12-2023

The Effect Of Demographic Characteristics On The Mathematics Performance Of Middle School Students On A Standardized Examination

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THE EFFECT OF DEMOGRAPHIC CHARACTERISTICS ON THE MATHEMATICS PERFORMANCE OF MIDDLE SCHOOL STUDENTS ON A STANDARDIZED EXAMINATION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for

the Degree of Doctor of Education in the Graduate School

of Texas Southern University

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2023

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By

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Texas Southern University, 2023

Dr. Ingrid Haynes, Advisor

The purpose of this study was to investigate the impact of the demographic characteristics of middle school students on their mathematics performance on the STAAR examination. More specifically, this study examined the effect of the variables gender, ethnicity, and at-risk status, separate and collectively, on the four mathematics components (numerical representation and relationships, computations and algebraic, geometry and measurement and data analysis and personal financial literacy) of the STAAR's examination among middle school students.

Additionally, a 2x2x3 factorial design was used in the students. Two hundred forty (240) eighth-grade students enrolled in middle schools in the southern region of the United States. The data analysis for this study was accomplished through the application of the Three-Way Analysis of Variance and the Scheffé Multiple Comparison Statistical techniques. All four hypotheses were tested at the .05 level.

From the results, this study concludes that eighth-grade students who did not receive a free lunch possessed significantly higher mathematics scores in all sections of the STAAR's examination than those eighth-grade students who received a free lunch. Female middle school students performed academically better than their male peers on the geometry, measurement and computations, and algebraic sections of the STAAR's examination. Male, and female middle school students scored similarly on the numerical representation and relationship section as well as the data analysis and performed financial literacy section on the STAAR's examination. High-income students tend to do significantly better in mathematics on the state's standardized examination than low-income students.

Keywords: *Mathematics Performance, Middle School, STAAR examination*

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DEDICATION

As I reflect on my journey towards earning a doctorate degree, I cannot help but be overwhelmed with gratitude and humility, for it has been a path paved by the guidance of Allah and the unwavering support of my family. This transformative journey has not only been an academic pursuit but a religious and familial odyssey that has shaped me into the person I am today. Allah's guidance has been a constant presence in my life throughout this journey. I firmly believe that my pursuit of higher education was not only driven by personal ambition but also a divine plan. My faith in Allah has been my anchor, providing constant strength during the most challenging times.

My family, particularly my brothers and sisters, has helped me a lot during my success. They were pillars of support during moments of doubt and exhaustion. Whether it was offering words of encouragement or helping me manage my responsibilities, even when there was an ocean separating us your words transcended that boundary. Their sacrifices and their never-ending belief in me were everything to me.

Equally important in my journey have been my wife and children. They taught me the true meaning of responsibility, sacrifice, and love. As I balanced the roles of husband and father, they were my constant reminders of what it means to be a man. My children's innocence and my wife's resilience served as beacons of hope during the darkest hours, pushing me to persist. This journey was far from easy, filled with sleepless nights and numerous sacrifices. Yet, as I stand on the brink of the finale, I am filled with a sense of accomplishment and the realization that the trials were stepping stones, each leading me closer to my goal. The pursuit of knowledge, inspired by faith and supported by my family, has shaped my character, and instilled in me a profound sense of gratitude. As I approach the culmination of this arduous journey, I am reminded that it was not just about acquiring a doctor's degree; it was about personal growth and the love and support of my family. Thank you all!

ACKNOWLEDGEMENTS

I want to convey my deepest appreciation to the dedicated committee members who played an instrumental role in guiding me on this transformative academic journey. The invaluable guidance and encouragement provided by each of you, namely Dr. Ingrid Haynes, Dr. Ronnie Davis, Dr. Delilah Gonzales, and Dr. Emmanuel Nwagwu, have been pivotal in shaping my path to success. I am genuinely thankful for your unwavering support.

In particular, I would like to extend my heartfelt gratitude to Dr. Ronnie Davis, whose commitment to my progress has been truly exceptional. Your willingness to invest countless hours in reviewing my work and offering constant feedback has left an indelible mark on my academic and personal growth. Your mentorship extended beyond the classroom, positively impacting my day-to-day life. Your dedication not only sharpened my intellect but also contributed to the development of my character, and for this, I am deeply proud and thankful.

Last but certainly not least, I would like to express my profound appreciation to my advisor, Dr. Ingrid Haynes. Your unwavering belief in my potential, even when I doubted myself, has been a source of immense motivation. Your constant encouragement pushed me to become a better version of myself. Your influence compelled me to step out of my comfort zone, mentally preparing me for the challenges that lie ahead in life. Words fall short of expressing the depth of my gratitude and appreciation toward you. Your support is instrumental in turning my dreams into reality, and for that, I am eternally grateful.

CHAPTER 1

INTRODUCTION

Math achievement and its relationship with socio-economic status has been an enduring issue in education. Mathematic skills are increasingly important for everyday life, yet literature confirms that math achievement continues to affect a large proportion of the population, especially students of low SES. Although the US has adopted many educational policies, such as No Child Left Behind, it has not been effective in eliminating this correlation. Mathematics has been regarded as a fundamental subject because arithmetic and logical reasoning are the basis of science and technology. For this reason, educational authorities emphasize students' proficiency in computational skills and problem-solving. The existence of a significant percentage of low-achieving students is probably due to teacher-led instruction.

Instructional strategies and practices are also important to consider when looking to close the achievement gap of low SES students. Teacher preparation and tenure can lead to enhanced academic achievement as these teachers have accumulated experience can lead to the recognition and developmentally appropriate response of at-risk students. The use of higher-order thinking focuses on conceptual strategies and also enhances mathematical knowledge and student achievement (Yu & Singh, 2018). Mathematics is usually taught through direct instruction in which teachers review mathematical concepts, present the procedures required to solve tasks, and then have students practice these procedures with traditional problems (Yu & Singh, 2018). According to Yu and Singh (2018), teaching that focuses on higher-order thinking is associated with increased student performance. Standards-based instruction, which places greater emphasis on conceptual understanding, real life situations, and the integration of concepts across subjects, has been shown to have a positive relationship with student achievement. Contrary, procedural teaching has been found to negatively influence mathematic achievement.

Yu and Singh (2018) also state that US teachers use fewer conceptual teaching strategies than teachers in high-achieving countries. An example provided was of how Japanese students spend more time on inventing, analyzing, and proving, and less time on routine procedures. However, U.S. students spend most of their time on routine procedures, making connections between mathematics concepts, and developing problem-solving skills. In addition, U.S. teachers have different instructional strategies for different ability students. It was found that teachers use significantly less computation and more conceptual strategies for higher-achieving students. Yet, for students considered lower achieving, teachers alternatively use more computation and less conceptual strategies. In contrast, it was found that Japanese teachers use similar conceptual and computation strategies for lower-achieving as well as higher-achieving students. Providing students with conceptual strategies in math may be one way to enhance achievement with students of low SES.

McGraw et al. (2006) analyzed NAEP scores for students enrolled in fourth grade, eighth grade, and twelfth grade, illuminating a gender gap at the higher percentiles. “Overall, we found that gaps in scores were largest at the upper end, i.e., the 75th and 90th percentiles” (McGraw et al., 2006, p. 139). Further, this gender gap in mathematics achievement grew wider as students matriculated into higher grades. “As grade level increased, gaps became larger and more concentrated at the upper end of the percentile range" (McGraw et al., 2006, p. 146).

There is a gap in all academic areas, mathematics is an area where researchers have found significant cumulative effects on achievement (Chambers & Spikes, 2016). Studies have found that African American students score lower on national tests of math and consistently achieve at lower levels than Caucasian American students in similar-level mathematics (de Brey et al., 2019; West-Olatunji et al., 2010). Singh (2015) posited that students' math performance in the early grades could be a determining factor of their future academic success in mathematics.

Statement of the Problem

The purpose of this study was to examine the effect of demographic characteristics on the Mathematics performance of middle school students on a standardized examination. Specifically, this study ascertained the effect of the variables gender, ethnicity, and at-risk status, independently and combined on the four Mathematics components (numerical representation and relationships, computations and algebraic, geometry and measurement and data analysis, and personal financial literacy) on the STAAR examination.

Research Questions

Answers to the following questions were sought:

1. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the numerical representation and relationship component of the Mathematics section of the STAAR examination among middle school students?

2. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the computations and algebraic component of the Mathematics section of the STAAR examination among middle school students?
3. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the geometry and measurement component of the Mathematics section of the STAAR examination among middle school students?
4. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the data analysis and personal financial literacy component of the Mathematics section of the STAAR examination among middle school students?

Significance of the Study

This study provided relevant data on the significant insights into achievement patterns and demographic factors of gender, ethnicity, and SES, independently and combined on the Mathematics section of the STAAR examination of middle school students. By identifying middle students who are not performing well academically in their courses, teachers and officials, on the academic side can develop and implement strategies to assist these students in improving their academic performance on standardized tests, especially the STAAR test.

There should never be just one assessment used in making instructional decisions about a student, teacher, or school (Zernike, 2015). “Our children are dealing with an education approach that is inappropriate for their needs” (Popham, 2015, p.15). A study by Popham (2015) reveals that teachers are losing power in the classroom and are being punished for insufficient test scores. As part of her ongoing advocacy, she illustrates how unfair it is to determine a student's abilities by merely looking at their test score and stresses the importance of understanding student disabilities, language barriers, and/or mental illnesses that can make a test difficult for them. With such high pressure, schools are being forced to cheat, excessively prep for tests, and change test scores to ensure that test scores appear to meet requirements in fear of sanctions as a result of the high pressure they face today (Berliner, 2011). Awareness of this problem must be raised.

Theoretical Framework

One of the major theoretical frameworks for this study is the Cognitive Development Theory of Vygotsky suggests that social interaction is an essential part of cognitive growth. According to Vygotsky, his theory encompasses culture-specific tools, linguistic and cognitive interdependence, and the zone of proximal development. In addition, the theoretical concepts presented here are a major component of constructivism and have greatly influenced the restructuring of formal education. According to Vygotsky, cultural and social contexts are important for learning (Vygotsky, 1978). The concept of academics was Vygotsky's conviction that everyday concepts were presupposed by academic ones, but that they were at the same time fundamentally altered once acquired. His theory was that teaching children networks of interconnected academic concepts in school would have a significant impact on their way of thinking. Thus, in Vygotsky's view, intellectual development is a consequence of education. Thus, Vygotsky argued, that education promotes intellectual development.

Research Hypotheses

The following research hypotheses were formulated for this empirical study:

H_1: There is a statistically significant difference between the numerical representation and relationship of STAAR Mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

H_2: There is a statistically significant difference between the STAAR's computations and algebraic Mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

H_3: There is a statistically significant difference between the STAAR 's geometry and measurement Mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

H_4: There is a statistically significant difference between the STAAR's data analysis and personal financial literacy Mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Assumptions

The following assumptions were made about the present study:

1. It is assumed that the demographic factors gender, ethnicity, and SES, individually and collectively do have some effect on the Mathematics Performance of middle school students on a State Standardized Test.

2. It is assumed that the pre-existing data collected from the Texas Education Agency's websites are valid and reliable.
3. It is assumed that the Mathematics Performance of middle school students represents to a large extent the Mathematics Achievement of other middle school students from similar school districts.
4. Finally, it is assumed that middle school students' performance in Mathematics can truly be measured by the STAAR examination.

Limitations/Delimitations

The following limitations and delimitations were made for the current study.

1. This study was limited to archival data collected from the Texas Education Agency's websites.
2. This study was limited to middle school students attending a large urban school district located in the Southern Region of Texas.
3. The generalizations drawn from the findings of this investigation were limited to those of similar school districts in their attempts to evaluate the effect of demographic characteristics of middle school students on their Mathematics Performance.
4. Finally, the study was limited to the Mathematics Performance of middle school students on the STAAR examination for the 2019-2020 Academic School Year.

Definitions of Variables/Terms

The following variables/terms were operationally defined to provide clarity and understanding about the objective of this empirical study.

1. Academic Achievement – refers to the number of students in each middle school classroom who met the standards on the Mathematics Section of the STAAR during the 2019-2020 Academic School Year.
2. Ethnicity – refers to whether a middle school student is African American, Anglo American, or Hispanic American.
3. Gender – refers to whether a middle school student is male or female.
4. Mathematics Performance – refers to a middle school student's raw score on the Mathematics Section of the STAAR examination.
5. Middle School – refers to a public educational institution that consists of grades 6^{th} through 8^{th}.
6. Middle School Math Teacher – refers to an educator who provides classroom Math instructions to students in grades 6^{th} through 8^{th}.
7. Middle School Student – refers to a student attending a public school in grades 6^{th} through 8^{th}.
8. Public School – refers to a primary or secondary educational institution that consists of kindergarten through twelve grades.
9. Socioeconomic Status – refers to whether a middle school student is receiving a free lunch or not receiving a free lunch.
10. STAAR Examination – refers to an assessment level upon the State of Texas Academic Standards for all students in grades third through 12^{th}.
11. Suburban School District – refers to an educational enterprise that oversees the academic instruction of students from 1^{st} through 12^{th} grades in a Suburban area.

Organization of the Study

This empirical study consists of five chapters. Chapter 1 includes the Introduction of the Study, the Statement of the Problem, and the Significance of the Study. The Theoretical Framework and the hypotheses generated are stated and key variables are operationally defined.

Chapter 2 presents a review of selected literature on the Mathematics Performance of middle school students and how this phenomenon was impacted by selected demographic factors. Chapter 3 describes the design of the study. It details the type of research design, the population and research setting as well as the sampling procedure that was utilized. In addition, other sections included in Chapter 3 are the source of data, data collection procedures, and statistical analysis.

Chapter 4 consists of the organization and analysis of the data including interpretation and tubular presentations. Finally, Chapter 5 provides a summary of the study, findings, and conclusions, drawn from the study as well as discussion, implications, and recommendations for further and/or future studies.

CHAPTER 2

REVIEW OF RELATED LITERATURE

The purpose of this study was to examine the effect of demographic characteristics on the Mathematics performance of middle school students on a standardized examination. Specifically, this study ascertained the effect of the variables gender, ethnicity, and at-risk status, independently and combined on the four Mathematics components (numerical representation and relationships, computations and algebraic, geometry and measurement and data analysis, and personal financial literacy) on the STAAR examination.

This chapter includes a review of literature related to the No Child Left Behind Act, Testing History in Texas, Family Social Structures, Effect of Social Structures, Economically Disadvantaged, Students Classified as Economically Disadvantaged, Students identified as low-income in High-Income Schools, The Influence of High-Income Schools on Performance of Low-Income Students, Parental Impact on Low-Income Student Academic Achievement, Impact of Tracking Low-income Students, Mathematic Performance of Low-Income Students, Impact of Gender on Mathematics Achievement, Impact of Ethnicity on Academic Achievement, and Literacy and Reading Achievement of Low-income Students. The final section includes a summary.

No Child Left Behind Act

In 2002, a school reform was enacted, the No Child Left Behind Act (NCLB), which seemingly contributed to the growth difference in the academic achievement between low-income and high-income students. Regardless of its efforts, it did not close the academic achievement gap between the rich and the poor (Mickelson, Giersch, Stearns, & Moller, 2013; Rury & Saatcioglu, 2011). Many reformers have attempted to make small changes to improve the school system with the intention that the school system will be “transformed into a modern, well-functioning system” (Papert, 1991, p. 21). Reformers have placed their focus on issues, such as funding, school leadership roles, parental involvement, school choice, and other reforms and not on pedagogy (Haberman, 2010). Consequently, school reforms turn out to hurt children and neglect to improve schools. According to Mickelson et al. (2013), the No Child Left Behind (NCLB) Act was a failure. The objectives of NCLB were to achieve equity and excellence, through “market principles of choice, competition, standards, and accountability,” but it did not achieve the objectives (Mickelson, et al., 2013, p. 3). In lieu, the students NCLB was trying to help suffered. President George W. Bush expected NCLB to end racism in the wake of student low expectations and eliminate the achievement gap between White students and students of color (Orfield & Lee, 2005). Based on this act, all students, regardless of race, ethnicity, socioeconomic status, and other groups, were required to make yearly progress toward proficiency standards determined by the state. The NCLB required standardized test scores to measure student academic achievement (Jacob & Lefgren, 2007).

Following the implementation of NCLB, schools were to be assessed by student scores on standardized tests (Jacob & Lefgren, 2007). Under NCLB, schools were penalized for low student performance on state-mandated standardized tests; but the penalties resulted in schools cheating to raise student scores without students having the knowledge and skills (Chiang, 2009). Teachers and principals also cheated to meet accountability standards (Ravitch, 2010). On the other hand, high-stakes advocates suggest offering students and teachers external incentives (Harris, 2007). Student motivation, interests, and needs are detracted by high-stakes testing and focus points toward students' ability to successfully perform on standardized tests (Harris, 2007; Loveless 2013), though testing is a limited measure of student ability (Giersch, 2018). Harris (2007) further claimed that holding teachers accountable for low-income students' low scores is unfair because socioeconomic factors affect academic achievement which teachers have no control over.

Chambers et al. (2014) maintained that attention given to standards, accountability, and high-stakes testing has been unsuccessful in promoting student learning and development. The outcome of high-stakes standardized testing is measured by student success on the tests. For example, if students pass, they are promoted and have a chance to graduate and if they fail, earning a diploma is in jeopardy (Harris, 2007). However, Bowles and Gintis (1976) found that test scores have little contribution to a person's economic success.

Testing History in Texas

High-stakes testing intensifies the issue of school system failing students identified as low-income and students of color. Texas was a trailblazer in the high-stakes testing culture, in 1980 when the state adopted the Texas Assessment of Basic Skills [TABS]. According to Lorence (2010), "Texas was one of the first states to implement a state-wide accountability system providing data evaluating the performance of all public schools in the state" (p. 19). TABS assessed grades three, five, and nine basic skills in mathematics, reading, and writing (Cruse & Twing, 2000). Ninth-grade students could retake TABS if they failed the test and test performance was not a determining factor for high school graduation. TABS was replaced with the Texas Educational Assessment of Minimum Skills [TEAMS] in 1986 (Neumann, 2013). As reported by Cruse and Twing (2000), TEAMS increased the responsibility of students for their scores as well as the responsibility of the schools. They reported that the number of students tested increased for TEAMS and failing students schools were required to implement remediation programs. Students in grades one, three, five, seven, nine, and eleven were tested in mathematics, reading, and writing during TEAMS administration. Unlike TABS, to graduate students were compelled to pass the test in 11th grade. TEAMS came to an end in 1989 and was replaced by the Texas Assessment of Academic Skills [TAAS] (Neumann, 2013). TAAS measured reading and mathematics in grades 3–8 and 10; grades 4, 8, and 10 were also assessed in writing; and grade 8 in science and social studies every spring until 2002 (Historical Overview of Assessments in Texas, 2010-2011). Students in grade 10 were required to pass the reading writing, and mathematics exit level tests. The Commissioner of Education and State Board of Education implemented TAAS because they wanted students to achieve at higher levels (Cruse & Twing, 2000). Because TAAS scores were accessible to the public, policymakers assumed academic performance would increase since school ratings would be available for all to see (Lorence, 2010). After the enactment of the No Child Left Behind Act, the Texas Assessment of Knowledge and Skills (TAKS) replaced TAAS in 2003 (Neumann, 2013). Per the historical overview of assessments in Texas (2010-2011),

> TAKS was designed by legislative mandate to be more comprehensive than its predecessors and to measure more of the state-mandated curriculum, the Texas Essential Knowledge and Skills (TEKS), and administered in two additional grades. By law, students for whom TAKS is the graduation testing requirement must pass exit level tests in four content areas—English language arts,

> mathematics, science, and social studies—to graduate from a Texas public high school. Spanish versions of TAKS were administered in grades 3–6. (para. 17)

Finally, Texas adopted what is currently known as the State of Texas Assessments of Academic Readiness, or STAAR in 2011 (Lorence, 2010). Like the tests prior, STAAR is based on the Texas Essential Knowledge and Skills, or TEKS (Texas Education Agency, 2019). This assessment is the first of its kind to be timed, offered on paper or online allowing students four hours to complete each subsection. Each test is provided on a different day. Special Education students are given an alternative test. Using STAAR, students are tested in reading, writing, mathematics, science, and social studies beginning in grades three and culminating in grade 12. Specifically, students in grades three to twelve, take STAAR mathematics and reading; however, in 4th grade students take writing, and 5th graders take science. Once STAAR assessments are graded, each public school is given an accountability rating from A to F.

There has been disagreement with the use of the STAAR assessment by parents, students, educators, and school leaders. Ravitch (2010) cited claims that knowledge and skills are limited in the assessment, scores do not accurately measure students' knowledge, and responses are restricted to multiple-choice questions. Another critique of STAAR is that it presents a challenge for economically disadvantaged students (McGown & Slate, 2019). Although STAAR has been criticized, it is the one assessment that every public school student in Texas must take regularly and is used for accountability across the state. Most researchers use standardized test scores in their research to compare scores (Nicks et al., 2018). It is for this reason that STAAR was used in this study to measure student academic achievement in mathematics and reading. The current study used STAAR to evaluate student academic achievement.

Family Social Structures

Social class ranks affect the way the world, individuals, and others identify themselves (Kraus et al., 2012). Using social class ranks, people are separated into classes upper, middle, and lower (Lareau, 2011). Members of the upper class have “more economic resources, alongside socialization into influential networks, clubs, business opportunities that build their social and cultural capital” (Kraus & Park, 2017, p. 55). Kraus and Park found that the lower class members have lower access to land, capital goods, financial resources, and powerful groups. Inequalities in society are created by the division of classes (Kraus & Park, 2017). Low socio-economic live in poverty and often have a difficult time finding work because employers “believe that people who live in distressed neighborhoods are an unsuitable workforce” (Orfield, 2002, p. 54). Not only are people living in poverty challenged with finding work, but they also encounter unfavorable learning environments; this explains why low socio-economic people “distrust people representing institutional power and privilege” (Gorski, 2008, p. 141). When low socio-economic discern their abilities to be substandard, achieving educational goals is highly unlikely (Ivcevic & Kaufman, 2013).

Effects of Social Structures

America has social structures based on the socioeconomic status of students. Schools are no exception to producing advantages and disadvantages for low socioeconomic students (Lucey, 2010). Inequality in schools affects low socioeconomic students’ educational opportunities (Drake, 2017). Schools “advantage high-SES students but disadvantage low-SES students" (Jury et al., 2017, p. 29) by promoting the dominant culture. Schools have an unequal effect on "children from different social classes, and whose success varies considerably among those upon whom it has an effect, tends to reinforce and to consecrate by its sanctions the initial inequalities" (Bourdieu, 1973, p. 266). Schools and social orders are changed into academic social scales with the appearance of basing academic achievement on skills or talents (Bourdieu, 1973). Social structures directly and indirectly affect school structures which influences students' level of educational success (Kraus & Park, 2017). Orfield and Lee (2005) noted that community socioeconomic segregation is a precursor to segregation in schools. Educational inequality is the result of the increase of segregation in schools (Jury et al., 2017; Orfield, 2002; Shirley, 2011). School structures are not "used to sustain a sense of agency among those they shelter; instead, they legitimate treatment, remediation, control – anything but difference and release" (Greene, 1995, p. 41).

Schools imitate the relationships of power and oppression in society "through competition, success, and defeat in the classroom" (Bowles & Gintis, 1976, p. 106). Low socioeconomic students have difficulty completing assignments because they are not familiar with the school's structure that aligns with the dominant culture in society (Goudeau & Croizet, 2016). Gleasure's (2020) case study investigated low socioeconomic secondary students' school settings. Online surveys and semi-structured interviews were used to determine the experiences of students from low-SES backgrounds. Findings indicate positive experiences of low SES students as they developed friendships, participated in extra-curricular activities, and teacher support.

Economically Disadvantaged

Income achievement gap inequalities have increased over the years. The extent of increased income-related achievement gaps, Reardon (2013) examined the relationship between family income and student achievement in the United States. In Reardon's analysis, it was found that the reading achievement gap by socioeconomic status continues to widen. Also, in the study, Reardon (2013) disclosed that there was a decrease in racial inequality, though economic inequality achieved "historic highs" (2013, p. 12). Consequently, Reardon (2013) alleged that reducing the inequality gap calls for schools and stakeholders to jointly combine their efforts.

Students Classified as Economically Disadvantaged

Under the National School Lunch and Child Nutrition Program, economically disadvantaged students are eligible for free or reduced-price meals [Source: 2007-2008 PEIMS Data Standards]. Students who do not possess assets equal to the dominant culture are considered disadvantaged in education (Reay et al., 2009). A student's socio-economic status affects academic achievement (Caldas, 1993; Majoribanks, 1996; McNeal, 2001; Rumberger & Willms, 1992). Low SES is related to a lack of language skills, reading skills, letter recognition skills, and math (Aikens & Barbarin, 2008). On the other hand, students from higher SES homes have acquired basic math skills more than those from lower SES homes (Coley, 2002). Duncan and Magnuson (2005) found that having money does not account for increased academic achievement, but higher income can open doors to unlimited opportunities.

Low-income students face barriers such as economic and psychological to education (Jury et al., 2017). Psychologically, low-income students experience negative stereotypes about their intelligence (Jury et al., 2017). Low-income students are inclined to feel their teachers consider them unable to achieve compared to high-income students (Thiele et al., 2017). Low-income students also understand that there are differences between their socio-economic class with regard to receiving free lunches, school supplies, care packages, school uniforms, and class funds and they try to conceal these differences from their peers (Thiele et al., 2017). Thiele et al.'s (2017) study found that those with a lack of capital (economic, social, and cultural) are disadvantaged in various ways that can be detrimental to their educational opportunities and outcomes from an early age, which "influenced their engagement with education, including their motivations for overcoming obstacles, achieving high grades and pursuing HE [higher education]" (p. 63).

Avvisati (2020) found significant differences related to indicators of socio-economic background and achievement from data analyzed in the Programme for International Student Assessment (PISA). Furthermore, research indicates that the differences in the relationship between socioeconomic background and achievement are dependent on individual characteristics or the school characteristics attended by students (Sirin, 2005). Research by Bannerjee (2015), Gabriel et al. (2016), and White et al. (2016) reveal the direct relationship between family socioeconomic status and student achievement. Lareau (2011) noted that parents' socio-economic status is a judge of the future status of their children.

Students Identified as Low-income in High-Income Schools

Regarding academic development low-income students who attend rich schools have advantages and disadvantages. It is beneficial for low-income students to have advantaged peers (Harris, 2007). Boger (2005) posited that contrasted with low-income students attending high-poverty schools, low-income students at wealthy schools exhibited substantial academic achievement growth because of the many opportunities afforded them. On the other hand, numerous studies have shown that low-income students who attend middle-class schools have “higher expectations and more educational and career opportunities” (Orfield & Lee, 2005, p. 16). Harris (2007) maintained that the academic achievement for disadvantaged students increased with the integration of the curriculum but had no effect on students from a high SES background.

Low-income students are aware of their social status and how others view them, which affects their sense of belonging (Gaztambide-Fernandez & DiAquoi, 2010; Thiele et al., 2017). Stereotyping plays a part in low-income students’ sense of belonging in affluent schools. Underprivileged students are often misjudged by their teachers and peers (Ispa-Landa, 2013; Matrenec, 2011; Thiele et al., 2017). Ispa-Landa (2013) also argued that Black, low-income students placed in lower tracks are viewed as trouble makers and underachievers, and these stereotypes are used for social exclusion.

Caldas and Bankston (1997) found that low SES students score better on standardized tests when attending wealthier schools with their peers. A growing body of research has connected students’ SES to standardized test performance. A study by Perry and McConney (2010) found that students of all SES backgrounds standardized test scores increased equally from attending a school with higher income students. A study conducted in New York City found that achievement gaps in both economic and high-income, White, and Asian students on state ELA and Math exams were higher for economically advantaged students (Kirkland & Sanzone, 2017). The same study found that low-income students benefited more from attending racially diverse schools (Kirkland & Sanzone, 2017).

Differences in socioeconomic backgrounds were related to resources available in wealthier schools. Poor schools that serve low-SES have limited resources which affects the quality of education that can be provided by wealthier schools. In most states, public school funding levels are based on local property taxes, and wealthier areas have higher property values that are able to direct more money to schools (Biddle & Berliner, 2002). In poorly funded schools, there is a lack of resources and less access to specialized equipment, and less access to tutoring (Duncombe, 2019). Under-funded schools are likely to be attended by Indeed, low-SES students who are exposed to improper textbooks, technological resources, overcrowded classrooms, and poor facilities (Biddle & Berliner, 2002; Fine & Burns, 2003).

The Influence of High-Income Schools on Performance of Low-Income Students

Schools in the suburbs make up "more than half the U.S. population, an even higher percentage of voters, and an overwhelming majority of elites" (Orfield, 2002, p. 28). The educational system serves the elite or the "classes or groups from whom it derives its authority" (Bourdieu & Passeron, 1990, p. 114). Durkheim (2000) contends that a student's standard of education differs from one area to another. Students who attend high-income schools have different educational experiences than those who do not attend this kind of school (Rury & Saatcioglu, 2011). Students who attend high-income schools are exposed to more academic resources, advanced classes, and abundant financial resources in contrast to low-income neighborhood schools (Orr & Rogers, 2011; Poesen-Vandeputte & Nicaise, 2015; Werblow et al., 2013).

Destin et al. (2019) collected data during the 2015-2016 school year from a sample of adolescents to examine the relationships between SES, students' mindsets, and student grades. To measure students' grades in language arts, mathematics, science, and social studies, the researchers collected administrative records. Destin et al. (2019) findings revealed that higher-SES background students believe intelligence and abilities can grow through effort in contrast, lower-SES students have a fixed mindset and believe that their intelligence and talents cannot be changed, which means all SES students are academically successful when they do not hold a fixed mindset. Destin et al. (2019) concluded that low-SES students' academic achievement is impacted by a fixed mindset

Boaler et al. (2018) study consisted of an online course to change students' minds about mathematics and their ability to improve their mathematics achievement. In this experimental study, two groups were randomized to examine middle school students' beliefs about math, engagement during class, and their state test achievement. Students completed a pre-and post-survey, to measure the success of a mindset shift effort by 156 students. Students in the treatment group took online math classes. During teacher observation, they detected four dimensions of engagement: (a) student participates in class discussions, (b) student works as hard s/he can, (c) student appears to be involved in classwork, and (d) student gives up quickly" (p. 4). These findings showed reasons students in the treatment group achieved significantly higher levels on state mathematics tests. Findings showed that regardless of ethnicity, gender, and SES, the online class improved students' belief and achievement in mathematics. Math class engagement was shown to improve achievement and eliminate negative ideas about math performance. According to Boaler and Zoido (2016), students who consider mathematics as a subject that allows one to think conscientiously about ideas achieve higher scores than those who view mathematics as memorization.

In another study, Claro, Paunesku, and Dweck (2016) examined the relationship between SES, mindset, and achievement test scores of students in Chile. Among this population of students, a negative association was found between SES fixed mindset that produced lower achievement test scores compared to higher SES students. On the other hand, Hwang, Reyes, and Eccles (2016) reported different relationships. They found students from high socio-economic backgrounds had a fixed mathematics mindset that yielded negative achievement test scores. Based on the results, Hwang et al. (2016) suggested future research should be conducted on the outcome of mathematics academic performance related to fixed mindsets and how they directly influence school performance.

Parental Impact on Low-Income Student Academic Achievement

Overall, compared to advantaged children, low-income children performed poorly on standardized achievement tests (Lareau, 2011; OECD, 2011). Researchers in the United States agree that economically disadvantaged students do not perform as well academically as students from higher socioeconomic status; however, researchers disagree on the explanations of this achievement gap (Allington et al., 2010; Gordon, 1996; Lareau, 2000, 2011; Rothstein, 2008).

In a mixed-method study, Renth et al. (2015) examined the extent income was related to the achievement gap in a rural school and investigated low-income parents' perceptions of factors contributing to the achievement gap. Sixty-two low-SES students provided quantitative data and compared a sample of higher-income students. Six low-

SES parents were interviewed and provided qualitative data regarding their perception of factors that affect their children's performance.

From the parent interview, four themes emerged: "parental involvement and capacity, access to resources, the role of the schools and limits, and American societal and governmental systems"(p.77). Considering the first theme, parents admitted they were not involved in their children's education; however, they felt parental involvement was an urgent issue that affects low-SES students' academic progress. Parents addressed additional sources contributing to the achievement gap within the three themes such as limited access to resources, the inability to access technology, and other institutional and social factors. Parents also noted that the way the American governmental system is organized is unfair to low-income families by imposing unrealistic testing requirements, and failure to provide adequate financial assistance to low-SES families. Schools also play a role that impacts parental involvement. According to the participants, schools' ineffective communication with parents, and high-stakes testing requirements contribute significantly to social class systems in the school.

Academic achievement gaps were confirmed from the quantitative data between low-SES students and higher-SES students. Low-income students perform poorly when compared to higher-income peers. The students in the low-SES sample performed below the higher-SES academically on standardized achievement tests. Overall, the study results showed that gaps in educational achievement are not limited to the urban context, but are also evident in rural regions. The findings of the study also revealed that low-income parents believe educational gaps are the result of the interaction of education policies and officials.

Machebe et al. (2017) also explored the effect of socio-economic status and parents-child relationship on student's academic performance. The sample population consisted of three hundred randomly selected students. To determine parental income effect on students' academic performance a questionnaire was completed using a four-point Likert scale. Students' academic achievement was determined by grade point averages. Their study indicated that students from financially stable families have greater academic achievement. Machebe et al. (2017) noted that parental socio-economic background impacts the academic achievements of students. In their study, the researchers confirmed that children with professional parents have the capability to improve in their academic journey because parents can provide the necessary learning materials their children need. It is recommended that parents continuously encourage their children, provide moral support, and have confidence in their children's academic work.

Impact of Tracking Low-income Students

It is customary for suburban schools to track students by making it seem that tracks are based on merit; when tracking is used to exclude low-income students (Rury & Rife, 2018). Tracking gives opportunities to high SES and disproportionately assigns low-income students to lower tracks (Drake, 2017). According to Werblow et al. (2013), low-SES students are disadvantaged through the use of tracking. Giersch (2018) affirmed that tracking advanced high-income students leaves low-income students behind. As a general rule, low-income and ethnic minority students are placed in remedial classes, whereas, high-income students are enrolled in advanced classes to receive highly demanding curricula (Batruch et al., 2018; Mickelson et al., 2013; Noddings, 2008;

Werblow et al., 2013). Lower tracks affect the abilities and academic achievement of students (Giersch, 2018; Werblow et al., 2013).

Curricular academic tracking "assigns students to academic paths and courses that guide their career through high school" (Drake, 2017, p. 2425). Batruch et al. (2018) posited that tracking prohibits low-income students from gaining higher education and achieving higher academic goals. Kelly and Price (2011) investigated differences between schools in course-taking policies and explored the factors that could explain why some schools have sophisticated tracking systems even though other schools have a lesser scope of tracking students. Their study found that students who are tracked remain until graduation. As previously noted by Giersch (2018), students' achievement is affected by tracking. The wide gap between high-income and low-income students is associated with high-stakes testing and tracking (Mickelson et al., 2013).

Nonetheless, educational inequality has a negative consequence and is strengthened by tracking, which remains the practice in American schools (Loveless, 2013; Schofield, 2010; Werblow et al., 2013). Although tracking falls short of improving student performance and providing equal opportunities for all students (Van de Werfhorst & Mijs, 2010), it continues to thrive (Loveless, 2013). Advocates of tracking contend that detracking would cause lower achievement for students on higher tracks (Loveless, 2013). Supporters of tracking advocate for accelerated reading and math programs, because students on higher tracks tend to be high-income students (Landeros, 2011).

Mathematic Performance

The National Center for Children in Poverty (2018) reported that in Texas, almost one-fourth of the children less than 18 years of age were from poor families. Flores's

(2007) study confirmed that low-income students such as Black and Hispanic students are not provided the same opportunities to be successful in mathematics. Based on the results, he found that the economic status of students was exhibited in mathematics performance. Flores (2007) concluded that students' mathematics performance was negatively related to poverty.

According to Hernandez (2014), SES had a strong negative correlation with the standardized test mathematics scores. Multiple Linear Regression was used to test the hypothesis "There is a significant negative relationship between the FCAT 2.0 mathematics scores and SES" (p. 2). It was determined that there is a significant relationship between middle school students' mathematics scores on the standardized test and SES, which means as low-income students increased, the students' passing rates decreased. The study concluded that the standardized test mathematics scores of middle school students in Florida have a significant negative relationship with SES. Nisbett (2011) states that "people with low SES have lower IQ test scores" (p. 91).

Davenport and Slate's (2019) causal-comparative study was concerned with the degree to which mathematics performance differed among the economic status of students in Texas after the administration of the STAAR test. Three levels of mathematics performance were addressed: "(a) Approaches Grade Level, (b) Meets Grade Level, and (c) Masters Grade Level" (Texas Education Agency, 2017). A causal-comparative research design was used because mathematics performance had already occurred based on the independent variable of economic status and the dependent variables of mathematics performance (Johnson & Christensen, 2017). Low-income students scored poorest in mathematics in all three mathematics standards, whereas, high-income students scored the best. These results are consistent with the effects of poverty on reading performance identified by other researchers (Burchinal et al., 2011; Conradi et al., 2016). Suggestions based on the findings to improve students' mathematics performance included: "(a) additional funding should be supplied to schools with high enrollment numbers of students who are economically disadvantaged, (b) teachers, campus administrators, and district personnel should begin to monitor students identified as economically disadvantaged before state testing begins, and (c) schools should also be provided with additional support to provide interventions to students who are economically disadvantaged as early as possible " (p. 173).

Lee and Slate (2014) examined the relationship between SES and statewide reading and mathematics performance. They reported a statistically significant difference between poor students' low performance in reading and mathematics compared to their affluent peers. In a similar study, McGown (2016) analyzed the relationship between economic status and reading scores on the State of Texas Assessment of Academic Readiness (STAAR). She also documented that there were statistically significant differences in the reading achievement of economically disadvantaged and economically advantaged students.

Impact of Gender on Mathematics Achievement

Mathematics is a core content area vital to student learning in science, technology, and engineering subjects. In the United States, gender disparities show that female and male students have similar scores on math tests, but females score better on reading tests (Cimpian et al., 2016; Fryer & Levitt, 2010; Lee, Moon, & Hegar, 2011; Robinson & Lubienski, 2011; Sohn, 2012). More often than not, stereotypes about gender align with the notion that math Is a male subject because White male adolescents have higher math motivational beliefs than White female adolescents (Sax et al., 2015, Su et al., 2009, Umarji et al., 2018).

Reardon et al. (2019) provided detailed information about gender differences between math and English Language Arts among grades 3 through 8 in various U. S. school districts. Aggregated state accountability tests were provided by the EDFacts database. The EDFacts data include "counts of students scoring at each state-defined proficiency level (e.g., ''Below Basic,'' ''Basic,'' ''Proficient,'' and ''Advanced'') on state accountability tests" (p. 2482). During an eight year span, female test scores surpassed male student scores in each ELA proficiency category. In contrast, math scores were slightly slanted toward male students. On an average, Reardon et al. found that by grade 8, females and males in most school districts had similar math test scores, however, on ELA tests females remained ahead of male peers.

Penner and Paret (2008) analyzed gender gaps in the mathematics achievement of students and found that parental education and race, affect gender differences and predicted male, and female distributions along the range of scores. This ". . . male advantage at the top of the distribution is most pronounced among students whose parents have a college or advanced degree" (Penner & Paret, 2008, p. 250). Such a finding ". . . is interesting in that it indicates that the male advantage at the top of the distribution is mediated by socioeconomic factors in a way that the female advantage at the bottom does not appear to be" (Penner & Paret, 2008, p. 250).

Fryer and Levitt (2010) analyze the appearance of the gender gap in math to shed new light on community characteristics where girls were more likely to experience a wide gender gap in mathematics performance. Fryer and Levitt's (2010) study found that female students living in high socioeconomic communities and whose parents were highly educated experienced the greatest gender achievement gap. Fryer and Levitt (2010) further found that schools located in suburbs favored males in contrast to schools in rural areas.

Reardon et al. (2019), showed a variation in gender performance according to socioeconomic factors. Males who come from higher-income families had a mathematics advantage. Reardon et al. stated "In wealthier school districts and in school districts with more socioeconomic gender inequity, math gaps favor males more, on average" (pp. 20-22). The researchers further affirmed that schools with high performance give preference to males in mathematics achievement "Districts with higher math performance tend to have more male-favoring math gaps" (Reardon, et. Al., 2019, p. 20).

Not only are male advantages given in mathematics on state assessments, but national assessments also showed gender gap inequities (McGraw et al., 2006). McGraw et al. (2006) studied NAEP scores in grades four, eight, and twelfth that showed a gender gap at the higher percentiles. McGraw et al. (2006) declared "Overall, we found that gaps in scores were largest at the upper end, i.e., the 75th and 90th percentiles" (p. 139). As students entered higher grade levels, the mathematics achievement gap widened. The authors expressed "As grade level increased, gaps became larger and more concentrated at the upper end of the percentile range" (McGraw et al., 2006, p. 146).

Meinck and Brese's (2019) studied trends in mathematics gaps. Using 20 years of evidence it was determined there was a male advantage in mathematics. Meinck and Brese (2019) closely examined trends in students' scores and found that males were consistently among the highest-performing students in mathematics. However, in recent years, a small number of female students fell below the 20th percentile. Further, this ". . . gender gap in favor of boys widened over the last 20 years. . ." (Meinck & Brese, 2019, p. 8).

Pope and Sydnor (2010) compared eighth-grade NAEP mathematics scores for males and females. A repeated pattern of similar scores was revealed for females and males, still with male students ". . . disproportionately represented at the top of test scores in math and science" (Pope & Sydnor, 2010, p. 107). Further analysis of data by Pope and Sydnor (2010) learned that male to female ratio of achievement varied across geographic locations in the U.S. "Across states and regions, there is substantial variation in these high-end gender ratios, and this variation tends to be geographically clustered" (Pope & Sydnor, 2010, p. 107).

Impact of Ethnicity on Academic Achievement

In the past 20 years, the demographic of students attending public schools within the United States has undergone a dramatic change. The United States has undergone a dramatic change in the demographics of students in public schools in the past two decades. With the flux of diverse students in the classroom, African American students continually score lower in academics than their Caucasian peers. A gap exists in all academic areas that affect achievement; however, researchers have found a significant discontinuity in mathematics (Chambers & Spikes, 2016; Kotok, 2017). Studies by de Brey et al. (2019) and West-Olatunji et al. (2010) report African American students consistently score lower in math on national tests than their White peers. Additional studies by Byun et al. (2015) and Schiller et al. (2010) have suggested that African

American students lag behind Caucasian American students in similar-level math courses.

Singh (2015) proposed that math performance in early grades could be a defining factor of their future success in mathematics. Regarding racial/ethnic differences, White and Asian American students score higher in math than Latina/o and Black students (Andersen &Ward, 2014; Brown & Leaper, 2010).

Rojas-LeBouef (2010) analyzed data from the Texas Assessment of Academic Skills (TAAS) and the Texas Assessment of Knowledge and Skills (TAKS) to examine differences in reading and mathematics among Hispanic and White students in grade 5. According to the data, Rojas-LeBouef (2010) found that White students outperformed Hispanic students on TAAS and TAKS Reading and Mathematics tests.

Since the enactment of No Child Left Behind (2001), the researcher found that passing rates on the state test for White students ranged from 71.82% to 93.41% for reading and from 80.85% to 97.92% for mathematics compared to Hispanic student scores ranging from 54.19% to 85.93% for reading and from 67.31% to 96.42% for mathematics. A study conducted in Texas by Harris (2018) analyzed the reading performance of students on STAAR according to ethnicity. Harris performed her study based on a similar study conducted by McGown (2016). Harris (2018) found statistically significant differences between reading scores on STAAR for Asian, Black, Hispanic, and White students. Blacks scored significantly lower than the three groups in all STAAR reading categories. Similarly, lower scores were reported for Hispanic students on the reading sections of STAAR than Asian and White students. In addition, Asian students scored higher than their White peers. According to Harris (2018), “the differences in the percentages of students who met the state-mandated performance standard were the largest between Asian students and Black students with the differences being 36% (2012-2013), 36.5% (2013- 2014), and 40.5% (2014-2015)" (p. 119). The findings of Harris (2018) showed a regular pattern based on ethnicity for the STAAR Reading assessment.

Rojas-LeBouef (2010), McGown (2016), and Harris (2018) all agree that there are academic achievement disproportions by ethnicity on TAAS, TAKS, and STAAR state-mandated assessments. They also agree that ethnicity gaps existed in reading and mathematics in Texas.

In an explanatory mixed methods study, Morton (2014) explanatory mixed method study examined the mathematical problem-solving skills of African American female students.' The study consisted of 52 sixth through eighth graders who participated in a longitudinal study called Mathematical Identity Development and Learning Project (MIDDLE). The study was conducted in two phases: (1) administration of proportional reasoning, and (2) students' perceptions of proportional reasoning. Morton tested the following research questions: "What strategies do African American female students employ during mathematical problem-solving? How do African American female students understand proportionality concepts? How do African American female students perceive themselves as mathematics learners?" (p. 236).

The study results showed that more than 50% of participants performed unsatisfactorily on the proportional reasoning section scoring 0 or 1 in each of the three years' first phase. During the second phase, participants were asked about their perceptions of proportional reasoning, and from their responses they believed in their mathematics ability more than what was demonstrated. According to Morton (2014), strategies used by Black female participants mirrored those used by their White peers. Morton concluded that underlying factors must be present outside of African American female students' thinking that impact mathematical performance. Future research was suggested to examine factors that contribute to African American female performance in mathematics using a larger sample.

To counterbalance negative stories regarding Black girls in mathematics, Young et al. (2018) examined Black girls using the National Assessment of Educational Progress (NAEP) data management tool to retrieve data using the National Center for Educational Statistics (NCES) from 2005 to 2015. Young et al. compiled mathematics data on Black girls to determine achievement customs and differences between the grade levels' achievements. The assumption was that more exposure to mathematics after fourth grade would lead to higher performance in mathematics for eighth-grade girls.

Young et al. (2018) findings were slightly disturbing in that math exposure did not increase eighth-grade performance. The most substantial increase in eighth grade was in the Measurement category and their overall performance increased in all areas. Specifically, there was a 16% performance increase overall for Black girls who took the NAEP assessments. Inclinations from the data showed that fourth graders were strong in Algebra, yet it was a cause for concern for eighth graders. Based on Black girls' decrease in fourth through eighth-grade mathematics performance, a study is warranted to investigate why there is a decrease.

Test Format Impact on ELA and Mathematics. From the 2008-2009 school years, Reardon et al. (2018) quantitative study examined the test scores of fourth through eighth-grade students from approximately eight million. Using the data from the National Assessment of Educational Progress (NAEP) and Northwest Evaluation Association (NWEA), the researchers wanted to determine if there was a relationship between test item format and male-female gender differences on state achievement tests. Moreover, they sought to test if there was a relationship between grade levels in ELA and mathematics. The findings from the study revealed that variation in male and female achievement gap was dependent on test item format. Reardon et al. also found a negative relationship between response items in ELA and mathematics by gender achievement gap across fourth- and eighth-grade students. Since data was gathered from 2008-2009, the findings are not applicable may not to recent testing.

Self-efficacy and Mathematics. Louis and Mistele's (2012) study sought to increase awareness of the relationship between 8th-grade students' mathematics achievement scores, gender, and self-efficacy. Using data from the Trends in International Mathematics and Science Study (TIMMS) revealed a gender difference in mathematics subjects (Number, Algebra, Geometry, and Data) in the United States. The sample population was composed of 239 eighth-grade schools and 7,377 eighth-grade students. The researchers collected data specifically from four separate survey instruments: (a) student achievement assessment in mathematics and science, (b) a student survey, (c) teacher survey, and (d) a general school survey (Louis & Mistele, 2012, p. 1170). The male participants in the study scored higher than the female students in Geometry, Data, and Number. However, ". . . the area of Algebra showed a statistically significant difference between females and males' achievement scores, where female's achievement scores were higher than males" (Louis & Mistele, 2012, p. 1175). In addition, Louis and Mistele (2012) found that there was a gender difference in self-efficacy identified in mathematics. "We found that males exhibit statistically significant higher self-efficacy levels when compared to females in mathematics" (Louis & Mistele, 2012, p. 1174). According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), 2017), Self-efficacy in STEM-related subjects can have an influence on STEM outcomes (p. 44) and the gender gap (Cheema & Galluzzo, 2013). "Those who have a strong sense of self-efficacy in mathematics or science are more likely to perform well and to choose related studies and careers" (UNESCO, 2017, p. 46).

Usher (2009) and Usher and Pajares (2009) examined sources of self-efficacy such as emotional, cognitive, or motivational processes with middle school students in mathematics. Skaalvik and Skaalvik (2006) conducted a longitudinal study of middle school and high school mathematics students that revealed self-perceptions were a predictor of future achievement rather than prior achievement. They found that self-concept and self-efficacy came together to improve academic achievement. In contrast, no evidence was found to support self-perception influence on later achievement in mathematics.

Success in Mathematics Predictors. A quantitative study by Siegler et al. (2012) examined the effect of early knowledge of fractions to determine mathematics achievement in adolescents. Siegler et al. used two different samples, one from a British Cohort Study (Butler & Bynner, 1980; Bynner, Ferri, & Shepherd, 1997) composed of 3,677 children from the United Kingdom, and another sample collected in the United States from the Panel Study of Income Dynamics-Child Development Supplement (Hofferth et al., 1998) with 599 children. In phase one, children ages 10 to 12 were involved and the second phase included children ages 15 to 17. The primary hypothesis tested by the researchers "was that knowledge of fractions at age ten would predict algebra knowledge and overall mathematics achievement in high school, above and beyond the effects of general intellectual ability, other mathematical knowledge, and family background" (p. 693).

Bivariate and multiple regression analyses were conducted and Siegler et al. (2012) found similar data between the two samples. The data revealed that mastery of fractions was an overall predictor of mathematics achievement more than algebra knowledge, which supports the researchers' hypothesis. Furthermore, division was found to be the second most significant factor in mathematics success. Siegler et al. suggested early exposure of students to more instruction of fractions and division for mastering mathematics content. However, a more in-depth look into demographic factors on gender and ethnicity could prove beneficial to current students in the United States.

Literacy and Reading Achievement of Low-Income Students

Consistently, researchers have shown that the academic success of students depends on family income (Hagans & Good, 2013; Reardon, 2013; Saez, 2012). This "income inequality gap" (Reardon et al., 2012, p. 29) appears in the results of standardized testing of literacy (Reardon, 2013).

The decrease in reading achievement scores has been an inclination for years by state assessments among eighth-grade students. The National Assessment of Educational Progress (2015) performs a continuing assessment of trends in various subjects in fourth, eighth, and twelfth grades of American student achievement. Grade levels 4, 8, and 12 are considered "critical junctures in academic achievement" (NCES, 2015, para. 1).

According to the NAEP (2015) report, eighth-grade reading scores were lower than what was reported in 2013 (Nation's Report Card, 2015). Approximately 34% of eighth-grade students are performing at or above the proficient level in reading. Although the report indicated no change in eighth-grade students' reading scores from 2013 to 2015 (Nation's Report Card, 2015), the reading score changed for eighth-grade students in Texas to reflect a 3-point decline.

In Texas, reading skills in STAAR are reported in three categories of genres across genres by determining "the meaning of unfamiliar English words through the use of context, and comparing and contrasting themes or moral lessons" is assessed in (Texas Education Agency Student Assessment Division, 2011, para. 3). In addition, students must demonstrate the ability "to comprehend and analyze literary texts (fiction, poetry, drama, literary nonfiction) for elements such as foreshadowing, character development, sensory detail, and figurative language" (Texas Education Agency Student Assessment Division, 2011, para. 4). Lastly, students must be able "to comprehend and analyze informational texts (i.e. expository, persuasive) by demonstrating the ability to summarize the main idea and supporting details, analyze organizational patterns and text features, and make logical connections between ideas and across texts" (Texas Education Agency Student Assessment Division, 2011, para. 5). Concerning the degree of literacy and the extent disparities exist by economic status remain questionable.

McGown and Slate (2019) investigated differences in students' STAAR reading performance due to economic disadvantage for Texas students. Data were obtained for three years of scores from the Texas Education Agency on all Texas students. Based on grade level 5 results, students in poverty had lower scores in reading; therefore, Reardon et al. (2012) concluded poverty matters. This difference in performance can be explained partly by the fact that students from low-SES families lack academic opportunities and rigor and are more likely to be reared in a poor information environment with limited exposure to books and reading material (Burney & Beilke, 2008).

In a similar study, McGown (2016) analyzed the reading scores on STAAR and the relationship of economic status. She discovered that the economic status of students receiving free or reduced lunch had poor reading skills compared to those not on free or reduced lunch. Similar to McGown (2016) Harris and Slate (2017) focused their study on the relationship between economic status and the reading performance of students and found reading scores decreased when their poverty level increased.

Summary

This review of the literature showed factors that affect students' academic performance on standardized testing in mathematics and reading. Students from low-income families score lower on the State of Texas Assessment of Academic Readiness (STAAR) compared to students from high-income families. Math achievement and its relationship with socio-economic status has been an enduring issue in education. Mathematic skills are increasingly important for everyday life, yet literature confirms that math achievement continues to affect a large proportion of the population, especially students of low SES.

With the introduction of The No Child Left Behind Act requiring high-stakes testing has been responsible for widening the gap between low-SES and high-SES students (Mickelson et al., 2013). Low-income students families are at a disadvantage in the classroom because of fewer opportunities (Jury et al., 2017), negative stereotypes and perceptions (Thiele et al., 2017), and fragmented social structures (Maunder et al., 2012). Kraus et al. (2012) noted that social class structures impact the way low-income students view themselves. A wider gap between student achievements is also affected by the classroom (Gourdeau & Croizet, 2016).

CHAPTER 3

METHODOLOGY

The purpose of this study was to examine the effect of demographic characteristics on the Mathematics performance of middle school students on a standardized examination. Discussion in this chapter of the study is divided into the following twelve (12) sections: (1) Type of Research Design; (2) Population and Research Setting; (3) Sampling Procedure; (4) Data Source; (5) Instrumentation; (6) Validity of the Instrument; (7) Reliability of the Instrument; (8) Data Collection Procedure; (9) Identification of Independent and Dependent Variables; (10) Null Hypotheses; (11) Statistical Analysis; and (12) Examination of Statistical Assumptions.

Type of Research Design

A 2 x 2 x 3 Factorial Design (See Figure 1) was employed in this study. Gender (male and female) ethnicity (African American, Hispanic, and White), and SES (Free lunch and non-free lunch) are the independent variables. The STAAR's Mathematics Component Scores were the dependent variable.

The factorial design as a methodological paradigm allowed the researcher the opportunity to manipulate two or more variables simultaneously to study the independent and combined effects of the independent variable on the dependent variable (Mertler & Vannatta, 2021). Additionally, the factorial design utilized in this investigation will not only provide the researcher with the opportunity to examine the differences between mean Mathematics scores of Student groups but also to test for any interaction effects between the various levels of the independent variables (Mertler & Vannatta, 2021).

Figure 1*: 2x2x3 Factorial Design*

	C_1 Free Lunch			C_2 Non-Free Lunch		
	African Am B_1	Anglo Am B_2	Hispanic B_3	African Am B_1	Anglo Am B_2	Hispanic B_3
Male A_1	$A_1 B_1 C_1$	$A_1 B_2 C_1$	$A_1 B_3 C_1$	$A_1 B_1 C_2$	$A_1 B_2 C_2$	$A_1 B_3 C_2$
Female A_2	$A_2 B_1 C_1$	$A_2 B_2 C_1$	$A_2 B_3 C_1$	$A_2 B_1 C_2$	$A_2 B_2 C_2$	$A_2 B_3 C_2$

Population and Research Setting

The population for this study consists of Middle School Students who attended Public Schools in the State of Texas during the 2019-2020 academic school year and who had taken the STAAR examination. The target school district is the largest in the State of Texas and the eighth largest school district in the United States.

Moreover, the School District has a Student Clientele of 194,607. Regarding ethnicity, 62.01 percent of the students are Hispanic, 22.19 percent African American, 4.45 percent Asian, and 9.51 percent White. In addition, 79.17 percent of the students are economically disadvantaged. There are 276 schools housed in the school district 39 of these are middle schools (HISD Facts and Figures, 2020-2021).

Sampling Procedures

Two probability sampling procedures are used in this study. They are the Stratified Sampling and Simple Random Sampling procedures. The Middle School Students who were selected for this study were stratified according to the independent variables (gender, ethnicity, and SES). These students were then classified into 12 subgroups based on the new independent variable (Privitera, & Ahlgrim-Delzell, 2019).

First, the middle school students are categorized into groups based on their gender (male and female). Secondly, according to ethnicity, the Middle School Students were categorized into three ethnic groups – African American, Hispanic American, and Angelo American. Thirdly, the Middle School Students were categorized into two groups concerning their SES (free lunch and non-free lunch). A total number of 360 Middle School Students were randomly selected to participate in this study. This process involved an equal number of cases, thirty (30) Middle School Students randomly selected from each subgroup.

The sample was stratified into the following twelve categories based on the Middle School Student's gender, ethnicity, and SES.

1. Thirty (30) African-American Middle School male students receiving free lunch;
2. Thirty (30) African-American Middle School male students receiving no free lunch;
3. Thirty (30) Anglo American Middle School male students receiving free lunch;

4. Thirty (30) Anglo American Middle School male students receiving no free lunch;
5. Thirty (30) Hispanic Middle School male students receiving free lunch;
6. Thirty (30) Hispanic Middle School male students receiving no free lunch;
7. Thirty (30) African American Middle School female students receiving free lunch;
8. Thirty (30) African American Middle School female students receiving no free lunch;
9. Thirty (30) Anglo American Middle School female students receiving no free lunch;
10. Thirty (30) Anglo American Middle School female students receiving no free lunch;
11. Thirty (30) Hispanic Middle School female students receiving free lunch; and
12. Thirty (30) Hispanic Middle School female students receiving no free lunch.

Sources of Data

The archival data used in the present study was obtained from the Texas Education Agency's websites. The primary role of TEA is to assist and support Public Schools within twenty educational regions for the State of Texas.

Furthermore, the Texas Education Agency (TEA) was mandated in 1994 under the Safe School Act to develop and maintain a data collection system on Public School Students (Texas Education Agency, 1994). Based on the above ACT enacted in 1994, the following data were generated:

- Yearly personnel (3) 2019 – 2020 academic school year

- Demographic Factors
    - Gender
    - Ethnicity
    - SES

Academic Data

- STAAR's Math Scores

Instrumentation

The Texas Assessments of Academic Readiness (STAAR) test was utilized to gather data for the present study. In 2012, the Texas Education Agency developed the STAAR examination which is a more vigorous assessment program that provides the foundation for the new accountability system for Texas Public Education. One of the major goals of the STAAR test is to develop a progress measure status for student achievement growth. The STAAR examination was directly aligned to the curriculum standard mandated by the Texas Essential Knowledge and Skill (TEA, 2012) under the auspices of House Bill 5 passed in 2013 by the Texas Legislative (TEA, 2015).

Furthermore, the data generated from the STAAR's assessments is public information which is provided on the Texas Education Agency website. Middle School Students from 6 to 8 grades are tested annually in Math and Reading. Student's performance falls into one of the three following categories: Advanced Academic Performance, Satisfactory Academic Performance, and Unsatisfactory Academic Performance. For this study, STAAR's mathematics raw scores of Middle School Students enrolled in public school during the 2019-2020 academic school year were used to measure academic achievement.

Validity of the Instrument

Content Validity was established on the STAAR examination. The Meadows Center for Preventing Education Risk at the University of Texas at Austin under the auspices of the Texas Education Agency analyzed the content validity of the 2019 STAAR examination. This organization found that 99.55% of Mathematics items have aligned with the TEKs in 2018 but 100% in 2019; 100% in Reading for both 20018 and 2019; 93.18% in Social Studies for 2018 but 100% in 2019; 100% in science for both 2018 and 2019; and 98.18% in Writing for 2018 but 100% for 2019 (TEA, 2019).

Likewise, analyses were conducted by the Student Assessment Division of TEA and found similar results regarding the four components of the STAAR's mathematics examination. In grades 6th to 8th, 100% of the test items on the Numerical Representations and Relationship Component was found to be fully aligned with expectation among the reviewers. On the computations and Algebra component, the average percentages ranged from 95% to 100% for full alignment. In addition, on the Geometry and Measurement component, the percentages ranged from 96% to 98%. Finally, concerning the Data Analysis and Personal Finance Literacy component, full alignment ranged from 96% to 100% (TEA, 2016).

Reliability of the Instrument

Internal consistency reliability was established on the Texas Assessments of Academic Readiness (STAAR) test. Reliability coefficients ranging from .91 to .93 were computed for the Mathematics Section of the STAAR for grades 6th of 8th. On the Reading section of the STAAR test for the same grade levels, the reliability coefficient ranged from .90 to .91. In addition, an internal consistency reliability coefficient of .91

was found in the Science section and .90 for the Social Studies section for grade 8th. Finally, a reliability coefficient of .85 was found for the Writing section for grade 7th (Human Resources' Research Organization, 2016).

Data Collection Procedure

During the Spring Semester of 2022, the researcher contacted by phone the Texas Education Agency requesting 2019-2020 STAAR's data in mathematics for middle school students attending schools in the State of Texas. Data was only collected from middle school students enrolled in schools in the largest school district located in the Southwest region of Texas. After contact had been made with the proper officials at TEA, the researcher emailed a copy of the abstract which included the purpose of the study, background of the study, and hypotheses as well as the methodological procedures to conduct the study.

After permission was granted by TEA to use its websites to collect the data, this document was shared with the University's Human Subject Committee for final approval to carry out the study. The researcher agreed to all of the demands to safeguard the data imposed by the university as well as TEA.

Once the database was identified by the researcher under the auspice of TEA, the data was downloaded into the SPSS software package. During this analytical process, the data was recoded to meet statistical requirements for analysis purposes.

Identification of the Independent and Dependent Variables

With regard to the present study, the independent variables were gender, ethnicity, and SES. These three variables were assumed to have some significant effect on the four dependent measures associated with the dependent variable mathematics performance.

The four dependent measures are numerical representation and relationship, computation and algebraic, geometry and measurement and data analysis, and personal financial literacy.

Null Hypotheses

The following null hypotheses were tested in this study:

Ho_1: There is no statistically significant difference between the STAAR's numerical representation and relationship mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Ho_2: There is no statistically significant difference between the STAAR's computation and algebraic mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect on gender, ethnicity, and SES.

Ho_3: There is no statistically significant difference between the STAAR's scores among middle school students by gender, ethnicity, and SES nor the interaction of gender, ethnicity, and SES.

Ho_4: There is no statistically significant difference between the STAAR's data analysis and personal financial literacy mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Statistical Analysis

Since the dependent variable for the present study was measured on an interval-ratio scale, a parametric statistical technique was used. The parametric procedure that was utilized in this study was the three-way analysis of variance. According to Mertler and Vannatta (2021), the three-way analysis of variance is a quantitative analytic procedure that examines the independent and combined effects of three independent variables on one dependent variable.

Moreover, if a statistically significant mean difference is found between three or more samples, the researcher used the Scheffé test, a post hoc procedure to assess whether there is a true difference or whether it could be attributed to chance (Vogt, 2007). The four null hypotheses formulated in this study were tested at the .05 level or better.

Examination of Statistical Assumptions

The following statistical assumptions are associated with the three-way analysis of variance:

1. Independent Samples – refers to whether the samples of participants in each group have been assembled in such a way that a logical relationship did not exist between members of the group. This assumption is a design issue, and it was handled during the sampling process.
2. Homogeneity of Variance – refers to the variance in the population of all the cells within the factorial design are equal. This assumption was tested employing Levene's test.
3. Normality – Refers to the observations on the dependent variable that are normally distributed in the population. This assumption was tested with the Kolmogorov – Smirnov statistics.

4. Random Samples – refers to the individuals within the samples being randomly selected from a defined population. This assumption is a design issue and was handled during the sampling process (Vogt, 2007).

CHAPTER 4

RESULTS OF THE DATA

The purpose of this study was to examine the effect of demographic characteristics on the mathematics performance of middle school students on a standardized examination. Specifically, this study ascertained the effect of the variables gender, ethnicity, and at-risk status, independently and combined on the four mathematics components (Numerical representation and relationships, computations and algebraic, geometry and measurement, and data analysis and personal financial literacy) on the STAAR examination. Answers to the following questions were sought:

Answers to the following questions were sought:

1. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the numerical representation and relationship component of the Mathematics section of the STAAR examination among middle school students?
2. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the computations and algebraic component of the Mathematics section of the STAAR examination among middle school students?
3. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the geometry and measurement component of the Mathematics section of the STAAR examination among middle school students?

4. To what effect, if any, do the variables gender, ethnicity, and SES, independently and combined have on the data analysis and personal financial literacy component of the Mathematics section of the STAAR examination among middle school students?

The sample population for this study consisted of 240 eighth-grade students enrolled in middle schools in one of the largest school districts in the southern region of the United States. The first section of this chapter dealt with the demographic characteristics of the middle school students in this study. The second section addressed the four null hypotheses formulated and tested in this study. The third and final section of this chapter provided a summary of the null hypotheses generated in the study. The three-way analysis of variance and the Scheffé multiple comparison procedure was used to analyze the data. All the hypotheses were tested at the .05 level or better.

Demographic Characteristics of the Participants in the Study

Gender

Regarding the variable, gender, 120 or 50 percent of the middle school students who participated in this study were males. By contrast, 120 or 50 percent of the participants who were involved in this study were females as shown in Table 1 below.

Table 1

Frequency Distribution of Middle School Students by Gender

Variable	Number	Percent
Gender		
Male	120	50.0
Female	120	50.0
Total	240	100.0

Ethnicity

The variable ethnicity was classified into three distinct groups for this study. Eighty or 33.3 percent of the middle school students identified their ethnicity as African American and 80 or 33.3 percent of them reported their ethnic background as Anglo American. Likewise, eighty or 33.3 percent of the middle school students indicated their ethnic status as Hispanic American. See Table 2 below for these analyses.

Table 2

Frequency Distribution of Middle School Students by Ethnicity

Variable	**Number**	**Percent**
Ethnicity		
African American	80	33.3
Anglo American	80	33.3
Hispanic American	80	33.3
Total	240	100.0

Socioeconomic Status

The variable socioeconomic status was categorized into two groups for this study. There were 120 or 50 percent of the middle school students who reported they received free lunch. On the other hand, 120 or 50 percent of the middle school students acknowledged they received no free lunch. See Table 3 below for these findings.

Table 3

Frequency Distribution of Middle School Students by Socioeconomic Status

Variable	**Number**	**Percent**
SES		
Free Lunch	120	50.0
Non-Free Lunch	120	50.0
Total	240	100.0

Testing of the Null Hypotheses

Ho_1: There is no statistically significant difference between the STAAR's numerical representation and relationship mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

In Table 4, the separate and combined effects of middle school students' gender, ethnicity, and SES on their STAAR's numerical representation and relationship mathematics scores were reported. As shown in this table, there were no significant differences found between the numerical representation and relationship mathematics scores of the two gender groups, a main effect ($F(1, 228) = 1.176$, $p > .05$) and the three ethnic groups, B main effect ($F(2, 228) = 2.445$, $p > .05$). However, there were significant differences found between the numerical representation and relationship mathematics scores of the two SES groups of middle school students at the .001 level ($F(1, 228) = 21.708$, $p < .001$).

Moreover, statistically significant two-way interaction effects were not found between middle school students' gender and ethnicity, A x B (F (2, 228) = .506, p > .05), gender and SES, A x C (F (1, 228) = 1.588, p > .05), ethnicity and SES, B x C F (2, 228) = .636, p > .05), and gender, ethnicity and SES, A x B x C F (2, 228) = .975, p > .05) regarding their numerical representation and relationship mathematics scores at the .05 level.

Furthermore, the mean results (see Table 5) revealed that middle school students who did not receive a free lunch had significantly higher STAAR's numerical representation and relationship mathematics scores than those middle school students who did not receive a free lunch.

Table 4

Three-way ANOVA Summary Table Regarding the STAAR's Numerical Representation and Relationship Mathematics Scores of Middle School Students by Gender, Ethnicity and SES

Source of Variance	**SS**	**df**	**MS**	**F**	**p**
Main Effects					
A (Gender)	5.704	1	5.704	1.176	.279
B (Ethnicity)	23.725	2	11.863	2.445	.089
C (SES)	105.338	1	105.338	21.708	.000***
A x B	4.908	2	2.454	.506	.604
A x C	7.704	1	7.704	1.588	.209
B X C	6.175	2	3.087	.636	.530
A x B x C	9.658	2	4.829	.975	.371

Within Groups	1106.350	228	4.852
Total	1269.563	239	

****Significant at the .001 level*

Table 5

Mean Results Regarding the Differences Between Numerical Representation and Relationship Mathematics Scores of Middle School Students by SES

SES	**Mean**
Free Lunch	4.02
No Free Lunch	5.35*

*Highest Mean

Ho_2: There is no statistically significant difference between the STAAR's computations and algebraic mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Presented in Table 6 are the Three-way Analysis of Variance analyses pertaining to the influence of middle school students' gender, ethnicity, and SES on their STAAR's computations and algebraic mathematics scores. Statistically significant differences were found between the two gender groups, A main effect (F (1, 228) = 7.223, p < .01), the three ethnic groups, B main effect (F (2, 228) = 5.623, p < .01), and the two SES groups, C main effect (F (1, 228) = 28.254, p <.001) of middle school students regarding their STAAR's computations and algebraic mathematics scores.

Additionally, no two-way interaction effects were found between middle school students' gender and ethnicity, A x B ($F(2, 228) = .090, p > .05$), gender and SES, A x C ($F(1, 228) = 2.600, p > .05$), and ethnicity and SES, B x C ($F(2, 228) = .604, p > .05$) with regard to their STAAR's computations and algebraic mathematics scores. Also, no three-way interaction effects were found between middle school students' gender, ethnicity, and SES, A x B x C ($F(2, 228) = 2.373, p > .05$) regarding their STAAR's computations and algebraic mathematics scores.

Moreover, further data analyses using the mean results (See Table 7) revealed that female middle school students possessed significantly higher STAAR's computations and algebraic mathematics scores than their male counterparts. Additionally, the Scheffé procedure as a follow-up test (See Table 8) revealed that middle school students scored significantly higher on the computations and algebraic section of the STAAR's examination than African American and Hispanic middle school students. Finally, the mean results (See Table 9) reported that middle school students who did not receive free lunch exhibited significantly higher scores on the computations and algebraic section of the STAAR's examination than those who received free lunch.

Table 6

Three-way ANOVA Summary Table Regarding the STAAR's Computations and Algebraic Mathematics Scores of Middle School Students by Gender, Ethnicity and SES

Source of Variance	**SS**	**df**	**MS**	**F**	**p**
Main Effects					
A (Gender)	75.937	1	75.937	7.223	.008**
B (Ethnicity)	118.233	2	59.117	5.623	.004**
C (SES)	297.038	1	297.038	28.254	.000***
A x B	1.900	2	.950	.090	.914
A x C	27.337	1	27.337	2.600	.108
B X C	12.700	2	6.350	.604	.547
A x B x C	49.900	2	24. 950	2.373	.095
Within Groups	2396.950	228	10.513		
Total	2979.996	239			

***Significant at the .01 level*
****Significant at the .001 level*

Table 7

Mean Results Regarding the Differences Between Computations and Algebraic Mathematics Scores of Middle School Students by Gender

Gender	**Mean**
Male	7.81
Female	8.93*

*Highest Mean

Table 8

Scheffé Results Regarding the Differences Between STAAR's Computations and Algebraic Mathematics Scores of Middle School Students by Ethnicity

Mean 1 African American	Mean 2 Anglo American	Mean 3 Hispanic American	Observed Mean Difference	p
7.84	9.36		-1.52	.013*
7.84		7.91	-.07	.989
	9.36	7.91	1.45	.020*

**Significant at the .05 level*

Table 9

Mean Results Regarding the Differences Between Computations and Algebraic Mathematics Scores of Middle School Students by SES

SES	Mean
Free Lunch	7.26
No Free Lunch	9.48*

*Highest Mean

Ho3: There is no statistically significant difference between the STAAR's geometry and measurement mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Reported in Table 10 was the Analysis of Variance (Three-Way) results concerning the impact of the gender, ethnicity, and SES of middle school students with respect to their STAAR's geometry and measurement mathematics scores. As shown in this table, statistically significant differences were found in the geometry and measurement mathematics scores of the two gender groups, A main effects ($F (1, 228) = 3.879, p < .05$) and the two SES groups, C main effect ($F (1,228) = 32.955, p < .05$) of middle school students. Also, no statistically significant differences were observed in the geometry and measurement mathematics scores of the three ethnic groups, B main effect ($F (2, 228) = 1.665, p > .05$) of middle school students.

Moreover, gender and ethnicity, A x B ($F (2, 228) = .892, p > .05$), gender and SES, A x C ($F (1, 228) = 1.477, p > .05$), ethnicity and SES, B x C ($F (2, 228) = 1.145, p > .05$), and gender, ethnicity, and SES, A x B x C ($F (2, 228) = .976, p > .05$), did not significantly interact on the STAAR's geometry and measurement mathematics scores among middle school students.

Further data analyses using mean results (See Table 11) revealed that female middle school students had significantly higher geometry and measurement mathematics scores than male middle school students. In addition, the mean results (See Table 12) indicated that middle school students who did not receive a free lunch possessed significantly higher STAAR's geometry and measurement mathematics scores than those middle school students who received a free lunch.

Table 10

Three-way ANOVA Summary Table Regarding the STAAR's Geometry and Measurement Mathematics Scores of Middle School Students by Gender, Ethnicity and SES

Source of Variance	**SS**	**df**	**MS**	**F**	**p**
Main Effects					
A (Gender)	9.204	1	9.204	3.879	.050*
B (Ethnicity)	7.900	2	3.950	1.665	.192
C (SES)	78.204	1	78.204	32.955	.000***
A x B	4.233	2	2.117	.892	.411
A x C	3.504	1	3.504	1.477	.226
B X C	5.433	2	2.717	1.145	.320
A x B x C	4.633	2	2.317	.976	.378
Within Groups	541.050	228	2.373		
Total	654.163	239			

***Significant at the .05 level*
****Significant at the .001 level*

Table 11

Mean Results Regarding the Differences Between Geometry and Measurement Mathematics Scores of Middle School Students by Gender

Gender	**Mean**
Male	7.81
Female	8.93*

*Highest Mean

Table 12

Mean Results Regarding the Differences Between Geometry and Measurement Mathematics Scores of Middle School Students by SES

SES	**Mean**
Free Lunch	2.84
No Free Lunch	3.98*

*Highest Mean

Ho4: There is no statistically significant difference between the STAAR's data analysis and personal financial literacy mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Illustrated in Table 13 were the Three-way ANOVA findings regarding the independent and combined effects of middle school students' gender, ethnicity, and SES on their STAAR's data analysis and personal financial literacy mathematics scores. As revealed in this table, no significant differences were found between the STAAR's data analysis and personal financial literacy mathematics scores of the two gender groups, A main effects ($F(1, 228) = .097, p > .05$) and the three ethnic groups, B main effect ($F(2, 228) = .875, p > .05$) of middle school students. Nevertheless, a significant difference was found between the STAAR's data analysis and personal financial literacy mathematics scores of the two SES groups, C main effect ($F(1, 228) = 12.188, p < .001$) of middle school students.

Additionally, statistically significant interaction effects were not found between middle school students' gender and ethnicity ($F(2, 228) = .961, p > .05$), gender and SES ($F(1, 228) = .632, p > .05$), ethnicity and SES ($F(2, 228) = 2.643, p > .05$), and gender, ethnicity and SES (F (2, 228) = 2.442, p > .05) with regard to their STAAR's data analysis and personal financial literacy mathematics scores.

Further data analysis utilizing the mean results (See Table 14) revealed that middle school students who did not receive a free lunch scored significantly higher on data analysis and personal financial literacy section of the STAAR's examination than those who did receive a free lunch.

Table 13

Three-way ANOVA Summary Table Regarding the STAAR's Data Analysis and Personal Financial Literacy Mathematics Scores of Middle School Students by Gender, Ethnicity and SES

Source of Variance	**SS**	**df**	**MS**	**F**	**P**
Main Effects					
A (Gender)	.337	1	.337	.097	.756
B (Ethnicity)	6.100	2	3.050	.875	.418
C (SES)	42.504	1	42.504	12.188	.001***
A x B	6.700	2	3.350	.961	.384
A x C	2.204	1	2.204	.632	.427
B X C	18.433	2	9.217	2.643	.073
A x B x C	17.033	2	8.517	2.442	.089
Within Groups	795.150	228	3.488		
Total	888.463	239			

****Significant at the .001 level*

Table 14

Mean Results Regarding the Differences Between Data Analysis and Personal Financial Literacy Mathematics Scores of Middle School Students by SES

SES	**Mean**
Free Lunch	3.32
No Free Lunch	4.16*

*Highest Mean

Summary of Hypotheses

There were three null hypotheses tested in this study. All three hypotheses were tested for differences between the STAAR's mathematics scores by gender, ethnicity, and socioeconomic status.

Regarding hypothesis one, section c was found to be significant. The variable socioeconomic status was found to have a significant impact on the numerical representation and relationship mathematics scores among middle school students. In addition, sections A, B, and C in hypothesis two were found to be significant. The variables, gender, ethnicity, and SES were found to have independent effects on the computations and algebraic mathematics scores of middle school students.

Moreover, regarding hypothesis 3, sections A and C were found to be significant. The variables gender and SES independently were found to have a significant effect on the geometry and measurement mathematics scores among middle school students. Finally, regarding hypothesis 4, the variable SES was found to have a significant influence on the data analysis and personal financial literacy mathematics scores. See Table 15 for these results.

Table 15

Summary of Hypotheses Results

Hypotheses	F	df	p	Conclusion
H01				
A (Gender)	1.176	1	.279	Not Significant
B (Ethnicity)	2.445	2	.089	Not Significant
C (SES)	21.708	1	.000***	Significant
D (AxB)	.506	2	.506	Not Significant
E (AxC)	1.588	1	1.588	Not Significant
F (BxC)	.636	2	.636	Not Significant
G (AxBxC)	.975	2	.975	Not Significant
H02				
A (Gender)	7.223	1	.008	Significant
B (Ethnicity)	5.623	2	.004**	Significant
C (SES)	28.254	1	.000***	Significant
D (AxB)	.090	2	.914	Not Significant
E (AxC)	2.600	1	.108	Not Significant
F (BxC)	.604	2	.547	Not Significant
G (AxBxC)	2.373	2	.095	Not Significant
H03				
A (Gender)	3.879	1	.050*	Significant
B (Ethnicity)	1.665	2	.192	Not Significant
C (SES)	32.955	1	.000***	Significant
D (AxB)	.892	2	.411	Not Significant
E (AxC)	1.477	1	.226	Not Significant
F (BxC)	1.145	2	.320	Not Significant
G (AxBxC)	.976	2	.378	Not Significant
H04				
A (Gender)	.097	1	.756	Not Significant
B (Ethnicity)	.875	2	.418	Not Significant
C (SES)	12.188	1	.001***	Significant
D (AxB)	.961	2	.384	Not Significant
E (AxC)	.632	1	.427	Not Significant
F (BxC)	2.643	2	.073	Significant
G (AxBxC)	2.442	2	.089	Not Significant

**Significant at the .05 level **Significant at the .01 level*
****Significant at the .001 level*

CHAPTER 5

SUMMARY, FINDINGS, DISCUSSION, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate the impact of the demographic characteristics of middle school students on their mathematics performance on the STAAR's examination. More specifically, this study examined the effect of the variables gender, ethnicity, and at-risk status, separate and collectively, on the four mathematics components (numerical representation and relationships, computations and algebraic, geometry and measurement and data analysis and personal financial literacy) of the STAAR's examination among middle school students.

Additionally, a 2x2x3 factorial design was used in the students. Two hundred forty (240) eighth-grade students enrolled in middle schools in the southern region of the United States. The data analysis for this study was accomplished through the application of the Three-Way Analysis of Variance and the Scheffé Multiple Comparison Statistical techniques. The following null hypotheses were tested at the .05 level or better:

Ho_1: There is no statistically significant difference between the STAAR's numerical representation and relationship mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Ho_2: There is no statistically significant difference between the STAAR's computations and algebraic mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Ho_3: There is no statistically significant difference between the STAAR's geometry and measurement mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Ho_4: There is no statistically significant difference between the STAAR's data analysis and personal financial literacy mathematics scores among middle school students by gender, ethnicity, and SES nor the interaction effect of gender, ethnicity, and SES.

Findings

Based on the analysis of data, the researcher obtained the following findings:

1. The variable socioeconomic status independently did produce a significant effect on the STAAR's numerical representation and relationship mathematics scores of eighth-grade students.
2. The variables gender and ethnicity separately did not produce a significant effect on the STAAR's numerical representation and relationship mathematics scores of eighth-grade students.
3. The variables gender and ethnicity, gender and SES, ethnicity and SES, and gender, ethnicity, and SES combined did not produce a significant effect on the STAAR's numerical representation and relationship mathematics scores of eighth-grade students.

4. The STAAR's computations and algebraic mathematics scores of eighth-grade students were significantly influenced by their gender, ethnicity, and SES.
5. The variables 1) gender and ethnicity, 2) gender and SES, 3) ethnicity and SES, and 4) gender, ethnicity, and SES collectively did not produce a significant effect on the STAAR's computations and algebraic mathematics scores of eighth-grade students.
6. Middle school students' gender and SES independently did produce a significant impact on their STAAR's geometry and measurement mathematics scores.
7. The variable ethnicity independently had no effect on the STAAR's geometry and measurement mathematics scores of middle school students.
8. The variables gender and ethnicity, gender and SES, ethnicity and SES, and gender, ethnicity, and SES combined did not produce a significant effect on the STAAR's geometry and measurement mathematics scores of middle school students.
9. The STAAR's data analysis and personal financial literacy mathematics scores of eighth-grade students were significantly influenced by the variable SES.
10. Eighth-grade students' gender and ethnicity did not produce a significant effect on the STAAR's data analysis and personal financial literacy mathematics scores.

11. Finally, middle school students' gender, ethnicity, and SES combined did not produce a significant effect on the STAAR's data analysis and personal financial literacy mathematics scores.

Discussion

One of the most interesting findings of the present study was the significant influence the variable ethnicity independently had on the STAAR's mathematics scores among eighth-grade students. Particularly white eighth grade students scored significantly higher on the computations and algebraic section of the STAAR's mathematics examination than their Black and Hispanic counterparts.

The findings comparing the mathematics performance of white and black middle school students were consistent with those of Kirkland and Sanzone (2017), Sax et al., (2015), Umarji et al., (2018), Chambers and Spikes (2016), Kotok (2017), Brey et al., (2019), Anderson and Ward (2014) and Schuller et al., (2010). The above researchers found that white students performed significantly better in mathematics than African American students.

Furthermore, the findings comparing the mathematics performance of white and Hispanic middle school students were favorable to those of Singh (2015), Rojas-LeBouef (2010), Brown and Leaper (2010), West-Olatoni et al., (2010), Harris (2018), Flores (2007) and Hernandez (2014). The aforementioned researchers in their works reported that white students outperformed their Hispanic peers in mathematics on national examinations.

A reasonable explanation for the current findings regarding the mathematics ability of white, black, and Hispanic middle school students in the eighth grade may be that white students tend to have higher levels of self-efficacy than their minority counterparts which could explain the difference in their performance in this academic area. Another explanation for these findings may be that white middle school students have had more exposure to mathematics than their black and white counterparts. Because of the amount of coursework that white students have received in mathematics might be a major reason for their academic performance in this subject area.

Moreover, another significant finding as well as surprising, is the impact of the variable gender had on the mathematics performance of eighth-grade students. Specifically, female middle school students performed academically better than their male peers on the geometry and measurement and computations and algebraic sections of the STAAR's examination. These findings did not correspond with those of Reardon et al. (2019), Meinck and Brese (2019), Pope and Sydnor (2010), McGraw et al. (2006), Penner and Paret (2008) and Su et al. (2009). Research conducted by the above researchers found that male students performed significantly better in mathematics than female students.

Notwithstanding, male, and female middle school students scored similarly on the numerical representation and relationship section as well as the data analysis and performed financial literacy section on the STAAR's examination. These findings were supported by research conducted by Cimpion et al. (2016), Fryer and Levitt (2010), Lee, Moon, and Hegar (2011), Robinson and Lubienski (2011), and Sohn (2012). The previous researchers found that there were no differences in the mathematics performance of male and female students.

A plausible explanation for female eighth-grade students outperforming their male counterparts may be that female students have acquired similar strategies that have helped them to develop quality mathematical skills which enable them to perform better in mathematics than in the past. Another subjective explanation for these findings may be that female students are now receiving the proper attention in mathematics by teachers and administrators which have raised their level of motivation and belief that they can do well in mathematics.

Finally, another notable finding of the present study pertained to the influence of the variable socioeconomic status on the mathematics performance of middle school students. Eighth-grade students who did not receive a free lunch possessed significantly higher mathematics scores on all sections of the STAAR's examination than those eighth-grade students who received a free lunch. These findings were supported by the works of Claro, Pavnesku, and Dweck (2016), Huang, Reyes, and Eccles (2016), Poesem-Vanderputte and Nicaise (2015), Boaler et al. (2018), Machebe et al. (2017), Batruch et al. (2018), Drake (2017), Lee and Slate (2014) and Johnson and Christensen (2017). All of these above researchers found that high-income students scored significantly better on state standardized examinations than did lower-income students.

An explanation for these findings may be that high-income students have had the advantages of access to more resources in mathematics, access to better schools and better teachers, access to technology, and familiarity with high-stakes testing in mathematics than low-income students. Because of these advantages and others, high-income students tend to do significantly better in mathematics on the state's standardized examination than low-income students. Another theoretical explanation for these findings may be the educational system itself. The results pertaining to the interaction of education policies and officials concerning providing the necessary resources in mathematics to low-income students have contributed to their academic performance in mathematics on standardized examinations such as the STAAR.

Conclusions

Based on the findings generated from the data analysis of this study, the researcher drew the following conclusions:

1. In general, eighth-grade students who did not receive a free lunch had significantly higher scores on the numerical representation and relationship section of the STAAR's mathematics examination than those eighth-grade students who received a free lunch.
2. Regardless of their gender and ethnicity, eighth-grade students had similar numerical representation and relationship scores.
3. Female eighth-grade students had significantly higher computations and algebraic mathematics scores than their male counterparts.
4. It appeared that white eighth-grade students scored significantly better on the computations and algebraic math section of the STAAR's examination than Black and Hispanic eighth-grade students.
5. The variables gender, ethnicity, and SES combined did not influence the numerical representation and relationship mathematics scores among middle school students.

6. Irrespective of the various combinations of the variables gender, ethnicity, and SES, these variables had no significant impact on the computations and algebraic math.
7. Female middle school students possessed significantly higher STAAR's geometry and measurement mathematics scores than their male peers.
8. Eighth-grade students who did not receive a free lunch had significantly higher STAAR's geometry and measurement mathematics scores than those eighth-grade students who did receive a free lunch.
9. Regardless of the combinations of the variables gender, ethnicity, and SES, these variables collectively had no significant effects on the STAAR's geometry and measurement mathematics scores of middle school students.
10. It appeared that the variables gender and ethnicity individually had no impact on the STAAR data analysis and personal financial literacy mathematics scores among eighth-grade students.
11. Eighth-grade middle school students who did not receive a free lunch exhibited significantly higher STAAR data analysis and personal financial literacy mathematics scores than their free lunch counterparts.
12. Finally, the STAAR's data analysis and personal financial literacy mathematics scores were not influenced by some combinations of the variables gender, ethnicity, and socioeconomic status of eighth-grade students.

Implications

From the results of the study, the following implications were drawn:

1. The impact of the variable gender on the mathematics performance of middle school students on standardized examinations, particularly those related to the performance of female students, suggests that school system officials paid more attention to those strategies that have been shown to improve the mathematical reasoning of these students. A better understanding of these strategies by school administrators as well as teachers may assist in developing instructional modules to increase the academic performance among female students and decrease the academic gap in mathematics with their male counterparts.
2. The influence of the variable ethnicity on the mathematics performance of middle school students on standardized examinations suggests that teachers, principals, and top administrative officials should be aware of those factors that produce the racial-ethnic differences in the academic success of students in this subject matter. Thus, an understanding of these factors is crucial in identifying those minority students who need assistance in mathematics.
3. Finally, the impact of social-economic status on the academic performance of middle school students in mathematics regardless of other demographic characteristics such as gender and ethnicity is vital to the academic progress of all students. Public school officials as well as state officials must consider the importance of financial resources on school completion or school dropout, especially among Black and Hispanic students. An understanding of the

negative consequences derived from social economic problems among this population of students will go a long way in enhancing their ability to learn mathematics as well as remaining in school.

Recommendations for Further Study

To extend the results of this study, the following recommendations are offered:

1. Conduct a study to examine the impact of selected academic and demographic factors on the academic achievement of middle school students.
2. Performed to examine the influence of parent and teacher characteristics on the academic performance of middle school students.
3. Carry out a study to investigate the differences in academic performance of middle school students across grade levels.
4. Finally, investigate the effects of instructional strategies and curriculum modules on the academic preparedness of middle school students.

APPENDIX A

IRB APPROVAL LETTER

TSU TEXAS SOUTHERN UNIVERSITY
Office of Research

June 16, 2022

Good day, Muteb Alanazi!

This is to inform you that your protocol #**ES081**, *"The Effect of Demographic Characteristics on the Mathematics Performance of Middle School Students on a Standardized Examination"*, is exempt from Texas Southern University's Institutional Review Board (IRB) full committee review. Based on the information provided in the research summary and other information submitted, your research procedures meet the exemption category set forth by the federal regulation 45CFR 46.104(d)(4):

Secondary research for which consent is not required

The Federal Wide Assurance (FWA) number assigned to Texas Southern University is FWA00003570.

If you have questions, you may contact the Research Compliance Administrator for the Office of Research at 713-313-4301.

PLEASE NOTE: (1) All subjects must receive a copy of the informed consent document, if applicable. If you are using a consent document that requires participants' signatures, signed copies can be retained for a minimum of 3 years of 5 years for external supported projects. Signed consents from student projects will be retained by the faculty advisor. Faculty is responsible for retaining signed consents for their own projects, however, if the faculty leaves the university, access must be made available to TSU CPHS in the event of an agency audit. (2) Documents submitted to the Office of Research indicate that information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subject; and the identities of the subjects will not be obtained or published; and any disclosures of the human subjects' responses outside the research will not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. The exempt status is based on this information. If any part of this understanding is incorrect, the PI is obligated to submit the protocol for review by the CPHS before beginning the respective research project. (3) Research investigators will promptly report to the CPHS any injuries or other unanticipated problems involving risks to subjects and others.

This protocol will expire June 16, 2025

Sincerely,

Institutional Review Board (IRB)

APPENDIX B

RELEASE OF STAAR DOCUMENTS

From: متعب العنزي <metab.f.s@hotmail.com>
Date: Wed, May 24, 2023 at 3:56 PM
Subject: Fwd: PIR # 59076 Release Documents with Invoice
To: Nuwayyir Alanazi <nuwayyirnuwayyir@gmail.com>

أُرسلت من الـ iPhone

بداية الرسالة المحولة:

من: PIR <PIR@tea.texas.gov>
التاريخ: ٩ مايو، ٢٠٢٣، ١:٣٩:٤٧ م غرينتش-٥
إلى: metab.f.s@hotmail.com
الموضوع: PIR # 59076 Release Documents with Invoice

Public Information Request
Release Documents with Invoice
May 9, 2023

Muteb Alanazi

TEA PIR #59076

Dear Muteb Alanazi:

On May 3, 2023, you responded to the Cost Estimate Statement sent to you by the Texas Education Agency (TEA). In your response, you agreed to accept the estimated cost associated with providing you the information.

The attached files include information masked in compliance with the federal Family Educational Rights and Privacy Act (FERPA), 20 U.S.C. Section 1232g. TEA is required to withhold from public disclosure personally identifiable, non-directory information in education records. Additionally, FERPA does not permit state and local educational authorities to disclose to the Office of the Attorney General (OAG) personally identifiable information contained in education records for the purpose of review in the open records ruling process under the Texas Public Information Act. The United States Department of Education has ruled FERPA determinations must be made by the educational authority in possession of the education records. Consequently, it is impermissible for TEA to seek an OAG opinion concerning the applicability of FERPA to records responsive to a public information request. https://www.texasattorneygeneral.gov/sites/default/files/files/divisions/open-government/20060725-USDept-Education.pdf

So that we may provide you with the requested information promptly, the records/data are released to you with this letter. Your final **Invoice Statement is enclosed** and includes any adjustments.

Please remit your full payment to the **Texas Education Agency** and write **ORR-TEA # 59076** on the check/money order.

Mail Payment to:	**TEA - PIR# 59076** P.O Box 13717 Austin, Texas 78711-3717
In Person Deliver to:	TEA Cashier Accounting Room 2-115A Texas Education Agency, WB Travis Bldg. 1701 North Congress Avenue Austin, Texas 78701

Accepted payment methods by mail are money orders and checks; please make payable to "Texas Education Agency- PIR". We do not accept credit card or online payments at this time. Please include your PIR number with your payment; the payment address is listed above. In person payments are currently accepted by the TEA Accounting office on weekdays between 8:00 am -10:00 am. If you would like to make a payment during business hours outside this timeframe, please contact the PIR office to arrange an appointment.

If you have any questions or wish to discuss this matter further, please contact me at (512) 463-3464 or by email at PIR@tea.texas.gov.

Sincerely,

Jenny Eaton
Public Information Coordinator

Enclosures: Responsive Documents
Invoice Statement

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