revealed, $F(1, 1015) = 106.28$, $p < .001$, partial $\eta^2 = .10$, moderate effect size (Cohen, 1988). Regarding the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(1, 1206) = 71.97$, $p < .001$, partial $\eta^2 = .06$, moderate effect size (Cohen, 1988). Concerning the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 949) = 0.15$, $p = .70$. Grade 4 boys who were enrolled in special education and who were Poor answered statistically significantly fewer items correctly on the STAAR Mathematics Reporting Category I than their peers who were Not Poor for the first two school years, but not for the most recent one, which is presented in Table 2.1.

Insert Table 2.1 about here

For the 2015-2016 and 2016-2017 school years, Grade 4 boys in special education who were Poor answered over one and one-half fewer items correctly than boys who were in special education and who were Not Poor. Concerning the 2017-2018 school year, boys who were in special education and who were Poor answered a similar number of questions correctly as their peers who were Not Poor, which is revealed in Figure 2.1.

Insert Figure 2.1 about here

Results for Mathematics Reporting Category II for Boys Across All Three School Years

Regarding the 2015-2016 school year, a statistically significant difference was present, $F(1, 1015) = 189.12$, $p < .001$, partial $\eta^2 = .16$, large effect size (Cohen, 1988). The ANOVA yielded a statistically significant difference for the 2016-2017 school year, $F(1, 1206) = 93.42$, $p < .001$, partial $\eta^2 = .07$, moderate effect size (Cohen, 1988). With respect to the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 949) = 0.03$, $p = .88$. On the STAAR Mathematics Reporting Category II questions, for the first two school years, Grade 4 boys in special education who were Poor answered statistically significantly fewer items correctly than students who were Not Poor. The effect size was large for the 2015-2016 school year and moderate for the 2016-2017 school year. During the 2015-2016 school year, for the STAAR Mathematics Reporting Category II questions, Grade 4 boys in special education who were Poor answered, on average, more than three and one-half fewer items correctly than boys who were Not Poor. Contained in Table 2.2 are the descriptive statistics for these analyses.

Insert Table 2.2 about here

In the 2016-2017 school year, Grade 4 boys in special education who were Poor answered, on average, over one and one-half fewer items correctly than boys who were Not Poor. Illustrated in Figure 2.2 is that boys who were Poor answered a similar number of questions correctly as boys who were Not Poor, in the 2017-2018 school year.

Insert Figure 2.2 about here

Results for Mathematics Reporting Category III for Boys Across All Three School Years

For the 2015-2016 school year, a statistically significant difference was present, $F(1, 1015) = 204.36$, $p < .001$, partial $\eta^2 = .17$, large effect size (Cohen, 1988), on the STAAR Mathematics Reporting Category III by student economic status. Concerning the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(1, 1206) = 76.40$, $p < .001$, partial $\eta^2 = .06$, moderate effect size (Cohen, 1988). With respect to the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 949) = 2.52$, $p = .11$. Grade 4 boys in special education who were Poor answered statistically significantly fewer items correctly than boys who were Not Poor, on the STAAR Mathematics Reporting Category III, for the first two school years, but not for the most recent school year. The effect size for the first school year was large, whereas the effect size for the 2016-2017 school year was moderate. Descriptive statistics for the STAAR Mathematics Reporting Category III are presented in Table 2.3.

Insert Table 2.3 about here

In the 2015-2016 school year, Grade 4 boys in special education who were Poor answered, on average, over three and one-quarter fewer items correctly than boys who were Not Poor. For the 2016-2017 school year, boys who were Poor answered, on average, one and one-half fewer items correctly than boys who were Not Poor. With respect to the 2017-2018 school year, Grade 4 boys in special education who were Poor answered a similar number of questions correctly as boys who were Not Poor. Depicted in Figure 2.3 is the average number of questions Grade 4 boys in special education answered correctly for Mathematics Reporting Category III as a function of their economic status.

Insert Figure 2.3 about here

Results for Mathematics Reporting Category IV for Boys Across All Three School Years

With respect to the 2015-2016 school year, a statistically significant difference was revealed, $F(1, 1015) = 116.43$, $p < .001$, partial $\eta^2 = .10$, moderate effect size (Cohen, 1988), on the STAAR Mathematics Reporting Category IV by student economic status. Regarding the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(1, 1206) = 99.36$, $p < .001$, partial $\eta^2 = .08$, moderate effect size (Cohen, 1988). Concerning the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 949) = 0.73$, $p = .40$. In the 2015-2016 and 2016-2017 school years, Grade 4 boys in special education who were Poor answered statistically significantly fewer items correctly on the STAAR Mathematics Reporting Category IV than boys who were Not Poor. In the most recent school year, Grade 4 boys in special education, regardless of their economic status, answered a similar number of items correctly. Descriptive statistics for the STAAR Mathematics Reporting Category IV are delineated in Table 2.4.

Insert Table 2.4 about here

Regarding the 2015-2016 school year, for the STAAR Mathematics Reporting Category IV, Grade 4 boys in special education who were Poor answered, on average, one fewer item correctly than boys who were Not Poor. Concerning the 2016-2017 school year, Grade 4 boys in special education who were Poor answered almost one fewer item correctly than boys who were Not Poor. With respect to the 2017-2018 school year, boys who were in special education, regardless of their economic status, answered a similar number of items correctly. Illustrated in Figure 2.4 is the average numbers of questions Grade 4 boys in special education answered correctly for Mathematics Reporting Category IV by economic status.

Insert Figure 2.4 about here

Grade Level Standards

To address the research questions about the Grade Level Standard performances, Pearson chi-square procedures were conducted. This statistical method was the optimal statistical procedure because of the presence of frequency data for the three mathematics Grade Level Standard performances (i.e., met and not met) and for boys' economic status. When both the independent variable and the dependent variables are nominal in nature, Pearson chi-squares are the statistical technique of choice (Slate & Rojas-LeBouef, 2011). With a large sample size, the criteria for using Pearson chi-squares were met.

Results for the STAAR Mathematics Approaches Grade Level Standard for Boys Across All Three School Years

Grade level performance standards could not be analyzed herein for the 2015-2016 school year. Taylor and Slate (2020) had already examined those data for that particular school year. Their results will be addressed in the Discussion section of this article.

Concerning the 2016-2017 school year, the result was statistically significant, $\chi^2(1) = 125.02$, $p < .001$, moderate effect size, Cramer's V of .32 (Cohen, 1988). As delineated in Table 2.5, more than 75% of boys in special education who were Poor did not meet this standard compared to just over 40% of boys who were in special education and who were Not Poor.

Insert Table 2.5 about here

Regarding the 2017-2018 school year, the result was statistically significant, $\chi^2(1) = 6.94$, $p = .008$, small effect size, Cramer's V of .09 (Cohen, 1988). Boys in special education who were in the Poor group were 50% more likely to not meet this standard than boys in special education who were not in the Poor group. As presented in Figure 2.5, for the 2016-2017 and 2017-2018 school years, boys in special education who were Poor barely met the Approaches Grade Level Standard compared to their peers who were Not Poor.

Insert Figure 2.5 about here

Results for the STAAR Mathematics Meets Grade Level for Boys Across All Three School Years

Regarding the 2015-2016 school year, the grade level performance was not examined. Data for that school year were analyzed and published by Taylor and Slate (2020). The results of that article will be addressed in the Discussion section of this study. Concerning the 2016-2017 school year, a statistically significant difference was yielded, $\chi^2(1) = 132.16$, $p < .001$, moderate effect size, Cramer's V of .33 (Cohen, 1988). Grade 4 boys in special education who were Poor were four times less likely to meet this standard than Grade 4 boys in special education who were Not Poor. For the 2017-2018 school year, the result was statistically significant, $\chi^2(1) = 39.65$, $p < .001$, small effect size, Cramer's V of .20 (Cohen, 1988). As revealed in Table 2.6, almost three times as many Grade 4 boys in special education who were Poor did not meet this standard than Grade 4 boys in special education who were Not Poor.

Insert Table 2.6 about here

Results for the STAAR Mathematics Masters Grade Level for Boys Across All Three School Years

Regarding the 2015-2016 school year, the grade level performance was not examined. Data for that school year were analyzed and published by Taylor and Slate (2020). The results of that article will be addressed in the Discussion section of this study. Regarding the 2016-2017 school year, the result was statistically significant, $\chi^2(1) = 152.65$, $p < .001$, moderate effect size, Cramer's V of .36 (Cohen, 1988). As delineated in Table 2.7, almost 10 times fewer Grade 4 boys in special education who were Poor met this standard than Grade 4 boys in special education who were Not Poor. With respect to the 2017-2018 school year, a statistically significant difference was yielded, $\chi^2(1) = 65.07$, $p < .001$, small effect size, Cramer's V of .26 (Cohen, 1988). As revealed in Table 2.7, more than four times as many Grade 4 boys in special education in the Poor group did not meet this standard than Grade 4 boys in special education who were in the Not Poor group.

Insert Table 2.7 about here

Discussion

Mathematics performance was investigated by the economic status of Grade 4 boys in special education in this multiyear Texas statewide investigation. Two mathematics measures were present: (a) the number of test questions correctly answered and (b) the percentages of boys who met three mathematics Grade Level Standards. For the 2015-2016 and 2016-2017 school years, statistically significant gaps were established in all four Mathematics Reporting Categories. Grade 4 boys in special education who were Poor had statistically significantly lower mathematics scores than Grade 4 boys in special education who were Not Poor. Depicted in Figures 2.6 and 2.7 is that as the Grade Level Standards increased for Grade 4 boys in special education by their economic status, the achievement gaps increased as well for the 2016-2017 and 2017-2018 school years. For the Meets Grade Level Standard, only 8.4% of Grade 4 boys in special education who were Poor met this standard. Concerning the Masters Grade Level Standard, only 2.7% of Grade 4 Boys who were Poor met this standard.

Insert Figures 2.6 and 2.7 about here

As mentioned earlier in the article, Taylor and Slate (2020) conducted a study on mathematics performance by the economic status of Texas Grade 4 students in special education for the 2015-2016 school year. In their investigation, about three times fewer Grade 4 boys in special education who were economically disadvantaged met the Approaches Grade Level Standard than boys in special education who were not economically disadvantaged. Moreover, Grade 4 boys in special education who were

Poor had about 10 times fewer boys who met the Meets Grade Level Standard than boys who were Not Poor. Regarding the Masters Grade Level Standard, Grade 4 boys in special education who were Poor were 26 times less likely to meet this standard than boys in special education who were Not Poor.

Results for the 2017-2018 school year, the most recent school year of data, were indicative of a similar performance of Grade 4 boys in special education, regardless of their economic status. During the 2017-2018 school year, the STAAR Mathematics exam requirements to be eligible for common accommodations such as mathematics charts and calculator increased, compared to the 2015-2016 and 2016-2017 school years. As such, students who may have used a calculator for the 2016-2017 school year may have performed well. However, for the 2017-2018 school year, their performance declined because they no longer meet the requirement to use the calculator on the exam.

Furthermore, the use of STAAR Mathematics online testing increased, an increase which may have resulted in improvements in student performance. Because technology decreases the complexity of performing a task, special education teachers emphasized the use of the STAAR online assessment. The STAAR online exam also included embedded accommodations that improved student performance by decreasing the level of difficulty. Because both groups (i.e., Poor and Not Poor) had equal access to resources that stabilized their academic performance, it appears that poverty did not have the same effects on student academic performance as in previous school years.

Connection with Existing Literature

As documented in this study, Grade 4 boys in special education who were Poor performed statistically significantly lower than Grade 4 boys in special education who were Not Poor on the Texas state-mandated mathematics assessment. Results delineated herein are congruent with the findings of previous researchers (Davenport & Slate, 2019; Harris, 2018; Harris & Slate, 2017; McGown, 2016; Pariseau, 2018; Schleeter, 2017) who established the existence of statistically significant differences in student achievement as a function of their economic status and special education enrollment status. Children's ability to learn and obtain mathematical skills is clearly adversely affected by poverty.

Implications for Policy and Practice

Several implications for policy and practice can be generated based on the findings of this multi-year statewide investigation. With respect to policy implications, educators and legislators need to provide financial resources and services to resolve the mathematical achievement disparities that are present for boys who are in special education and who reside in poverty. Students who are economically disadvantaged should have access to tutorial programs outside of school funded by their local school district or community. Second, it will be beneficial for students in special education to start school at pre-kindergarten and receive early intervention in mathematics while developing fundamental skills. Hence, more funding is needed for school districts to finance special education programs for the pre-kindergarten grade level.

Regarding implications for practice, postsecondary graduate teaching programs need to add special education courses to their curriculum. The number of students in special education who receive instruction in the mainstream is rapidly increasing in Texas because a cap no longer exists. Therefore, many first-year general education teachers lack the knowledge of supporting and teaching students with disabilities, which impedes student's academic performance. Furthermore, educators need access to professional learning opportunities that consist of strategies for teaching mathematical skills to students with exceptional needs. It is vital that educators are trained on how to meet the academic, functional, and emotional needs of students who are diagnosed with disabilities. Moreover, teachers need to participate in professional development activities in which they are shown how to develop an effective intensive program of instruction program which is required for students in special education who did not pass the STAAR content exam.

An intensive program of instruction is not effective if it is not properly designed to meet the individual needs of the student. If educators have the knowledge and understanding to build and implement an efficient intensive program of instructional plan, students in special education probability rate of demonstrating academic success on the next statewide exam will increase. Finally, Grade 3 STAAR Mathematics test scores should be utilized to design an effective intensive program of instruction for Grade 4 boys in special education, which will allow educators to immediately respond to mathematical gaps. Boys who are in special education, live in poverty, and are required to participate in the Grade 4 STAAR Mathematics exam will have the opportunity to be successful, if state and federal legislatures adhere to these ideas.

Suggestions for Future Research

Several recommendations for future studies can be made based on the findings of this empirical, multiyear statewide study. First, because this investigation was restricted to Texas Grade 4 boys enrolled in special education, researchers are recommended to replicate this study in other states to ascertain the degree to which results described herein are generalizable. Second, only Grade 4 STAAR Mathematics results were analyzed in this study. As such, researchers are encouraged to extend this study to other content areas such as reading, science, social studies, and writing. Third, because only Grade 4 test data were examined in this investigation, researchers are encouraged to analyze data at other grade levels. Fourth, in this article, data on boys enrolled in special education were analyzed. The extent to which results discussed in this article would be generalizable to other student populations such as Section 504, and English Language Learners is not known. Fourth, the only demographic group that was studied in this article was economic status. Hence, researchers should examine the relationship between boys in special education and their ethnicity/race (i.e., Black, Hispanic, and White). Lastly, data on only boys were analyzed in this article. Accordingly, data on girls in special education and their mathematics performance should be investigated as a function of their economic status.

Conclusion

The purpose of this journal-ready article was to analyze the degree to which differences were present in the mathematics performance of Texas Grade 4 boys in special education by their economic status. Statistically significant differences were documented in the mathematics performance by Grade 4 boys in special education by their economic status. For the 2015-2016 and 2017-2018 school years, Grade 4 boys in special education who were poor had statistically significantly lower mathematics scores on all four STAAR Mathematics Reporting Categories. For the most recent school year, 2017-2018, however, regardless of Grade 4 boys in special education economic status, they answered a similar number of questions correctly on the STAAR Mathematic Reporting Categories.

With respect to the three STAAR Mathematics Grade Level Standards, a consistent trend was revealed. In all three school years of Texas statewide data, statistically significant differences were presented for Grade 4 boys in special education as a function of their economic status. Grade 4 boys in special education who were Poor had statistically significantly lower percentages who met these three Grade Level Standards than Grade 4 boys in special education who were Not Poor group. The results of this multiyear statewide study were congruent with previous researchers (Davenport & Slate, 2019; Harris, 2018; Harris & Slate, 2017; McGown, 2016; Pariseau, 2018; Ravitch, 2013; Schleeter, 2017) in terms of the mathematics disparities present for boys in poverty.

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Table 2.1

Descriptive Statistics for Reporting Category I for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	347	7.85	4.07
Poor	670	5.43	3.24
2016-2017			
Not Poor	304	5.30	3.44
Poor	904	3.68	2.66
2017-2018			
Not Poor	146	3.64	3.45
Poor	805	3.55	2.31

Table 2.2

Descriptive Statistics for Reporting Category II for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	347	9.13	5.12
Poor	670	5.41	3.44
2016-2017			
Not Poor	304	5.37	3.89
Poor	904	3.48	2.56
2017-2018			
Not Poor	146	4.36	4.10
Poor	805	4.31	2.69

Table 2.3

Descriptive Statistics for Reporting Category III for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	347	7.52	4.61
Poor	670	4.24	2.70
2016-2017			
Not Poor	304	4.84	3.45
Poor	904	3.33	2.25
2017-2018			
Not Poor	146	4.04	3.60
Poor	805	3.67	2.58

Table 2.4

Descriptive Statistics for Reporting Category IV for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	347	2.75	1.70
Poor	670	1.74	1.26
2016-2017			
Not Poor	304	2.18	1.61
Poor	904	1.33	1.15
2017-2018			
Not Poor	146	1.62	1.58
Poor	805	1.52	1.16

Table 2.5

Frequencies and Percentages for Approaches Grade Level Standard for 2016-2017 and 2017-2018

	Did Not Meet Standard		Met Standard	
School Year and Economic Status	*n*	%	*n*	%
2016-2017				
Not Poor	127	41.80	177	58.20
Poor	691	76.40	213	23.60
2017-2018				
Not Poor	87	13.30	568	86.70
Poor	59	19.90	237	80.10

Table 2.6

Frequencies and Percentages for Meets Grade Level Standard for 2016-2017 and 2017-2018

	Did Not Meet Standard		Met Standard	
School Year and Economic Status	*n*	%	*n*	%
2016-2017				
Not Poor	195	64.10	109	35.90
Poor	828	91.60	76	8.40
2017-2018				
Not Poor	106	12.60	732	87.40
Poor	40	35.40	73	64.60

Table 2.7

Frequencies and Percentages for Masters Grade Level Standard for 2016-2017 and 2017-2018

	Did Not Meet Standard		Met Standard	
School Year and Economic Status	*n*	%	*n*	%
2016-2017				
Not Poor	227	74.70	77	25.30
Poor	880	97.30	24	2.70
2017-2018				
Not Poor	119	13.20	784	86.80
Poor	27	56.30	21	43.80

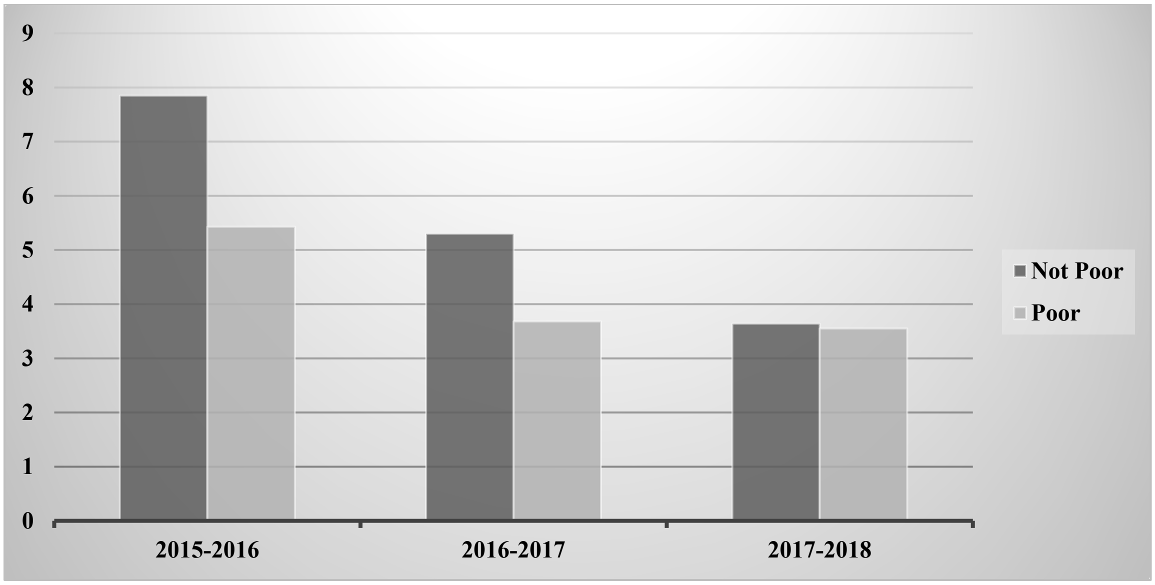

Figure 2.1. Average number of correct responses for Reporting Category I for 2015-2016 through 2017-2018.

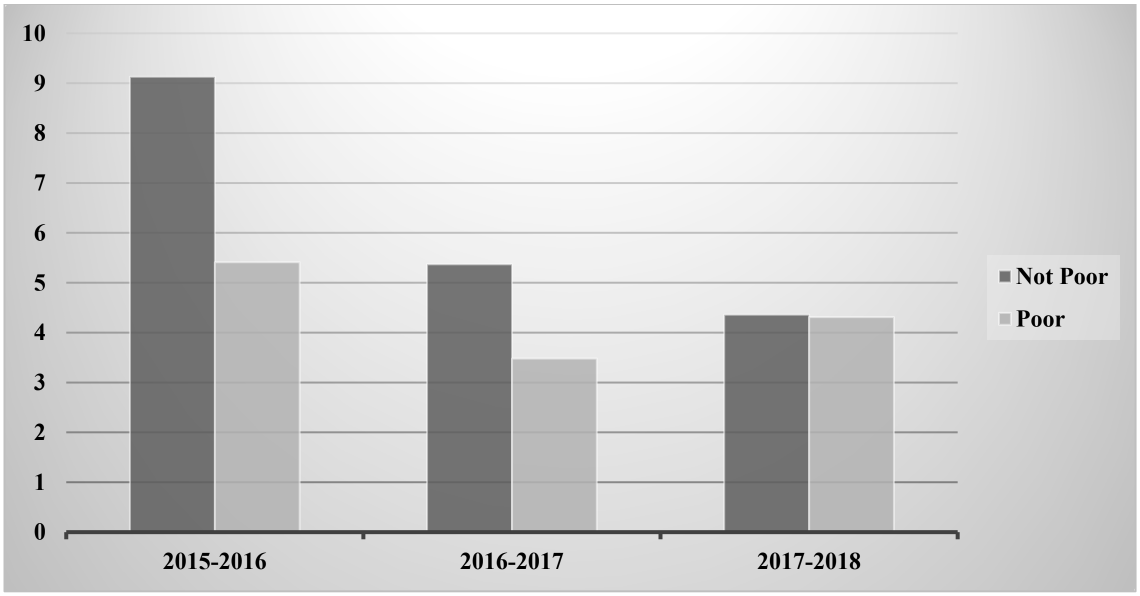

Figure 2.2 Average number of correct responses for Reporting Category II for 2015-2016 through 2017-2018.

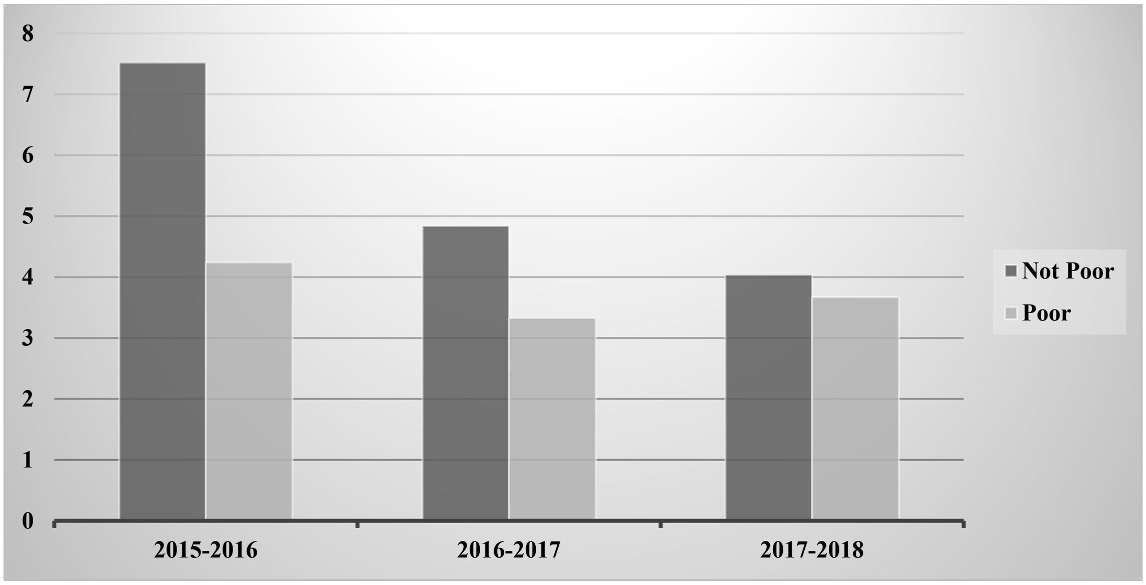

Figure 2.3. Average number of correct responses for Reporting Category III for 2015-2016 through 2017-2018.

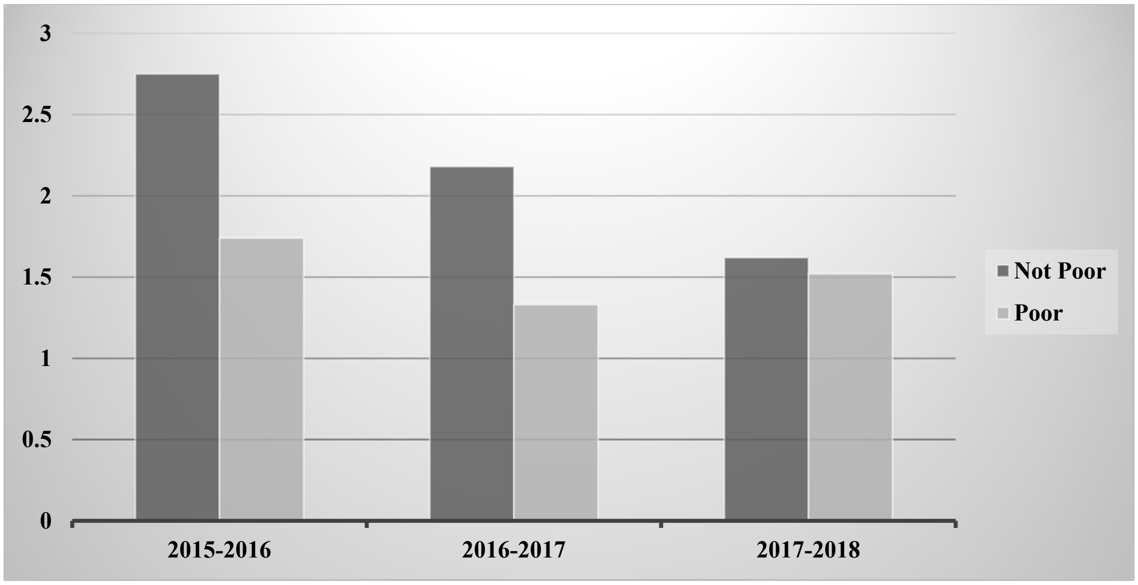

Figure 2.4. Average number of correct responses for Reporting Category IV for 2015-2016 through 2017-2018.

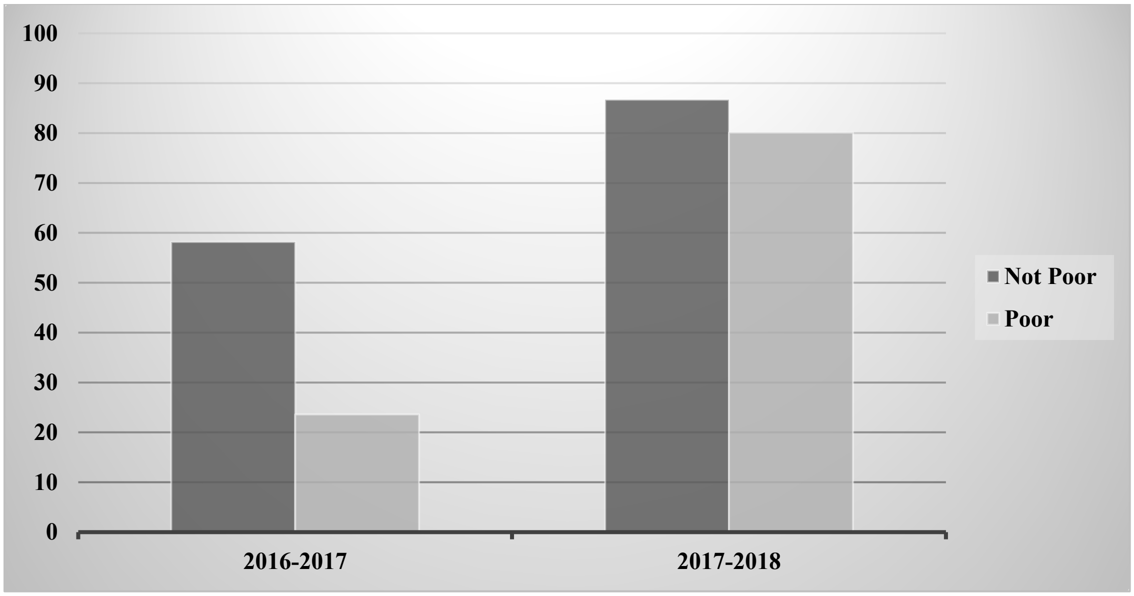

Figure 2.5. Frequencies and percentages for Approaches Grade Level Standard by economic status for 2016-2017 and 2017-2018.

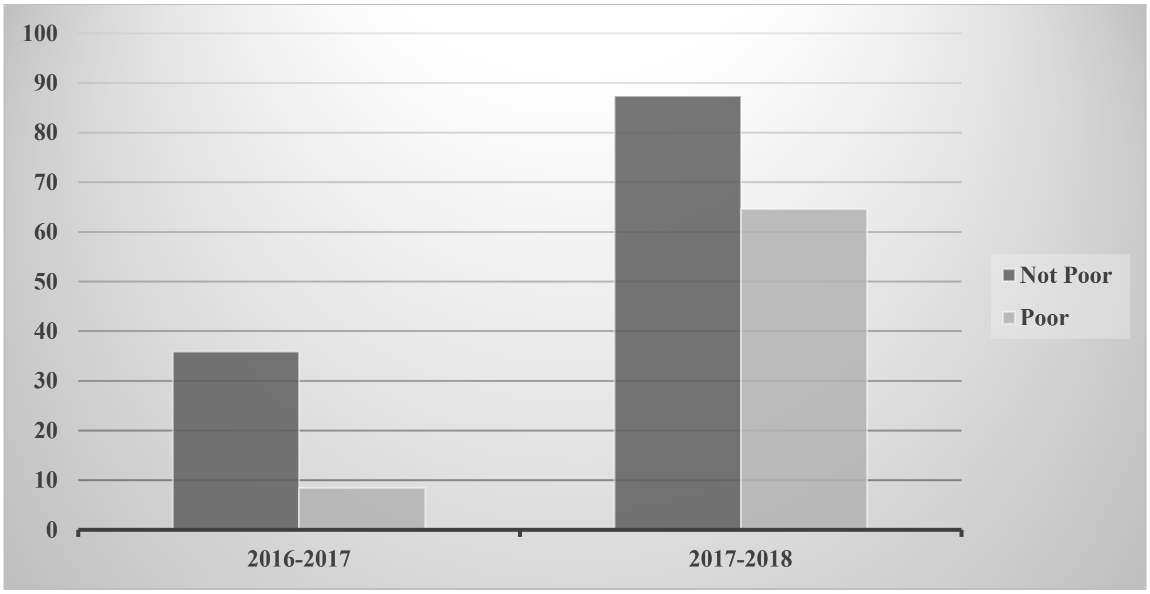

Figure 2.6. Frequencies and percentages for Meets Grade Level Standard by economic status for 2016-2017 and 2017-2018.

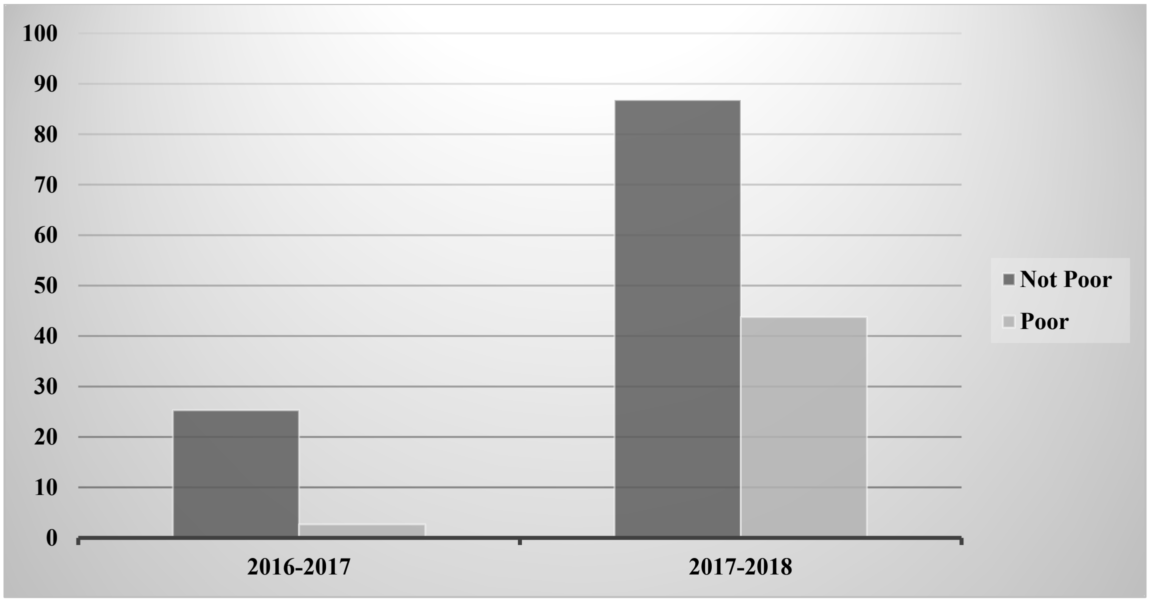

Figure 2.7. Frequencies and percentages for Masters Grade Level Standard by economic status for 2016-2017 and 2017-2018.

CHAPTER III

DIFFERENCES IN MATHEMATICS PERFORMANCE BY THE ETHNICITY/RACE OF TEXAS GRADE 4 BOYS ENROLLED IN SPECIAL EDUCATION: A MULTIYEAR STATEWIDE INVESTIGATION

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

Abstract

In this multiyear, statewide investigation, the extent to which ethnic/racial differences were present in the mathematics performance of Texas Grade 4 boys in special education was addressed. Statewide archival data were obtained from the Texas Education Agency Public Education Information Management System data for all Texas Grade 4 boys in special education for the 2015-2016, 2016-2017, and 2017-2018 school years. Inferential statistical analyses, conducted for boys in special education, revealed that across all three years examined, White boys performed statistically significantly better than Hispanic boys and Black boys in mathematics. Similarly, Hispanic boys performed statistically significantly better than Black boys in mathematics. Grade 4 Black boys in special education had the poorest mathematics performance in all three years and for all mathematics measures analyzed herein. Findings were congruent with the extant research literature. Implications for policy and for practice, as well as recommendations for future research, were discussed.

Key Words: Special education; Mathematics performance; Ethnicity; Race; STAAR Mathematics exam; Reporting categories; Phase-In standards; Grade level standards

DIFFERENCES IN MATHEMATICS PERFORMANCE BY THE ETHNICITY/RACE OF TEXAS GRADE 4 BOYS ENROLLED IN SPECIAL EDUCATION: A MULTIYEAR STATEWIDE INVESTIGATION

Since 1954, racial segregation in public schools has been illegal as a result of the Supreme Court ruling from Brown v. Board of Education in which segregated education services were considered to be unequal in providing learning opportunities for students (American Psychological Association, 2012). Although more than 60 years have passed since that constitutional ruling, ethnic and racial inequalities still exist in public schools (American Psychological Association, 2012; Harris, 2018; McGown, 2016; Pariseau, 2019). For instance, on the National Assessment of Academic Achievement Mathematics test, only 41% of Grade 4 students in the United States were at or above proficient level (The Nation's Report Card, 2019). According to the Nation's Report Card (2019), within that percentage, 20% were Black, 27% were Hispanic, 52% were White, and 70% were Asian. Such percentages are consistent with previous researchers (e. g., Harris, 2018; McGown, 2016; Pariseau, 2019; Schleeter, 2017) who have reported the highest test scores for Asian students, followed by White students, Hispanic students, and then Black students in mathematics. Documented by these researchers was a gap of 32% between White and Black students as well as a gap of 25% between White and Hispanic students.

Between 2009 and 2019, the White-Black achievement gap and the White-Hispanic achievement gap decreased by three and four percentage points, respectively (The Nation's Report Card, 2019). About 33% of Grade 8 students in the United States were at or above proficient in measuring the National Assessment of Academic Achievement Mathematics (The Nation's Report Card, 2019). Within the 33% of Grade 8 students who were proficient, 14% were Black, 20% were Hispanic, 44% were White, and 64% were Asian. In Grade 8, the achievement gap between White-Black and White-Hispanic was almost similar to the achievement gaps for Grade 4 students.

As it relates to Texas, the state of interest for this investigation, Rojas-LeBouef (2010) examined the degree to which disparities were present in academic achievement between Hispanic and White students. She analyzed 16 years of Texas statewide data, in particular, Grade 5 Texas Assessment of Academic Skills and the Texas Assessment of Knowledge and Skills Reading and Mathematics assessments. Rojas-LeBouef (2010), in a total of 60 statistical analyses, documented the presence of 43 large effect sizes, 15 moderate effect sizes, and 2 small effect sizes. She established that White students consistently outperformed Hispanic students on both Texas state-mandated assessments in reading and in mathematics in all 16 years of data analyzed. Although the academic performance of Hispanic students increased, the achievement gap remained because White students also increased their test performance (Rojas-LeBouef, 2010).

In a recent investigation, McGown (2016) analyzed data on the current Texas state-mandated assessment, the State of Texas Assessments of Academic Readiness (STAAR) Reading tests for three school years (i.e., 2012-2013, 2013-2014, 2014-2015). McGown (2016) established the presence of statistically significant ethnic/racial differences in reading. Concerning the three STAAR Reading Reporting Categories, Black students had the lowest reading performance, with Hispanic students performing only slightly better. Asian students had the highest reading performance, followed by White students (McGown, 2016). In all of the Grade 3 STAAR Reading measures, a stairstep effect was present, in that Asian students had the best performance, followed by

White, Hispanic, and then Black students. McGown's (2016) results were commensurate both with the results of Rojas-LeBouef (2010) on Texas students and with national results.

In another study on the current Texas state-mandated assessments, Schleeter (2017) analyzed the Grade 3 reading performance of English Language Learners by their ethnicity/race. Similar to McGown (2016), the same three school years (i.e., 2012-2013, 2013-2014, 2014-2015) were examined. Commensurate with Rojas-LeBouef (2010) and McGown (2016), statistically significant gaps were present for Asian, Black, Hispanic, and White English Language Learners. Asian English Language Learners outperformed White English Language Learners, followed by Black English Language Learners, and then Hispanic English Language Learners for all three school years (Schleeter, 2017). In regard to the STAAR Reading Met Standard measures, Hispanic English Language Learners performed statistically significantly lower on 11 of the 12 comparisons. In one school year, Black English Language Learners had the statistically significant lowest reading performance on the Grade 3 STAAR assessment. Concerning the Grade 3 STAAR Reading Reporting Categories, Asian English Language Learners had the best performance in all three Reporting Categories. White, Hispanic, and Black English Language Learners had similar reading test scores.

Similar to Schleeter (2017), Harris (2018) examined the presence of ethnic/racial differences in the reading performance of Texas Grade 4 students. She investigated three years of data (i.e., 2012-2013, 2013-2014, 2014-2015) from the state-mandated reading assessment to ascertain whether ethnic/racial (i.e., Asian, Black, Hispanic, and White) differences were present. Concerning the three Grade 4 STAAR Reading Reporting

Categories, Black students had the poorest performance, with Hispanic students performing slightly better. The highest reading performances were by Asian and White students (Harris, 2018). In the three reading categories, Asian students had the highest reading test scores, followed by White students, Hispanic students, and then Black students in all three years. Harris (2018) established that Black students had the lowest passing rates on the STAAR Level II Final Satisfactory Performance Standard in reading. Harris (2018) provided results that were consistent with Rojas-LeBouef (2010), McGown (2016), and Schleeter (2017) in that a stairstep effect was clearly present in student reading performance. Asian students had the best reading test scores, followed by White Students, Hispanic students, and then Black students.

In the most recent publication that could be located, Pariseau (2019) analyzed the extent to which ethnic/racial differences were present in the Grade 4 reading performance of boys who were enrolled in special education. As for performance indicators, two sets of measurements on the Grade 4 STAAR Reading exam were examined. The first set of measurements consisted of the number of test items that were correctly answered (i.e., Reporting Category 1: Understanding and analysis across genres, Reporting Category 2: Understanding and analysis of literary texts, and Reporting Category 3: Understanding and analysis of informational text). The second set of indicators was the percentage of boys who achieved the three levels of state performance standards.

Pariseau (2019) established the presence of statistically significant racial/ethnic differences in the reading performance of boys. In all four years examined, Black and Hispanic boys had statistically significantly lower reading scores than White boys in all three of the STAAR Reading Reporting Categories. Moreover, for the STAAR Reading

Phase-In 1, 2, and 3 Standards by student ethnicity/race, the same pattern existed in all four years. For the Phase-In 1 Standard, 46.35% of White boys met the standard compared to 15.23% of Hispanic boys, an achievement gap of 31.12%. Concerning the comparison of White boys to Black boys, an achievement gap of 34.32% was present. Regarding the Phase-In 2 Standard, 27.8% of White boys met this standard, whereas only 2.43% of Black boys did, resulting in an achievement gap of 25.37%. Similar results were observed for the achievement gap between White boys and Hispanic boys, with the gap being 24.57%. On the Phase-In 3 Standard, the achievement gaps were 13.3% between White boys and Hispanic boys and 13.5% between White boys and Black boys. Regardless of the specific STAAR Reading measure, Black boys had the poorest performance, with Hispanic boys performing only slightly better in all four school years of data analyzed.

One important contribution from Pariseau (2019) was his observation that substantially more boys were enrolled in special education who had taken the STAAR exam than girls. Pariseau (2019) documented that almost four times as many boys enrolled in special education had taken the Grade 4 STAAR Reading test in the 2014-2015 school year. In the 2015-2016 school year, more than seven times as many boys enrolled in special education than girls participated in the Texas STAAR Grade 4 Reading test. For the 2016-2017 and 2017-2018 school year, 1 to 6 times more boys were enrolled in special education who had test results than girls for the Texas Grade 4 Reading assessment. For all four years, more boys than girls were in special education and participated in Grade 4 STAAR Reading exams. As such, only data on boys who are in special education and participated in the Grade 4 STAAR Mathematics assessment was addressed in this study.

Statement of the Problem

In 1954, the Brown vs. Board of Education historical ruling promoted integration and established the civil rights movement in American. Due to the Brown vs. Board of Education case, schools were authorized to offer an equal opportunity for all students to have access to education. In 1990, the Individuals with Disabilities Education Act was created to ensure that students be diagnosed with a disability were provided admission to a free and appropriate public education. In 2001, the No Child Left Behind Act was introduced to public education as a federal law that provides monetary assistance to schools to provide services for students in poverty. Despite these mandates, students from various ethnic/racial backgrounds continue to perform poorly in school. In 2015, former-President Obama signed the Every Student Succeeds Act, which promoted the importance of preparing all students for academic success in college and careers. In the area of mathematics, White, Hispanic, and Black students have underperformed Asian students for decades (The Nations Report Card, 2015). Despite the increased accountability made by federal legislative actions, disparities in academic achievement by student ethnicity/race continue to exist (American Psychological Association, 2012; Wei et al., 2013).

Of note to this article are several researchers (Rojas-LeBouef, 2010; McGown, 2016; Harris, 2018; Pariseau, 2019) who have documented the presence of similar ethnic/racial disparity gaps for the past two decades in the State of Texas. The content and grade level gaps in the literature need to be addressed, to provide practical perspectives and educate educational policymakers about ways to resolve possible inequalities within their ethnicity/racially diverse special education populations. Therefore, focused upon in this study was the mathematics performance of Grade 4 boys enrolled in special education to determine the degree to which ethnic/racial differences might be present.

Purpose of the Study

The overall purpose of this article was to determine the degree to which differences existed in the mathematics performance by the ethnicity/race (i.e., Black, Hispanic, and White) of Texas Grade 4 boys enrolled in special education. The first purpose was to ascertain the extent to which student ethnicity/race was related to performance on the Texas state-mandated assessment in mathematics in four areas: (i.e., Reporting Category I: understand numerical representations and relationships, Reporting Category II: computations and algebraic relationships, Reporting Category III: geometry and measurements, and Reporting Category IV: data analysis and personal financial literature). A second purpose was to determine the degree to which student ethnicity/race was related to performance on the Texas state-mandated assessment in mathematics in three passing areas: (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level). The third and final purpose was to ascertain the extent to which trends were present in the Reporting Categories and Phase-In Standards across three years by the ethnicity/race of Grade 4 boys in special education.

Significance of the Study

Achievement gaps are present in reading and mathematics between ethnic/racial groups. Numerous researchers (Harris, 2018; McGown, 2016; Pariseau, 2019) have conducted studies on the STAAR Reading exam, yet no published articles could be located on the mathematics performance of students in special education, in conjunction with their ethnicity/race. Several researchers (e.g., Harris, 2018; McGown, 2016; Pariseau, 2019; Schleeter, 2017; Thoron & Myers, 2011) have published empirical articles on the relationship of ethnicity/race and reading performance. Nevertheless, no published empirical articles were located in which researchers had investigated ethnic/racial achievement gaps of Grade 4 boys in special education and their mathematics performance by ethnicity/race. Few researchers have addressed the relationship between ethnicity/race, mathematics performance, and special education concurrently. Stakeholders who could benefit from this study include mathematics general and special education teachers, specialists, campus leaders, and associated decision-makers, curriculum and instruction directors, and administrators at the district level.

Research Questions

In this study, the following overarching research question was addressed: What is the effect of ethnicity/race (i.e., Black, Hispanic, and White) on the mathematics performance of Texas Grade 4 boys in special education? Specific subquestions under this overarching research question were: (a) What is the effect of ethnicity/race on the ability to understand numerical representations and relationships (i.e., STAAR Mathematics Reporting Category I) of Texas Grade 4 boys in special education?; (b)

What is the effect of ethnicity/race on the ability to understand computations and algebraic relationships (i.e., STAAR Mathematics Reporting Category II) of Texas Grade 4 boys in special education?; (c) What is the effect of ethnicity/race on the ability to understand geometry and measurement (i.e., STAAR Mathematics Reporting Category III) of Texas Grade 4 boys in special education?; (d) What is the effect of ethnicity/race on the ability to understand data analysis and personal financial literature (i.e., STAAR Mathematics Reporting Category IV) of Texas Grade 4 boys in special education?; (e) What is the effect of ethnicity/race on the Approaches Grade Level performance of Texas Grade 4 boys in special education?; (f) What is the effect of ethnicity/race on the Meets Grade Level performance of Texas Grade 4 boys in special education?; (g) What is the effect of ethnicity/race on the Masters Grade Level performance of Texas Grade 4 boys special education?; (h) What trend is present across the STAAR Mathematics Reporting Categories I, II, III, and IV by the ethnicity/race of Grade 4 boys across three school years of data?; and (i) What trend is present across the STAAR Mathematics Phase-In performance standards by the ethnicity/race of Grade 4 boys across three school years of data? The nine research questions involved comparisons across all three school years (i.e., 2015-2016, 2016-2017, 2017-2018). These research questions only concern boys. In special education, boys are overwhelmingly represented compared to girls. Because of the possibility that this unequal population could distort the overall outcome of this study, research questions were addressed for only boys (National Center for Education Statistics, 2019a).

Method

Research Design

The research design was a non-experimental, quantitative, causal comparative design (Johnson & Christensen, 2020). After actions have taken place, causal comparative designs are used to determine the presence of relationships between independent and dependent variables (Johnson & Christensen, 2020). A state archival dataset was analyzed to assess the effect of ethnicity/race on the overall mathematics performance of Grade 4 boys who are in special education. In this investigation, ethnicity/race (i.e., Black, Hispanic, White) is the independent variable. The four STAAR Mathematics Reporting Categories (i.e., Reporting Category I, Reporting Category II, Reporting Category III, and Reporting Category IV) and the three STAAR Mathematics Phase-In Standards (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level) for Grade 4 boys who were enrolled in special education were the dependent variables.

Participants and Instrumentation

Data for this investigation were obtained from the Texas Education Agency Public Education Information Management System. Specifically addressed herein was the academic performance on the Texas state-mandated mathematics assessment for 2015-2016, 2016-2017, and 2017-2018 school years by Black, Hispanic, and White Grade 4 boys who were eligible for special education across three school years. Further analyses were conducted to determine the presence of trends across the four STAAR Mathematics Reporting Categories and the three STAAR Mathematics Phase-In performance standards for Black, Hispanic, and White Grade 4 boys.

Mathematics performance was examined based on the STAAR Mathematics Reporting Categories. STAAR Mathematics Reporting Category I measures student ability to understand numerical representations and relationships. In contrast, STAAR Mathematics Reporting Category II assesses students' ability to understand computations and algebraic relationships. The STAAR Mathematics Reporting Category III measures students' ability to understand geometry and measurement. Assessed in the STAAR Mathematics Reporting Category IV is student ability to understand data analysis and personal financial literature.

Furthermore, the STAAR Mathematics Phase-In Standards 1, 2, and 3 were examined. The Texas Education Agency (2014) created three Phase-In Standards to measure student satisfactory performance on the STAAR assessment. In compliance with the STAAR Satisfactory Criteria, participants have to reach a minimum threshold depending on the Phase-In Standard in effect during the school year. Three phases' minimum scaled scores increased over a 5-year period. The STAAR Grade 4 Mathematics assessment for the 2014-2015 school year (i.e., Phase-In 1) required a scaled score of 1347 for a Satisfactory performance designation, for 2015-2016 through 2017-2018 (i.e., Phase-In 2), a minimum scaled score of 1388 was required. The minimum required scale score was 1444 for the 2018-2019 (i.e., Phase-In 3) school year.

Results

With respect to the STAAR Mathematics Reporting Categories, multivariate analysis of variance procedures (MANOVAs) were conducted. Before conducting MANOVA procedures to address the first four research questions previously presented, its underlying assumptions (i.e., data normality, Box's Test of Equality of Covariance, and the Levene's Test of Equality of Error Variance) were checked. Despite some of these assumptions not being met, the MANOVA is sufficiently robust to be able to withstand these violations (Field, 2009). Starting with the 2015-2016 school year and ending with the 2017-2018 school year, the results will be described in chronological order.

Overall Results for Boys Across All Three Years

For the 2015-2016 school year, the MANOVA revealed the presence of a statistically significant difference, Wilks' $\Lambda = .84$, $p < .001$, partial $\eta^2 = .08$, in the overall mathematic performance of Grade 4 boys in special education by their ethnicity/race. The effect size was moderate, using Cohen's (1988) criteria. Regarding the 2016-2017 school year, the MANOVA yielded a statistically significant difference, Wilks' $\Lambda = .90$, $p < .001$, partial $\eta^2 = .05$, small effect size (Cohen, 1988). With respect to the 2017-2018 year, a statistically significant difference was yielded, Wilks' $\Lambda = .97$, $p < .001$, partial $\eta^2 = .02$, small effect size (Cohen, 1988). One effect size was moderate, and two effect sizes were small.

Mathematics Reporting Category 1 Results Across All Three School Years

To determine whether statistically significant differences were present for the STAAR Mathematics Reporting Category I for Grade 4 boys in special education by their ethnicity/race, univariate follow-up analysis of variance (ANOVA) procedures were calculated for each school year. With respect to the 2015-2016 school year, a statistically significant difference was revealed, $F(2, 1129) = 47.55$, $p < .001$, partial $\eta^2 = .08$, moderate effect size (Cohen, 1988). Regarding the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(2, 1342) = 52.66$, $p < .001$, partial $\eta^2 = .07$, moderate effect size (Cohen, 1988). Concerning the 2017-2018 school year, a statistically significant difference was revealed, $F(2, 1061) = 3.85$, $p = .02$, partial $\eta^2 = .01$, a small effect size (Cohen, 1988) . Two effect sizes were moderate, and one effect size was small. In Table 3.1 are the descriptive statistics for the three school years for the STAAR Mathematics Reporting Category I scores.

Insert Table 3.1 about here

To determine which ethnic/racial pairwise comparisons were statistically significantly different, Scheffé' post hoc procedures were conducted. For STAAR Mathematics Category I, statistically significant differences existed for all ethnic/racial comparisons. With respect to the 2015-2016 school year, Grade 4 White boys in special education answered 1.78 more items correctly than Hispanic boys and 3.09 more items than Black boys. Grade 4 Hispanic boys answered 1.31 more items correctly than Black boys. Regarding the 2016-2017 school year, Grade 4 White boys in special education correctly answered 1.24 more items than Hispanic boys and correctly answered 2.70 more items than Black boys. Grade 4 Hispanic boys answered 1.47 more items correctly than Black boys. Concerning the 2017-2018 school year, Grade 4 White boys in special education answered 0.06 more items correctly than Hispanic boys and 0.79 items more correctly than Black boys. Grade 4 Hispanic boys answered 0.73 more items correctly than Black boys. A clear stair-step effect (Carpenter, Ramirez, & Severn, 2006) existed for all three school years. White boys outperformed Hispanic boys, and Hispanic boys outperformed Black boys, for all three school years. Revealed in Figure 3.1 is that Black boys had the lowest mathematics scores. In Table 3.1 are the descriptive statistics for the three school years for the STAAR Mathematics Reporting Category I scores.

Insert Figure 3.1 about here

Mathematics Reporting Category 2 Results Across All Three School Years

A statistically significant difference was revealed for the 2015-2016 school year, $F(2, 1129) = 79.07$, $p < .001$, partial $\eta^2 = .12$, moderate effect size (Cohen, 1988), on the STAAR Reading Reporting Category II by boys in special education by their ethnicity/race. Regarding the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(2, 1342) = 56.91$, $p < .001$, partial $\eta^2 = .08$, moderate effect size (Cohen, 1988). Concerning the 2017-2018 school year, a statistically significant difference existed, $F(2, 1061) = 5.80$, $p = .003$, partial $\eta^2 = .01$, a small effect size (Cohen, 1988). Two effect sizes were moderate, and one effect size was small.

Scheffé post hoc procedures were conducted following the three ANOVA procedures to determine which ethnic/racial pairwise comparisons were statistically significantly different. All ethnic/racial pairwise comparisons were statistically significantly different on the STAAR Mathematics Reporting Category II. Regarding the 2015-2016 school year, White boys correctly answered about three times more than Hispanic boys and 3.91 more items correctly than Black boys. Hispanic boys correctly answered 0.91 more items than Black boys. Descriptive statistics for these school years and STAAR Mathematics Reporting Category II are delineated in Table 3.2.

Insert Table 3.2 about here

With respect to the 2016-2017 school year, White boys correctly answered 1.53 more items correctly than Hispanic boys and 2.65 items more correctly than Black boys. Hispanic boys correctly answered 1.12 items more than Black boys. In the 2017-2018 school year, White boys answered 0.96 more items correctly than Black boys. Hispanic boys answered 0.14 more items correctly than White boys and 1.10 more items than Black boys. For the STAAR Mathematics Reporting Category II section of the STAAR exam, in all three school years, a clear stair-step effect (Carpenter et al., 2006) was revealed for boys in special education. For the 2015-2016 and 2016-2017 school years, White boys outperformed Hispanic boys, and Hispanic boys outperformed Black boys. However, in the 2017-2018 school year, Hispanic boys outperformed White boys, and White boys outperformed Black boys. Depicted in Figure 3.2 is that Black boys had the lowest mathematics scores.

Insert Figure 3.2 about here

Mathematics Reporting Category 3 Results Across All Three School Years

For the 2015-2016 school year, a statistically significant difference was present, $F(2, 1129) = 90.01$, $p < .001$, partial $\eta^2 = .14$, large effect size (Cohen, 1988), on the STAAR Mathematics Reporting Category III for boys in special education by their ethnicity/race. Concerning the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(2, 1342) = 45.61$, $p < .001$, partial $\eta^2 = .06$, moderate effect size (Cohen, 1988). With respect to the 2017-2018 school year, a statistically significant difference was revealed, $F(2, 1061) = 9.30$, $p < .001$, partial $\eta^2 = .02$, small effect size (Cohen, 1988). The effect size for the first school year was large, whereas the effect size for the 2016-2017 school year was moderate and for the 2017-2018 school year was small.

To determine which ethnic/racial pairings were statistically significantly different, Scheffé' post hoc procedures were conducted and revealed that all ethnic/racial pairwise comparisons were statistically significantly different. With respect to the 2015-2016 school year, Grade 4 White boys in special education answered 2.71 more items correctly than Hispanic boys and 3.50 more items than Black boys. Grade 4 Hispanic boys answered 0.79 more items correctly than Black boys. Contained in Table 3.3 are the descriptive statistics for these analyses.

Insert Table 3.3 about here

Regarding the 2016-2017 school year, Grade 4 White boys in special education correctly answered 1.15 more items than Hispanic boys and correctly answered 2.17 more items than Black boys. Grade 4 Hispanic boys answered 1.02 more items correctly than Black boys. Concerning the 2017-2018 school year, Grade 4 White boys in special education answered 0.34 more items correctly than Hispanic boys and 1.34 items more correctly than Black boys. Grade 4 Hispanic boys answered one more item correctly than Black boys. A clear stair-step effect (Carpenter et al., 2006) existed for all three school years. White boys outperformed Hispanic boys, and Hispanic boys outperformed Black boys, for all three school years. Illustrated in Figure 3.3 is that Black boys had the lowest mathematics scores.

Insert Figure 3.3 about here

Mathematics Reporting Category 4 Results Across All Three School Years

With respect to the 2015-2016 school year, a statistically significant difference was revealed, $F(2, 1129) = 52.68$, $p < .001$, partial $\eta^2 = .10$, moderate effect size (Cohen, 1988), on the STAAR Mathematics Reporting Category IV for boys in special education by their ethnicity/race. Regarding the 2016-2017 school year, the ANOVA yielded a statistically significant difference, $F(2, 1342) = 56.71$, $p < .001$, partial $\eta^2 = .08$, moderate effect size (Cohen, 1988). Concerning the 2017-2018 school year, a statistically significant difference was not revealed, $F(2, 1161) = 1.52$, $p = .22$. In the 2015-2016 and 2016-2017 school years, effect sizes were moderate.

Scheffé' post hoc procedures revealed that all ethnic/racial pairwise comparisons were statistically significantly different on the STAAR Mathematics Reporting Category IV. Regarding the 2015-2016 school year, White boys correctly answered 3.0 items more than Hispanic boys and 0.81 more items correctly than Black boys. Hispanic boys correctly answered 1.21 more items than Black boys. Descriptive statistics for these analyses are presented in Table 3.4.

Insert Table 3.4 about here

With respect to the 2016-2017 school year, White boys correctly answered 0.63 more items correctly than Hispanic boys and 1.22 items more correctly than Black boys. Hispanic boys correctly answered 0.59 items more than Black boys. In the 2017-2018 school year, White boys answered 0.11 more items correctly than Hispanic boys and answered 0.25 more items correctly than Black boys. Hispanic boys answered 0.14 more items correctly than Black boys. In all three school years, a clear stair-step effect (Carpenter et al., 2006) was present for boys on the STAAR Mathematics Reporting Category IV. In all three school years, White boys outperformed Hispanic boys, and Hispanic boys outperformed Black boys. Black boys had the poorest mathematics scores in all instances. For the STAAR Mathematics Reporting Category IV, descriptive statistics are presented in Figure 3.4.

Insert Figure 3.4 about here

Grade Level Standards

To address the research questions about the Grade Level Standard performances, Pearson chi-square procedures were conducted. This statistical method was the optimal statistical procedure because of the presence of frequency data for the three mathematics grade level performance standards (i.e., met and not met) and for boys in special education. When both the independent variable and the dependent variables are nominal in nature, Pearson chi-squares are the statistical technique of choice (Slate & Rojas-LeBouef, 2011). With a large sample size, the criteria for using Pearson chi-squares were met.

Approaches Grade Level Standard Results Across All Three School Years

With respect to the STAAR Mathematics Approaches Grade Level Standard, the result for the 2015-2016 school year was statistically significant, $\chi^2(2) = 164.56$, $p < .001$, Cramer's V of .38, moderate effect size (Cohen, 1988). As delineated in Table 3.5, White boys had 4.99 times more boys who met the Approaches Grade Level Standard than did Black boys and 2.40 times more boys who met this standard than Hispanic boys. Hispanic boys had 2.08 times more boys who met this standard than Black boys.

Insert Table 3.5 about here

Concerning the 2016-2017 school year, the result was statistically significant, $\chi^2(2) = 120.54$, $p < .001$, Cramer's V of .30, moderate effect size, (Cohen, 1988). As revealed in Table 3.5, White boys had 6.90 times more boys who met the Approaches Grade Level Standard than did Black boys and 1.99 times more than Hispanic boys. Hispanic boys had 3.47 times more boys who met this standard than Black boys. Regarding the 2017-2018 school year, the result was statistically significant, $\chi^2(2) = 6.42$, $p = .042$, small effect size, Cramer's V of .08 (Cohen, 1988). White boys, as presented in Table 3.5, had 1.47 times more boys who met the Approaches Grade Level Standard than did Black boys and 1.25 times more than Hispanic boys. Hispanic boys had 1.78 times more boys who met this standard than Black boys.

Meets Grade Level Standard Results Across All Three School Years

With regard to the STAAR Mathematics Meets Grade Level Standard by the ethnicity/race of Grade 4 boys in special education, the result for the 2015-2016 school year was statistically significant, $\chi^2(2) = 196.22$, $p < .001$, moderate effect size, Cramer's V of .42 (Cohen, 1988). White boys had 7.22 times more boys who met the Meets Grade Level Standard than did Hispanic boys and 21.24 times more than Black boys. Hispanic boys had 2.94 times more boys who met this standard than Black boys. Table 3.6 contains the frequencies and percentages for the 2015-2016 school year.

Insert Table 3.6 about here

Concerning the 2016-2017 school year, a statistically significant difference was revealed, $\chi^2(2) = 107.19$, $p < .001$, small effect size, Cramer's V of .28 (Cohen, 1988). As delineated in Table 3.6, White boys had 3.23 times more boys who met the Meets Grade Level Standard than did Hispanic boys and 13.36 times more than Black boys. Hispanic boys had 4.14 times more boys who met this standard than Black boys. For the 2017-2018 school year, a statistically significant difference was yielded, $\chi^2(2) = 21.60$, $p < .001$, small effect size, Cramer's V of .14 (Cohen, 1988). As presented in Table 3.6, White boys had 2.12 times more boys who met the Meets Grade Level Standard than did Hispanic boys and 2.98 times more than Black boys. Hispanic boys had 1.41 times more boys who met this standard than Black boys.

Masters Grade Level Standard Results Across All Three School Years

With respect to the STAAR Mathematics Masters Grade Level Standard by the ethnicity/race of Grade 4 boys, the result for the 2015-2016 school year was statistically significant, $\chi^2(1) = 160.30$, $p < .001$, moderate effect size, Cramer's V of .38 (Cohen, 1988). White boys had 23.30 times more boys who met the Masters Grade Level Standard than did Hispanic boys and 25.89 times more than Black boys. Hispanic boys had 1.11 times more boys than Black boys who met the Masters Grade Level Standard. Revealed in Table 3.7 are the frequencies and percentages for the 2015-2016 school year.

Insert Table 3.7 about here

Concerning the 2016-2017 school year, a statistically significant difference was yielded, $\chi^2(2) = 120.26$, $p < .001$, moderate effect size, Cramer's V of .30 (Cohen, 1988). As delineated in Table 3.7, White boys had 7.14 times more boys who met the Masters Grade Level Standard than did Hispanic boys and 28.57 times more than Black boys. Hispanic boys had four times more boys than Black boys who met the Masters Grade Level Standard. Regarding the 2017-2018 school year, a statistically significant difference was yielded, $\chi^2(2) = 36.51$, $p < .001$, small effect size, Cramer's V of .19 (Cohen, 1988). White boys, as revealed in Table 3.7, had 3.97 times more boys who met the Masters Grade Level Standard than did Hispanic boys. No Black boys met this standard.

Discussion

The extent to which ethnic/racial disparities existed in the mathematics performance of Grade 4 boys in special education was addressed in this investigation. Two sets of measures were utilized as performance indicators for mathematics achievement. The first set reflected the number of reading test items correctly answered. The second set contained the percentages of boys who met one of three state-mandated performance standards. Inferential analyses revealed the presence of statistically significant ethnic/racial disparities for Grade 4 boys in special education.

Hispanic and Black boys had statistically significantly lower mathematics scores than White boys, in each STAAR Mathematics Reporting Category and in all three years investigated. Similar trends existed in all three years regarding the STAAR Mathematics Approaches Grade Level, Meets Grade Level, and Masters Grade Level Standards for Grade 4 boys in special education by their ethnicity/race. Depicted in Figures 3.5, 3.6, and 3.7 are substantially lower percentages of Black and Hispanic boys in special education who met these standards than White boys.

Insert Figures 3.5, 3.6, and 3.7 about here

Connections to Existing Literature

Similar to the ethnic/racial achievement gaps documented in national reports, ethnic/racial achievement gaps are prominent for boys in special education (American Developmental Association, 2012; Harvey, 2013; Wei et al., 2011). Recent researchers (Harris, 2018; Harris & Slate, 2017; McGown, 2016; Pariseau, 2019; Rojas-LeBouef,

2010) have established the same ethnic/racial achievement gaps on the Texas state-mandated assessment. As demonstrated by the findings of this investigation, ethnic/racial achievement gaps were clearly present for Grade 4 boys in special education for each STAAR Mathematics Reporting Category for the 2015-2016, 2016-2017, and 2017-2018 school years. Hispanic and Black boys had substantially lower mathematics scores than White boys. Moreover, statistically significantly lower percentages of Black and Hispanic boys in special education met these standards than White boys in special education. In all three years, similar trends existed for all three STAAR Mathematics Grade Level Standards. Though efforts have been made by federal and state governments to address ethnic/racial achievement gaps (American Psychological Association, 2012; Craft, 2011; Harvey, 2013; Wei et al., 2011), substantial disparities still clearly exist in special education for boys.

Implications for Policy and Practice

On the basis of the findings of this multiyear analysis, in which the Grade 4 mathematics performance of boys in special education was examined by their ethnicity/race, implications for policy and practice can be made. In regard to policy implications, the state and federal government should allocate extra funds to school districts for mathematics labs that include hands-on relevant, and culturally appropriate scenarios that foster realistic connections. Students who may struggle with comprehending mathematics word problems to which they can directly connect to or personally experienced, are more likely to become involved in the computation process of solving mathematics word problems.

With respect to implications for practice, professional development that involves the development and implementation of culturally relevant instructional strategies for mathematics would be beneficial for educators to participate in. Children in special education encounter various challenges due to their disabilities and the stigma that is attached to it. Based upon the results of this study, further learning barriers such as ethnicity/race are apparent.

Recommendations for Future Research

Based on the results of this multiyear study, several recommendations for future studies can be made. In this multiyear investigation, only the area of mathematics was addressed. Therefore, other core content areas, such as science and social studies, should be addressed in future research. Second, data on only students in Grade 4 were analyzed. As such, data on students in other grade levels should be analyzed to determine the extent to which the results discussed herein on Grade 4 students would be generalizable to other grade levels. Third, in this study, only the demographic characteristic of ethnicity/race was addressed. Accordingly, researchers are encouraged to examine other demographic characteristics such as gender, at-risk status, and poverty. Lastly, only data on boys were analyzed herein. As such, researchers are encouraged to examine data on girls to determine the extent to which these findings based on the ethnicity/race of boys would be generalizable to girls.

Conclusion

In this multiyear, statewide investigation, the degree to which differences were present in the mathematics performance of Texas Grade 4 boys in special education by their ethnicity/race was addressed. Inferential analyses of three years of Texas statewide data revealed the presence of statistically significant disparities between White, Hispanic, and Black boys in special education mathematics performance in their mathematics performance. A clear stair-step effect (Carpenter et al., 2006) was established wherein Black boys in special education had poorer mathematics performances than Hispanic and White boys, and Hispanic boys had poorer mathematics performance than White boys. With respect to the substantial mathematics achievement gaps for boys of color, the findings of this 3-year state-wide study are consistent with previous researchers (Harris, 2018; Harris & Slate, 2017; McGown, 2016; Pariseau, 2019; Rojas-LeBouef, 2010).

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Table 3.1

Descriptive Statistics for Reporting Category I by Ethnicity/Race for 2015-2016 Through 2017-2018

School Year and Ethnicity/Race	*n*	*M*	*SD*
2015-2016			
Black	115	4.41	3.12
Hispanic	618	5.72	3.20
White	399	7.49	4.08
2016-2017			
Black	135	2.38	2.12
Hispanic	809	3.84	2.71
White	401	5.08	3.23
2017-2018			
Black	91	2.88	2.24
Hispanic	729	3.61	2.31
White	244	3.67	3.00

Table 3.2

Descriptive Statistics for Reporting Category II by Ethnicity/Race for 2015-2016 Through 2017-2018

School Year and Ethnicity/Race	*n*	*M*	*SD*
2015-2016			
Black	115	4.74	3.15
Hispanic	618	5.65	3.47
White	399	8.65	5.07
2016-2017			
Black	135	2.45	2.11
Hispanic	809	3.57	2.56
White	401	5.10	3.63
2017-2018			
Black	91	3.36	2.81
Hispanic	729	4.47	2.69
White	244	4.32	3.54

Table 3.3

Descriptive Statistics for Reporting Category III by Ethnicity/Race for 2015-2016 Through 2017-2018

School Year and Ethnicity/Race	*n*	*M*	*SD*
2015-2016			
Black	115	3.59	2.73
Hispanic	618	4.38	2.65
White	399	7.09	4.54
2016-2017			
Black	135	2.41	2.02
Hispanic	809	3.44	2.21
White	401	4.49	2.25
2017-2018			
Black	91	2.74	2.42
Hispanic	729	3.74	2.34
White	244	4.07	3.06

Table 3.4

Descriptive Statistics for Reporting Category IV by Ethnicity/Race for 2015-2016 Through 2017-2018

School Year and Ethnicity/Race	*n*	*M*	*SD*
2015-2016			
Black	115	1.43	1.24
Hispanic	618	1.83	1.26
White	399	2.63	1.67
2016-2017			
Black	135	.81	.96
Hispanic	809	1.41	1.16
White	401	2.03	1.55
2017-2018			
Black	91	1.41	1.16
Hispanic	729	1.54	1.16
White	244	1.66	1.41

Table 3.5

Frequencies and Percentages for Approaches Grade Level Standard by Ethnicity/Race for 2015-2016 Through 2017-2018

	Met Standard		Did Not Meet Standard	
School Year and Ethnicity/Race	*n*	%	*n*	%
2015-2016				
Black	14	12.20	101	87.80
Hispanic	157	25.40	461	74.60
White	243	60.90	156	39.10
2016-2017				
Black	10	7.40	125	92.60
Hispanic	208	25.70	601	74.30
White	205	51.10	196	48.90
2017-2018				
Black	23	25.30	68	74.70
Hispanic	217	29.80	512	70.20
White	91	37.30	153	62.70

Table 3.6

Frequencies and Percentages for Meets Grade Level Standard by Ethnicity/Race for 2015-2016 Through 2017-2018

	Met Standard		Did Not Meet Standard	
School Year and Ethnicity/Race	*n*	%	*n*	%
2015-2016				
Black	2	1.70	113	98.30
Hispanic	31	5.00	587	95.00
White	144	36.10	255	36.10
2016-2017				
Black	3	2.20	132	97.80
Hispanic	74	9.10	735	90.90
White	118	29.40	283	70.60
2017-2018				
Black	6	6.60	85	93.40
Hispanic	68	9.30	661	90.70
White	48	19.70	196	80.30

Table 3.7

Frequencies and Percentages for Masters Grade Level Standard by Ethnicity/Race for 2015-2016 Through 2017-2018

	Met Standard		Did Not Meet Standard	
School Year and Ethnicity/Race	*n*	%	*n*	%
2015-2016				
Black	1	0.90	114	99.10
Hispanic	6	1.00	612	99.00
White	93	23.30	306	76.70
2016-2017				
Black	1	0.70	134	99.30
Hispanic	23	2.80	786	97.20
White	80	20.00	321	80.00
2017-2018				
Black	0	0.00	91	100.00
Hispanic	22	3.00	707	97.00
White	29	11.90	215	88.10

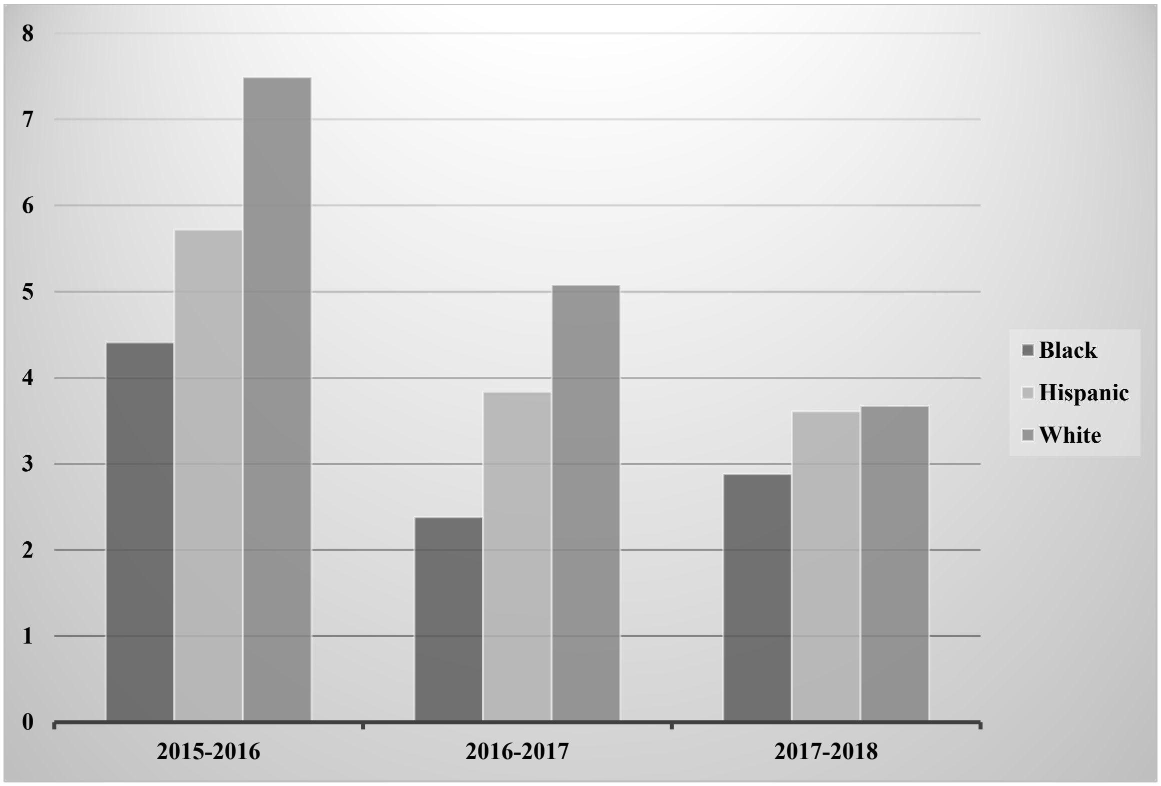

Figure 3.1. Average number of correct responses for Reporting Category I by ethnicity/race for 2015-2016 through 2017-2018.

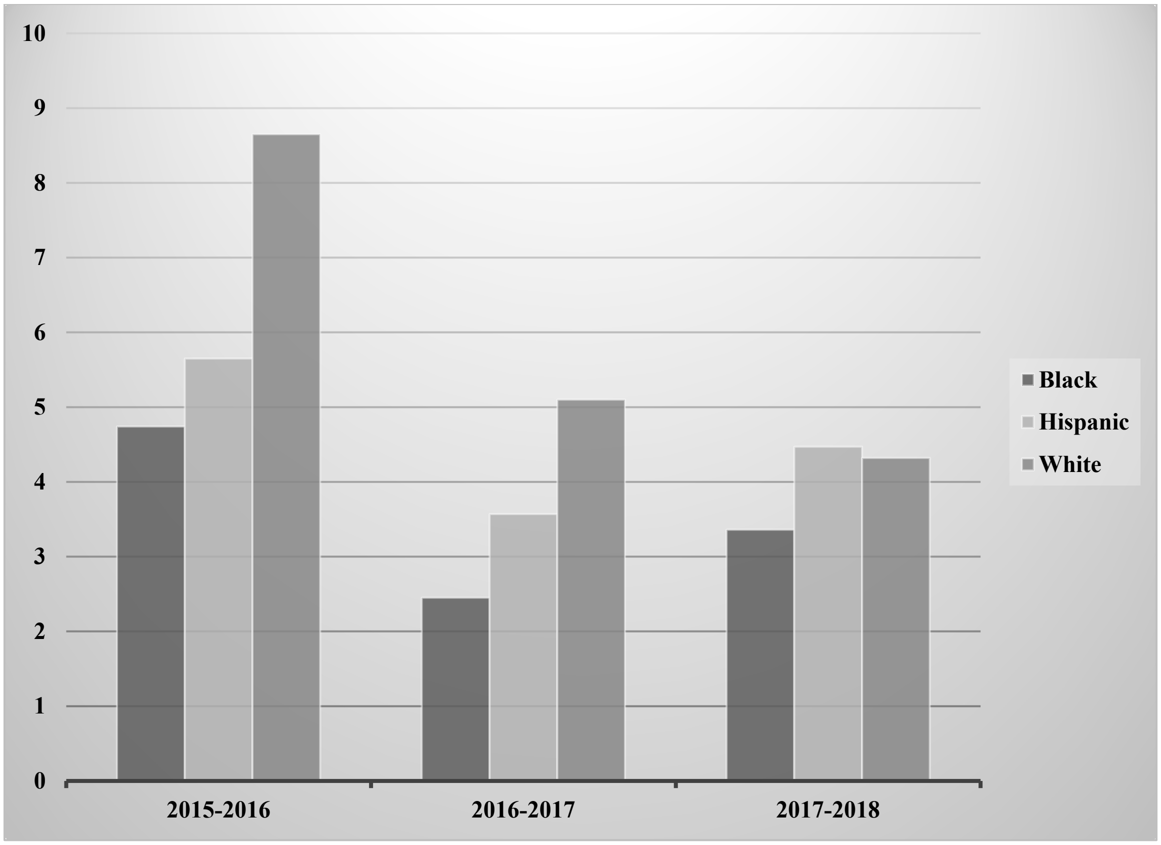

Figure 3.2. Average number of correct responses for Reporting Category II by ethnicity/race for 2015-2016 through 2017-2018.

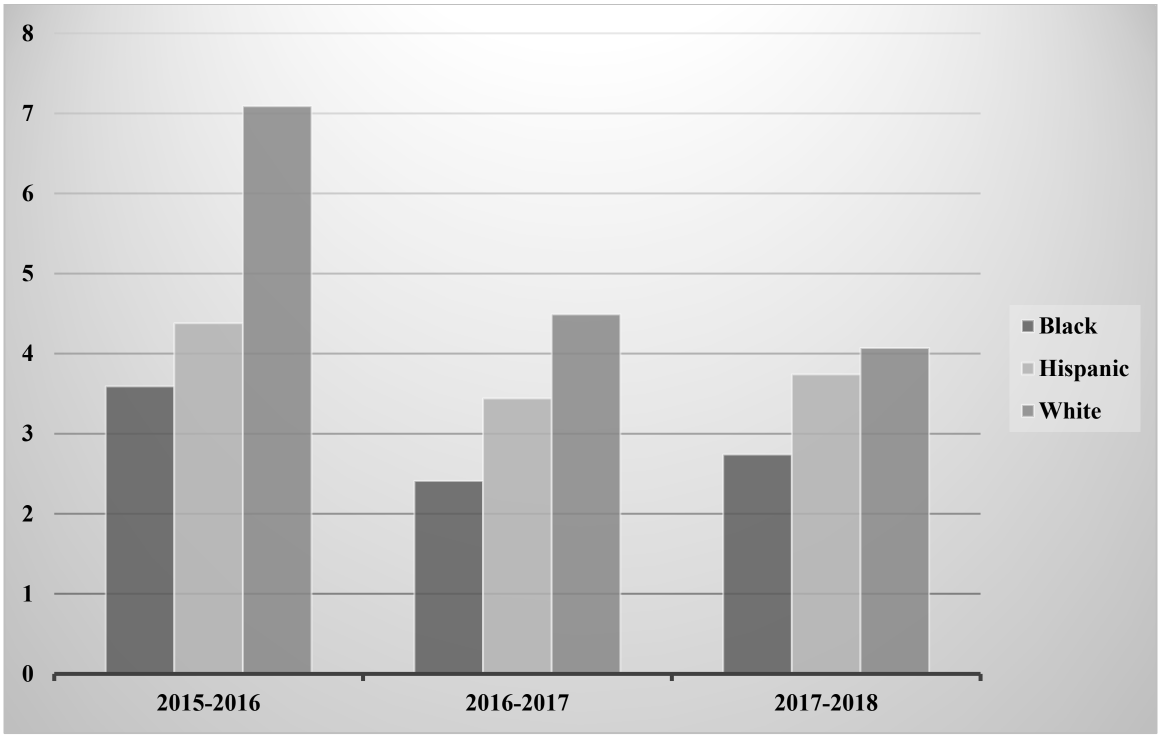

Figure 3.3. Average number of correct responses for Reporting Category III by ethnicity/race for 2015-2016 through 2017-2018.

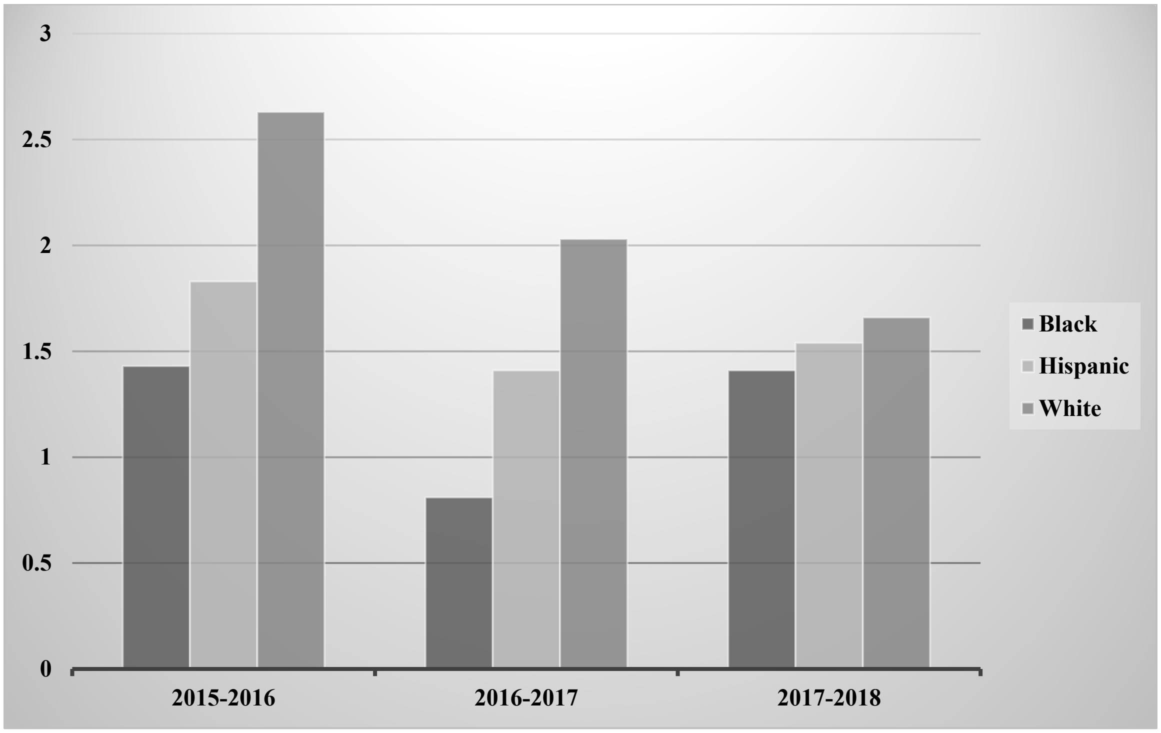

Figure 3.4. Average number of correct responses for Reporting Category IV by ethnicity/race for 2015-2016 through 2017-2018.

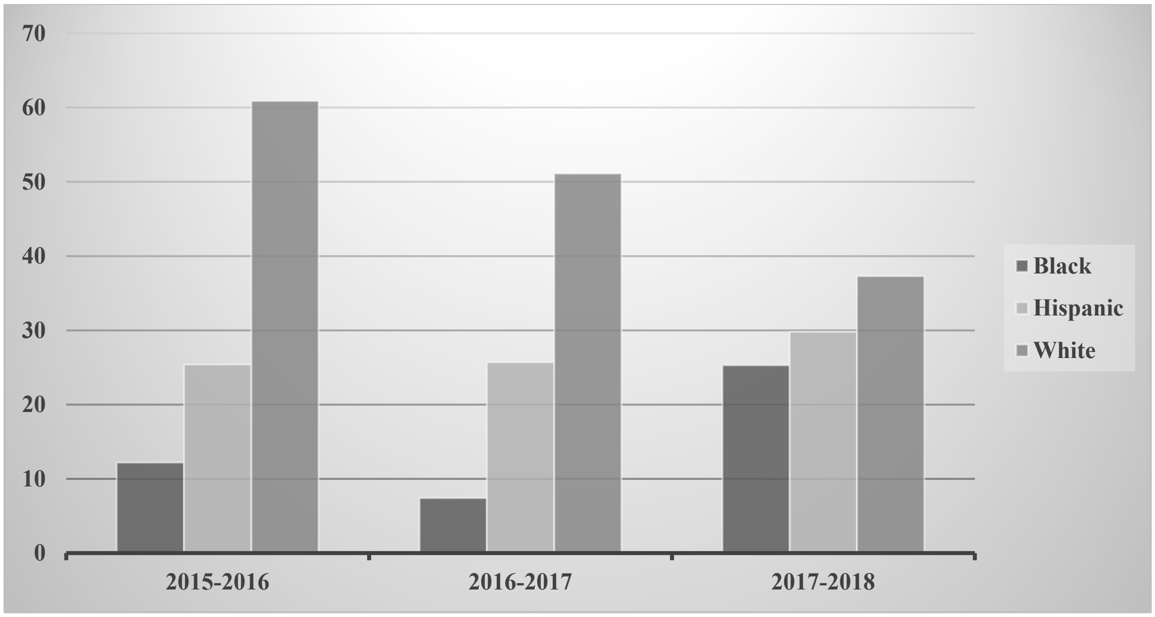

Figure 3.5. Frequencies and percentages for Approaches Grade Level Standard by ethnicity/race for 2015-2016 through 2017-2018.

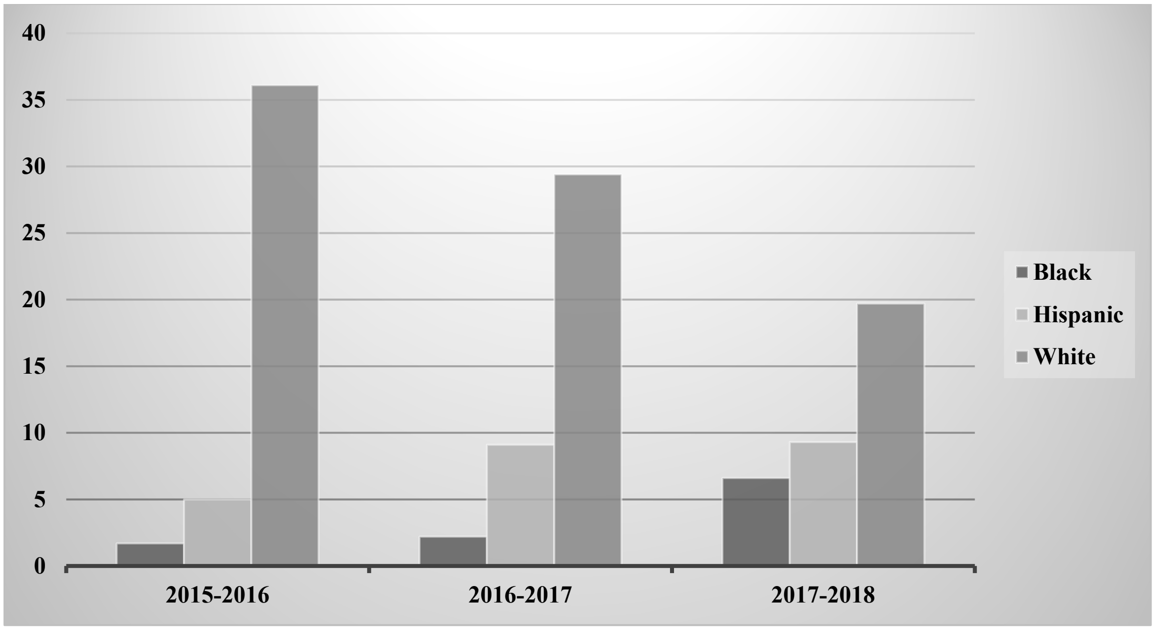

Figure 3.6. Frequencies and percentages for Meets Grade Level Standard by ethnicity/race for 2015-2016 through 2017-2018.

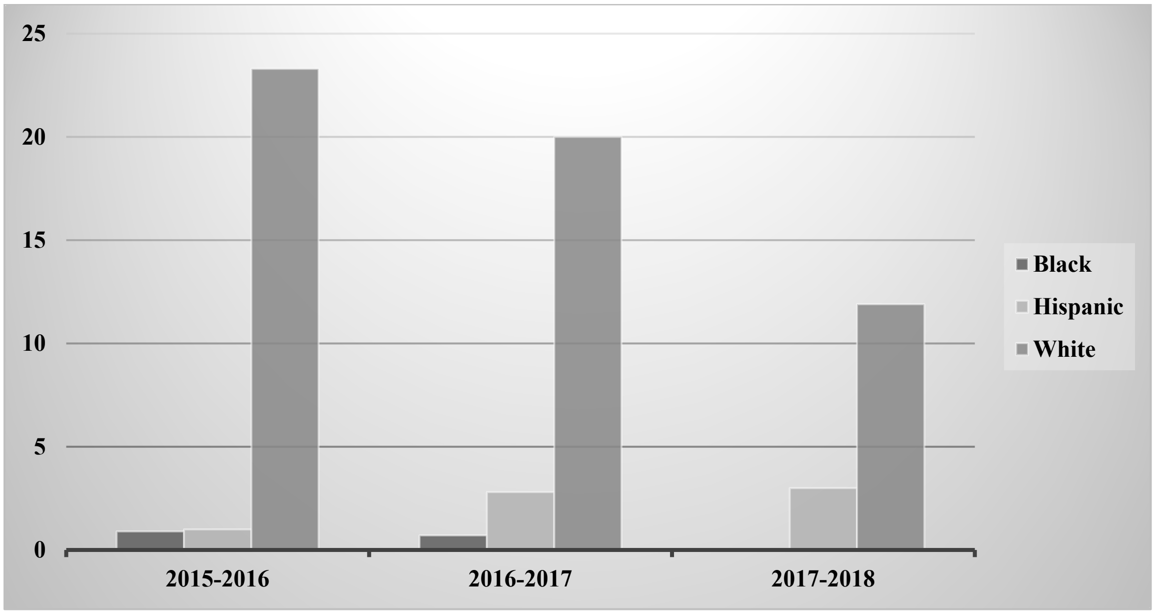

Figure 3.7. Frequencies and percentages for Masters Grade Level Standard by ethnicity/race for 2015-2016 through 2017-2018.

CHAPTER IV

DIFFERENCES IN MATHEMATICS PERFORMANCE BY THE ECONOMIC STATUS OF TEXAS GRADE 4 GIRLS ENROLLED IN SPECIAL EDUCATION: A MULTIYEAR STATEWIDE INVESTIGATION

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

Abstract

The degree to which the economic status (i.e., Poor and Not Poor) of Texas Grade 4 girls in special education was related to their mathematics achievement was addressed herein. Statewide archival data were obtained from the Texas Education Agency Public Education Information Management System for the 2015-2016, 2016-2017, and 2017-2018 school years for Grade 4 girls in special education. Inferential analyses revealed the presence of statistically significant differences in mathematics achievement by economic status. Grade 4 girls who were in special education and who were economically disadvantaged consistently had lower mathematics test performance than Grade 4 girls who were in special education and who were not economically disadvantaged. Results in all three school years were congruent with existing research literature in that poverty has detrimental effects on student mathematics performance. Recommendations for future research, as well as implications for policy and practice, were discussed.

Key Words: Special education; STAAR; Mathematics performance; Poverty; Economic status; STAAR Mathematics test; Reporting categories; Phase-In standards; Grade level standards

DIFFERENCES IN MATHEMATICS PERFORMANCE BY THE ECONOMIC STATUS OF TEXAS GRADE 4 GIRLS ENROLLED IN SPECIAL EDUCATION: A MULTIYEAR STATEWIDE INVESTIGATION

According to the National Center for Children in Poverty (2019), in the United States, the average percentage of children who reside in poverty is 29%. In the United States, this percentage defines over 7,000,000 children who are adversely influenced by poverty (National Center for Children in Poverty, 2019a). Additionally, this percentage indicates that nearly 1 in 5 children in the United States lives in poverty.

Regarding the State of Texas, over 50% of the student population in Texas reside in poverty since the 2001-2002 school year (Texas Education Agency, 2003). In the 2015-2016 school year, the percentage of students who were living in poverty increased to about 60%. Almost 61% of Texas public school students were economically disadvantaged in the most current school year, 2018-2019 (Texas Education Agency, 2019).

In current published articles, researchers have documented the presence of even larger percentages of students in poverty. Taylor and Slate (2020), in a Texas longitudinal study of the mathematics achievement of Grade 4 students in special education, established that an average of 77.48% of girls was economically disadvantaged. Economic status is important as students in poverty start school with poorer academic skills relative to their high-income peers (Portia, Elizabeth, & Levine, 2019). Tran, Luchters, and Fisher (2017) reported that children from financially disadvantaged families did not develop at the same rate as their peers who were not in financially disadvantaged families. Such disparities result in long-term effects on educational attainment and adult income. Students from financially disadvantaged families have a high probability rate of struggling in mathematics than do their peers who are not from financially disadvantaged families (Lee, Park, & Ginsburg, 2016). Poverty has a negative effect on children's ability to develop skills and contribute to society (National Center for Children in Poverty, 2019). Moreover, children growing up in poverty constantly confront uncontrolled circumstances that, over time, hamper academic success (Taylor & Slate, 2020).

In terms of academic achievement, poverty has detrimental effects on student achievement in mathematics (Davenport & Slate, 2019; Taylor & Slate, 2020). Taylor and Slate (2020) examined 2015-2016 data on the State of Texas Assessment of Academic Readiness (STAAR) Mathematics test to determine the effect of poverty for boys and girls in special education. Three STAAR Mathematics Phase-In Standards were analyzed. Economic status consisted of two categories: (a) students who qualified for the Federal Free Lunch Program (i.e., Poor students) and (b) students who did not qualify for the Federal Free Lunch Program (i.e., Not Poor students) (Taylor & Slate, 2020).

Taylor and Slate (2020) documented the presence of statistically significant relationships between student poverty and low performance in mathematics. For all three STAAR Mathematics Phase-In Standards, students in special education who were in the Poor Group had statistically significantly lower passing rates than their peers in special education who were in the Not Poor Group. For girls, an average of 16.73% fewer girls in the Poor group met the state-mandated performance level in mathematics than girls in the Not Poor group. Effect sizes for these statistically significant differences were small to moderate in nature.

Similarly, Davenport and Slate (2019) analyzed STAAR Mathematics performance by the economic status of Grade 3 students in a Texas statewide investigation. In their study, they defined economic status as Not Poor, Moderately Poor, or Very Poor. Children who were eligible for the federal free lunch program were described as Very Poor, students who were eligible for the federal reduced-price lunch were classified as Moderately Poor, and students who did not qualify for either federal program were categorized as Not Poor. Davenport and Slate (2019) established the presence of statistically significantly lower test scores in mathematics as poverty levels increased. Grade 3 students who were in the Poor group had statistically significantly lower passing rates than their peers who were in the Moderately Poor group and their peers who were in the Not Poor group, on all three STAAR Mathematics Phase-In Standards. Similarly, Grade 3 students who were in the Moderately Poor group had statistically significantly lower passing rates in mathematics than their peers who were in the Not Poor group. Effect sizes ranged from small to moderate for these statistically significant differences.

Concurrent with the Davenport and Slate (2019) study, Pariseau (2019) conducted a multi-year study on the reading achievement of Grade 4 students in special education. He specifically focused on the extent to which student economic status (i.e., Not Poor, Moderately Poor, and Extremely Poor) was related to their reading achievement on the Grade 4 STAAR Reading exam. He analyzed two sets of reading variables on the Grade 4 STAAR test: (a) the number of questions answered correctly on the exam, and (b) the proportions of participants who met the criteria for the three Reading Reporting Categories (i.e., Reporting Category 1: Understanding and analysis across genres, Reporting Category 2: Understanding and analysis of literary texts, and Reporting Category 3: Understanding and analysis of informational text). Statistically significant differences were established in all of the inferential statistical analyses by student economic status, for Grade 4 girls in special education. Girls in the Poor group performed statistically significantly lower than girls in the Poor group, in all four years of analyzed data. With respect to the STAAR Reading Phase-In 1, 2, and 3 Standards, by student economic status, the same patterns were established in all four years. Statistically, significantly higher percentages of girls who were in the Poor group did not meet these criteria than their peers who were in the Not Poor group.

Statement of the Problem

Girls from low-income families are more likely to have access to teachers who lack quality training and are less likely to encounter high expectations than girls are from high-income families. Although many researchers (e.g., Harris, 2018; McGown, 2016; Pariseau, 2019; Rojas-LeBouef, 2010) have established relationships between poverty and reading, these relationships to the Texas state-mandated mathematics assessment have not been established. No published studies could be located in which the mathematics performance on the Texas state-mandated assessment of girls enrolled in special education was related to their demographic characteristics. Only one study, Pariseau (2019), was located in which the effects of poverty on academic achievement for girls in special education were located. In his study, however, he focused solely on reading achievement and not on mathematics performance.

Purpose of the Study

The overall purpose of this study was to ascertain the extent to which differences were present in mathematics performance by the economic status (i.e., Poor, Not Poor) of Texas Grade 4 girls enrolled in special education. The first purpose was to ascertain the extent to which economic status was related to performance on the Texas state-mandated assessment in mathematics in four content areas: (i.e., Reporting Category I: understand numerical representations and relationships, Reporting Category II: computations and algebraic relationships, Reporting Category III: geometry and measurements, and Reporting Category IV: data analysis and personal financial literature) and in three passing areas: (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level). The second purpose was to ascertain the extent to which trends represent in the Reporting Categories and Phase-In Standards across three years by the economic status of Grade 4 girls in special education. The third and final purpose was to determine the degree to which trends existed in the Reporting Categories and Phase-In Standards across three years by the economic status of Grade 4 girls in special education.

Significance of the Study

Multiple researchers (e.g., Harris, 2018; McGown, 2016; Pariseau, 2019; Schleeter, 2017; Thoron & Myers, 2011) have previously conducted research on the relationship between student economic status and reading performance on Texas state-mandated exams. No published articles in which the mathematics performance of Texas Grade 4 students in special education was examined in relation to their economic status could be located. In the only directly related study that could be located, Pariseau (2019) conducted a related study on the reading performance of Texas Grade 4 students in special education based on their economic status.

As a result, the research study was an expansion of Pariseau's (2019) work in the area of mathematics. Further details may be made available to stakeholders on the mathematics performance of Grade 4 girls enrolled in special education by their economic status. Due to the limited number of empirical investigations on special education and mathematics, teachers lack support on the continuous delivery of specially designed courses and the preparation of teaching strategies for students who find mathematics challenging. It is essential that specialists and teachers recognize the interactions among economic status and mathematics performance of girls enrolled in special education.

Research Questions

In this article, the overall research questions addressed were: What is the effect of economic status (i.e., Poor and Not Poor) on the mathematics performance of Texas Grade 4 girls in special education? Specific research subquestions were: (a) What is the effect of economic status on the ability to understand numerical representations and relationships (i.e., STAAR Mathematics Reporting Category I) of Texas Grade 4 girls in special education?; (b) What is the effect of economic status on the ability to understand computations and algebraic relationships (i.e., STAAR Mathematics Reporting Category II) of Texas Grade 4 girls in special education?; (c) What is the effect of economic status on the ability to understand geometry and measurement (i.e., STAAR Mathematics Reporting Category III) of Texas Grade 4 girls in special education?; (d) What is the effect of economic status on the ability to understand data analysis and personal financial literature (i.e., STAAR Mathematics Reporting Category IV) of Texas Grade 4 girls in special education?; (e) What is the effect of economic status on the Approaches Grade Level performance of Texas Grade 4 girls in special education?; (f) What is the effect of economic status on the Meets Grade Level performance of Texas Grade 4 girls in special education?; (g) What is the effect of economic status on the Masters Grade Level performance of Texas Grade 4 girls education?; (h) What trend is present across the STAAR Mathematics Reporting Categories I, II, III, and IV by the economic status of Grade 4 girls across three school years of data?; and (i) What trend is present across the STAAR Mathematics Phase-In performance standards by the economic status of Grade 4 girls across three school years (i.e., 2015-2016, 2016-2017, 2017-2018) of data?

Method

Research Design

In this article, the research design was a non-experimental, quantitative, causal comparative design (Johnson & Christensen, 2020). According to Johnson and Christensen (2020), causal comparative designs are used to determine the presence of relationships between independent and dependent variables. A Texas statewide archival dataset was investigated to determine the effect of economic status on the overall mathematics performance of Grade 4 girls who were enrolled in special education. In this study, economic status (i.e., Poor and Not Poor) constituted the independent variables. The dependent variables were the four STAAR Mathematics Reporting Category I, Reporting Category II, Reporting Category III, and Reporting Category IV and the three STAAR Mathematics Phase-In Standards: Approaches Grade Level, Meets Grade Level, and Masters Grade Level for Grade 3 girls who were enrolled in special education.

Participants and Instrumentation

The data for this examination were obtained from the Texas Education Agency Public Education Information Management System. In this article, the following variables were specifically addressed for Grade 4 girls in special education: (a) academic performance on the Texas state-mandated mathematics assessment for 2015-2016, 2016-2017, and 2017-2018 school years, and (b) economic status across three school years.

The Mathematics performance standards were measured on the basis of the STAAR Mathematics Reporting Categories. Student competence to comprehend numerical representations and relationships is measured in STAAR Mathematics Reporting Category I. In comparison, the student's capacity to acquire computation and algebraic relationships is measured in STAAR Mathematics Reporting Category II. STAAR Mathematics Reporting Category III tests the students’ capacity to comprehend algebra and calculation. Lastly, students' ability to interpret personal financial literacy and data analysis is targeted in Mathematics Reporting Category IV.

In addition, data from the STAAR Mathematics Phase-Standards 1, 2, and 3 (i.e., also known as Approaches Grade Level, Meets Grade Level, and Masters Grade Level) was analyzed. On the STAAR assessment, three Phase-In Standards were created by the Texas Education Agency (2014) to measure satisfactory performance in Mathematics. In conjunction with the STAAR Satisfactory Requirements, participants must meet a minimum standard based on the Phase-In Standard in effect throughout the school year. Three phases of minimal level scores were raised over a 5-year span. For the 2014-2015 academic year, the STAAR Grade 4 Mathematics test (i.e., Phase-In 1) required a scaled score of 1347 for Satisfactory, for 2015-2016 to 2017-2018 (i.e., Phase-In 2) school year, a minimum scaled score of 1388, and a minimum scaled score of 1444 for 2018-2019 (i.e., Phase-In 3) was required.

Results

With respect to the STAAR Mathematics Reporting Categories, multivariate analysis of variance procedures (MANOVAs) were conducted. Before conducting MANOVA procedures to address the first four research questions previously presented, its underlying assumptions (i.e., data normality, Box's Test of Equality of Covariance, and the Levene's Test of Equality of Error Variance) were checked. Despite some of these assumptions not being met, the MANOVA is sufficiently robust to be able to withstand these violations (Field, 2009). Starting with the 2015-2016 school year and ending with the 2017-2018 school year, the results will be described in chronological order.

Overall Results for Girls Across All Three School Years by Economic Status

The MANOVA yielded a statistically significant difference in overall mathematics performance by the economic status (i.e., Poor and Not Poor) of Grade 4 girls in special education for the 2015-2016 school year, Wilks' $\Lambda = .89$, $p = .003$, partial $\eta^2 = .11$, moderate effect size (Cohen, 1988). With respect to the 2016-2017 school year, a statistically significant difference was not revealed in overall mathematics performance, Wilks' $\Lambda = .98$, $p = .30$. Concerning the 2017-2018 school year, a statistically significant difference was not present, Wilks' $\Lambda = .99$, $p = .70$.

Results for Mathematics Reporting Category I for Girls Across All Three School Years

To determine whether statistically significant differences were present for the STAAR Mathematics Reporting Category I by student economic status, univariate follow-up analysis of variance (ANOVA) procedures were calculated for each school year. With respect to the 2015-2016 school year, the result approached, but did not reach the conventional level of statistical significance, $F(1, 136) = 3.56$, $p = .06$. Regarding the 2016-2017 school year, the ANOVA did not yield a statistically significant difference, $F(1, 231) = 2.49$, $p = .12$. Concerning the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 169) = 1.88$, $p = .17$. Table 4.1 contains the descriptive statistics for this analysis.

Insert Table 4.1 about here

For the 2015-2016 school year, Grade 4 girls in special education who were Poor answered almost one and one-quarter fewer items correctly than girls who were in special education and who were Not Poor. However, in the 2016-2017 and 2017-2018 school years, Grade 4 girls in special education who were Poor and girls who were Not Poor answered a similar number of test items. Depicted in Figure 4.1 are these results.

Insert Figure 4.1 about here

Results for Mathematics Reporting Category II for Girls Across All Three School Years

Regarding the 2015-2016 school year, a statistically significant difference was present, $F(1, 136) = 8.61$, $p = .004$, partial $\eta^2 = .06$, moderate effect size (Cohen, 1988). The ANOVA did not yield a statistically significant difference for the 2016-2017 school year, $F(1, 231) = 0.15$, $p = .69$. With respect to the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 169) = 0.83$, $p = .36$. On the STAAR Mathematics Reporting Category II questions, the effect size was moderate for the 2015-2016 school year. Grade 4 girls in special education who were Poor answered, on average, more than one and one-half fewer items correctly than girls who were Not Poor. Contained in Table 4.2 are the descriptive statistics for these analyses.

Insert Table 4.2 about here

Grade 4 girls who were Poor answered a similar number of questions correctly as girls who were Not Poor in both the 2016-2017 and the 2017-2018 school years. Illustrated in Figure 4.2 is that, in the 2017-2018 school year, Grade 4 girls in special education who were Poor answered a similar number of items correctly than girls who were Not Poor.

Insert Figure 4.2 about here

Results for Mathematics Reporting Category III for Girls Across All Three School Years

For the 2015-2016 school year, a statistically significant difference was present, $F(1, 136) = 7.88$, $p = .006$, partial $\eta^2 = .06$, moderate effect size (Cohen, 1988), on the STAAR Mathematics Reporting Category III by student economic status. Concerning the 2016-2017 school year, the ANOVA did not yield a statistically significant difference, $F(1, 231) = 0.87$, $p = .35$. With respect to the 2017-2018 school year, a statistically significant difference was not revealed, $F(1, 169) = 0.55$, $p = .46$. Grade 4 girls in special education who were Poor answered statistically significantly fewer items correctly than girls who were Not Poor, for the 2015-2016 school year, on the STAAR Mathematics Reporting Category III, but not for the most recent school years. Descriptive statistics for the STAAR Mathematics Reporting Category III are presented in Table 4.3.

Insert Table 4.3 about here

In the 2015-2016 school year, Grade 4 girls in special education who were Poor answered, on average, over one and one-half fewer items correctly than girls who were Not Poor. With respect to the 2016-2017 and 2017-2018 school years, Grade 4 girls in special education who were Poor answered a similar number of questions correctly as girls who were Not Poor. Depicted in Figure 4.3 is the average number of questions Grade 4 girls in special education answered correctly for Mathematics Reporting Category III as a function of their economic status.

Insert Figure 4.3 about here

Results for Mathematics Reporting Category IV for Girls Across All Three School Years

With respect to the 2015-2016 school year, a statistically significant difference was not revealed, $F(1, 136) = 2.76$, $p = .29$, on the STAAR Mathematics Reporting Category IV by student economic status. Regarding the 2016-2017 school year, the result was not statistically significant, $F(1, 231) = 0.08$, $p = .78$. Concerning the 2017-2018 school year, a statistically significant difference was not yielded, $F(1, 169) = 0.74$, $p = .39$. For all school years, Grade 4 girls in special education, regardless of their economic status, answered a similar number of items correctly. Descriptive statistics for the STAAR Mathematics Reporting Category IV are delineated in Table 4.4. Illustrated in Figure 4.4 is the average numbers of questions Grade 4 girls in special education answered correctly for Mathematics Reporting Category IV by their economic status.

Insert Table 4.4 and Figure 4.4 about here

Grade Level Standards by Economic Status

To address the research questions about the Grade Level Standard performances, Pearson chi-square procedures were conducted. This statistical method was the optimal statistical procedure because of the presence of frequency data for the three mathematics Grade Level Standard performances (i.e., met and not met) and for economic status.

When both the independent variable and the dependent variables are nominal in nature, Pearson chi-squares are the statistical technique of choice (Slate & Rojas-LeBouef, 2011). With a large sample size, the criteria for using Pearson chi-squares were met.

Results for the STAAR Mathematics Approaches Grade Level Standard for Girls Across All Three School Years

Grade level performance standards could not be analyzed herein for the 2015-2016 school year. Taylor and Slate (2020) had already examined those data for that particular school year. Their results will be addressed in the Discussion section of this article. Concerning the 2016-2017 school year, a statistically significant difference was revealed, $\chi^2(1) = 0.77$, p =.38, Cramer's V of .06, below small effect size (Cohen, 1988). Girls in special education who were in the Poor group about 6% more likely to not meet this standard than girls in special education who were not in the Poor group. As delineated in Table 4.5, similar percentages of girls, regardless of their economic status, did not meet this standard.

Insert Table 4.5 about here

Regarding the 2017-2018 school year, the result was statistically significant, $\chi^2(1) = 6.94$, $p = .008$, Cramer's V of .09, below small effect size (Cohen, 1988). Girls in special education who were in the Poor group were 9% more likely to not meet this standard than girls in special education who were not in the Poor group. As presented in Figure 4.5, for the 2016-2017 and 2017-2018 school years, girls in special education who were Poor barely met the Approaches Grade Level Standard compared to girls who were Not Poor.

Insert Figure 4.5 about here

Results for the STAAR Mathematics Meets Grade Level for Girls Across All Three School Years

Regarding the 2015-2016 school year, grade level performance was not examined. Data for that school year were analyzed and published by Taylor and Slate (2020). The results of that article will be addressed in the Discussion section of this study. Concerning the 2016-2017 school year, a statistically significant difference was yielded, $\chi^2(1) = 2.34$, $p = .13$, Cramer's V of .10 small effect size, (Cohen, 1988). Almost 6% of Grade 4 girls in special education who were Poor did not meet this standard than Grade 4 girls in special education who were Not Poor. For the 2017-2018 school year, the result was statistically significant, $\chi^2(1) = 7.56$, $p = .006$, Cramer's V of .21 small effect size, (Cohen, 1988). As revealed in Table 4.6, about 11% of Grade 4 girls in special education who were Poor did not meet this standard than Grade 4 girls in special education who were Not Poor.

Insert Table 4.6 about here

Results for the STAAR Mathematics Masters Grade Level for Girls Across All Three School Years

Regarding the 2015-2016 school year, grade level performance was not examined. Data for that school year were analyzed and published by Taylor and Slate (2020). The results of that article will be addressed in the Discussion section of this study. Regarding the 2016-2017 school year, the result was statistically significant, $\chi^2(1) = 6.55$, $p = .01$, small effect size, Cramer's V of .17 (Cohen, 1988). As delineated in Table 4.7, almost none of Grade 4 girls in special education who were Poor met this standard. With respect to the 2017-2018 school year, a statistically significant difference was yielded, $\chi^2(1) = 16.33$, $p < .001$, moderate effect size, Cramer's V of .31 (Cohen, 1988). As revealed in Table 4.7, no Grade 4 girls in special education in the Poor group met this standard. Only 12% of Grade 4 girls in special education who were in the Not Poor group met this standard.

Insert Table 4.7 about here

Discussion

Mathematics performance was investigated by the economic status of Grade 4 girls in special education in this multiyear Texas statewide investigation. Two mathematics measures were present: (a) the number of test questions correctly answered and (b) the percentages of girls who met three mathematics Grade Level Standards. In analyzing the mathematics performance of Grade 4 girls in Texas across the three years of data that were analyzed herein, few statistically significant results existed for the

STAAR Mathematics Reporting Categories. In each of these analyses, regardless of their economic background, girls correctly answered a comparable number of items in the STAAR Mathematics Reporting Categories. In contrast, for the STAAR Mathematics Grade Level Standards (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level), consistent trends in scores existed by student economic status in 2016-2017 and 2017-2018 years investigated, girls in the Poor Group had statistically significantly lower percentages who met this standard than girls in the Not Poor group. These percentages are depicted in Figures 4.6 and 4.7.

Insert Figures 4.6 and 4.7 about here

As mentioned earlier in the article, Taylor and Slate (2020) conducted a study on mathematics performance by the economic status of Texas Grade 4 students in special education for the 2015-2016 school year. In their investigation, about six times fewer Grade 4 girls in special education who were economically disadvantaged met the Approaches Grade Level Standard than girls in special education who were not economically disadvantaged. Moreover, no Grade 4 girls in special education who were economically disadvantaged met the Meets Grade Level and Masters Grade Level performance standard.

Connection with Existing Literature

As documented in this study, few statistically significant results existed for Grade 4 girls in special education who were Poor and Grade 4 girls in special education who were Not Poor on the Texas state-mandated mathematics assessment. Results delineated herein are congruent with the findings of a previous researcher (Pariseau, 2018). Pariseau (2018) analyzed the reading performance of Grade 4 girls in special education in Texas. Few statistically significant results were present for the STAAR Reading Reporting Categories across the four school years (i.e., 2014-2015, 2015-2016, 2016-2017, and 2017-2018) of data that were examined. Similar to the results of this study, regardless of Grade 4 girls' economic status, they answered a similar number of items correctly on the STAAR Reading Reporting Categories, in the majority of these analyses. Similar results existed for the STAAR Mathematics Grade Level Standards as well.

Implications for Policy and Practice

Based on the results of this multi-year statewide investigation, various recommendations for policy and procedure can be generated. Educators and policymakers need to include financial support and programs with regard to legislative implications to remedy the inequalities in mathematics success that occur for girls who are in special education and live in poverty. Girls who are affected by poverty should have access to tutorial programs funded by their local school district or community outside of school. Second, attending school at pre-kindergarten and having early intervention in mathematics while learning fundamental skills would be helpful for girls in special education. More money is therefore required for school districts to support grade-level pre-kindergarten special education services.

In terms of implications for practice, postsecondary graduate teaching programs should add special education classes to their curriculum. In addition, educators need to have access to professional learning opportunities, which consist of strategies for teaching mathematical skills to students with exceptional needs. It is important to train educators on how students diagnosed with disabilities respond to academic, functional, and emotional needs.

Moreover, students in special education who did not pass the STAAR tests for any content exam are required to have an intensive program of instructional plan. School personnel must acquire the skills and knowledge to develop and execute an innovative intensive program of instructional plan and improve the likelihood of academic achievement for special education students during the next state examination. Hence educators need to engage in continuing professional development that shows teachers how to create and execute an effective intensive program of instruction. If state and federal legislatures adhere to these ideas, girls who are in special education, live in poverty, and required to participate in Grade 4 STAAR Mathematics exam will have the opportunity to be academically successful.

Suggestions for Future Research for Economic Status

Several recommendations for future studies can be made based on the findings of this empirical, multiyear statewide study. First, because this investigation was restricted to Texas Grade 4 girls enrolled in special education, researchers are recommended to replicate this study in other states to ascertain the degree to which results described herein are generalizable. Second, only Grade 4 STAAR Mathematics results were analyzed in this study. As such, researchers are encouraged to extend this study to other content areas such as reading, science, social studies, and writing. Third, because only Grade 4 test data were examined in this investigation, researchers are encouraged to analyze data at other grade levels. Fourth, in this article, data on girls enrolled in special education were analyzed. The extent to which results discussed in this article would be generalizable to other student populations such as Section 504, and English Language Learners is not known. Fourth, the only demographic characteristic that was addressed in this article was economic status. Hence, researchers should examine the relationship between girls in special education and their ethnicity/race (i.e., Black, Hispanic, and White). Lastly, data on only girls were analyzed in this article. Accordingly, data on boys in special education and their mathematics performance should be investigated as a function of their economic status.

Conclusion

The purpose of this article was to analyze the degree to which differences were present in the mathematics performance of Texas Grade 4 girls in special education by their economic status. Few statistically significant differences were documented in the mathematics performance by Grade 4 girls in special education by their economic status. For the 2015-2016 school year, Grade 4 girls in special education who were poor had statistically significantly lower mathematics scores on all four STAAR Mathematics Reporting Categories. For the most recent school years, 2016-2017 and 2017-2018, regardless of Grade 4 girls in special education economic status, they answered a similar amount of questions correctly on the STAAR Mathematics Reporting Categories.

With respect to the three STAAR Mathematics Grade Level Standards, a consistent trend was revealed. In all three school years of Texas statewide data, statistically significant differences were presented for Grade 4 girls in special education as a function of their economic status. Grade 4 girls in special education who were Poor had statistically significantly lower percentages who met these three Grade Level Standards than Grade 4 girls in special education who were Not Poor group. The results of this multiyear statewide study were congruent with previous researchers (Davenport & Slate, 2019; Harris, 2018; Harris & Slate, 2017; McGown, 2016; Pariseau, 2018; Ravitch, 2013; Schleeter, 2017) in terms of the mathematics disparities present for boys in poverty.

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Table 4.1

Descriptive Statistics for Reporting Category I by the Economic Status of Grade 4 Girls for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	45	4.69	4.87
Poor	93	3.42	2.99
2016-2017			
Not Poor	67	2.88	3.23
Poor	166	3.52	2.64
2017-2018			
Not Poor	41	2.27	3.12
Poor	130	2.91	2.42

Table 4.2

Descriptive Statistics for Reporting Category II by the Economic Status of Grade 4 Girls for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	45	5.58	6.21
Poor	93	3.29	2.97
2016-2017			
Not Poor	67	2.84	3.49
Poor	166	2.99	2.46
2017-2018			
Not Poor	41	3.00	4.02
Poor	130	3.49	2.64

Table 4.3

Descriptive Statistics for Reporting Category III by the Economic Status of Grade 4 Girls for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	45	4.29	4.98
Poor	93	2.57	2.22
2016-2017			
Not Poor	67	2.85	3.26
Poor	166	3.20	2.32
2017-2018			
Not Poor	41	2.49	3.70
Poor	130	2.74	2.18

Table 4.4

Descriptive Statistics for Reporting Category IV by the Economic Status of Grade 4 Girls for 2015-2016 Through 2017-2018

School Year and Economic Status	*n*	*M*	*SD*
2015-2016			
Not Poor	45	1.69	1.96
Poor	93	1.39	1.38
2016-2017			
Not Poor	67	1.15	1.44
Poor	166	1.20	1.09
2017-2018			
Not Poor	41	1.22	1.61
Poor	130	1.42	1.15

Table 4.5

Frequencies and Percentages for Approaches Grade Level Standard by Economic Status for 2016-2017 and 2017-2018

	Did Not Meet Standard		Met Standard	
School Year and Economic Status	*n*	%	*n*	%
2016-2017				
Not Poor	48	71.60	19	28.40
Poor	128	77.10	38	22.90
2017-2018				
Not Poor	28	68.30	13	31.70
Poor	101	77.70	29	22.30

Table 4.6

Frequencies and Percentages for Meets Grade Level Standard by Economic Status for 2016-2017 and 2017-2018

	Did Not Meet Standard		Met Standard	
School Year and Economic Status	*n*	%	*n*	%
2016-2017				
Not Poor	59	88.10	8	11.90
Poor	156	94.00	10	6.00
2017-2018				
Not Poor	35	85.40	6	14.60
Poor	126	96.90	4	3.10

Table 4.7

Frequencies and Percentages for Masters Grade Level Standard by Economic Status for 2016-2017 and 2017-2018

	Did Not Meet Standard		Met Standard	
School Year and Economic Status	*n*	%	*n*	%
2016-2017				
Not Poor	63	94.00	4	6.00
Poor	165	99.40	1	0.60
2017-2018				
Not Poor	36	87.80	5	12.20
Poor	130	100.00	0	0.00

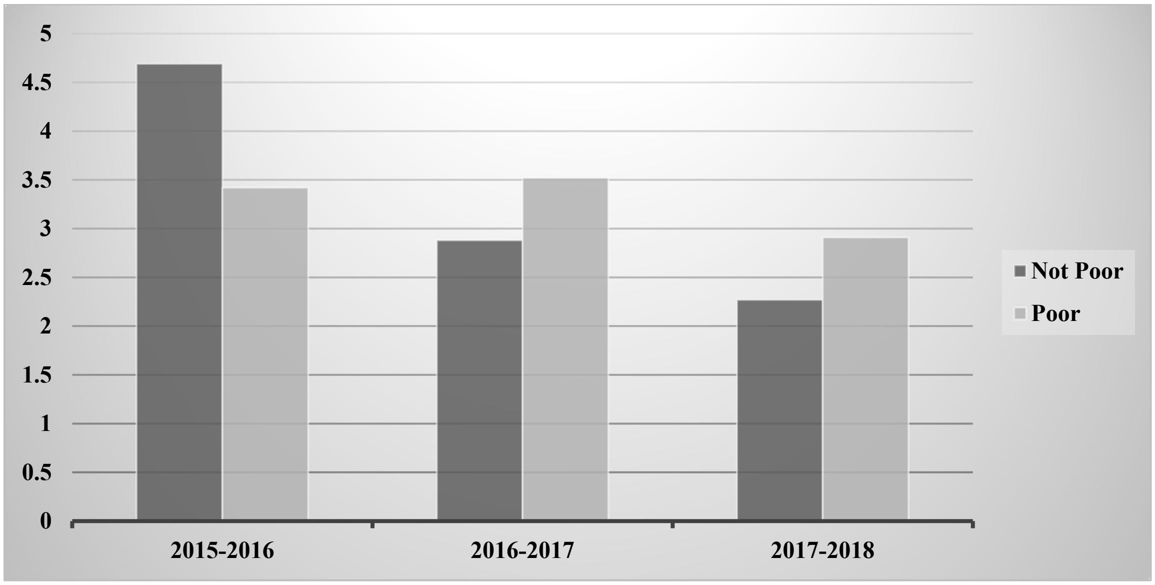

Figure 4.1. Average number of correct responses for Reporting Category I for Grade 4 girls for 2015-2016 through 2017-2018.

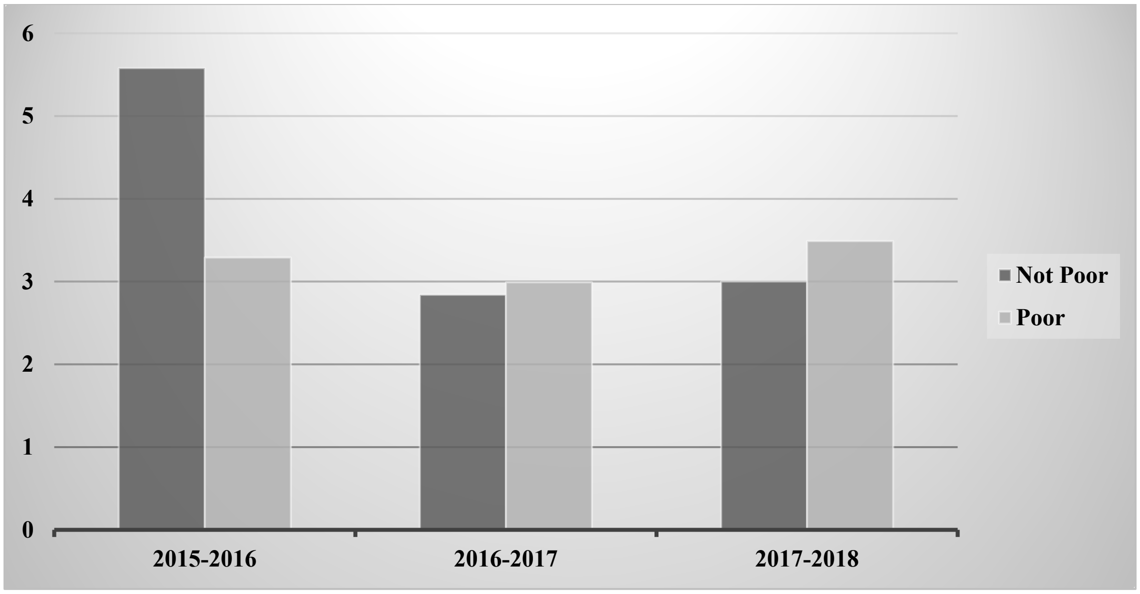

Figure 4.2. Average number of correct responses for Reporting Category II for Grade 4 girls for 2015-2016 through 2017-2018.

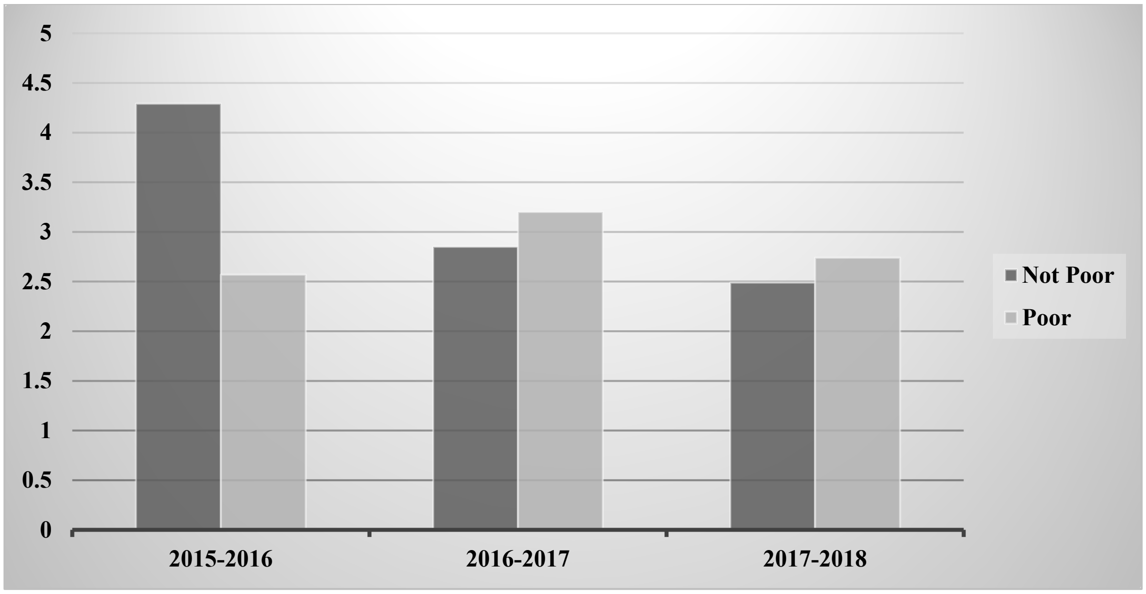

Figure 4.3. Average number of correct responses for Reporting Category III for Grade 4 girls for 2015-2016 through 2017-2018.

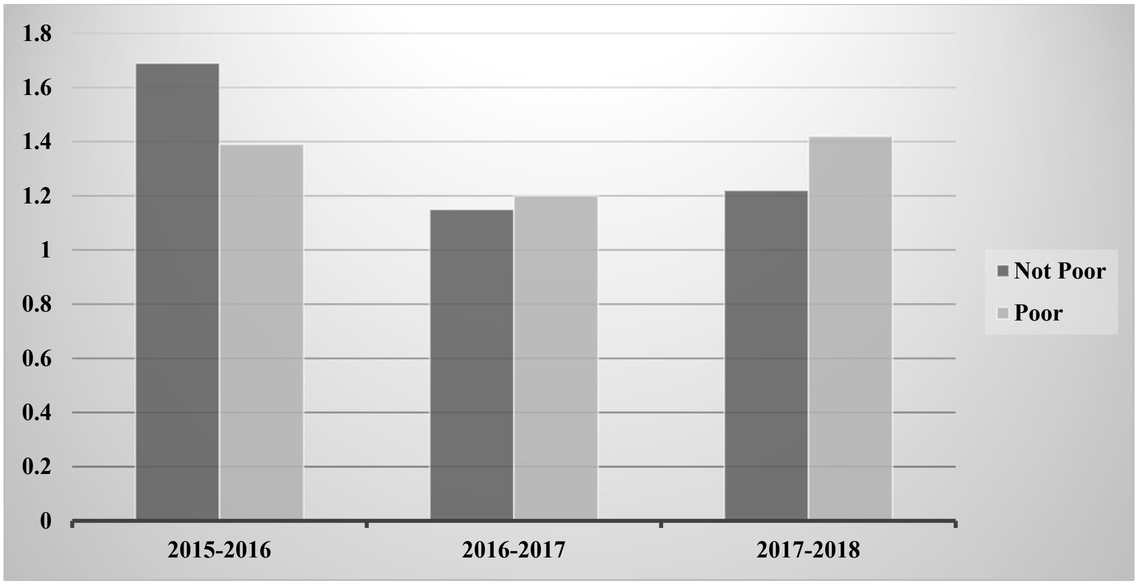

Figure 4.4. Average number of correct responses for Reporting Category IV for Grade 4 girls for 2015-2016 through 2017-2018.

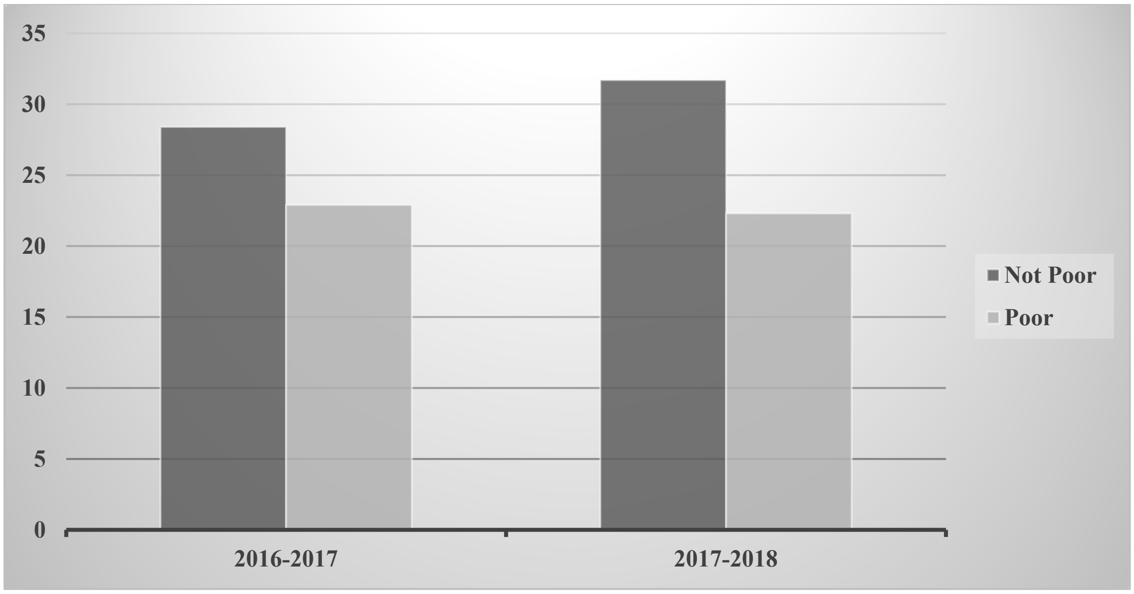

*Figure 4.5.*Frequencies and percentages for Approaches Grade Level Standard of Grade 4 girls in 2016-2017 and 2017-2018.

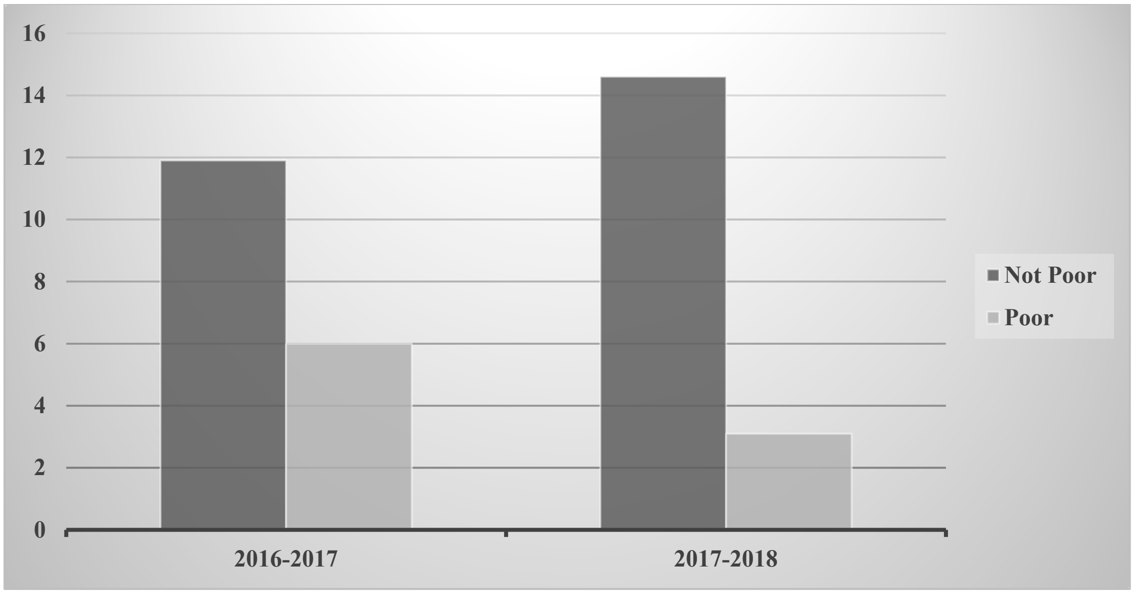

Figure 4.6. Frequencies and percentages for Meets Grade Level Standard of Grade 4 girls in 2016-2017 and 2017-2018.

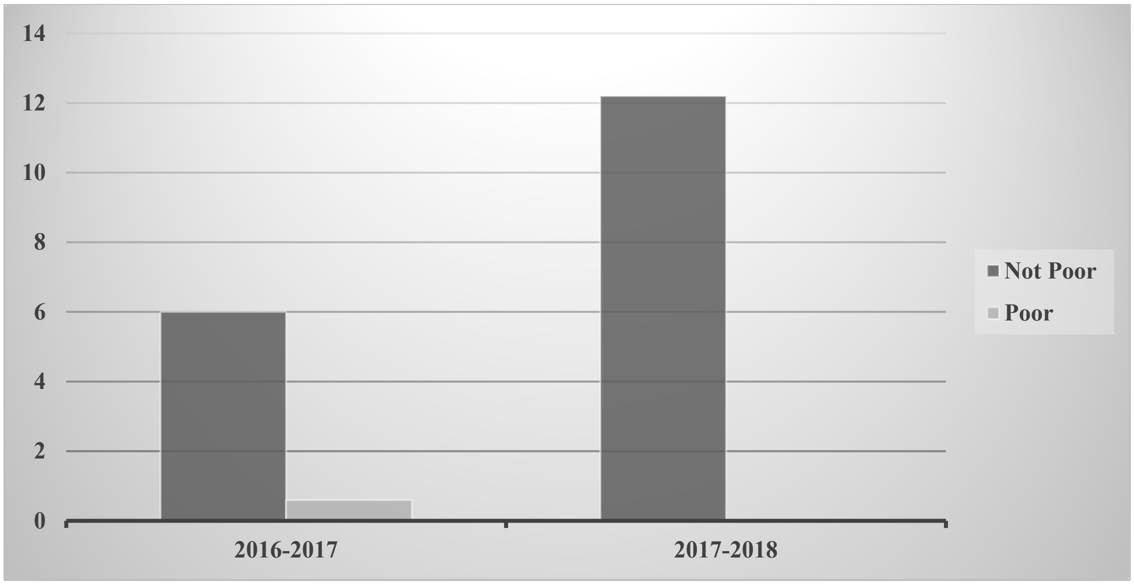

Figure 4.7. Frequencies and percentages for Masters Grade Level Standard of Grade 4 girls in 2016-2017 and 2017-2018.

CHAPTER V

DISCUSSION

The overall purpose of this journal-ready dissertation was to determine the degree to which the economic status and ethnicity/race of Texas Grade 4 boys and girls in special education are related to their mathematics performance on Texas state-mandated assessment. In the first article, the purpose was to ascertain the effect of the economic status (i.e., Poor and Not Poor) of boys in special education on their mathematics performance on the Texas state-mandated assessment. In the second article, the purpose was to examine the mathematics performance of Grade 4 boys in special education as a function of their ethnicity/race (i.e., Black, Hispanic, and White). In the third article, the purpose was to investigate the extent to which the economic status (i.e., Poor and Not Poor) was related to the mathematics performance of Grade 4 girls in special education. In all three articles, the extent to which trends were present in the Reporting Categories (i.e., Reporting Category I: understand numerical representations and relationships, Reporting Category II: computations and algebraic relationships, Reporting Category III: geometry and measurements, and Reporting Category IV: data analysis and personal financial literature) and mathematics performance levels: (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level) were examined across three school years (i.e., 2015-2016, 2016-2017, 2017-2018).

For each of the studies in this journal-ready dissertation, the results are discussed and summarized in this chapter. Then, implications for policy and practice will be provided, followed by recommendations for future research. A summary will conclude this chapter.

Discussion of Article One Results

The results of the statistical analyses of Texas Grade 4 boys in special education who participated in the STAAR Mathematics exam for the 2015-2016, 2016-2017, and 2017-2018 school years are summarized in Table 5.1. In each STAAR Mathematics Reporting Category and in all three years investigated, boys who were Poor had statistically significantly lower mathematics scores than boys who were Not Poor. For the 2015-2016 and 2016-2017 school years and for four Reporting Categories, two effect sizes were large, and six effect sizes were moderate (Cohen, 1988).

Table 5.1

Summary of Results for the Reporting Categories by the Economic Status of Grade 4 Boys for 2015-2016 through 2017-2018

School Year and Mathematics Reporting Category	Statistically Significant	Effect Size	Lowest Performing Group
2015-2016			
Reporting Category I	Yes	Moderate	Poor
Reporting Category II	Yes	Large	Poor
Reporting Category III	Yes	Large	Poor
Reporting Category IV	Yes	Moderate	Poor
2016-2017			
Reporting Category I	Yes	Moderate	Poor
Reporting Category II	Yes	Moderate	Poor
Reporting Category III	Yes	Moderate	Poor
Reporting Category IV	Yes	Moderate	Poor
2017-2018			
Reporting Category I	No	-	-
Reporting Category II	No	-	-
Reporting Category III	No	-	-
Reporting Category IV	No	-	-

According to Taylor and Slate (2020), a lower percentage of boys who were Poor met the STAAR Grade Level Standards (i.e., Approaches Grade Level, Meets Grade Level, and Masters Grade Level). In this study, during the 2016-2017 and the 2017-2018 school years, the percentages of Grade 4 boys in special education who were poor were similar to Taylor and Slate's (2020) findings. The results of the statistical analyses of Texas Grade 4 boys in special education who participated in the STAAR Mathematics assessment in the 2016-2017 and 2017-2018 school years are delineated in Table 5.2. Lower percentages of boys who were Poor met grade level expectations than boys in the Not Poor group across all STAAR Grade Level Standards. Effects sizes were moderate in three instances and small in three instances (Cohen, 1988).

Table 5.2

Summary of Results for the Grade Level Standards by the Economic Status of Grade 4 Boys for 2016-2017 and 2017-2018

School Year Grade Level Standard	Statistically Significant	Effect Size	Lowest Performing Group
2016-2017			
Approaches	Yes	Moderate	Poor
Meets	Yes	Moderate	Poor
Masters	Yes	Moderate	Poor
2017-2018			
Approaches	Yes	Small	Poor
Meets	Yes	Small	Poor
Masters	Yes	Small	Poor

Discussion of Article Two Results

The results of the statistical analyses of Texas Grade 4 boys in special education who took the STAAR Mathematics test in the 2015-2016, 2016-2017, and 2017-2018 school years are summarized in Table 5.3. In all three years investigated and in each STAAR Mathematics Reporting Category, Hispanic and Black boys had statistically significantly lower mathematics scores than White boys. Black boys performed the lowest across all three years of data that were analyzed and for all four Mathematics

Reporting Categories. Concerning practical relevance, one effect size was large, seven were moderate, and three effect sizes were small (Cohen, 1988).

Table 5.3

Summary of Results for the Reporting Categories by Ethnicity/Race of Grade 4 Boys for 2015-2016 Through 2017-2018

School Year and Mathematics Reporting Category	Statistically Significant	Effect Size	Lowest Performing Group
2015-2016			
Reporting Category I	Yes	Moderate	Black
Reporting Category II	Yes	Moderate	Black
Reporting Category III	Yes	Large	Black
Reporting Category IV	Yes	Moderate	Black
2016-2017			
Reporting Category I	Yes	Moderate	Black
Reporting Category II	Yes	Moderate	Black
Reporting Category III	Yes	Moderate	Black
Reporting Category IV	Yes	Moderate	Black
2017-2018			
Reporting Category I	Yes	Small	Black
Reporting Category II	Yes	Small	Black
Reporting Category III	Yes	Small	Black
Reporting Category IV	No	-	-

Presented in Table 5.4 are the results of the statistical analyses of Texas Grade 4 boys in special education who participated in the STAAR Mathematics test in the 2015-2016, 2016-2017, and 2017-2018 school years. For all three school years and all three STAAR Mathematics Grade Level Standards, statistically significantly lower percentages of Black and Hispanic boys met these standards than White boys. Black boys performed the lowest for all three Grade Level Standards for the three years that were examined. Five effect sizes were moderate, and four effect sizes were small (Cohen, 1988).

Table 5.4

Summary of Results for Grade Level Standards by Ethnicity/Race of Grade 4 Boys for 2015-2016 Through 2017-2018

School Year and Grade Level Standard	Statistically Significant	Effect Size	Lowest Performing Group
2015-2016			
Approaches	Yes	Moderate	Black
Meets	Yes	Moderate	Black
Masters	Yes	Moderate	Black
2016-2017			
Approaches	Yes	Moderate	Black
Meets	Yes	Small	Black
Masters	Yes	Moderate	Black
2017-2018			
Approaches	Yes	Small	Black
Meets	Yes	Small	Black
Masters	Yes	Small	Black

Discussion of Article Three Results

A summary of the findings of the statistical analyses of Texas Grade 4 girls in special education who took the STAAR Mathematics exam in the 2015-2016, 2016-2017, and 2017-2018 school years is revealed in Table 5.5. In analyzing the mathematics achievement of Grade 4 girls in Texas across the three years of data, few statistically significant results existed. Grade 4 girls in special education answered a similar number of items correctly on the STAAR Mathematics Reporting Categories, regardless of their economic status. Only for the 2015-2016 school year for Reporting Category II and III were statistically significant results revealed. For this school year, girls who were Poor had lower mathematics performance results than girls who were Not Poor. For the 2015-2016 school year, across the four Reporting Categories, two effect sizes were moderate (Cohen, 1988).

Table 5.5

Summary of Results for Reporting Categories by the Economic Status of Grade 4 Girls for 2015-2016 Through 2017-2018

School Year and Mathematics Reporting Category	Statistically Significant	Effect Size	Lowest Performing Group
2015-2016			
Reporting Category I	No	-	-
Reporting Category II	Yes	Moderate	Poor
Reporting Category III	Yes	Moderate	Poor
Reporting Category IV	No	-	-
2016-2017			
Reporting Category I	No	-	-
Reporting Category II	No	-	-
Reporting Category III	No	-	-
Reporting Category IV	No	-	-
2017-2018			
Reporting Category I	No	-	-
Reporting Category II	No	-	-
Reporting Category III	No	-	-
Reporting Category IV	No	-	-

For the 2015-2016 school year, Taylor and Slate (2020) established that a lower percentage of girls who were Poor met the STAAR Grade Level Standards. The results of the statistical analyses of Texas Grade 4 Girls in special education who participated in the STAAR Mathematics assessment in the 2016-2017 and 2017-2018 school years are summarized in Table 5.6. In each STAAR Grade Level Standard and in the two years investigated, girls who were Poor had statistically significantly lower mathematics scores than girls who were Not Poor. Across the two years and three Grade Level Standards, girls who were Poor performed the lowest. One effect size was moderate, and five effect sizes were small (Cohen, 1988).

Table 5.6

Summary of Results for the Grade Level Standards by the Economic Status of Grade 4 Girls for 2015-2016 Through 2017-2018

School Year Grade Level Standard	Statistically Significant	Effect Size	Lowest Performing Group
2016-2017			
Approaches	Yes	Small	Poor
Meets	Yes	Small	Poor
Masters	Yes	Small	Poor
2017-2018			
Approaches	Yes	Small	Poor
Meets	Yes	Small	Poor
Masters	Yes	Moderate	Poor

Connections with the Existing Literature

The findings in all three articles were congruent with previous research in this journal-ready study. As presented in the first investigation, boys in special education who were Poor had statistically significantly lower mathematics test scores than boys in special education who were Not Poor. These results are consistent with the findings of other researchers (e.g., Davenport & Slate, 2019; Harris, 2018; McGown, 2016; Pariseau, 2019; Schleeter, 2017) who documented the presence of substantial achievement gaps by special education enrollment status, ethnicity/race, and poverty.

In comparison, the results presented in this journal-ready dissertation are commensurate with national education reform laws in that educational inequities deprive students of a free and appropriate quality education (American Psychological Association, 2012; Ravitch, 2013). Poverty adversely affects the ability to learn (e.g., Davenport & Slate, 2019; Harris, 2018; Hernandez, 2012; McGown, 2016; Pariseau, 2019; Wright & Slate, 2015). Previous researchers (e.g., Jones et al., 2017) revealed that students who qualify for special education appeared to struggle with comprehension at higher rates than their non-disabled counterparts, which was further reinforced by this study.

As revealed in the second investigation, ethnic/racial achievement disparities in mathematics are prominent for boys in special education (American Psychological Association, 2012; Harvey, 2013; Wei et al., 2011). On the Texas state-mandated assessment, recent researchers (Harris, 2018; Harris & Slate, 2017; McGown, 2016; Pariseau, 2019; Rojas-LeBouef, 2010) have established the presence of similar ethnic/racial achievement gaps. As documented herein, ethnic/racial achievement gaps were clearly present for Grade 4 boys in special education for each STAAR Mathematics Reporting Category for the 2015-2016, 2016-2017, and 2017-2018 school years. Hispanic and Black boys had substantially lower mathematics scores than White boys. Moreover, statistically significantly lower percentages of Black and Hispanic boys in special education met these standards than White boys in special education. In all three years, similar trends existed for all three STAAR Mathematics Grade Level Standards. Though efforts have been made by federal and state governments to address ethnic/racial achievement gaps (American Psychological Association, 2012; Craft, 2011; Harvey, 2013; Wei et al., 2011), substantial disparities still clearly exist in special education for boys.

The findings discussed in the third study were reflective of only a few statistically significant results for Grade 4 girls in special education who were Poor and Grade 4 girls in special education who were Not Poor on the Texas state-mandated mathematics assessment. Results delineated herein were congruent with the findings of Pariseau

(2018), who established the existence of few statistically significant differences in the reading achievement of girls in special education by their economic status. Similar to the results of this study, regardless of Grade 4 girls' economic status, they answered a similar number of items correctly on the STAAR Reading test. Similar results existed for the STAAR Mathematics Grade Level Standards as well.

Implications for Policy and Practice

Several implications for policy and practice can be generated based on the findings of this journal-ready dissertation. In terms of policy implications, educators and legislators need to provide financial resources and services to resolve the mathematical achievement disparities that are present for boys who are in special education and who reside in poverty. Students who are economically disadvantaged should have access to tutorial programs outside of school funded by their local school district or community. Second, the state and the federal government should allocate extra funds to school districts for mathematics labs that include hands-on relevant, and culturally appropriate scenarios that foster realistic connections. Students who may struggle with comprehending mathematics word problems to which they can directly connect to or personally experienced, are more likely to become involved in the computation process of solving mathematical word problems. Third, it will be beneficial for students in special education to start school at pre-kindergarten and receive early intervention in mathematics while developing fundamental skills. Hence, more funding is needed for school districts to finance special education programs for the pre-kindergarten grade level.

Regarding implications for practice, postsecondary graduate teaching programs need to add special education courses to their curriculum. The number of students in special education who receive instruction in the mainstream is rapidly increasing in Texas because a cap no longer exists. Therefore, many first-year general education teachers lack the knowledge of supporting and teaching students with disabilities, which impedes student's academic performance. Furthermore, educators need access to professional learning opportunities that consist of strategies for teaching mathematical skills to students with exceptional needs. It is vital that educators are trained on how to meet the academic, functional, and emotional needs of students that are diagnosed with disabilities. Moreover, teachers need to participate in professional development activities in which they are shown how to develop an effective intensive program of instruction program which is required for students in special education who did not pass the STAAR any content exam.

An intensive program of instruction is not effective if it is not properly designed to meet the individual needs of the student. If educators have the knowledge and understanding to build and implement an efficient intensive program of instructional plan, students in special education probability rate of demonstrating academic success on the next statewide exam will increase. Grade 3 STAAR Mathematics test scores should be utilized to design an effective intensive program of instruction for Grade 4 boys in special education, which will allow educators to immediately respond to mathematical gaps. Boys who are in special education, live in poverty, and required to participate in Grade 4 STAAR Mathematics exam will have the opportunity to yield academic success if state and federal legislatures adhere to these ideas. Finally, professional development that involves the development and implementation of culturally relevant instructional strategies for mathematics would be beneficial for educators to participate in. Children in special education encounter various challenges due to their disabilities and the stigma that is attached to it. Based upon the results of this study, further learning barriers such as ethnicity/race are apparent.

Recommendations for Future Research

Several recommendations for future studies can be made based on the findings of this empirical, multiyear journal-ready dissertation. First, only Grade 4 STAAR Mathematics results were analyzed in this study. As such, researchers are encouraged to extend this study to other content areas such as reading, science, social studies, and writing. Second, because only Grade 4 test data were examined in this investigation, researchers are encouraged to analyze data at other grade levels. Third, in this article, data on students enrolled in special education were analyzed. The extent to which results discussed in this article would be generalizable to other student populations such as Section 504, and English Language Learners is not known. Fourth, the only demographic characteristics that were addressed in this journal-ready dissertation were economic status and ethnicity/race. Hence, researchers are encouraged to examine other demographic characteristics, such as gender and at-risk status.

Conclusion

The purpose of this journal-ready dissertation was to determine the degree to which the economic status and ethnicity/race of Texas Grade 4 boys and girls in special education are related to their mathematics performance on Texas state-mandated assessment. Poverty was determined herein to be negatively related to mathematics achievement in all three school years. Boys in special education who were Poor performed lower in mathematics than boys in special education who were Not Poor. In contrast, for Grade 4 girls, few statistically significant results existed in examining the mathematics performance of Grade 4 girls in Texas across the three years of data. For the most recent school years, 2016-2017 and 2017-2018, regardless of Grade 4 girls in special education economic status, they answered a similar amount of questions correctly on the STAAR Mathematics Reporting Categories. However, with respect to the three STAAR Mathematics Grade Level Standards, a consistent trend was revealed. In all three school years of Texas statewide data, for Grade 4 girls in special education who were Poor had statistically significantly lower percentages who met these three Grade Level Standards than Grade 4 girls in special education who were Not Poor group.

Regarding ethnicity/race, statistically significant differences were revealed in the mathematics performance of White, Hispanic, and Black boys in special education for all three years in Mathematics Reporting Categories I, II, III, and IV as well as STAAR Mathematics Grade Level Standards. A clear stair-step effect (Carpenter et al., 2006) existed in that Black boys in special education performed lower than Hispanic and White.

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APPENDIX

Date: Sep 17, 2020 1:17 PM CDT

TO: Alexis Taylor John Slate
FROM: SHSU IRB
PROJECT TITLE: Differences in the Mathematics Performance of Texas Grade 3 Boys and Girls Enrolled in Special Education as a Function of Their Economic Status and Ethnicity/Race: A Multiyear Statewide Investigation
PROTOCOL #: IRB-2020-233
SUBMISSION TYPE: Initial
ACTION: Exempt
DECISION DATE: September 17, 2020
EXEMPT REVIEW CATEGORY: Category 4. Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:

(i) The identifiable private information or identifiable biospecimens are publicly available;

(ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;

(iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "health care operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or

(iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for nonresearch activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section 208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C. 552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 et seq.

Greetings,

Thank you for your submission of Initial Review materials for this project. The Sam Houston State University (SHSU) IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

*** What should investigators do when considering changes to an exempt study that could make it nonexempt?**

It is the PI's responsibility to consult with the IRB whenever questions arise about whether planned changes to an exempt study might make that study nonexempt human subjects research.

In this case, please make available sufficient information to the IRB so it can make a correct determination.

If you have any questions, please contact the IRB Office at 936-294-4875 or irb@shsu.edu. Please include your project title and protocol number in all correspondence with this committee.

Sincerely,

Chase Young, Ph.D.
Chair, IRB
Hannah R. Gerber, Ph.D.
Co-Chair, IRB

VITA

Alexis N. Taylor

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Doctorate of Education – Educational Leadership, May, 2021
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PROFESSIONAL CERTIFICATIONS

Principal EC-12
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2017-Present	Spring Independent School District, Special Education Coordinator
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2015-2016	Spring Independent School District, Special Education Department Chair
2014-2015	Spring Independent School District, Mathematics Inclusion Teacher
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RECOGNITIONS

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Dr. Carol Laing Ritter Award Recipient, Educational Leadership Scholarship, 2019
Houston Area Alliance of Black School Educators (HAABSE) Teacher of the Year Award, 2014
Honors' Award in Educational Administration, 2012
Presidential Honor's Award, 2012
H.M. Carroll Elementary Rookie Teacher of the Year Award, 2012

PRESENTATIONS AND PUBLICATIONS

Taylor, A. N., & Slate, J. R. (2020). Differences in mathematics performance by the economic status of Texas Grade 4 students in special education: Should we be concerned? In J. R. Slate (Ed.), *Exemplars of archival data analyses in K-12 and postsecondary settings.* Hauppauge, NY: Nova Science Publishers.

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Presentation at the University Council for Educational Administration Conference, Graduate Studies**,** Houston, TX.

Taylor, A. N. (2019, September). *Differences in Mathematics Performance by the Economic Status of Texas Grade 4 Students in Special Education: Should We Be Concerned?* Roundtable presentation at the Texas Council of Professors of Educational Administration Graduate Research Exchange Conference**,** Dallas, T.

Taylor, A. N., & Allen, V. (2017, July). *Paraprofessional Strategies to Support Exceptional Learners.* Presentation at the Region 4 Access to General Education Curriculum Institute**,** Houston, TX.

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