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The Relationship Among Learners' At-Risk Indicators and Ninth Grade Algebra I Achievement

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THE RELATIONSHIP AMONG LEARNERS' AT-RISK INDICATORS AND NINTH GRADE ALGEBRA I ACHIEVEMENT

A Dissertation

by

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ABSTRACT

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The purpose of this research is to examine the relationship between at-risk indicators including socioeconomic status, English language learners (ELL), and gender to student performance in the Algebra I End of Course assessment. The research questions presented in the non-experimental quantitative research design were: (1) What is the impact of socioeconomic status on the Algebra I EOC exam? (2) What is the success rate of ninth grade students identified as English Language Learners (ELL) compared to non-identified ninth grade students in Algebra I? and (3) What is the difference in ninth grade Algebra I achievement between males and females? (4) What is the relationship between socioeconomic status, English Language Learner classification, and gender interactions?

A three-way ANOVA was conducted in this study to show the interactions between the three independent variables, socioeconomic status, gender, and English Language Learner classification, in relation to the dependent variable, student achievement as measured by the Texas Algebra I End of Course 2019 assessment. The data was collected using the district data management program from a South Texas school district's predominantly Hispanic rural high school located along the US-Mexico border. After analyzing the three-way ANOVA which was conducted using the computer program, SPPS V27, it was evident by the Boxplots and Estimated

Marginal Means graphs that females who were economically disadvantaged and classified as ELLs had lower student achievement than females who were not classified as ELLs and were not economically disadvantaged. Moreover, males who were economically disadvantaged and were not ELLs had slightly higher student achievement than those who were ELLs and were not economically disadvantaged.

Key Words: algebra, socioeconomic status, at-risk, gender, English Language Learners, student achievement.

DEDICATION

I dedicate my dissertation to my father who encouraged me to take advantage of all the educational opportunities provided and to reach higher than the stars. I am also thankful for my children and husband for their encouragement, support, patience, and love while I worked to complete my doctoral degree. My family inspired me to attain my goals and complete my journey. I am so appreciative of their encouraging words when I needed them most. With the love, support, and understanding of my dear family and friends, I accomplished my lifelong dream.

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CHAPTER I

INTRODUCTION

For many students, math is not something that comes intuitively or automatically. It is a subject that sometimes requires students to devote lots of time and energy and is found difficult by many students in America (Fleming, 2020). An analysis of recent National Assessment of Educational Progress (NAEP, 2017) data has demonstrated long-term and significant positive trends in the learning of mathematics at middle and elementary levels while high school assessment scores have remained flat for many decades (Berry III & Larson, 2019). Data shows that despite improvements in overall scores for reading, there continues to be large achievement gaps for subgroup populations in mathematics where only 36% of testers scored proficient or better (NAEP, 2017).

Various factors such as poor mathematical foundation and the inability to retain information influence the results of high stakes assessments such as the NAEP for subgroup populations (Fleming, 2020). However, the existence of a significant percentage of low-achieving students is due to teacher-led lecture instruction, which still dominates mathematics classrooms in most countries (Berry III & Larson, 2019). It should be noted that students in every classroom possess different abilities and hence demonstrate different achievements in state and national mathematics assessments. Unfortunately, in teacher-led instruction, all students are required to learn from the teacher in the same way at the same pace (Parke, 2016). Low-achieving students, without sufficient time, are forced to receive knowledge passively and thus the cause of poor performance. Educators do not emphasize the importance of building a solid mathematical foundation (Berry III & Larson, 2019). Researchers have pointed out that it is critical for low-achieving students to have more opportunities to learn mathematics at their own pace, and this is especially true for students who fall under the at-risk category (Berry III & Larson, 2019; Morales-Chicas & Agger, 2017).

There have been urgent calls to reform math education in high school with some critics arguing that mathematics course standards are factors that contribute to the increased number of high school students failing state and national assessments (Berry III & Larson, 2019). These calls have been redirecting attention at different components of high school math such as learning and teaching experiences, practices that are expected of learners, skills, knowledge, and other related programs (Parke, 2016). Nonetheless, there is still a gap between reform recommendations and implementation of systematic and meaningful change that applies to all learners in courses such as high school Algebra (Berry III & Larson, 2019).

Algebra has been regarded as a gatekeeper to future success (Morales-Chicas & Agger, 2017; Morgatto, 2008). One of the main reasons as to why the status quo in the United States' high school Algebra I persists is because the structure of the course has been the same for many decades which includes catering to the advanced level mathematics learners rather than those who are identified as struggling or at-risk (Berry III & Larson, 2019; Morales-Chicas & Agger, 2017). Hastening the curriculum to suit advanced mathematics learners can widen the gulf in achievement between lower-performing students, including those who are economically disadvantaged and racial minorities. The practice reflects a long-standing feature of American math education since as early as middle school, students are often split into "tracks" in ways that predetermine who will take advanced classes in high school, and the students who are at-risk continue to be underrepresented (McGuinn, 2016). Addressing socioeconomic status, grade retention, and those students who are English language learners can make the difference in a successful future not only in mathematics but in all areas of the students' education experience.

Statement of the Problem

Previous studies have been conducted regarding Algebra achievement that focus on students with disabilities as well as advanced, gifted learners (Arnold, 2016; Berry II & Larson, 2019; Craig, 2010). Moreover, there also exists research on how gender affects Algebra I achievement in connection to the type of education that students receive such as magnet, private or religious affiliated schooling (Craig, 2010).

Educational policy makers among other stakeholders have made attempts to close the achievement gap between low socioeconomic students and affluent students, males and females and students in special population groups such as those identified as ELLs but they have failed in scope and practice (Arnold, 2016; Fullan, 2015; Keeley, 2015). The No Child Left Behind Act is an example of a failed attempt to close the gap. The goal of the No Child Left Behind Act was to guarantee that every child was taught and held accountable for the same standards. High-stakes testing shifted educators and school leaders focus from student learning needs to accountability (Harris, 2007). The achievement gap that the No Child Left Behind Act was attempting to close has widened (Bates, 2017; Fullan, 2015; Keeley, 2015; Piketty, 2014).

As previously mentioned, there is existing literature on the relationship between race/ethnicity, gender, and academic achievement in public schools (Drake, 2017; Ispa-Landa, 2013; Matrenec, 2011; Rury & Rife, 2018). In South Texas, specifically in the Rio Grande Valley, public schools also encounter issues with gender, economic disadvantaged students, and English Language Learners when it comes to mathematics performance (Taylor, 2019). With that being said, there is a lack of quantitative research related to these factors and academic achievement on public schools that have a predominantly Latino student population such as districts found in the Rio Grande Valley. This research contributes to our understanding of the association between student socioeconomic status, gender, ELL classification and student academic achievement in a predominately Latino South Texas public school.

Purpose Statement

Despite efforts made by education institutions, children continue to fall behind and show little academic success in mathematics achievement. This is especially true for subgroup populations such as low-income students and English Language Learners. Students under these subgroups have scored below basic performance on the National Assessment of Educational Progress (NAEP, 2017) assessments (U.S. Department of Education, 2017). The purpose of this research is to examine the relationship between at-risk indicators including socioeconomic status, English language learners (ELL), and gender to student performance in Algebra I End of Course assessment.

Significance of the Study

One of the components of *Every Student Succeeds Act* requires states, districts, and schools to look more holistically at student achievement (Darling-Hammond, et al., 2016). This study will examine the impact that socioeconomic status, English language learner status, and gender have with a student’s success in ninth grade Algebra I. The researcher will examine the at-risk factors and contribute to research related to ninth grade Algebra I achievement.

Factors will be further examined and possibly provide insight into strategies that can help students overcome obstacles that may be detrimental to the student’s academic success. Moreover, this study may provide data to base professional learning opportunities for teachers to address specific concerns about student's success in high school mathematics. For instance, teachers can better understand how to formulate mathematics problems that include less gender bias or learn about strategies of how to best address English language learners in their Algebra I classrooms.

This research is also significant since limited research has been conducted at districts where Hispanic students make up the majority of the student population and the connection between Algebra I student achievement in the end of course assessment to indicators such as economic status, gender, and ELL classification (Ayieko et al., 2016).

Research Questions

The following research questions will be presented in the non-experimental quantitative research design:

Research Question 1: What is the impact of socioeconomic status on the Algebra I EOC exam?

Research Question 2: What is the success rate of ninth grade students identified as English Language Learners (ELL) compared to non-identified ninth grade students in Algebra I?

Research Question 3: What is the difference in ninth grade Algebra I achievement between males and females?

Research Question 4: What is the relationship between socioeconomic status, English Language Learner classification, and gender interactions?

Definitions of Terms

The following definitions provide explanations for terms specific to this study.

1. Student Achievement: the measure of student performance on learned material. For the purpose of this study, student achievement was measured by student performance on the State of Texas Assessments of Academic Readiness (STAAR), in Algebra I. Student

performance was comprised of STAAR scale scores and performance levels.

2. State of Texas Assessments of Academic Readiness (STAAR): a series of standardized assessments given to public school students in grades three through twelve. It assesses student achievement and knowledge of curriculum from the Texas Essential Knowledge and Skills (TEKS). STAAR is administered once a year in the spring semester.

3. Texas Academic Performance Reports (TAPR): an annual report recorded of each public school in Texas covering an extensive scope of data on the characteristics of the school as well as the achievement of students on the STAAR exams. Student performance is broken into several populations, including ethnicity, gender, and low-economic status. In addition, the report contains information on the school’s faculty and staff, expenditures, and student programs (Texas Education Agency, 2019).

4. At-risk: Students who have a greater chance of dropping out or failing school (Texas Education Agency, 2019).

5. Socioeconomic status (SES): the social standing of a group or person. It is a combination of education, income, and occupation. In this study, low socioeconomic status refers to students who are eligible for free or reduced-priced lunch programs in the school system.

6. Economically Disadvantaged: A member of a household meets income eligibility guidelines for free or reduced-priced school meals (Texas Education Agency, 2019).

Overview of the Study

The study is organized into five chapters. Chapter 1 includes the introduction, the statement of the problem, purpose statement, the definition of terms, the research questions, significance of the study, and an overview of the study. Chapter 2 contains the theoretical frameworks that ground this study, a review of literature related to school and family factors that can be detrimental to the individual student’s success in high school mathematics. The review includes sections on socioeconomic status, students who are English language learners, and gender. The methodology used in the study is detailed in Chapter 3. The description includes the population, research questions, procedures used for research, data collection, and the procedures for data analysis. Chapter 4 reports the findings of the data analyses. Chapter 5 provides a summary of findings, limitations, conclusions, and recommendations for further research related to this study.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this research is to examine the relationship between at-risk indicators including socioeconomic status, English language learners (ELL), and gender to student performance in Algebra I End of Course assessment. The focus of the research questions is to answer whether the examined indicators affect student achievement. This chapter includes an abbreviated review that focuses on literature related to the findings as well as the theoretical framework that grounds this study. It includes a review of literature related to the connection of the indicators being examined to Algebra student achievement as well as an overview of the literature that exists related to each indicator. I present a background on testing in the state of Texas as well as studies that have included socioeconomic status, English language learners, and gender in relation to mathematics achievement. Moreover, I provide information on how students identified as being low socioeconomic and English language learners have encountered challenges in mathematics. I also investigate how gender impacts student achievement in relation to mathematics including Algebra. In connection to the significance of the study, I draw from several studies that connect to Hispanic populations and student achievement.

Theoretical Framework

Due to the factors examined, this study is grounded on social constructionism (Berger & Luckmann, 1966). The idea emerges from postmodern and post structural theories in cultural studies and sociology. Social constructionism is used to explain how social interactions help people construct meaning of their world, and in this study, I focus on how this theory connects to students' socioeconomic status, gender, and English Language Learner classification.

Social Constructionism

Social constructionism theory stems from Berger and Luckmann's (1966) work on social constructs. Social constructionism is a focus "on how knowledge is socially constructed in communities" (Hruby, 2001, p. 58). It depicts how we share our world with others, interacting and communicating with them (Berger & Luckmann,1966). It states that it is the way people explain the world where we live (Gergen, 2008). People make meaning of their world through interactions, and humans construct their thinking, learning, beliefs, and self-identity through interaction with others (Lucey, 2010). Socialization takes place in social structures (Berger & Luckmann, 1966). Berger and Luckmann (1966) found that socialization is unsuccessful when it is impaired due to a biological or social accident. For example, a child's socialization may be compromised because he/she is born with a physical disability that is "socially stigmatized or because of a stigma based on social definitions" (Berger & Luckmann, 1966, p. 184). Moreover, poverty is also social construct. One might consider an individual to be poor, but someone else may not recognize the financial situation as poor because poverty looks very different in their eyes. Can one be considered poor when he/she has clothes, shelter, and food, and how does that affect their social classification? (Berger & Luckmann, 1966).

In this study, for example, students identified as economically disadvantaged may be subject to negative perceptions and deficit thinking, which illustrates the social constructs of the teachers and their peers. They may be labeled based on their parent' social class or poverty level which is not by the students' choice but rather economic status.

Society considers language to be critical (Berger & Luckmann, 1966). People need to interact in order to communicate, and if humans were meant to derive meaning of the world independently, there would be no communication (Gergen, 2008). Words that humans create in their minds have no meaning until they are shared with another person and acknowledged (Gergen, 2008). For example, when a baby first begins to speak, the language is meaningless and lacks communication. No one understands the baby's communication, but the language makes sense in the baby's mind. The baby's language is useless because he/she is the only one who can understand it. If others do not acknowledge a person's language as communication, the person's language is considered to be meaningless (Gergen, 2008).

This study includes data from students who are classified as English Language Learners, and those who are recent immigrants struggle to communicate with others, including their teachers and peers. It is critical that they attain enough English language to interact effectively and ask questions as well as carry conversations that will help them be successful not only in math class, but also in daily life.

Social constructionism effects the way that we view the world (Crotty, 2015). Humans construct meaning through interactions with people whom they encounter regularly, without the intention to do so (Hruby, 2001). Lock and Strong (2010) found that humans are constructed through shared experiences with others and social constructs are created through the interaction with others form our society. The way that humans interpret the world produces "rules, norms, identities, concepts, and institutions" (Schneider & Sidney, 2009, p. 106). According to the theory of social constructionism, all things that we give meaning to were constructed at one time through our interactions with others. The construction of our presence in the world involves interactions with others (Freire, 1998). For instance, money is socially constructed and it only has value because humans have given it value, but otherwise it would be worthless pieces of paper (Elder-Vass, 2012). Moreover, gender is also socially constructed. Social expectations and how a specific gender should act or behave is constructed by society (Elder-Vass, 2012). Gender expectations differ between societies. What is acceptable for women in the United States might be different than what is acceptable for them in other parts of the world or even within one side of the country compared to another. Gender expectations also change as the society changes.

Another factor analyzed in this study is that of gender in relation to student achievement in mathematics. The generalization that females do not perform as well in mathematics as males comes from social expectations that may have been determined from social constructs rather than concrete studies (Elder-Vass, 2012). As more studies are being conducted and more research is evolving, that generalization may eventually fade as a social construct.

Students construct meaning of their place in the classroom, and consequently, their place in society from interactions with peers and school authorities, such as teachers and campus administrators (Dewey, 1916). There are different types of relationships present in the school setting. Social relations in education include the vertical relationship between teachers and students and the horizontal relationship between students (Finke, 1993). It is through interactions with teachers and students that "children find out what the culture is about and how it conceives of the world" (Bruner, 2008, p. 169). Students learn cooperatively through their relationships (Gergen, 2008a) and through real-life situations. Students learn by doing rather than merely receiving information from a teacher (Bruner, 2008; Dewey, 1916; Haberman, 2010). Drawing from Dewey (2019), "true education comes through the stimulation of the child's powers by the demands of social situations in which he finds himself" (p. 35).

Certain classroom practices have an effect on the way that students construct their truths (Goudeau & Croizet, 2016). In this view, student interactions with peers, teachers, and administrators aid in the construction of student self-image and shape student behavior and experiences. Student self-worth and expectations for the future are influenced by their social interactions in school (Martin, Smith, & Williams, 2018). For instance, if teacher perceptions of students are based on student academic success, rather than student character and talents, students will begin to construct meaning of their self-worth by attaching it to their academic success (Harris, 2007). School experiences help students learn how to "use the tools of meaning making and reality construction, to better adapt to the world in which they find themselves and to help in the process of changing it as required" (Bruner, 2008, p. 169). Hence, students are "socially constructed participants in their shared lives" (Lock & Strong, 2010, p. 10).

High School Mathematics

Since the population analyzed in this study includes students in ninth grade, it is important to include literature related to high school mathematics. Both quantity and rigor of courses taken in secondary school, as well as success in those courses, has an important effect on eventual graduation, postsecondary education enrollment and attainment, and lifelong earnings and career prospects (Attewell & Domina, 2008; Kena et al., 2016; National Center for Education Statistics, 2016). Mathematics courses are particularly important, serving as gatekeepers to high school graduation, postsecondary enrollment, and career opportunities (Adelman, 2006; Rose & Betts, 2004). The influence of mathematics courses lies first in their necessity for satisfying graduation requirements. The majority of states require between two and four years of mathematics courses for graduation, frequently including at minimum the completion of Algebra I and/or Geometry (Education Commission of the States, 2007). Beyond high school graduation, the completion of mathematics coursework is associated with several positive benefits for students. Researchers have found that the completion of more advanced mathematics coursework raised the probability of doing well on college placement tests (Roth et al., 2000). Similarly, completion of high school Algebra I has been associated with a higher likelihood of enrollment in a postsecondary institution (Adelman, 2006; Kim et al., 2015). Taken together, these findings offer support for the importance of mathematics coursework in encouraging positive educational outcomes, including high school graduation and potential postsecondary enrollment.

The benefits of both extensive and rigorous mathematics coursework extend beyond educational outcomes. Several studies have also provided evidence regarding correlations between higher mathematics attainment and socioeconomic outcomes (Joensen & Nielsen, 2009; Rose & Betts, 2004). Rose and Betts, for example, found that students who enrolled in higher-level mathematics courses obtained significantly higher levels of education, in addition to earning significantly more a decade later than those who enrolled only in low-level mathematics courses (2004). This increase in future earnings confirmed earlier findings of mixed effects of the overall high school curriculum on wages, but small significant positive effects when examining only mathematics courses (Joensen & Nielsen, 2009). Additionally, there exists evidence that mathematics course taking of students in secondary school explained much of the variance in long-term wage earnings between students from low-income and middle income families, even after accounting for student and family characteristics (Rose & Betts, 2004). Such findings indicate that more rigorous or extensive mathematics curricula may help close the wage gap between low-income and middle-income families, an especially promising prospect when working with historically marginalized or disadvantaged student groups. While it is important to remember these relationships are not causal in nature, they provide evidence of the importance of intensive mathematics courses for improving students' academic and social outcomes.

It is not difficult to see how the disparity in the course enrollment will inevitably lead to inequality in other facets of students' lives. The numerous influences of mathematics course enrollment on key outcomes, such as high school graduation, postsecondary access and future career prospects, mark the importance of investigating such pathways further. This becomes especially critical when investigating historically marginalized student groups, such as ELL students.

Algebra is one of the most failed courses in high school (Strauss, 2017). Even though Algebra is considered by experts as the cornerstone of formal mathematics, the course is not entirely useful and significant to many forms of literacy in math. For instance, data analysis and statistics can be easy for some individuals who cannot conduct even the most basic algebraic thinking (Strauss, 2017). According to Schachter (2013), addressing the Algebra I problem can help increase the rate of graduation. Algebra I has for a long time been the gateway to higher-level science and math courses since approximately 80% of students who dropped out from high school were imperative that they were unable to pass that course (Schachter, 2013). Education administrators, math teachers, and experts in math education believe that high school courses, specifically Algebra I contribute to a high number of problems such as students not mastering required state assessments (Strauss, 2017). Thus, it is recommended that lasting solutions should be established and implemented in school districts (Schachter, 2013).

Although there have been small improvements in overall state math scores in Texas, some students continue to fall behind and show low achievement in high school Algebra I performance on national and high stakes assessments. This is especially true for subgroup populations such as the ones mentioned in this study. Large percentages of low-income students and English Language Learners score below basic performance on the National Assessment of Educational Progress (NAEP) assessments (U.S. Department of Education, 2017). Based on data from the 2016 National Center for Education Statistics, at-risk identified students scored significantly lower than their grade level peers on the national assessment in mathematics, with more than 50% of these students failing to reach proficiency.

This study is an analysis of the relationship of socioeconomic status, English language learners, and gender to ninth grade mathematics success as defined by achievement scores on the end of course (EOC) assessment for algebra I during the students' ninth grade year. Related data will be examined in relation to those factors that may contribute to an individual student's performance on the state assessment.

Testing in the State of Texas

Unlike the majority of states in the nation, Texas was one of the first states to implement a state-wide accountability system which provided data and evaluated the performance of all public schools in the state (Lorence, 2010). The state-wide assessment trajectory began in 1980 when Texas adopted Texas Assessment of Basic Skills, or TABS. This criterion-referenced test assessed basic skills in mathematics, reading, and writing in grades three, five, and nine (Cruse & Twing, 2000). Students in ninth grade who failed TABS had to retake the test, but student performance on TABS was not a deciding factor in whether a student would graduate from high school. In 1986, Texas replaced TABS with TEAMS, Texas Educational Assessment of Minimum Skills (Neumann, 2013). Per Cruse & Twing (2000), rigor was increased with TEAMS, and students were held responsible for their scores, not just the schools. They reported that TEAMS increased the number of students tested, and it required schools to offer remediation programs for students who failed. TEAMS assessed students in mathematics, reading and writing in grades one, three, five, seven, nine, and eleven. Under TABS, students who failed the test were still allowed to graduate; but with the implementation of TEAMS, students in grade 11 had to pass the test to graduate the following year. TEAMS ended in 1989 with the passage of TAAS, Texas Assessment of Academic Skills (Neumann, 2013). TAAS was implemented because the State Board of Education and the Commissioner of Education wanted students to achieve at higher levels (Cruse & Twing, 2000). TAAS was a criterion-based test that measured content covered in each grade level. TAAS scores were made available to the public. Policy makers thought accountability systems would raise academic performance because teachers and administrators would not want their school to have a low rating (Lorence, 2010). Students were required to pass TAAS in grade ten, previously they were required to pass in grade 11, so that teachers had more time to get failing students on-level before graduation. With the passage of the No Child Left Behind Act, the Texas Assessment of Knowledge and Skills (TAKS) replaced TAAS in 2003 (Neumann, 2013). In 2011, Texas adopted the State of Texas Assessments of Academic Readiness, or STAAR (Lorence, 2010). Like the prior tests, STAAR is based on the Texas Essential Knowledge and Skills, or TEKS (Texas Education Agency, 2019). Students are tested in grades three to twelve in reading, writing, mathematics, science, and social studies. In grades three to twelve, every student takes STAAR mathematics and reading. In grade four, students take STAAR Writing, and in grade five, students take STAAR Science. STAAR is the first timed assessment in Texas testing history with students given a maximum of four hours to complete each test, unless students qualify for extra time. STAAR is a paper test but can be taken online if students receive online accommodations. Each test is given on separate days, and an alternative test is given to students receiving special education services who meet certain requirements. STAAR report cards are given to each public school in the state of Texas, and schools receive a rating ranging from A to F. This study used the STAAR Algebra I End of Course to evaluate student academic achievement. STAAR has been a point of contention among parents, students, educators, and school leaders. Some argue that standardized tests measure a limited range of knowledge and skills, are not accurate representations of student knowledge, and restrict student responses with multiple-choice questions (Ravitch, 2010). Another critique of STAAR is that meeting the basic standards of the assessments has proved challenging for many students, especially economically disadvantaged students (McGown & Slate, 2019). Due to their comparability of scores and objective nature, most researchers use standardized tests scores in their research (Nicks et al., 2018). Even though STAAR is controversial, it is the one assessment that every public-school third thru high school level student in Texas must take regularly and is used for accountability across the state. It is for this reason that STAAR was used in this study to measure student academic achievement in mathematics, specifically Algebra I.

Students' Socioeconomic Status

Marginalized students have been known to be silenced in the classrooms (Greene, 1995). They are conditioned to believe that everyone has equal opportunities to succeed, that lack of family involvement on campus equates to lack of parental care about academics, and that they fail to succeed academically due to absence of grit (Gorski, 2016). Students are so accustomed to the pedagogy of poverty that when new teachers try to implement authentic learning experiences in the classroom, they are resistant to accept a different way of teaching and learning (Haberman, 2010).

Low-income students face both economic and psychological barriers to education (Jury et al., 2017). Negative stereotypes have an effect on students (Jury et al., 2017). Low-income students feel like they are judged by their teachers and are not expected to achieve as high as their affluent peers (Thiele, et al., 2017). Parents and teachers compel students to become aware of their social class differences through their actions and dialogue, and this affects student identity and academic success (Maunder, et al., 2012). Students also tend to recognize their social class in relation to receiving free lunches, school supplies, care packages, school uniforms, and perks such as field trips and parties, and they try to conceal these differences from their peers (Thiele, et al., 2017).

Students who possess capital that does not align with the dominant culture are at a disadvantage in education (Reay, et al., 2009). Many teachers tend to misjudge students living in poverty as not having the capital needed to succeed in school (Thiele et al., 2017). According to Batruch, et al. (2017), when low-income students outperform their peers, teachers view them as threats to the social-class hierarchy, which keeps students from advancing to a higher social class; some students are motivated by these negative perceptions. Drawing from a study by Thiele et al. (2017), it was found that low-income students were motivated by their teachers who had low expectations of them because the students wanted to prove them wrong. Other students fear that they will confirm the negative stereotypes, impacting their ability to perform to their full potential (Jury et al., 2017).

Most students who drop out of high school have been identified as low-income. Hernandez (2011) found that 70 percent of all high school dropouts lived in poverty for at least a year. In fact, the graduation gap between low-income and high-income students is higher than the graduation gap between Whites and students of color (Swanson, 2004). Students from low-income families have fewer opportunities to succeed (Jury et al., 2017) and are less likely to enter college compared to affluent students (Universities and Colleges Admissions Service, 2015). Research shows that family socioeconomic status and student achievement are directly related (Bannerjee, 2015; Gabriel et. al, 2016; White et. al, 2016), and parents' socioeconomic status is a predictor of their children's future status (Lareau, 2011). Thiele et al.'s (2017) study found that underprivileged students reported that their family background and school experiences disadvantaged them, which "influenced their engagement with education, including their motivations for overcoming obstacles, achieving high grades and pursuing HE [higher education]" (p. 63). This deficit ideology is supported by research which claims that people living in poverty are the problem (Payne, 2005), not the inequity of social structures in place.

The students are not the problem; schools are the problem (Gorski, 2016; Jenson, 2013; Jury et al., 2017; Lareau, 2011; Van de Werfhorst & Mijs, 2010). Jenson (2013) argued that schools are failing students:

> "This is not a failure within the students. There are no poor students with deficits; there are only broken schools that need fixing. There are no failing students; there are only schools that are failing our students. There are no unmotivated students; there are only teachers whose classrooms are frightfully boring, uncaring, or irrelevant." (p. 1)

There are factors that contribute to the inequitable conditions perpetuated by schools, such as lack of access to resources, academic tracking, classroom practices, and deficit ideology. For instance, parents experiencing poverty do not visit their children's campus as much as wealthy parents; this is not the fault of the parents but the fault of conditions inside and outside of school that work against low-income families, such as inadequate transportation or school events held during times when parents are working (Gorski, 2016). Educators and leaders in schools are quick to blame students and families in poverty for their academic performance when blame should be placed on schools.

Socioeconomic Status and Mathematics

Many researchers suggest that socioeconomic status is a major predictor in student achievement (Coleman et al., 1966; Jordan et al., 2007; Knapp & Woolverton, 2004; Persell, 1993). In Texas, socioeconomic status was a significant factor in predicting academic performance of fourth and eighth graders, specifically in mathematics. Students from low-socioeconomic backgrounds receive less support than many of their peers from other backgrounds (Jordan et al., 2007).

Socioeconomic status affects students' success in Algebra I (Valero et al., 2015). There exists research indicating that students from families who are well-off have higher chances of being successful in their studies compared to their counterparts from poor families (Ayieko et al., 2016; Morales-Chicas & Agger, 2017). The relationship between socioeconomic status and the achievement of learners in math has been considered as a problem since the 1980s (Valero et al., 2015). There are different perceptions and societal expectations of what normal school success should be in different parts of the world. In America, different factors that could systematically create the essence of differentiation to the expected norm include race and socioeconomic status (Morales-Chicas & Agger, 2017). Even though other factors affect the extent to which learners perform in specific courses, redirecting attention at individual factors could provide an ideal basis for establishing a lasting solution. The whole narrative that links development, economic superiority, and progress to students' competence in math courses such as Algebra I was made intelligible as early as the 20th Century (Valero et al., 2015).

Jordan and Levine (2009) explored the socioeconomic variation, number competence, and mathematics learning for young children. The foundation of their study is on the premises of "primary preverbal number knowledge and symbolic number knowledge" (p. 61). Jordan and Levine describe primary preverbal number knowledge as an object file system for precise representation of small numbers and an analogue magnitude system for approximate representation of larger sets. They describe secondary symbolic number knowledge as verbal subitizing, counting, numerical magnitude comparisons, linear representations of numbers, and arithmetic operations. Students that struggle early in mathematics usually have difficulties learning verbal and symbolic number knowledge as they progress due to the influence of experiences and instruction. Students from low-socioeconomic backgrounds often do not receive preschool experiences to assist in building verbal and symbolic number knowledge. In another study, Jordan et al. (2007) found that students from low-socioeconomic backgrounds entered kindergarten "well behind" (p. 36) students from middle-class backgrounds in tasks that assess number competence. Jordan and Levine (2009) propose that early interventions at home and school "have potential to help all children develop the foundations they need to learn school mathematics" (p. 65).

Chow (2007) conducted a four-year longitudinal study that analyzed the difference in achievement among students who were identified as receiving free lunches, receiving reduced-price lunches, and students who were considered ineligible for free or reduced lunches. Based on the findings of this study, there were no statistically significant differences across socioeconomic status. However, from the study, it was acknowledged that there were small differences of practical significance in achievement on the mathematics portion of the Texas Academic of Knowledge and Skills test (TAKS) (Chow, 2007). Students who did not receive free or reduced lunch attained the highest mean score, followed by students receiving reduced price lunch, and students receiving free lunch attained the lowest mean score. However, most students identified as receiving free lunch still passed the mathematics TAKS test. Therefore, there was no growth rate differences across time. Scores were consistent and provided evidence that students learn the same amount of information necessary to perform satisfactorily on the mathematics examination.

English Language Learners

English language learners (ELLs) are among one of the fastest growing subgroups of students in the United States, and their growth shows few signs of slowing down (Kena et. al., 2016). The percentage of ELL students enrolling in schools has greatly outpaced overall enrollment in the past decade (Office of English Language Acquisition, 2011), and by the 2015-16 school year ELL students made up 9.3% of all public-school students (Kena et al., 2016). This growing group of culturally and linguistically diverse students vary considerably across a variety of characteristics, including native language(s), English language proficiency, educational experiences, time in the U.S., race/ethnicity, and socioeconomic status (SES) (Kena et al., 2016; National Center for Education Statistics, 2016; Ryan, 2013). Adapting to these shifting demographics has proven challenging for educators, who must contend with difficulties in the adequate identification of ELL students (Carlson & Knowles, 2016; Halle, et al., 2012), attention to both language and content development (Beal et al., 2010; Janzen, 2008), and administering appropriate assessments (Abedi et al., 2005; Bailey & Carroll, 2015; Wolf, et al., 2008).

Given the disadvantages facing ELL students and the importance of mathematics for secondary success and beyond, it is critical to understand how the mathematics progress of ELL students in secondary school differs from those of their non-ELL peers, and how the factors predictive of success differ between the two groups. Past studies have found several factors predictive of success in secondary school mathematics for all students. Examples include both malleable factors such as interest or self-efficacy (Fast et al., 2010; Lee et al., 2014), as well as more intractable factors such as racial/ethnic background (Sciarra, 2010) or socioeconomic status (Attewell & Domina, 2008). However, it remains unclear how these factors influence ELL students' mathematics success differently from their English-proficient peers. Moreover, the predictors of mathematics success for ELL students have been studied primarily in smaller classroom settings, rather than on a large, national scale (Carlson & Knowles, 2016). Identifying key factors which may predict success in mathematics courses for ELL students on a larger scale has the potential to help inform classroom and school-level supports provided by educators. Knowing further how factors may impact ELL and non-ELL students differently may also help to better predict how classroom and school changes will impact the two groups differently (Bailey & Carroll, 2015). In doing so, we may better support educational changes which positively impact both ELL and non-ELL student groups.

English Language Learners and Mathematics Education

Questions about how to best support ELL students' learning remain critical to address in mathematics education. Modern reform efforts have stressed the importance of mathematical communication in the classroom, asking teachers and students alike to incorporate mathematical discourse, construct and critique reasoning-based arguments, and attend to mathematical precision (National Council of Teachers of Mathematics, 2014; National Governor's Association Center for Best Practices & Council of Chief State School Officers, 2010). In these discourse-focused learning environments, language becomes a key part of the learning experience. Linguistic challenges are further compounded by the complexity of language in mathematics, characterized by unique terms, discourse patterns, and methods of argumentation (Moschkovich, 2007; Schleppegrell, 2007; Zevenbergen, 2000). There also exist concerns about the cultural implications of mathematics problems that may be irrelevant or inappropriate for language minority students (Leonard et al., 2009; Nasir et al., 2008; Zevenbergen, 2000). While mathematics educators recognize the importance of calls towards communication in mathematics classrooms, such linguistic demands introduce unique challenges for students in the process of learning English.

ELL students may perceive the learning environment as less welcoming or meaningful, particularly if they struggle to contribute to discussions (Callahan & Shifrer, 2016). These perceptions could influence their beliefs about themselves and their mathematics abilities, inevitably impacting mathematics outcomes over time. Such concerns highlight the need to think carefully about the positioning of ELL students in mathematics classrooms, especially in the context of secondary schools where teachers may be less well-equipped to address linguistic issues in addition to mathematics (O'Brien, 2009; Reeves, 2006; Salazar, 2010). While many educators and researchers have demonstrated that it is certainly possible to include ELL students into mathematical discussions in a positive and productive manner, doing so requires special attention to the unique ways the learning environment differs for this student population (Barajas-Lopez & Aguirre, 2015; Cahnmann & Remillard, 2002; Gutierrez, 2002; Hansen-Thomas, 2009; Turner, Dominguez, & Empson, 2013).

While several studies have examined classroom environments that lead to then success of ELL students in mathematics courses, many have been smaller-scale and focused primarily on classrooms known to be successful with language minority or disadvantaged students (Barajas-Lopez & Aguirre, 2015; Hansen-Thomas, 2009; Turner et al., 2013). Some larger-scale quantitative studies have also examined the factors that impact ELL student success in science and mathematics, usually framing analyses in terms of language or ethnicity-based independent variables (Adamuti-Trache & Sweet, 2013; Barrett et al., 2012; Guglielmi, 2012). However, there remains a need for more research that examines the secondary mathematics experiences of ELL students, especially compared to their non-ELL peers.

These issues become increasingly urgent in the face of evidence that ELLs appear to be disadvantaged across multiple educational outcomes. For example, the average mathematics score for ELL twelfth-graders on the 2015 National Assessment of Education Progress (NAEP) was 115, compared to non-ELL twelfth-graders average score of 153, a statistically significant difference of nearly 40 points (National Center for Education Statistics, 2016). This gap between ELL and non-ELL students' NAEP mathematics scores is not new since longitudinal evidence of NAEP mathematics scores for fourth- and eighth-grade students in the period from 2003 to 2011, indicate that the gap between ELL and non-ELL students either steadied or widened during those years (Polat et al., 2016).

The difficulties experienced by ELL students extend beyond standardized test outcomes. ELL students are less likely to graduate high school than their English- proficient peers which may have long- lasting effects on postsecondary access and employment opportunities (National Center for Education Statistics, 2016). Prior studies have found that ELL students experience more restricted access to college preparatory courses in mathematics, science, and social studies and may sometimes feel like intensive college preparatory work is not for them (Callahan & Shifrer, 2016; Kanno & Kangas, 2014).

While past research has focused on the general educational outcomes and struggles of ELL students, less attention has been paid to ELL students' progress through mathematics in secondary school and the factors influencing that progress. Mathematics coursework in these later grade levels is of interest for several reasons. Mathematics courses taken in secondary school are required for timely graduation and serve as important gatekeepers for access to a postsecondary education (Adelman, 2006; Kim et al., 2015; Tate, 1997). Moreover, research has suggested that mathematics course enrollment in secondary school, especially in more advanced courses, has the potential to positively influence lifelong earning potential (Rose & Betts, 2004). While there certainly exists a significant language factor involved in the study of mathematics, past research has found that these advanced courses still offer multiple potential pathways for ELL students to succeed and merit further examination (Barajas-Lopez & Aguirre, 2015; Hansen-Thomas, 2009; Turner et al., 2013).

Given the disadvantages facing ELL students and the importance of mathematics for secondary success and beyond, it is critical to understand how the mathematics progress of ELL students in secondary school differs from those of their non-ELL peers, and how the factors predictive of success differ between the two groups. Some factors are predictive of success in secondary school mathematics for all students. Examples include both malleable factors such as interest or self-efficacy as well as more intractable factors such as racial/ethnic background or socioeconomic status (Attewell & Domina, 2008; Fast et al., 2010; Lee et al., 2014; Sciarra, 2010). However, it remains unclear how these factors influence ELL students’ mathematics success differently from their English-proficient peers. Moreover, the predictors of mathematics success for ELL students have been studied primarily in smaller classroom settings, rather than on a large, national scale. Identifying key factors which may predict success in mathematics courses for ELL students on a larger scale has the potential to help inform classroom and school-level supports provided by educators. Knowing further how factors may impact ELL and non-

ELL students differently may also help to better predict how classroom and school changes will impact the two groups differently.

Research has justified that students' home language plays an integral role in their performances in secondary math (Barajas-Lopez & Aguirre, 2015). To attain satisfactory progress in academics, learners require a high level of proficiency in at least a single language (Lee et al., 2014). Further findings have also indicated that students who are strong in at least two languages have greater chances of outperforming their counterparts who might end up underperforming in secondary school (Barajas-Lopez & Aguirre, 2015). These same ideas have been demonstrated in the field of mathematics where ELL students find it challenging to pass Algebra I and other high school mathematics courses that require a more in-depth understanding of unique terminology and greater emphasis on word problems (Cummins, 2000). This is due to ELLs not being strong in understanding the English Language required to be successful in higher math courses (Barajas-Lopez & Aguirre, 2015).

Gender and Mathematics

The question of gender difference when it comes to mathematics effect, attitude, and achievement has been a special concern for some researchers (Fast et al., 2010; Lee, Lee, & Bong, 2014). This has partly been in the effort to address the issue of women underrepresentation at advanced levels of engineering, mathematics, technology, and science. Stereotypes that women and girls do not have persistent mathematical ability has been the center of many studies (Blascovich et al., 2001). The issue is especially a matter of concern since negative stereotypes could have negative implications on the performance of girls in math courses including Algebra I.

Past research has shown that once reaching the middle grades, achievement differences in mathematics, although small, tend to favor males (Leahy & Guo, 2001; Marsh, 1989). However, more recent 2013 NAEP data indicates the differences have disappeared. At the eighth grade, the results of the NAEP show the average male and female score even, with no statistically significant differences in any of the five content strands (Ansell & Doerr, 2013).

At the high school level, researchers found that differences tend to favor males in terms of mathematics achievement (Fast et al., 2010; Lee et al., 2014). Males have higher scores on tests measuring mathematical concepts and problem solving as well as tests of advanced mathematics (Schreiber, 2002). In her meta-analysis of gender differences, Ansell and Doerr (2013) found only minor gender differences in cognitive ability but did find a moderate difference on one aspect of spatial ability (mental rotations); differences in mathematical performance were moderate and favored males. Ansell and Doerr (2013) reported that NAEP data showed no statistically significant difference between the overall average male and female score, although males did outscore females significantly in two of the content strands (Measurement, Geometry and Spatial Sense).

In an earlier study about gender and mathematics, Mendick (2005) claimed that male students approach mathematics differently than female students. Mendick asserted that male students relate to mathematics through an approach of separateness. In contrast, Mendick claimed female students relate to mathematics through an approach of connectedness. Mendick hypothesized that students' understanding of mathematics would improve if teachers moved away from individual, abstract, rational, and objective (masculine) ways of teaching mathematics and towards relational, grounded, emotional, and subjective (feminine) ways of teaching mathematics. To support that hypothesis, Mendick interviewed 43 students in London who elected to continue with mathematics coursework beyond compulsory schooling that ended at age 16. From interviews and observations, Mendick constructed two psychoanalytic stories (one about a male student and one about a female student) to support the finding that teachers need to consider how educational systems reinforce gender biases. This study is important because learning mathematics from objective (masculine) and subjective (feminine) viewpoints supports the notion that male and female students may learn mathematics differently.

The possibility exists that gender differences in mathematics achievement might be attributed, at least in part, to the differences in achievement of the top achieving subgroups in each gender. In a study of gender differences of high-achieving students (scoring in the top ten percent of the math standardized tests by NCES), Reis and Park (2001) found that although the ratio of males to females in the sample pool from which they drew was nearly even (48.5 percent male to 51.5 percent female), the sample of high achieving mathematics students was comprised of more high-achieving males than females (53.2 percent to 46.8 percent). An analysis of the 2003 SAT-Math data, shows that three percent of the males tested scored in the 750-800 range (800 is the highest possible score) while only one percent of the females tested did. Six percent of the males tested scored in the 700-749 range and thirteen percent scored in the 650-699 range compared with three percent and seven percent of females respectively (SAT, 2003). Similar percentages are found when analyzing ACT data for the 2002-2003 school year (ACT, 2003). Three percent of tested males compared with one percent of tested females scored at the highest mathematics achievement level, 33-36 (36 is the highest possible score). In the next two score levels, 28-32 and 24-27, we find the percentages of males to females to be 11 to 7 and 20 to 17 respectively. With an overall SAT-M gender difference of 34 points and an ACT gender difference of 1.1 points, the possibility is credible that the top scoring males versus the top scoring females generated the entire difference (Reis & Park, 2001).

Latinos and Student Achievement

Because of the growing Latino population nationwide, especially in the states of California, Arizona, and Texas, it is important that factors that facilitate improved academic performance of Latino students are understood (Colby & Ortman, 2015). The focus should also be on schools that produce academically successful Hispanic students. By focusing on such students and, by extension, successful schools, Cavazos (2010) suggested that a deeper understanding of achievement processes and the resources needed to attain these results is important. The investigation of influential factors that facilitated success in schools with a high Latino enrollment could encourage other schools with similar enrollment patterns to emulate characteristics of successful schools.

Limited research exists at districts where Latino students make up the majority of the student population and the connection of this population to Algebra student achievement (Cavazos, 2010; Colby & Ortman, 2015; Lewis & Dentice, 2015). Although there is existing research on students' Algebra I achievement, the research that exists is correlated to populations such as gifted and talented as well as special education and in more general settings where Latino populations are under 55% (Allen, 2011; Hanushek, 2009; Lewis & Dentice, 2015).

Similar to Latino studies, a study was conducted to determine which predictor variables (i.e., the percentage of Hispanic students, the percentage of Hispanic students enrolled in AP Math classes, the percentage of Hispanic teachers, percentage of Hispanic student math college readiness, the percentage of low-income students, school size, average math class size, school instructional expenditure, and average campus administrator salary) may predict whether the urban high schools with a 51% Hispanic population exceeded the state average passing rate on the STAAR Algebra I EOC exam (Gallagher, 2018). It included a discriminant analysis for those urban high schools that met or exceeded the state average passing scores and those schools that did not meet the state average passing score. The variables that were analyzed included the percentage of Hispanic students, the percentage of Hispanic students enrolled in AP Math classes, the percentage of Hispanic teachers, percentage of Hispanic student math college readiness, the percentage of low-income students, school size, average math class size, school instructional expenditure, and average campus administrator salary. This analysis was used to identify which of the nine school- related variables may be predictive in the group of successful schools.

Other studies that include Hispanics in Texas as a focus group have also been conducted which focus on Advanced Placement (AP) courses and exam results (Colby & Ortman, 2015; Gallagher, 2018; Lewis & Dentice, 2015). For instance, a collective study focused on four Texas high schools with academically successful Hispanic students who were not enrolled in AP courses (Borg et al., 2011). Across the state of Texas, 48% of students enrolled in AP courses were White, even though White students made up only 38% of the high school enrollment. In comparison, Hispanic students represented 43% of the total high school population, but only 30% of AP student enrollment (Borg et al., 2011). As a result of this study, it was found that many academically successful Hispanic students were advised to transfer to lower levels of courses that were less rigorous and challenging early in their academic career, due to mediocre grades in advanced courses. While many of the Hispanic students in this study mentioned positive relationships with their teachers, relationships with school counselors appeared to be non-existent in most cases. Hispanic students indicated that they had to actively pursue meetings to seek advice from their school counselors. While the academically successful Hispanic students involved in this study were confident about going to college, they were unsure of their actual college readiness. Borg et al. (2011) recommended an increase in counseling and course planning efforts in the careers of Hispanic students and other minority student groups in an effort to increase their participation in AP classes.

Summary and Conclusion

In summary, this chapter included the theoretical frameworks that grounded this study as well as a review of literature that began with a description of the indicators used to examine Algebra I student achievement. I presented literature connected to gender, socioeconomic status, and English Language Learners in relation to students and mathematics achievement. I also presented a background on testing in the state of Texas as well as studies that have included socioeconomic status in relation to mathematics. Moreover, due to the significance of this research, I also included literature that focused on studies that relate to Latino population and Algebra as well as Hispanics and AP mathematics exams (Colby & Ortman, 2015; Gallagher, 2018; Lewis & Dentice, 2015).

CHAPTER III

RESEARCH METHODOLOGY

The purpose of this study was to analyze differences between at-risk indicators (i.e., socioeconomic status, gender, and ESL classification) on Hispanic, ninth grade students' Algebra I End of Course examination scores. The current study is a non-experimental, Ex-Post Facto quantitative study (Lammers & Badia, 2005). This chapter includes sections on the research design, population, data collection, and data analysis. Statistical methods are included in the research design, and the data collections as well as the data analysis show the preparation, collection process, presentation, and analysis of data. The research questions addressed in this quantitative study are listed below.

Research Questions:

Research Question 1: What is the impact of socioeconomic status on the Algebra I EOC exam?

Research Question 2: What is the success rate of ninth grade students identified as English Language Learners (ELL) compared to non-identified ninth grade students in Algebra I?

Research Question 3: What is the difference in ninth grade Algebra I achievement between males and females?

Research Question 4: What is the relationship between socioeconomic status, English Language Learner classification, and gender interactions?

Setting and Population of the Study

The participating consolidated independent school district is located in South Texas consisting of 14 schools: one ninth/tenth grade high school, one eleventh/twelfth grade high school, 3 middle schools, and 9 elementary schools. The school district is identified as rural by the Texas Education Agency (TEA) (Texas Education Agency, 2019). The percent of economically disadvantaged students in the school district is 79.1% and the Limited English Proficient student percentage is 19.1% (Texas Education Agency, 2019). The population for this study consisted of 274 ninth grade students from the ninth/tenth high school enrolled in a ninety-minute year-round Algebra I course during the 2018-2019 school year. The percentage of economically disadvantaged students at the campus was 79.5% and the ELL population consisted of 12%. There were 134 females and 140 males.

There was a total of seven teachers who taught Algebra I for the 2018-2019 school year, and they averaged ten years of teaching experience. They used the same curriculum and supplemental materials provided by the district's curriculum and instruction department. The Algebra I End of Course (EOC) test review preparation included supplemental curriculum that was also used by each of the Algebra I teachers. Moreover, all students tested on the same day in separate classrooms and were assigned and seated in alphabetical order by their last name.

Data Collection

Permission for data collection was obtained from the superintendent and the Public Education Information Management System (PEIMS) Director. Archived data were obtained through the district's computer information system, E-School©, which is an approved company for the Statewide Student Management System (SSMS). The database was used to attain the data for the identified independent and dependent variables. This system provides information such as the students’ attendance rate, socioeconomic status (as measured by the free and reduced lunch program), English language learner status, and gender. The database includes ninth graders’ Algebra I End of Course exam scale scores for the 2018-2019 school year. These were the most recent scores because the Algebra I End of Course exam was not administered during the 2019-2020 school year due to the COVID-19 pandemic.

Data Analysis

A non-experimental quantitative-Post Facto study was conducted (Lammers & Badia, 2005). This method was selected since there was no control over the independent variables and conditions were explored after the state assessment took place (Lammers & Badia, 2005). The data were analyzed using the IBM SPSS Version 27 program (SPSSv27). In order to evaluate whether the three-way ANOVA was an appropriate statistical test for the purpose of this study, the following three assumptions were considered: the data must contain one continuous dependent variable; the data must contain three independent variables each consisting of two or more categorical groups; there must be independence of observations among the variables. Each of these assumptions was confirmed, thus validating the selection of the three-way ANOVA as an appropriate statistical test. The variables considered for the three-way ANOVA include Algebra I EOC scale scores as the dependent variable, and socioeconomic status, gender, and ELL classification (i.e., ELL/Non-ELL) as the independent variables.

Data were analyzed using a Two x Two x Two, three-way ANOVA in order to compare the means of three groups (i.e., socioeconomic status, gender, and ELL classification) on the dependent variable (i.e., the Algebra I EOC scores) (Green & Salkind, 2012). The main factors were Gender, Economic Status, and ELL Classification. Each main factor had two levels: Gender - Male/Female, Economic Status – Economically Disadvantaged/Non-Economically

Disadvantaged, and ELL Classification – ELL and Non-ELL. The dependent variable was the Algebra I EOC examination scale score. Interaction effects were also examined in order to compare performance by groups.

The ANOVA was conducted to evaluate whether the mean Algebra I EOC scale score of ninth-grade students who are not from low socioeconomic status (as determined by free and reduced priced lunch) scored higher on the Algebra I End of Course (EOC) assessment as opposed to those students from low socioeconomic status. Second, it was conducted to determine whether the mean score of ninth-grade male students scored higher on the algebra I End of Course (EOC) assessment as opposed to females. Third, it was also conducted to evaluate differences in group mean Algebra I End of Course (EOC) scores of ninth-grade students who were not classified as ELLs as opposed to those students who are ELLs.

The three-way ANOVA assumes that the variances of the dependent variable are equal in all combinations of groups of the independent variables (Green & Salkind, 2012). If the variances are unequal, this can affect the Type I error rate. This means that when multiple analyses are conducted on the same data set, it raises the probability of capitalizing on random chance (Green & Salkind, 2012). Using the SPSSv27 Statistics, this assumption was tested by determining if there are equal variances in all combinations of groups of the three independent variables: economic status, gender, and ELL classification. The assumption of homogeneity of variances was tested using Levene’s test of equality of variances, which is found in Levine’s Test of Equality of Error Variances.

Limitations and Assumptions of the Study

For the purpose of this study subjects were limited to high school students who were in the ninth grade during the 2018-2019 academic school year and enrolled in a South Texas high school. It was also limited to only examining the factors in the groups identified by the researcher which are socioeconomic status, gender, and English Language Learner classification. Another limitation was that standardized test scores might not be an accurate representation of student knowledge, since the scores are based on student achievement on a cumulative test given once a year. Moreover, the participating school district was chosen due to its convenience for the researcher since the results may directly impact the curriculum and teacher instruction as well as other possible areas. This study is specific to the school system included and may not be generalizable to other populations or other school systems.

Several assumptions were made by the researcher as the study was conducted. For instance, the researcher assumed that the participants were honest about their economic status when they filled out enrollment paperwork submitted to the district to be identified as such. In addition, the researcher assumed that the school district quantified data needed on socioeconomic status, demographics, and student achievement on the STAAR examination. Moreover, it was assumed that all ethnic groups had an equal chance of successfully passing the STAAR exams despite school size or region of the high school in which they were enrolled. Also, it was assumed that data collected from the district state data reports were accurate and complete. Furthermore, the combination of independent variables selected for the study only consisted of three existent variables that the researcher assumed applied to the assessed population rather than other possible variables.

experiences. Qualitative research based on student and teacher perceptions of predominantly Latino students and mathematics achievement would contribute to the body of literature on Latino studies.

Additionally, due to the Algebra I End of Course assessment being mostly multiple choice with a few grid items, it is recommended that more studies are conducted with students who are identified at-risk using performance-based (Telese, 1994) or alternate assessment methods such as Model-Eliciting Activities (MEA) to get a deeper insight into the mathematics that students really know (Aguilar, 2021). By taking specific concepts assessed on the Algebra I EOC such as properties of linear and quadratic functions and formulating Model-Eliciting Activities as well as using an evaluation rubric like a Quality Assessment Guide (QAG) or the mathematical knowledge rubric (Telese, 1994), educators can closely evaluate students' abilities to "interpret, invent, and find solutions that jump the barriers of achievement stereotype" (Aguilar, 2021 p.54). This will also allow for teachers to get a more solid understanding on whether students are able to apply what they learned and not just memorize a trick to solve the multiple-choice items.

Based on the results of the study, it is also important to note that there is work to be done at the school district due to the spread of scale scores between low socio-economic males and females as well as ELL males and non-ELL males. Whether it is more programs that allow for more targeted instruction for these populations or providing effective professional learning to teachers who service these populations.

CHAPTER IV

RESULTS

The presentation and analysis of findings will be shared in this chapter. The data was analyzed using the Statistical Package for the Social Sciences (SPSS V27). Descriptive and inferential statistics were used to answer each of the research questions. The analysis begins with the description of the results based on the Levene's Test for Equality of Variances (Table 1). It is then followed by the discussion of findings from the descriptive statistics table for Gender, Economic Status, and ELL Classification (Table 2). Moreover, the results of the Three-way ANOVA are presented (Table 3) and they are discussed based on the three factors analyzed. This is followed by a profile plot that shows the three-way interaction between Gender, Economic Status, and ELL Classification (*Figure 1*). Results for each research question will also be discussed based on the findings from Boxplots.

A Three-way ANOVA was conducted to compare the main effects of socioeconomic status, gender, and ELL classification as well as their interaction effects on Algebra I EOC exam results. The results of The Levene's Tests for Equality of Variances are presented in Table 1. The statistical significance or *p*-value used was 0.05. The statistical significance level was .320 which indicated that Levene's test was not statistically significant indicating that there were equal variances across groups, and the assumption of homogeneity of variances was not violated. Therefore, there was homogeneity of variances for student achievement for all group combinations of gender, socioeconomic status, and ELL classification, as addressed by Levene's test for equality of variances, $p = .320$. The degrees of freedom were 7 and 266 with an associated F-value is .622 all based on the Mean.

Table 1

Results of the Levene's Test for Equality of Variances

		Levene's Statistic	df1	df2	Sig.
Student Achievement	Based on Mean	.622	7	266	.320
	Based on Median	.516	7	266	.416
	Based on Median and with adjusted df	.516	7	255.606	.416
	Based on trimmed mean	.682	7	266	.277

The Descriptive Statistics depicted in Table 2 below includes the mean scale scores for each main factor and group comparison mean scale scores. In addition, Table 2 also includes information for the three factors displayed based on the Algebra I EOC performance. Based on the data, the mean scale scores and standard deviation for the sub categories are provided. Important information can be obtained by looking at Table 2 such as how the three factors interact with each other as well as the mean scale scores for each group. For instance, from table 2, it is evident that the mean scale score for females who were not economically disadvantaged was higher when compared to the females who were economically disadvantaged. Moreover, it is also evident that males who were not economically disadvantaged also had a higher mean scale score than males who were economically disadvantaged.

Table 2

Descriptive Statistics Table for Gender, Economic Status, and ELL Classification

Gender	Economic Disadvantaged	ESL Program	Mean	Std. Deviation	N
Female	No	No	3749.62	271.227	34
		Yes	3539.09	252.676	11
		Total	3698.16	279.384	45
	Yes	No	3695.52	292.270	56
		Yes	3551.03	260.041	33
		Total	3641.94	287.931	89
	Total	No	3715.96	284.185	90
		Yes	3548.05	255.339	44
		Total	3660.82	285.284	134
Male	No	No	3638.07	219.009	42
		Yes	3673.74	324.748	19
		Total	3649.18	254.346	61
	Yes	No	3668.71	289.561	51
		Yes	3573.61	279.866	28
		Total	3635.00	288.020	79
	Total	No	3654.87	259.189	93
		Yes	3614.09	299.513	47
		Total	3641.18	272.992	140
Total	No	No	3687.97	248.408	76
		Yes	3624.37	303.034	30
		Total	3669.97	265.079	106
	Yes	No	3682.74	289.919	107
		Yes	3561.39	267.282	61
		Total	3638.68	287.130	168
	Total	No	3684.91	272.744	183
		Yes	3582.15	279.467	91
		Total	3650.78	278.732	274

a. Dependent Variable: Algebra I EOC Scale Scores

A three-way ANOVA was conducted to determine interaction effects between the three independent variables (Green & Salkind, 2012). The results of the Three-way ANOVA and interaction effects between the variables gender, economic status, and ESL program are presented in Table 3. The degrees of freedom (df) are all equal to 1 for the factors being studied as well as for the interactions. That refers to the maximum number of independent values that have the freedom to vary without breaking any constraints. Moreover, the Type III Sum of Squares was used due to the number of expected interactions. The Mean Square outcomes are based on the average sum of squares for the factors being studied and the error.

There were no statistical differences found in the interaction effects. The result indicated that students performed similarly regardless of gender, being economically disadvantaged or not, or being classified as an ELL student. Therefore, based on this finding, the third research question regarding Algebra I achievement differences in ninth grade males and females has no impact on the other two factors, socioeconomic status and ELL classification.

The analysis revealed statistically significant differences for one of the main factors, ELL program classification (Sig. = .01). Although there was no significance regarding the interaction between factors because the Significance was greater than .05, the interaction between Gender and ELL Program approached significance but was not below .05.

Table 3
Results of the Three-way ANOVA: Gender by Economic Status by ELL Classification and Interaction Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	1185.276	1	1185.276	.016	.900
EcoDisadvantaged	41522.800	1	41522.800	.550	.459
ELL program	572090.297	1	572090.297	7.571	.006
Gender * EcoDisadvantaged	2488.620	1	2488.620	.033	.856
Gender * ELL program	290990.101	1	290990.101	3.851	.051
EcoDisadvantaged * ESLprogram	13953.045	1	13953.045	.185	.668
Gender * EcoDisadvantaged * ELL program	129000.146	1	129000.146	1.707	.192
Error	20100047.627	266	75564.089		
Total	3673144453.000	274			
Corrected Total	21209784.296	273			

a. Dependent Variable: Algebra I EOC Scale Scores

Information regarding the Tests of Between Subjects Effects is also presented in *Table 3* above. The information listed in this table showed whether the factors were significant and the results of the two-way and three-way interactions. None of the two-way interactions showed significance since the p-value was greater than .05. The three-way interaction (Gender by Economic Status by ELL Classification) showed no statistical significance and will be further analyzed in Research Question 4, where Table 3 will also be referenced further.

From a Three-way ANOVA, a three-way interaction produces results regarding the relationship between the independent variables (i.e., gender, socioeconomic status, and ELL classification). This is best visualized with a profile plot as shown on *Figure 1* below.

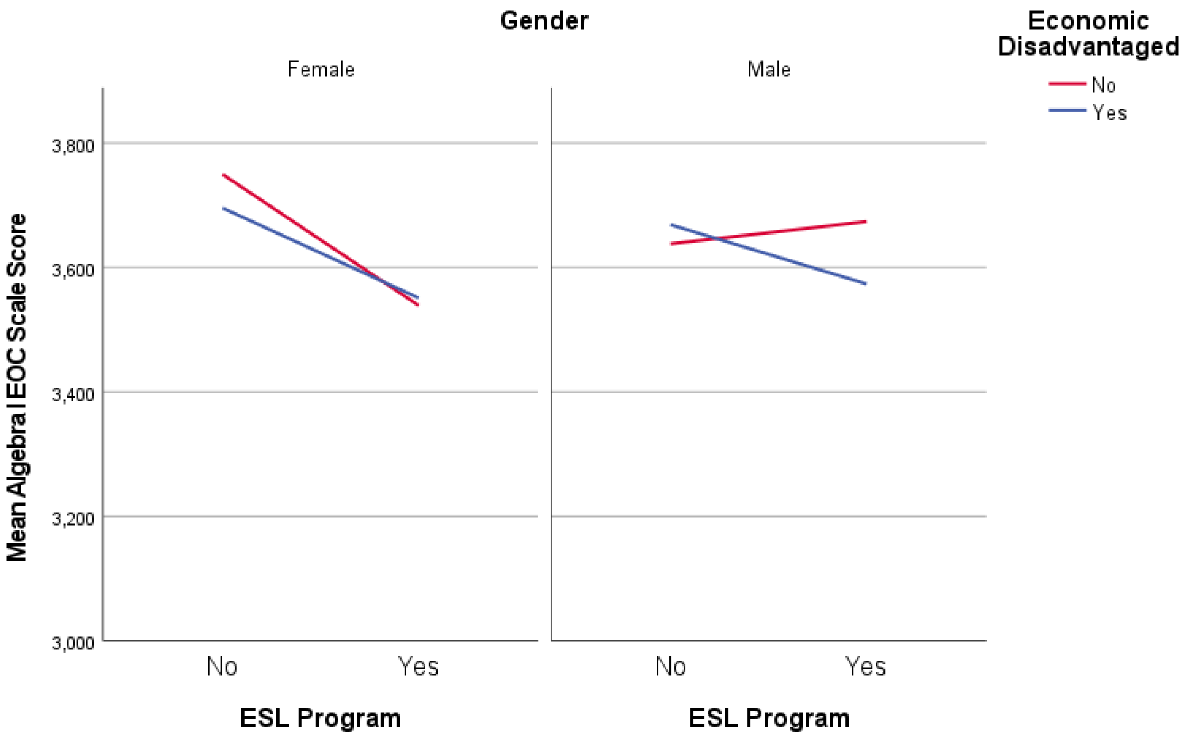

Figure 1. Student achievement based on ELL Program identification, Gender, and Economic Status

The interaction plot indicated that although not statistically significant, females who are economically disadvantaged and classified as ELLs had lower student achievement than females who are not classified as ELLs and are not economically disadvantaged. Based on *Figure 1*, the ELL females had nearly equal mean scores regardless of economic status. The females who were not classified as ELL had higher mean scores than the ELL females. More importantly, the non-economic disadvantaged females had the best performance in mean scores although not statistically significant. Similarly, although not statistically significant, males who are economically disadvantaged and are not ELLs have higher student achievement than those who are ELLs and are not economically disadvantaged. ELL males had nearly equal mean scores regardless of economic status and the non-ELL males had a higher mean score than ELL males. This may be because there are more economically disadvantaged students included in the study, 168 economically disadvantaged and 106 non-economically disadvantaged. There were also a few more male than female students, 134 females compared to 140 males. The profile plot in *Figure 1* will be referenced later in Research Question 4.

Moreover, based on the results of the Three-way ANOVA (*Table 2*), the two-way interaction between gender and ELL Classification was close to being statistically significant and if the sample size was increased, the p-value would be less than .05 which would show significance. Although no significance was found, I was able to produce graphs for the Estimated Marginal Means figures below (see *Figure 2* and *Figure 3*), and they include the scale score performance of females and males who are classified as ELL based on a 95% Confidence Interval (CI). It is evident that the Females who were classified as ELL had a lower scale score on the Algebra I EOC exam than females who were not classified as ELL (see *Figure 2 below*). Also, from *Figure 3 below*, it is evident that the difference in Algebra I EOC scale scores between Males who were classified as English Language Learners scored slightly lower than males who were not classified as English Language Learners.

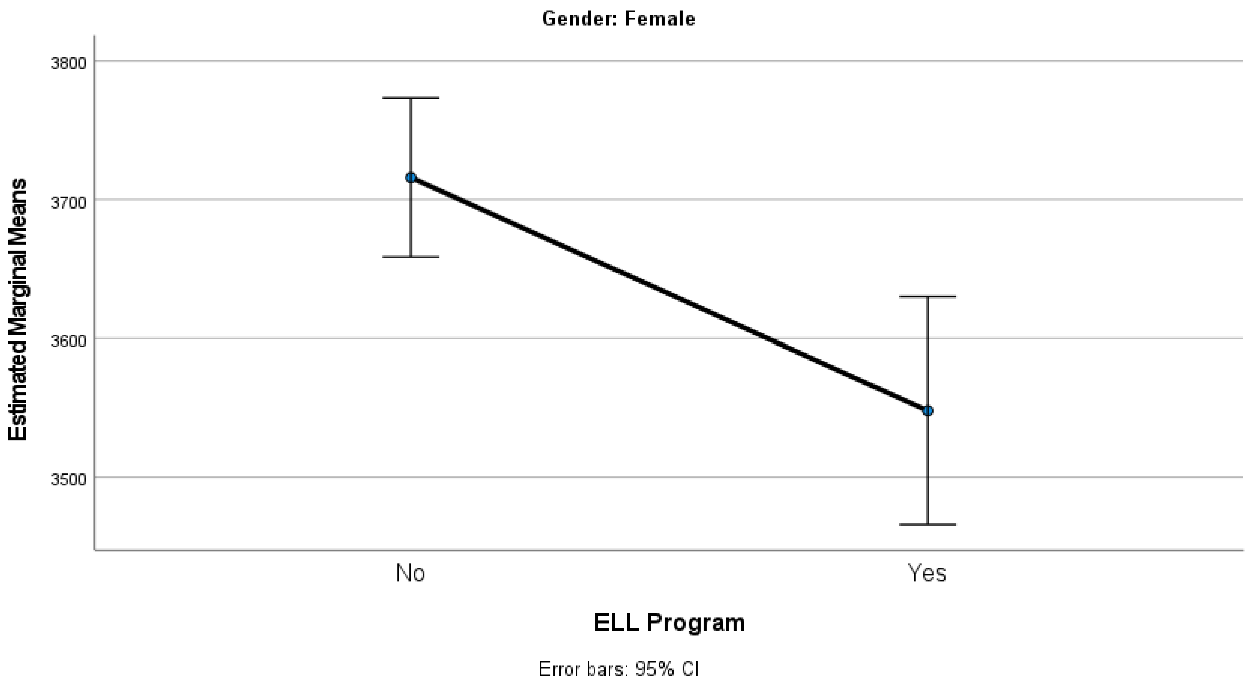

Figure 2. Estimated Marginal Means for Female English Language Learners

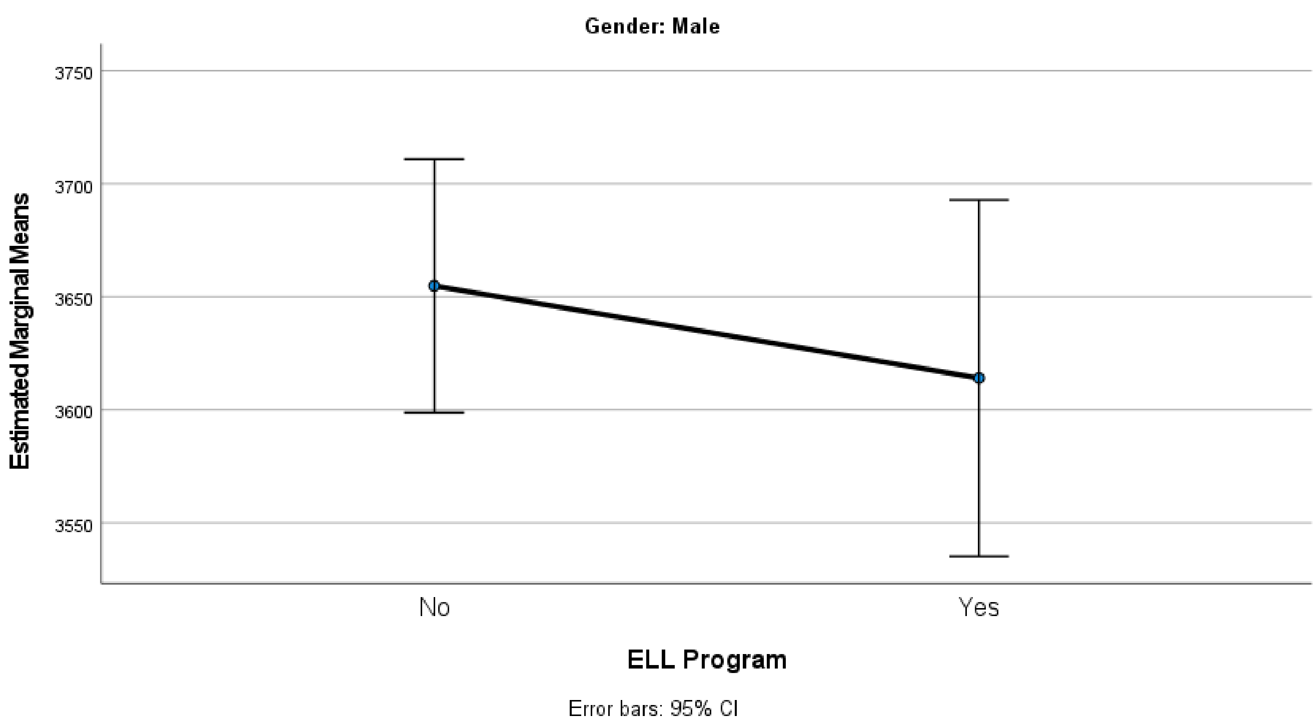

Figure 3. Estimated Marginal Means for Male English Language Learners

The findings in this study are relevant because the results found are similar to other results in the field that have indicated ELL students attain lower performance in mathematics state and national assessments (Martiniello, 2009; Haladyna & Downing, 2004). For example, in the study of ELL and non-ELL student performances on a state standards-based mathematics test, Martiniello (2009) found that greater lexical and syntactic complexity of math word problems favored the math outcomes of non-ELL students. Furthermore, she found that differential item functioning is attenuated when items included nonlinguistic schematic representations that ELL students could use to make meaning of the mathematics test items. However, the new mathematics content standards specify the teaching and assessment of the communication of content knowledge in addition to the content knowledge itself, as an additional aspect of the mathematics construct to be assessed (Haladyna & Downing, 2004).

To analyze each research question and provide the connection from the acquired data to the results, information from the Three-way ANOVA was analyzed.

Research Question 1

Research Question 1: What is the impact of socioeconomic status on the Algebra I EOC exam?

There was no impact of socioeconomic status on the Algebra I EOC exam since based on the results of the Three-way ANOVA, there was no statistical significance for the socioeconomic status factor (Sig. = .459). The sample was composed of 274 ninth grade students, from which 61% (n=168) were economically disadvantaged and 39% (n=106) were considered non-economically disadvantaged. From the Descriptive Statistics Table (See Table 1 above), the mean Algebra I scale EOC score for economically disadvantaged participants (M = 3638.68, SD = 287.13) was lower than the score for non-economically disadvantaged participants (M = 3669.97, SD = 265.079).

Moreover, the distribution of scores for the two groups is displayed in *Figure 4 below*. Based on the distribution graph from the Box Plots, the average scale score appears to be slightly higher for those students not economically disadvantaged, but students who are economically disadvantaged had a wider spread of scores and some actually appeared to have achieved a higher score on the exam by looking at the upper whisker (see Figure 2 above).

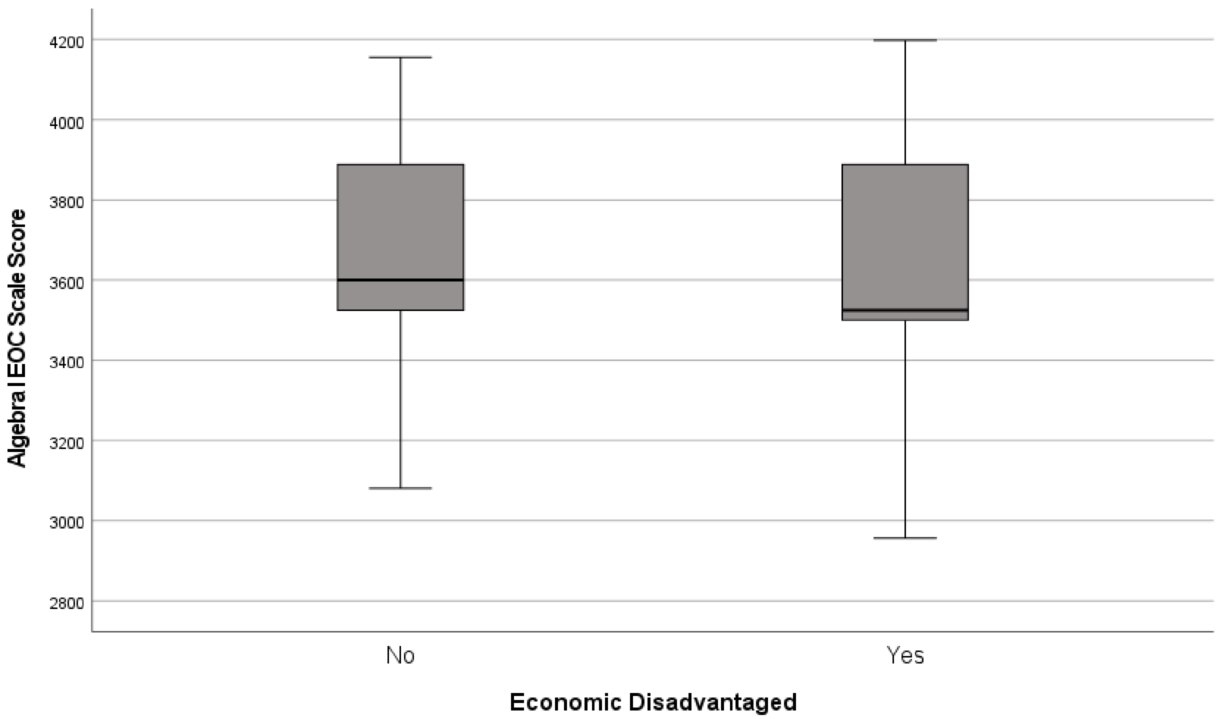

Figure 4: Box Plots of Algebra I EOC Scores for Economic Status

From the Box Plots depicted in figure 4, the average score (M) for economically disadvantaged participants was slightly lower than students who were not economically disadvantaged based on the average scale score. Although the number of students who were economically disadvantaged was higher than those who were not, the minimum value of the scale score appeared slightly lower for those who were classified as economically disadvantaged.

The distribution of scores in the first quartile was more spread out for students classified as economically disadvantaged than non-economically disadvantaged students. Moreover, students who were classified as economically disadvantaged were able to reach the maximum possible scale score of 4200 on the Algebra I EOC exam unlike students who were not economically disadvantaged.

The results of this study regarding socioeconomic status and Algebra I EOC performance were not significant based on the Three-way ANOVA as I perceived before analyzing the data. The results are relevant because they also contribute to the field and are similar to the results found in a longitudinal study by Chow (2007). Similarly, in her study, Chow analyzed the difference in a state assessment, the Texas Assessment of Knowledge and Skills (TAKS) achievement among students that were identified as receiving free lunches and students not eligible for free or reduced lunches. Chow also found that there were no statistically significant differences across socioeconomic status based on ANOVA results. Students who did not receive free or reduced lunch attained a higher mean score than students receiving free lunch. However, most students identified as receiving free lunch still passed the mathematics TAKS test. Moreover, Chow also found that scores were consistent providing evidence that students learn the same amount of information regardless of their economic status.

Due to the number of students identified as low socioeconomic in this study, my assumptions regarding their performance in the Algebra I EOC correlate with previous research regarding student achievement such as Chow's (2007). Being a former Algebra I teacher, I found that students classified as such work as hard as those students who are not low socioeconomic. In my study, I was able to show based on the ANOVA, that low socioeconomic students were able to reach the maximum scale score on the Algebra I EOC. This is contrary to what other researchers (Valero et al, 2015; Jordan, et al, 2007) have found in regards to low math performance in state and national assessments due to lack of support from parents and educators. However, future research should be conducted to see whether students from low-socioeconomic backgrounds receive less academic support than their non-low socioeconomic status peers from other backgrounds (Jordan et al., 2007).

Research Question 2

Research Question 2: What is the success rate of ninth grade students identified as English Language Learners (ELL) compared to non-identified ninth grade students in the Algebra I EOC exam?

Based on the results of the ANOVA (see Table 3 above), there was statistical significance for the English Language Learners Program factor (Sig. = .006). Since the ELL factor has statistical significance, it could have had a significant impact upon other factors included in the study; however, they did not show any significance based on the ANOVA results. The success rate for students classified as ELLs compared to non-identified ELLs is evident from the Descriptive Statistics in table 2 above. The Algebra I EOC mean scale score for students classified as ELLs (M = 3582.15, SD = 279.47) was lower than the score for non-ELLs (M = 3684.91, SD = 272.74).

Moreover, the success rate for ELLs compared to non-ELLs is also evident in the Box Plots shown in *Figure 5* below. The distribution on the graph shows that students who were not classified as ELL had a slightly higher mean scale score on the Algebra I EOC exam. In addition, the spread of scores was lower and had more variability for students who were not classified as

ELLs. Students who were classified as ELLs were not able to reach the maximum scale score of 4200 in the Algebra I EOC.

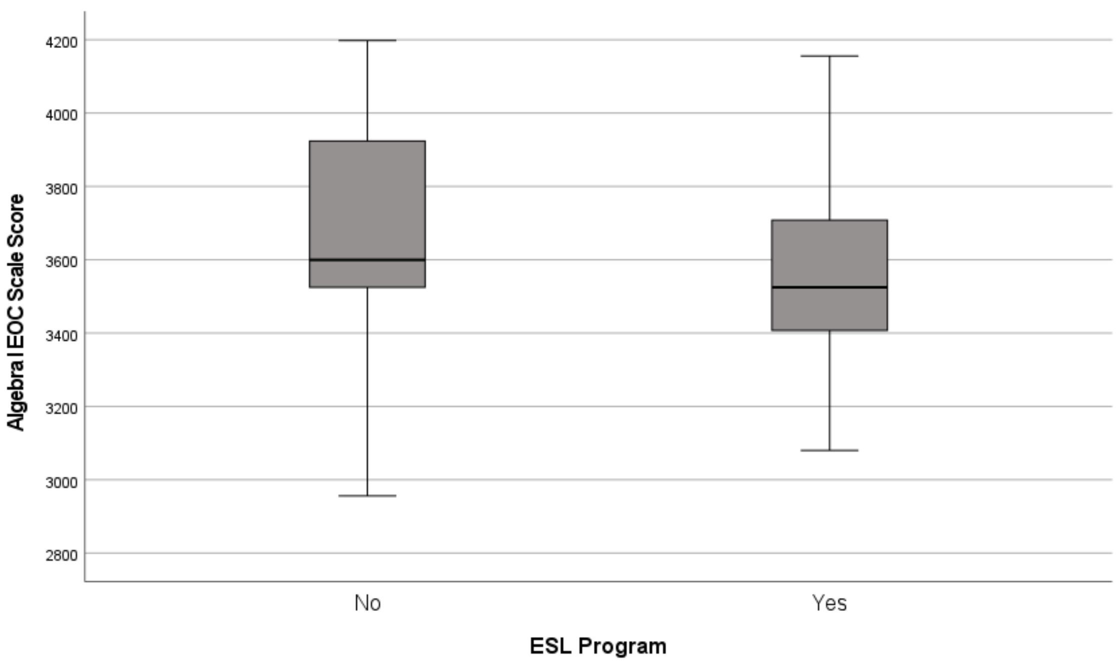

Figure 5: Box Plots of the Algebra I EOC Scores for English Language Learners

From the population data collected due to the number of students who tested, there are still interesting and useful results when analyzing the Algebra I EOC scores. Although the average scale score (M), was higher for non-ELLs than the scale score for ELLs, the spread of scores for the ELLs was not as wide and the distribution of scores in the first quartile was closer for the group. The least value score was higher for ELLs than for non-ELLs and the greatest value score for ELLs was not far from the non-ELL group. This could be due to factors such as teaching styles, scaffolding strategies, or the experience of the teachers who service ELLs. Not all teachers who service ELLs receive the same training that others do since there are student schedule changes that take place during the school year or for other reasons, but these teachers must find ways to help all their students succeed in Algebra I (Flemming, 2020). Moreover, scaffolding strategies for ELLs are essential since they encounter difficulties with processing new information and making connections to content areas such as mathematics (Walqui, 2006). If teachers are not trained on how to help ELLs by using scaffolding strategies, they will struggle to deliver effective instruction to the students.

Here, I depict that there is statistical significance (Sig. = .06) with the ELL factor in regards to the results of the Algebra I EOC exam. Similarly, there are studies that have been conducted in which ELL performance was analyzed in the area of mathematics and have found statistical significance when factoring the ELL population (Barajas-Lopez & Aguirre, 2015; Hansen-Thomas, 2009; Turner et al., 2013). This means that the significance value or p-value is less than .05 and results of the studies are reliable based on the data studied. For instance, drawing from Turner et al. (2013), factors such as language acquisition and absences were significant when connected to ELLs.

Moreover, several studies have been conducted that include ELLs and mathematics achievement (O'Brien, 2009; Reeves, 2006; Salazar, 2010). A study specifically mentioned Algebra I performance in relation to the performance of ELLs did not find any significant difference between ELLs and the Algebra I performance on a state assessment since the data did not meet the *p*-value to be less than .05 (Lamie, 2014). In addition, Lamie's results also indicated that the mean score on the state Algebra I assessment was only one point higher for non-ELLs compared to ELLs. Lamie (2014) found that the results contradicted his assumptions and recommended for more research to be conducted that included other factors such as Algebra I classroom performance.

There is a need for more research to be conducted regarding other factors that may affect how ELLs learn and perform in high school mathematics assessments such as attendance and grade retention. It would be meaningful and useful information for current education stakeholders if significance is found so they are able to address this population more intentionally.

Research Question 3

Research Question 3: What is the difference in ninth grade Algebra I achievement between males and females?

Based on the results of the Three-way ANOVA, there was no statistical significance for the gender factor (Sig. = .900). This means that the p-value was greater than .05 and the data is not reliable. Had the sample size been greater, the p-value would have been under .05 and significance would have been encountered. The sample was composed of 274 ninth grade students, from which 49% (n=134) were females and 51% (n=140) were males. From the Descriptive Statistics Table 1 above, the mean Algebra I scale EOC score for female participants (M = 3662.51, SD = 305.06) was slightly higher than the score for males (M = 3641.18, SD = 23.07). However, the standard deviation was over 280 scale points higher for females. This could be due to the instructional delivery by teachers or other factors such as class placement.

To view this data in a graphical representation, scale scores for males and females are presented in the Box Plots shown in *Figure 4 below*. From the Box Plots, it is evident that female students had a higher mean scale score than males, and the range of scores were higher with females and more consistent with male students as indicated by the smaller range. The female students had a higher median score than the male students. It appears that overall, the female students had more variability in performance and appeared to have higher performance than the male students.

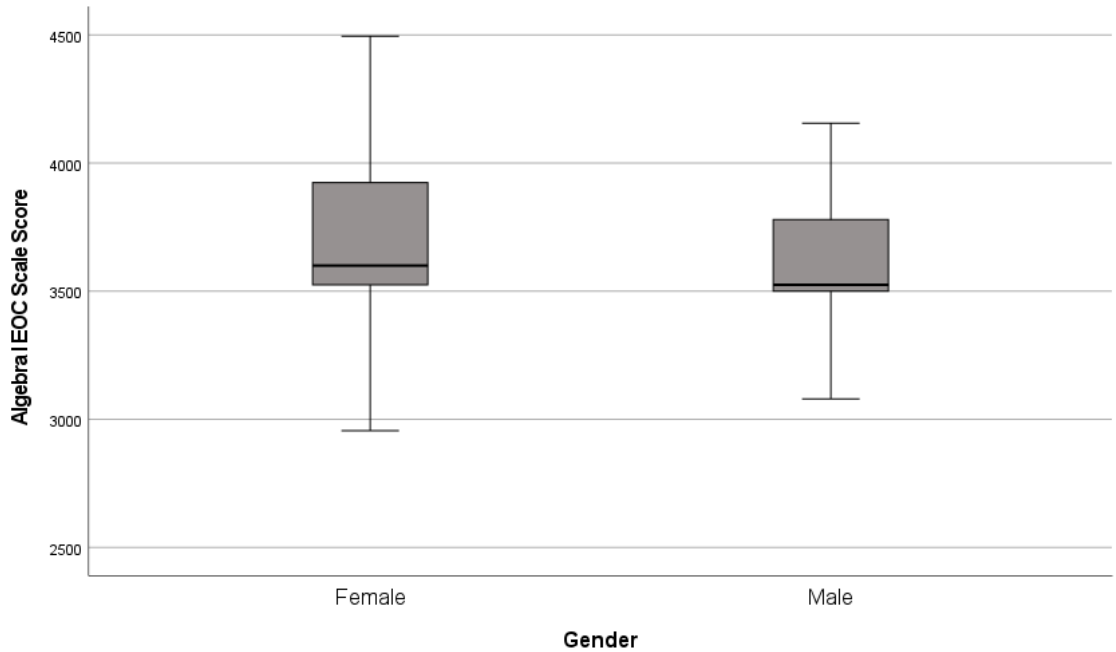

Figure 6: Box Plots of the Algebra I EOC Scores for Females and Males

The number of males and females was closely aligned for this category of the study. Based on the analysis and the results from the Box Plots, the mean scale score and greatest value for females was significantly higher than males.

Historically, males have performed better than females in mathematics (Ansell & Doerr, 2013). Several early studies that have been conducted indicated that at high school level, males were favored when it came to mathematics achievement (Schreiber, 2002; Marsh, 1989). Other studies found that males score higher on tests that measured mathematical concepts and algebraic problem solving such as those found on the Algebra I EOC exam (Ansell & Doerr, 2013). However, a large-scale study conducted by Hydea & Mertzb (2009) indicated that females have reached equivalence with boys in mathematics performance at high school level where the gap was significant in earlier decades. Based on the results of this study, it is evident from the Algebra I EOC mean scale score and Box Plots that female students performed better than males. This could be due to females selecting state required graduation pathways in eighth grade such as engineering or medical that require higher middle school mathematics scores (Texas Education Agency, 2019). However, this would need to be studied further.

Research Question 4

Research Question 4: What is the relationship between Socioeconomic Status, English Language Learner classification, and Gender interactions?

A Three-way ANOVA was conducted to compare relationship between socio-economic status, gender, and ELL classification as well as their interaction effects on Algebra I End of Course scale scores. From Table 4 below, it is evident that the three-way interaction was not significant since the Sig.=.192 and that means that the p-value is greater than .05. Had the sample size been larger, then the significance would have been found between the three variables and the p-value would have been below .05. The results of the Test Between Subjects (Table 4) also show that individual factors – Economic Status and Gender – were not significant; however, the ELL classification factor did show a significant value (Sig.=.006). The three-way interaction not being significant could be due to two of the three factors not having significance (Economic Status and Gender) nor the two-way interactions being significant since the p-value was greater than .05 for all three two-way interactions. Moreover, the numbers of the factors analyzed could have also contributed to the significance of the three-way interactions. For instance, there were 168 students who were economically disadvantaged compared to 106 non-economically disadvantaged; 134 females compared to 140 males; 91 ELL students compared to 183 non-ELLs.

It is also important to note that considering the ELL program data showed significance (Sig.=.006), my assumptions were that the Gender and ELL program interaction would have had some significance. From Table 4 below, it is also important to note that the interaction between Gender and ELL classification almost reached significance (Sig.=.051). However, even those results did not cause the three-way interaction to be significant.

Table 4
Test Between Subjects Results of the Three-way ANOVA: Gender by Economic Status by ELL Classification and Interaction Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	1185.276	1	1185.276	.016	.900
EcoDisadvantaged	41522.800	1	41522.800	.550	.459
ELL program	572090.297	1	572090.297	7.571	.006
Gender * EcoDisadvantaged	2488.620	1	2488.620	.033	.856
Gender * ELL program	290990.101	1	290990.101	3.851	.051
EcoDisadvantaged * ESLprogram	13953.045	1	13953.045	.185	.668
Gender * EcoDisadvantaged * ELL program	129000.146	1	129000.146	1.707	.192
Error	20100047.627	266	75564.089		
Total	3673144453.000	274			
Corrected Total	21209784.296	273			

a. Dependent Variable: Algebra I EOC Scale Scores

The three-way interaction for the three factors analyzed (Socio-economic status, Gender, and ELL Classification can further be seen in the Profile Plot below as previously discussed (Figure 1). The interaction plot indicated that although not statistically significant, females who are economically disadvantaged and classified as ELLs had lower student achievement than females who are not classified as ELLs and are not economically disadvantaged. Based on *Figure 7*, the ELL females had nearly equal mean scores regardless of economic status. The females who were not classified as ELL had higher mean scores than the ELL females. More importantly, the non-economic disadvantaged females had the best performance in mean scores although not statistically significant. Similarly, although not statistically significant, males who are economically disadvantaged and are not ELLs have higher student achievement than those who are ELLs and are not economically disadvantaged. ELL males had nearly equal mean scores regardless of economic status and the non-ELL males had a higher mean score than ELL males. This may be because there are more economically disadvantaged students included in the study, 168 economically disadvantaged and 106 non-economically disadvantaged. There were also a few more male than female students, 134 females compared to 140 males.

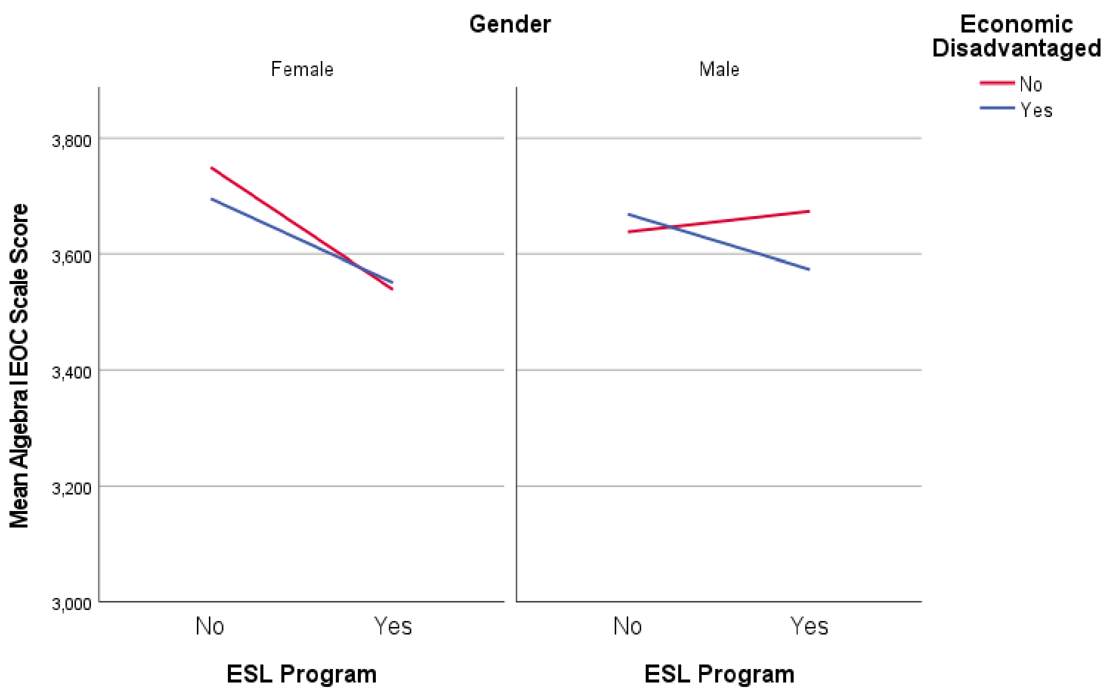

Figure 7. Student achievement based on ELL Program identification, Gender, and Economic Status

Summary of Findings

The analyses conducted in this study addressed four research questions presented earlier. Chapter three included a detailed analysis of each question and the components of the data analysis process. The dependent variable for each part of the analysis was student achievement based on the ninth grade 2019 Algebra I End of Course assessment. The independent variables were socioeconomic status – based on free and reduced lunch, English language learner identification, and gender.

A Lavene's test of equality of variances was performed with the collected data and it was determined that based on the statistical significance level of $p = .277$, the test was not statistically significant ($p > .05$). That meant that there were equal variances and the assumption of homogeneity of variances was not violated.

When the three-way ANOVA was conducted to determine whether there was a three-way interaction between the three independent variables, it was found that there was no statistical significance due to the *p*-value being .192 which is greater than .05. However, there was an interaction effect plot where Multiple Line Means of Student Achievement by ESL program, Economic Disadvantaged, and Gender was created. From this profile plot, several results were shown in relation to the factors associated with this study: socioeconomic status, ELL classification, and gender.

One result is that females who were economically disadvantaged and classified as ELLs had lower student achievement than females who were not classified as ELLs and were not economically disadvantaged. When it comes to males, those who were classified as ELLs and were not economically disadvantaged, were not statistically different but had higher student achievement than males who were not ELLs and were economically disadvantaged.

It was also found that due to the interaction between gender and ELL classification approaching statistical significance (Sig.=.051), the Estimated Marginal Means graph indicated that Female and Male ELL students attained a lower scale score on the Algebra I EOC exam. In addition, it was important to note that the scale score for ELL Females was lower than ELL Males when compared to non-ELLs Females and Males.

To analyze each research question and provide the connection from the acquired data to the results, data from the Three-way ANOVA was analyzed based on Algebra I End of Course performance as the dependent variable. The research questions were as follow:

Research Question 1: What is the impact of socioeconomic status on the Algebra I EOC exam?

Research Question 2: What is the success rate of ninth grade students identified as English Language Learners (ELL) compared to non-identified ninth grade students in Algebra I?

Research Question 3: What is the difference in ninth grade Algebra I achievement between males and females?

Research Question 4: What is the relationship between Socioeconomic Status, English Language Learner classification, and Gender interactions?

For the first research question, data from the Three-way ANOVA was analyzed to evaluate whether the mean score for the algebra I end of course (EOC) assessment of ninth grade students who were economically disadvantaged differed from the mean score of ninth grade students who were not economically disadvantaged. The score on the Algebra I End of Course (EOC) assessment was the dependent variable and the independent variable being the students' economic status. There were 168 economic disadvantaged and 106 non-economic disadvantaged participants. The Algebra I EOC score for economically disadvantaged students was lower than the score for non-economically disadvantaged students.

For the second question, data from the Three-way ANOVA results was also used to evaluate whether the mean score for the Algebra I End of Course (EOC) assessment of ninth grade students classified as ELLs differ from the mean score of ninth grade students who were not classified as ELLS. The score on the Algebra I End of Course (EOC) assessment was the dependent variable and the independent variable was the ELL classification of the student. There were 91 ELL and 183 non-ELL participants. The Algebra I EOC score for ELLs was lower than the score for non-ELL students.

Regarding the third question, the score on the Algebra I end of course (EOC) assessment was the dependent variable and the independent variable was the students' gender. There were 134 female and 140 male participants. The Algebra I EOC score for females was higher than the score for males.

The fourth question was answered by analyzing the data found in the Tests Between Subjects results table (Table 4) which showed there was no relationship between the three variables (Socio-economic Status, Gender, and ELL Classification). Based on the Profile Plot (Figure 1), it was also evident that ELL females almost had equal Algebra I scale scores regardless of their economic status and non-ELL males had a higher mean scale score than ELL males.

CHAPTER V

DISCUSSSION AND CONCLUSION

Chapter five includes the discussion and conclusion of the study with recommendations and connections to literature as well as implications for practice. Recommendations are provided for readers who may be able to reference the results when considering the implementation of professional learning opportunities for teachers or to select intervention strategies to address factors that influence academic success in high school Algebra I.

The purpose of this study was to examine the relationship of socioeconomic status (as measured by free and reduced priced meals), English language learners (ELL) classification, and gender in relation to student performance in high school Algebra I. Due to the factors examined, this study was grounded on social constructionism and by analyzing the results, it is presumed that teachers of English Language Learners formed their social constructs about the way that population learns. Drawing from the literature, the connection between socioeconomic status and being classified as ELL provided some insight into the results from this study in connection to social constructionism. Due to language and monetary limitations, these students may or may not have been provided the same opportunities as those who were not classified as such (Berger & Luckmann,1966).

Moreover, statistical data of 274 ninth grade students was analyzed to provide a baseline of patterns that influenced their success in mathematics on the Algebra I End of Course assessment. The analysis was based on three research questions that included important factors including those considered at-risk such as socioeconomic status and ELL classification. A Three-way ANOVA was conducted to determine whether there was a three-way interaction between three independent variables (Green & Salkind, 2012). Moreover, data from the results of the Three-way ANOVA was used to determine if there were differences in socioeconomic status (as measured by free and reduced meals), English language learner status, and gender in relation to the students' performance on the Algebra I End of Course (EOC) assessment.

Discussion

Many factors tend to impact students' performance on national and state assessments such as the at-risk factors that include socioeconomic status, gender, and ELL classification (Ansell & Doerr, 2013; Lewis & Dentice, 2015). In this study, I examined factors that contribute to student success in high school Algebra I. The research questions presented here guided the analysis and findings that will contribute to existing research as well as prompt topics for further research. The results for two research questions were quite startling considering it has been generalized that males tend to perform better in math courses than females and that ELL students tend to outperform non-ELL students in mathematics due to their bilingual advantage (Ansell & Doerr, 2013; Gallagher. 2018). Nonetheless, the group of participants included in this study came from a pre-dominantly Latino population rather than populations from other studies that have been conducted (Lewis & Dentice, 2015; Allen, 2011; Hanushek, 2009).

The results of the ANOVA conducted in this study showed that students who were classified as economically disadvantaged attained lower student achievement on the Algebra I EOC exam than those who were not economically disadvantaged. These results validate the research presented by Jenson (2013) and Schachter (2013) regarding the impact that social class has on student achievement. They found that students who came from disadvantaged homes and were classified as low socio-economic status did not perform at the level of their classmates who were not of low socio-economic status (Jenson, 2013; Schachter, 2013).

Moreover, drawing from the research conducted by Jordan et al. (2007), the findings from my research also support the idea that socioeconomic status is a predictor of students' mathematics achievement. Although the difference in the Algebra I EOC scale scores for students classified as economically disadvantaged compared to those who were non-economically disadvantaged was not significant in this research, it is important to note that there was a difference in performance and spread of scores. Economically disadvantaged students scored slightly lower than students who were not classified as economically disadvantaged. However, this research does not directly support his other findings regarding lack of mathematics support for low socioeconomic students compared to their peers nor having less resources since these factors were not the focus of my study. Further research would be needed to correlate those factors with socioeconomic status and mathematics achievement.

When students do not have English as their primary language, it is more difficult for them to solve complex word problems and develop conceptual understanding necessary to be successful in mathematics than for their English-speaking peers regardless of the grade level (Callahan & Shifrer, 2016; Fleming, 2020). This could be due to the understanding of mathematics vocabulary terms that do not have cognates associated to them or the inability to make connections to the mathematical concepts (Cahhahan & Shifrer, 2016). Results from this study, which included an analysis of data from a predominantly Hispanic high school, support findings from similar studies conducted in non-predominantly Hispanic settings (Cummings, 2000; Callahan & Shifrer, 2016; Parke, 2016; Barajas-Lopez & Aguirre, 2015; Abedi, Courtney, Leon, Kao, & Azzam, 2006). The researcher found that students who were classified as English language learners had lower performance than students who were not classified as such.

However, based on the ANOVA results from this study, it was also evident that some ELLs were able to attain the highest possible Algebra I EOC Scale Score of 2400. This could be a result of ELLs not being separated from their non-ELL peers as well as being provided with the same opportunities for Algebra I remediation throughout the school year. As mentioned in the study by Barajas-Lopez & Aguirre (2015), ELL students tend to perform better when they are included as part of the same educational environment as their non-ELL peers. Factors such as teacher experience and attendance were not part of this study, but could also be considered in further research.

Gender differences in mathematics achievement have been generalized in various studies by indicating that males outperform their female peers (Ansell & Doerr, 2013; Morgatto, 2008; Leahy & Guo, 2001). However, the findings from this study were similar to those from Reis & Park (2001) which showed that although not statistically significant, mean scale scores on the Algebra I end of course (EOC) assessment for female students were slightly higher than the scale scores for males. These findings are encouraging for educators who have explored studies which have found otherwise and also contribute to the research that validates mathematics abilities by females (Ansell & Doerr, 2013; Van de Werfhorst & Mijs, 2010; Morgatto, 2008; Reis & Park, 2001). Sharing these findings will also be thought-provoking to the educators and administrators from the students' campus since they encouraged females to attend more after school Algebra I remediation. Further research regarding factors that were not part of this research study such as how the amount of time males and females attend remediation sessions affect performance on the Algebra I EOC could be further explored.

After analyzing the three-way interaction between the three-variables (Socio-economic Status, Gender, and ELL Classification), it was evident that there was no significance based on the ANOVA results since Sig. = .192. The Profile Plot (Figure 1) also showed that there was no direct interaction between the variables.

Based on studies which aimed to find interactions between factors that affect mathematics performance, this study showed similar findings to some found in the literature where there is no correlation between gender and socioeconomic status (Cavazos, 2010; Colby & Ortman, 2015; Lewis & Dentice, 2015). The factor that has not been included in other studies is that of ELL classification and the focus of Latino students. Based on my assumptions and prior experiences when teaching Algebra I students, I thought there would be significance between the three-way interaction. Maybe with a larger data set or measuring grade performance in Algebra I such as in the study by Cavazos (2010), these interactions would have significance.

Implications for Practice

This research aimed to determine whether the findings of the ANOVA had any significance and in turn use the results to help target the factors studied at the district and campus level which consisted of a predominantly Latino population. The factors analyzed were socioeconomic status, gender, and ELL classification, and for several years, the Algebra I EOC performance has either remained stagnant and interventions have not been successful nor targeted accordingly. Although not significant, findings from this study will help Algebra I educators and administrators be more cognizant when formulating intervention groups as well as selecting professional learning opportunities.

For instance, when considering the gender factor, the graphs produced showed that females scored higher and reached the maximum scale score on the Algebra I EOC exam.

Perhaps the interventions and selected materials target the female population or are biased towards gender. This will help teachers and administrators focus more on that aspect of student interventions.

The analysis also included information on tables and graphs that showed English Language Learners had a closer spread of mean scale scores than non-ELLs. The information helps administrators to pay close attention to the curriculum and instructional strategies being implemented in the classroom which can help the non-ELL population be more successful. Whether it is scaffolding or vocabulary materials, they can also be beneficial to all students who take the EOC exam.

Recommendations for Further Research

Additional research regarding mathematics achievement considering other at-risk factors such as special education identification, single parent households, and previous year student retention is warranted at high school level in predominantly Latino populated areas. These factors in combination with those mentioned in this study are just some affecting students' academic performance. It is important for educators to understand the positive impact that identifying and addressing these issues can have over time as well as how this would help close mathematics education gaps.

Moreover, it is also important to consider qualitative research that could identify the experiences of students and teachers regarding their perceptions about what factors impact high school mathematics achievement. Teacher observations as well as interviews could help educators and other stakeholders gain a better understanding of what they believe correlates to what data shows regarding students' mathematics achievement. It would be interesting to see if what they believe impacts student achievement is biased or generalized based on past personal

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BIOGRAPHICAL SKETCH

Sara Elizabeth Tudon was born and raised in the Rio Grande Valley, Texas. She attended public schools in Los Fresnos, Texas. After high school, she attended The University of Texas at Brownsville (UTB) and earned a B.S. in Mathematics with a minor in English. While in college, she married her high school sweetheart, Alberto Tudon and relocated to North Carolina. While living in NC, Sara worked in Target as a supervisor and had her first child, Albert III. Sara returned to the Rio Grande Valley, and after graduation, she began her teaching career.

Sara was employed at Los Fresnos CISD in December of 1999 and taught high school English as well as mathematics for ten years. After teaching four years, Sara was blessed with the birth of her second child, Clarisse. She then attended The University of Texas in Brownsville and received a Masters in Curriculum and Instruction with an emphasis in mathematics.

After ten years of being in the classroom, Sara was employed as the K-12 Mathematics Strategist at the Los Fresnos school district. She served in that role for four years and then became the Curriculum Coordinator in the same school district. While working as a Curriculum Coordinator, Sara enrolled in the Doctoral program at the University of Texas Rio Grande Valley (UTRGV). Sara completed her Doctor of Education in Curriculum and Instruction at the University of Texas Rio Grande Valley in December 2022. Her goal is to become a graduate level professor in the Curriculum and Instruction department of a university so that she can share the gained knowledge and experience at the public-school level and what was learned and researched at the university level. Sara can be contacted via email at tudon26@yahoo.com or via post mail at 174 Village East Drive, Los Fresnos, TX 78566.