A CORRELATIONAL STUDY OF HISPANIC HIGH SCHOOL ENGLISH LANGUAGE LEARNERS' ENGLISH PROFICIENCY AND MATHEMATICAL RESILIENCE

by

Jettie Ann Dush

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

This quantitative study investigates the relationship between Hispanic high school English language learners' English language proficiency and mathematical resilience using a Pearson's *r* and Spearman's r correlation tests. The sample population consists of 9th-12th grade students enrolled in a large public high school in the northeast whose native language is Spanish. English proficiency is measured using the New York State English as a Second Language Achievement Test. Mathematic resilience is measured using the Mathematical Resilience Scale. The results of this study establish a positive relationship between Hispanic high school students' level of English language proficiency and mathematical resilience, particularly amongst males. These results can help to inform educators of how to best support the needs of a diverse population of students. The results may also influence curriculum changes in mathematics courses to include explicit instruction in the growth of mathematical resilience.

Keywords: Mathematical resilience, English language learners, resilience

Dedication

I would like to dedicate this work to my husband, my daughters, and my mother. To my husband: you are the epitome selflessness and have of provided unwavering support throughout this entire educative journey. There are no words to describe my gratitude toward all you have done to help me see this goal come to fruition; I am thankful each day that you asked me to be your partner for life. To my daughters: I hope that this body of work will serve as an example to you that there is no limit on the amount of education you can earn or the goals you can achieve. Hard work, passion, persistence, and faith in yourself can take you further than any amount of luck or quick fixes. And to my mother: thank you for showing me how to put the needs of others before my own, yet still successfully pursue personal and professional growth. You have truly taught me what it means to never give up, no matter the circumstances.

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List of Abbreviations

Common Core State Standards (CCSS)

English Language Learner (ELL)

English Language Proficiency (ELP)

Every Student Succeeds Act (ESSA)

General Education Diploma (GED)

Limited English Proficiency (LEP)

Mathematical Resilience Scale (MRS)

National Assessment for Educational Progress (NAEP)

National Mathematics Advisory Panel (NMAP)

New York State English as a Second Language Achievement Test (NYSESLAT)

No Child Left Behind (NCLB)

Programme for International Student Assessment (PISA)

Science, Technology, Engineering, Math (STEM)

CHAPTER ONE: INTRODUCTION

Overview

The study of mathematical resilience is a new interest in the field of education. There is also a rising concern for the services and resources put in place for the growing population of English language learning students in public schools. The intersection of these two elements constitutes the substance of this research and paper. This chapter examines the historical background that has contributed to the mandate of educational services offered to English language learning students, the theoretical underpinnings that serve as a platform for student resilience, and the intent of this research study.

Background

The landmark educational legislature titled No Child Left Behind Act (2002) created a dramatic shift in the focus of education. This law was designed to develop equity for groups of students who would be categorized as "disadvantaged" in some capacity, such as low socioeconomic status, students receiving special education services, minorities, and non-English speaking students (DuFour, DuFour, Eaker, & Karhanek, 2008). The overarching goal of the legislature was to eliminate the disparity between the achievement and graduation rates of those identified groups, as compared to their "non-disadvantaged" peers (DuFour et al., 2008). Since the adoption of the No Child Left Behind Act, a variety of subsequent educational movements have taken place, two of the most noteworthy being the launch of the Common Core State Standards in 2009 and the Every Student Succeeds Act of 2015. With the intent of supporting equal learning expectations across grade levels and state lines, the Common Core State Standards emphasize literacy in both English Language Arts and Mathematics (del Prado Hill, Friedland, & McMillen, 2016). Meanwhile, the Every Student Succeeds Act emphasizes the importance of

data-driven instruction and all students being college and career ready upon matriculation (Rothman, 2016). This increased focus on literacy (within mathematics specifically) and attention to student data has brought to light the fact that English language learning students are not only failing to meet benchmark scores expected from state education departments, but are falling further behind in achievement than their English-native peers (Johnson & Wells, 2017).

This concentration on student success and data has created a culture of high-stakes testing and accountability. State education departments have been monitoring school performance through carefully crafted accountability measures, referred to as Adequate Yearly Progress. Using a uniform accountability system, state education departments determine whether individual schools are successfully educating all students, to include all subgroups (Editorial Projects in Education Research Center, 2011). This information (and data) is then shared with the public and, if unsatisfactory, may result in state-mandated intervention (Hochbein, Mitchell, & Pollio, 2013). With the pressure and threat of government intervention, and even shut-down, schools are left making difficult choices of how to best serve all students using a finite budget and limited human capital (Hochbein et al., 2013).

The integration of Annual Yearly Progress has also brought about significant changes to teacher certification requirements, licensure retention, and observation practices. In an effort to ensure that post secondary teacher programs produce highly qualified teachers, many state universities have added a teacher performance assessment portfolio to a growing list of graduation requirements (Greenblatt & O'Hara, 2015). Additionally, almost every state has a mandated ongoing education and professional development requirement for practicing teachers in order to maintain certification (Hoffman & Harris, 2018). Finally, teacher performance reviews have been undergoing an overhaul since the Every Student Succeeds Act granted more

autonomy to states and school districts, to include what indicators of teacher performance are assessed, how scores are weighted and combined, and what thresholds determine teacher effectiveness (Steinberg, 2016). Despite this seemingly ever-changing educational landscape, there has remained one overarching point of focus – student growth and success that is anchored in high-stakes testing and graduation rates, yet indifferent of race, gender, primary language, socioeconomic class, and geographic location (Darling-Hammond et al., 2016).

Historical Context

With over five million English language learners in U.S. public schools, this limited English-speaking student population is the fastest growing amongst U.S. students (Babinski, Amendum, Knotek, Sanchez, & Malone, 2018; Blazer, 2015). Increasing more than 200% over the past decade, it is rare that a public school has remained untouched by the needs and challenges that accompany this population (Rivera & Waxman, 2011; Shi, 2017). Over 70% of classified ELL students identify as native Spanish speakers (Babinski et al., 2018). The levels of English language mastery and the accompanying dispersion of student ages vary dramatically, but the need for appropriate and meaningful learning experiences remains steadfast (Debossu, 2015). With no indication of the ELL population growth slowing, teachers and educational leaders must partner with families, communities, and political officials to meet the needs of the ELL population and close the achievement gap (Rivera & Waxman, 2011).

Ever since student performance data has been recorded and disaggregated for analysis, there has been a clear and persistent achievement gap between ELL students and their English-proficient peers (Waxman & Rivera, 2011). This underperformance has been documented in a variety of capacities. Johnson and Wells (2017) discussed the historical norm of ELL students lagging behind in graduation rates, standardized tests, the National Assessment of Educational

Progress, and the Programme for International Student Assessment. More specifically, Latino ELLs have a larger achievement gap in both mathematics and reading as compared to their non-Latino ELL peers, and also have a higher risk of dropping out of high school and not pursuing or completing a General Education Diploma (Babinski, et al., 2018; Rivera & Waxman, 2011; Shi, 2017). These continued gaps in educational performance have drawn a considerable amount of attention to the ELL student population, yet the gap remains and, in some cases, even grows (Shi, 2017).

In addition to consistently lower performance levels, ELLs tend to be misclassified in terms of special education (August, 2018; Fernandez & Inserra, 2013; LeClair, Doll, Osborn, & Jones, 2009). This compounds the bleak ELL situation as those who are not classified as having a disability, yet actually do, and are not receiving appropriate services in line with the students' unique needs. Conversely, ELL students who are classified as having a disability, but actually do not, are spending unnecessary school time in settings such as resource rooms, testing rooms, or other non-instructional environments. These misclassified ELL students would benefit more from traditional instructional environments such as classrooms, science laboratories, and technology centers (August, 2018; Fernandez & Inserra, 2013). This misclassification stems from generic testing measures and misinterpretation of results (Debossu, 2015; LeClair, et al., 2009). According to August (2018), it is imperative that the metrics used to assess reading and language properly discern between language development and academic disability.

It is also worth noting the impact that the Common Core State Standards reformation has had on the ELL student population. With an unprecedented emphasis on literacy, students must be masters of reading for information, content-specific vocabulary, and constructing justifying responses in core class subject domains (Johnson & Wells, 2017). This standards-based

movement has shifted how content is presented and how students are expected to engage with lesson material. Students of all varieties, and especially ELLs, have felt this change. It can be seen most in courses such as mathematics which used to be less literacy-dependent and more algorithmic-based, but has since become vocabulary-enriched and application driven (Johnston & Wells, 2017; Mitchell, 2018). The transference between ELL students' prior mathematics education to an English-based mathematics education in America used to be fairly strong; and the skills are still very transferable and necessary (Johnson & Wells, 2018). But with an added element of literacy-based problems and solutions, ELL students need a commanding proficiency of the English language to be successful in meeting the Common Core State Standards (Johnson & Wells, 2017).

This ongoing achievement gap requires a continued investigation into the contributing factors influencing ELL students' success or failure in mathematics (Swanson, Kong, & Petcu, 2018). It is only after proper collection and interpretation of data that meaningful interventions can be developed, tested, and potentially revised (Swanson et al., 2018). By examining the relationship between ELL students' mathematical resilience and English language proficiency, educational leaders and practitioners may purposefully design informed strategies to assist this subgroup of students in growing their mathematical achievement. This, in turn, will exemplify the positive impact of said strategies, indicate the need for further development and implementation/testing, or eliminate the line of strategies from the potential pool of appropriate interventions to test with ELL learners. The overall objective of moving toward a smaller achievement gap until the gap has been eliminated will require continued testing of informed strategies and student data that affirms the impact of said strategies (Campbell Wilcox, Gregory, & Yu, 2017).

Theoretical Background

Previous research has established the danger of students experiencing repeated course failure (LeClair, et al., 2009; Waxman, Padron, Shin, & Rivera, 2008). Students who fail a course on multiple occasions are at risk for lowered self-esteem (LeClair et al., 2009) and may fall into a cycle of repeated failure that can expand into additional course subjects (Waxman et al., 2008). In an effort to guard students against this damaging cycle, teachers can help students to develop a growth mindset. Dweck (2012) explores the differences between a fixed mindset and growth mindset in her seminal work regarding Mindset Theory. Students who have a fixed mindset – that is, they believe that they are not smart, not good at a particular subject, or will not benefit from extra effort – are much less likely to persevere when faced with academic challenge (Clinkenbeard, 2012). Students who possess a growth mindset are willing to work harder when faced with intellectual difficulty and understand that hard work can change ability levels (Dweck, 2012). Student resiliency begins with the belief that hard work can change ability levels (Lee & Johnston-Wilder, 2017).

Related to growth mindset is grit. Duckworth, Peterson, Matthews, and Kelly (2007) developed a theoretical framework regarding the term and quality of grit. The construct of grit refers to persistence and adaptation in the face of adversity (Duckworth et al., 2007). This characteristic is an element of Dweck's growth mindset, as well as resilience, but deals specifically with behavior. Morton (2014) warned that a student can have too much grit in the sense that it can require perfection before moving forward in a task. Such a high level of grit can be detrimental to student success, but when exercised at healthy and appropriate levels, grit can help ELL students see the value of iteration (Morton, 2014). Having or developing the quality of grit is critical for students to maintain a resilient disposition toward mathematics as students will

need to persevere in problem solving and abstract thinking processes (Lee & Johnston-Wilder, 2017).

Educational reform has become an integral part of the learning community throughout the past decades. In the face of high stakes testing and accountability measures, teachers, educational leaders, and state governments are implementing a series of revisions to standards, practices, and expectations. With a focus on student success, schools must determine how to address achievement and graduation gaps amongst the student population in the face of rigorous Common Core Standards. This poses a unique challenge to English language learning students, as literacy is a fundamental element of the standards. The historical underachievement of ELLs has made this population the subject of a great body of research. With underpinnings in Dweck's (2012) Mindset Theory and Duckworth et al.'s (2007) Grit Theory, the study of student resilience has been a growing segment of educational research.

Problem Statement

It is widely agreed upon that teacher effectiveness and efficacy are the most influential factors in student success (August, 2018; Johnson & Wells, 2017; Rivera & Waxman, 2011). With an invigorated momentum toward earning a certification in teaching English language learners, teacher preparation has become a topic of research interest. The readiness of pre-service teachers to teach ELL students was explored by Durgunoğlu and Hughes (2010). Johnson and Wells (2017) extended this research to account for pre-service teacher readiness to teach ELL students under the Common Core State Standards. Both studies concluded that teacher-training programs fall short in providing explicit instruction of how to appropriately challenge and support English language learners.

Another influential factor of student success is student disposition toward education. LeClair, Doll, Osborn, and Jones (2009) studied English language learners' and non–English language learners' perceptions of the classroom environment. Similar to non-English language learner, ELL students with a more positive perception of their classroom environment outperformed their ELL peers with more negative perceptions of their classroom environment (LeClair et al., 2009). Rivera and Waxman (2011) conducted a similar study, focusing on resilient and nonresilient Hispanic English language learners' attitudes toward classroom environment in mathematics. Restricting the population to Hispanic ELLs and measuring perceptions toward mathematics courses gave insight into the importance of student perception as it relates to academic success in mathematics. It was also concluded that the academic interventions provided to resilient ELL students who were struggling with mathematical concepts were the same as those provided to their non-resilient ELL peers (Rivera & Waxman, 2011). The resulting success of the resilient ELL students and continued struggle of non-resilient ELL students indicated that interventions provided to at-risk groups should be differentiated for resilient and non-resilient students (Rivera & Waxman, 2011). The narrowing of research to subject-specific domains may indicate a saturation of broad educational constructs and a readiness for more specialized focuses.

Studies regarding ELL students' academic performance have been a longstanding topic in educational research. Research focusing specifically on ELL students' academic resilience has concluded that this particular student population requires culturally relevant learning activities, explicit resiliency coaching embedded into course curriculums, and strong supportive relationships with course instructors (Pardon, Waxman, Brown, & Powers; 2000; Waxman, Padron, Shin, &, 2008; Waxman, Rivera, & Powers, 2012). Studies examining the relationship

between students' academic resilience and students' pursuit of mathematical achievement have concluded that there does exist a relationship between the two and that developing resilience in students whom have experienced repeated course failure as being critical to future mathematical success (Borman & Overman, 2004; Gaye, 2003; Johnston-Wilder, Lee, & Garton, 2015). Each of these resilience-related studies has narrowed the scope of population or examined a specific resilience-related phenomenon. Hispanic ELL students create a population that is known to be growing (Babinski et al., 2018) and mathematics is a subject that has been established as critical to students' college and career readiness, yet challenging to all student subgroups (Williams, 2003). The problem is that there is limited research focusing on the mathematical resilience of Hispanic ELL students as it relates to the level of English language proficiency.

Purpose Statement

The purpose of this quantitative, correlational study is to examine the relationship between Hispanic high school English language-learning students' level of English language proficiency and mathematical resilience. Students' New York State English as a Second Language Achievement Test scores will serve as the predictor variable. This metric is comprised of a battery of subtests, to include listening, reading, writing, and speaking (MetriTech Inc., 2018). The score of each subtest is then combined into a composite score and placed on a scale of scores ranging from 120-360 (Warner, 2018).

The criterion variable for the study will be students' mathematical resilience as measured by the Mathematical Resilience Scale. Mathematical resilience is defined as a positive disposition "towards learning mathematics, that includes both persistence and perseverance [as well as the ability to] recruit support when needed" (Johnston-Wilder & Moreton, 2018). The Mathematics Resilience Scale measures each of the following: the value a student places on

learning or knowing mathematics, a student's willingness to productively struggle through mathematical challenges, and a student's belief that academic ability levels can be affected by hard work (Kooken, Welsh, McCoach, Johnston-Wilder, & Lee, 2016). The instrument consists of 24 Likert-Scale questions and yields an overall score ranging from 24-120. A score of 24 indicates the lowest level of mathematical resilience and a score of 120 indicates the highest level of mathematical resilience. The population of the study consisted of Hispanic high school ELL students enrolled in a participating public school that utilized the New York State English as a Second Language Achievement Test to measure English language proficiency.

Significance of the Study

The results of this study add to the body of literature in a variety of capacities. First, the findings can help educational practitioners and leaders gain a deeper understanding of English language learners' mathematical resilience levels as they progress in English language proficiency. The outcomes of this research can be used to help appropriately plan and direct school resources to assist ELL students in mathematical growth. Having an understanding of when students are most or least resilient can influence instructional practices and supporting programs. Beginning to look at the subgroups within the ELL population and considering how these subgroups can be best served is the next step for educators to take in closing the achievement gap (Russell & Von Esch, 2018; Wong, Wing, Martin, & Society for Research on Educational Effectiveness, 2016).

Second, the study helps secondary mathematics teachers to better support ELL students within the classroom by further disaggregating the data related to the ELL student population and providing insight into the varying needs within the ELL student population. Because growth mindset can be taught, incorporating elements of this theory into general mathematics instruction

appropriately can help maximize student success (Duckworth et al., 2007). Additionally, teachers can make better-informed decisions on how to adapt accommodations for ELL students based on their New York State English as a Second Language Achievement Test score and the correlated level of resiliency (Pappamihiel & Lynn, 2016). This has never been more important given the adoption of the Common Core State Standards and the subsequent focus on literacy across the disciplines (Johnson & Wells, 2017).

Finally, results of the study create a foundation for better mathematics instruction for the ELL student population. This stronger foundation may result in higher ELL success rates in mathematics, which could help lead to a greater ELL student interest in STEM-related higher education tracks or career fields. Given the reportedly underrepresentation and lower achievement levels of ELLs in STEM courses (Shi, 2017), a movement toward an increased interest and success is highly desirable. According to Mitchell (2018), English-language learners are often denied full access to STEM education. Rather than precluding ELL students from STEM education, their culturally rich background and unique perspectives should be leveraged to enhance the STEM field (Mitchell, 2018).

Research Questions

RQ1: Is there a relationship between Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

RQ2: Is there a relationship between female Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

RQ3: Is there a relationship between male Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

Definitions

1. *Academic Resilience* – A personal trait that exists or is developed within relationships and interactions between personal and environmental factors (McMahon, 2006).
2. *Community Value* – Community value refers to the social aspect of people viewing success in a skill or concept as important as it will gain them entry into a community of others who are also successful in the skill or concept (Lee & Johnston-Wilder, 2017).
3. *English Proficiency* – The term *English proficiency* has a definition that varies by state. In the state of New York, English proficiency is defined in terms of the results of the New York State English as a Second Language Test and indicates a student who has a commanding use of the English language, in both academic and social language (Abedi, 2008; MetriTech, Inc., 2018).
4. *Fixed Mindset* – An individual's belief that his own abilities cannot be increased or developed through hard work and determination; an individual's belief that his abilities have a predetermined limit (Dweck, 2006).
5. *Global Value* – Global value refers to a person's recognition of the importance of a concept within the scope of modeling real-world phenomena or developing skills deemed to be desirable within the global economy (Lee & Johnston-Wilder, 2017).
6. *Grit* – Grit is a personal attribute that refers to an individual's capacity to persist and adapt in the face of adversity and stems from passion and determination (Duchworth et al., 2017)

7. *Growth* – As a component of mathematical resilience, growth is the belief that knowledge of mathematics is malleable and that mathematics ability can be improved with effort (Kooken et al., 2016).
8. *Growth Mindset* – An individual's belief that his own abilities can be increased through hard work and determination (Dweck, 2006).
9. *Growth Zone Model* – The Growth Zone Model is a diagram created to illustrate the varying degrees of intellectual distress learners face when presented with new challenges (Lee & Johnston-Wilder, 2016).
10. *High-Stakes Testing* – High-stakes testing is the use of standardized test scores to make educational decisions about students, staff, and schools (Valencia & Guadarrama, 1995).
11. *Implicit Theories* – Also known as *implicit influences,* implicit theories are the mindsets about abilities and intelligence that people hold about themselves (Haimovitz & Dweck, 2017).
12. *Mathematical Resilience* – Mathematical resilience is a positive disposition towards the learning of mathematics (Johnston-Wilder & Moreton, 2018).
13. *Mindset* – Mindset is an individual's belief about his own qualities, characteristics, and the potential to develop them (Dweck, 2006).
14. *Personal Value* – Personal value refers to the worth an individual ascribes to a skill or concept (Lee & Johnston-Wilder, 2017).
15. *Resilience* – As a component of mathematical resilience, resilience is the quality of being able to respond positively in the face of difficulties (Kooken et al., 2016).
16. *Struggle* – As a component of mathematical resilience, struggle is student perception and tolerance of difficulty in studying mathematics (Kooken et al., 2016).

17. *Value* – As a component of mathematical resilience, value is the extent to which students find studying mathematics valuable for current and future goals (Kooken et al., 2016).

CHAPTER TWO: LITERATURE REVIEW

Overview

Elements to consider when approaching research of English language learning students and their mathematical resilience include a history of educational legislation, the growth in the population of ELL students in America, and current research in academic resilience. Though the construct of mathematical resilience is a newly established segment of inquiry, the study of resilience as an educational construct has existed for a significantly longer period of time. As such, there is a substantial body of research results and literature explaining resilience. Chapter two includes an overview of the theoretical framework that serves as a foundation for the study of mathematical resilience, followed by a literature review of the historical and contemporary publications that serve as the groundwork for this study.

Theoretical Framework

The foundation of this research lies in the field of psychology. In their development of the construct of mathematical resilience, Lee and Johnston-Wilder (2017) integrated the research of Dweck's (2000) mindset theory, Seligman's (1995) research in optimism, Bandura's (1995) research of self-efficacy, and Ryan and Deci's (2000) research in motivation (p. 26). Using these theoretical frameworks as the cornerstones of their construct development, Lee and Johnston-Wilder (2010, 2017) were able to delineate mathematical resilience apart from the broader base of general resilience. The researchers reported the four elements that generate mathematical resilience as follows: growth mindset, perceived value of mathematics, awareness of how to work toward an increased understanding of mathematics, and a knowledge of how and when to elicit assistance (Lee & Johnston-Wilder, 2017, p. 10). The following is an overview of each of

these elements, accompanied by their relation to the purpose of this study. The section then concludes with the goal of this research study.

Mindset Theory

In her work regarding how a person's mindset impacts that person's willingness to exert effort and spend time on practice, psychologist Carol Dweck developed mindset theory. According to Dweck (2006), there are two mindsets: fixed and growth. A fixed mindset is one in which a person believes that qualities and characteristics (such as intellect, personality traits, and ability) are inflexible, have a ceiling, and cannot be changed (Dweck, 2012). That is to say, a person's effort cannot change his ability past a certain point. Alternatively, a growth mindset is one in which these same qualities and characteristics can be developed with time, energy, and effort (Dweck, 2000, 2012). According to this mentality, a person can improve his abilities if he commits his actions to the cause of improvement. These two mindsets contribute to students' understanding of themselves and lead to different learning paths and experiences (Plaks, Levy, & Dweck, 2009).

Dweck's work on growth and fixed mindset stems back as far as the late 1980's with studies designed to examine the social-cognitive approaches toward goals, motivation, personality, behaviors, and achievement (Dweck & Leggett, 1988; Elliott & Dweck, 1988). Mindset theory is grounded in studies regarding the effects of teacher praise (Brophy, 1981), effects of praise versus blame (Barker & Graham, 1987), perceptions of ability (Meyer, Bachmann, Bierman, Hempelmann, Plöger, & Spiller, 1979), informational versus verbal rewards (Pittman, Davey, Alafat, Wetherill, & Kramer, 1980), and delayed gratification (Mischel, 1965). Examining the relationships between motivational frameworks, mindsets, and academic achievement has been the primary focus of Dweck's studies, which have evolved to

incorporate the elements of grit and resilience within the past decade. The bulk of mindset theory research has studied adolescents, spanning from toddlers to college students, and aimed to understand the primary contributing factors leading to student success despite risks and barriers, as well as the advantages of a having or developing a growth mindset over a fixed mindset.

Growth mindset and resilience. Resilience can be defined in a variety of contexts, but academic resilience is most broadly defined as a personal trait that exists or is developed within relationships and interactions between personal and environmental factors (McMahon, 2006). As a personality trait applied to academic endeavors, resilience consists of four elements: easy temperament, responsiveness, flexibility, and adaptability (D'Anca, 2016). Individuals with resilience reportedly hold a strong sense of self-efficacy and tend to view personal experiences as adding value to their knowledge and skills (D'Anca, 2016). Related to growth mindset, resilience can be developed and may fluctuate over time for an individual based on experiences, environmental influences, and explicit training in the underlying psychology (Bush & Noltemeyer, 2013; Doney, 2013). An individual may exercise resilience in the face of major trauma, while coping with smaller negative situations, or in persevering through setbacks during tasks (Brackenreed, 2010).

Maintaining or developing a growth mindset requires resilience (Khan, 2018). Research has shown that an individual's mindset and level of resilience affect one another, resulting in high or low academic performance (Blackwell, Trzesniewski, & Dweck, 2007). Similar to growth mindset, resilience can be developed or increased through positive reinforcement toward an individual's creativity in problem-solving, praise for stamina and focus exercised during setbacks, and shared decision-making while developing or refining meaningful goals (D'Anca, 2016; Espedal, 2009). Another common thread between growth mindset and resilience is the

potentially positive or negative influence from family members, peers, social and community organizations, as well as educative institutions (McMahon, 2006; McMillan & Reed, 1994). Without resilience, developing or strengthening a growth mindset is improbable given the likeliness of an individual abandoning a task after one or more failed attempts and lack of confidence in desirable results given further effort or iteration (Kahn, 2018).

Growth mindset and grit. Another construct closely related to mindset theory is the attribute of grit. Duckworth (2017) defines the term *grit* as a combination of passion and determination. It is the willingness and commitment to pursue a goal despite barriers, setbacks, or limited means (Pueschell & Tucker, 2018). Individuals possessing the attribute of grit are able to work past failure and embrace the concept of "yet" (Duckworth, 2017; Dweck, 2012). Students with grit are able to achieve long-term goals and increase academic achievement (Hochanadel & Finamore, 2015). Grit is not talent, luck, or desire, but can drive an individual's choices and actions when properly applied (Pueschel & Tucker, 2018). The underlying element that constitutes an individual as having or lacking grit is a tenable goal, coupled with passion and commitment (Duckworth, 2017).

Implicit influences. Also referred to as *implicit theories*, mindsets about abilities and intelligence strongly correlate to motivation and learning (Haimovitz & Dweck, 2017). It is believed that different mindsets are associated with different goals; that is, students with a growth mindset are concerned with their learning experiences while students with a fixed mindset are focused on validating their abilities (Haimovitz, Wormington, & Corpus, 2011). Although it has widely been reported that mindset can be taught (Aronson et al., 2002; Blackwell et al., 2007; Good et al., 2003; Haimovitz & Dweck, 2017; Paunesku, 2013), it was not until recently that researchers examined the underlying influences adults may have on the mindsets of

adolescents. Reportedly, growth mindset can be developed through implicit or explicit methods, and are strongly influenced by students' interactions with teachers and parents, rather than the mindsets of teachers and parents (Haimovitz & Dweck, 2017).

In a study examining the influences on students' mindsets, it was found that the frequency in which parents use process praise could be used to predict their children's later mindsets (Gunderson et al., 2013; Pomerantz & Kemperner, 2013). A later study determined that parents' disposition toward failure and reaction to their children's failure could also be used to predict their children's later mindsets (Haimovitz & Dweck, 2017). Researchers reported that children who believed that their parents were interested in learning and improvement also believed they could growth their intelligence (Haimovitz & Dweck, 2017). Additionally, ". . . praising the *process* that lead to success (such as hard work or strategies) can lead students to believe that intelligence and abilities can be developed" (Haimovitz & Dweck, 2017, p. 1851).

The study concluded that the words and actions of influencing adults (teachers and parents) lead children to developing a growth or fixed mindset by attuning them to the process of learning and growth their abilities, or focusing on their performance and emphasizing innate ability (Haimovitz & Dweck, 2017). A word of caution was given against praising effort that has not contributed to growth or authentic learning as it may be internalized that the child cannot grow or learn in that particular task (Haimovitz & Dweck, 2017). The research shows that tying the process (e.g., effort or strategies) to *an outcome* (learning or attainment) rather than a tangible or verbal consolation reward can promote a growth mindset (Mueller & Dweck, 1998).

Explicit development. Given the proven advantages of exercising a growth mindset, intentionally cultivating a growth mindset culture within a school or classroom should be of interest and priority for all grade-level educators. Researchers have become increasingly

interested in what methods work best for explicitly teaching students how to develop a growth mindset, noting the importance of raising students' self-awareness, basic understanding of intellectual growth, and appreciation for iteration (Frank, 2018; Mueller & Dweck, 1998; Yeager & Walton, 2011). Students must be taught the value of mindset and the purpose of struggle within the growth process (Haimovitz & Dweck, 2017). This is important because students who embrace and exercise a growth mindset have a greater passion for leaning and work harder to improve despite any deficits they may have (Dweck, 2006; Frank, 2018; Tomlinson & Javius, 2012).

Teachers with a growth mindset tend to possess three specific characteristics: the capability to establish and communicate high expectations for all students, the ability to cultivate a classroom environment that nurtures and reinforces a growth mindset, and the capacity to create and assign appropriately challenging work to all students (Dweck, 2006). Growth-minded teachers are honest with their students about their current abilities and deficits, but immediately follow with suggestions of strategies and interventions students can use to grow their academic aptitude (Frank, 2018). This may be achieved through a mentoring approach where students meet with their teacher on an individual or small-group basis, or through the use of "wise, critical feedback" in which teachers invest time into written comments on student work that provides students with direction and encouragement (Dweck et al., 2011; Snipes et al., 2012, Yeager et al., 2013). When teachers invest time into meaningful and constructive feedback, students are more likely to increase their effort, resulting in higher-quality work and deeper learning experiences (Yeager et al., 2013).

Research has demonstrated that this explicit approach to teaching growth mindset is especially important for low-achieving students as they tend to have higher levels of

performance avoidance and lower levels of growth mindset (Snipes & Tran, 2017). Educators developing or implementing programs that allocate these interventions and materials for this demographic of student must be careful to direct focus away from students' shortcomings and toward their academic potential, resilience, persistence, and the payoff that can follow (Gutshall, 2013; Snipes & Tran, 2017). The overarching objective should be greater than sole academic growth; educators must aim to change students' dispositions toward academic work, effort, and the learning process (Yeager & Walton, 2011). Strategies implemented by teachers aimed toward increasing students' growth mindset may include the following: Conversations about growth, building relationships between teachers and students, teaching students to embrace mistakes, serving as a personal example in handling mistakes, practicing patience, grouping students purposefully, and tracking student growth. (Frank, 2018, p. 159). Researchers have hypothesized that these short-term interventions can have substantial long-term effects on both academic outcomes and overall success later in life for low-achieving and high-achieving students alike (Snipes & Tran, 2017).

Growth mindset and ELLs. Although little research has been published regarding growth mindset and English language learners, one substantial study has recently examined the relationships between Mindset Theory and students with limited English proficiency. Targeting appropriate interventions toward low-achieving English language learning students is especially important given the present culture of accountability and high-stakes testing (Snipes & Tran, 2017). Furthermore, students identified as limited in English proficiency have a reported dropout rate that is twice as high as students proficient or fluent in English, giving additional cause for concern in this vein of research (Jimerson, Patterson, Stein, & Babcock, 2016).

Finally, this group is currently the fastest growing demographic of students in both public and private K-12 schools (Frank, 2018).

Researchers have reported that performance avoidance rates are higher for English language learning students while their growth mindset scores are lower (Snipes & Tran, 2017). In fact, "the largest gaps in growth mindset scores were between low-achieving and high-achieving students and between English language learning and non-English language learning students" (Snipes & Tran, 2017, p. 15). Moreover, limited English proficiency students of higher-grade levels had lower growth mindset scores than those in lower grades (Snipes & Tran, 2017). Similar results were found regarding teachers in that the growth-minded scores for teachers of high-grade levels paled in comparison to those of lower-grade level teachers (Snipes & Tran, 2017). When examining these same teachers' results, there appeared to be no affect from schools' characteristics or demographics (Snipes & Tran, 2017). Considering the reported advantages to exercising a growth mindset and the historically lower achievement and graduation rates of English language learners, this trend in both English language learning students and their teachers gives rise to the need for further investigation into the subject (Frank, 2018).

Implications of growth mindset. The educational implications of mindset theory are multifaceted. Most notably, students who possess a growth mindset are willing to work harder when faced with intellectual difficulty (Haimovitz & Dweck, 2017; Yeager & Dweck, 2012). "They are more likely to understand that effort is important for academic success; they are more likely to seek out challenging academic tasks that help them learn; and they are more likely to seek out, pay attention to, and learn from critical feedback" (Claro & Paunesku, 2014, p. 2). This disposition toward the learning process and growth in intellectual ability can benefit students in any achievement bracket or demographic, but most especially those who

academically struggle or face barriers and risks as determined by their demographic and the surrounding research (Frank, 2018).

According to Lee and Johnston-Wilder (2017), having a growth mindset enables students to develop mathematical resilience. Students must pursue novel mathematical challenges with the understanding that the overarching objective is to make new connections, develop familiarity and fluency, and adapt previously learned strategies in order to apply new skills (Lee & Johnston-Wilder, 2017). As stated by Willis, "the brain grows every time a learner makes connections and learns something new" (2007). Those students who possess a fixed mindset are much less likely to persevere in the face of intellectual difficulty, believing that they simply are not able to perform the task at hand (Clinkenbeard, 2012). Students who do not possess or develop a growth mindset pay the price in both academic performance while in school and then later in life when career demands require an individual to overcome adversity and resolve himself to finding a solution to a problem (Lee & Johnston-Wilder, 2017).

Generally speaking, growth and fixed mindsets orient individuals toward different goals and learning experiences. A growth minded person views effort as productive, regards setbacks as learning experiences, and faces challenges with an optimistic attitude (Claro & Paunesku, 2014; Frank, 2018; Haimovitz & Dweck, 2017). In contrast, a fixed minded person views effort as undermining, internalizes setbacks as helplessness, and faces challenges with a fear of being exposed as having a lack of innate ability or limited potential (Claro & Paunesku, 2014; Frank, 2018); Haimovitz & Dweck, 2017). According to researchers, "success and failure in accomplishing a task do not validate ability but serve as an opportunity to improve proficiency in a specified area. Therefore, a growth mindset challenges the focus of being naturally smart or

proving your intelligence and instead focuses on developing and growing into your true potential" (Dweck & Leggett, 1988).

Mindset theory is important to the study at hand as the researcher aims to examine Hispanic high school English language learner students' resilience in mathematics. Not only is mindset a component of mathematical resilience, it is also one of the dimensions measured on the Mathematical Resilience Scale (Kooken et al., 2015). Additionally, researchers have reported that growth mindset scores are lower in secondary English language learning students when compared to their elementary and middle school counterparts (Snipes & Tran, 2017). Finally, with growth mindset scores lower than all other studied demographics, English language learners stand to benefit the most from further research and any resulting implications (Frank, 2018).

Value. Research has demonstrated the importance of student "buy-in" of course content and skill-based practices in terms of student academic achievement (Eccles, 1983). Students who see value in what is being taught within a classroom are more likely to exert effort toward developing proficiency in that skill or concept when compared to their peer counterparts (Eccles, 1983). The depth of the value a student ascribes to a concept, skill, or overall subject is also important. According to Lee and Johnston-Wilder (2017), a student may internalize content material and skills as having personal value, global value, or community value. Students who view a concept or skill that has personal value feel that mastery of the subject will add to their personal capital. Global value refers to students recognizing the importance of a concept within the scope of modeling real-world phenomena or developing skills seen as desirable within the global economy. Community value refers to the social aspect of students seeing success in a

skill or concept as important as it will include them in the community of others who are also successful (Lee & Johnston-Wilder, 2017).

According to Eccles (1983), the value that a student places on his mathematics education and its subcomponents impacts the level of motivation to study the subject. The value Hispanic ELL students place on mathematics is important to this study as it aims to examine mathematical resilience – of which value is an element. Like growth mindset, value is another dimension measured by the Mathematical Resilience Scale (Kooken et al., 2015).

Struggle. According to Lee and Johnston-Wilder (2017), resilient students understand that "progress in mathematics requires struggle, curiosity, and perseverance as well as learning to manage the emotions that come with learning something new" (p. 10). The struggle mentioned by the researchers can be more suitably thought of as productive struggle. To successfully navigate through mathematical struggles, students must possess and exercise grit. Researchers Duckworth, Peterson, Matthews, and Kelly developed a theoretical framework regarding the term and quality of grit. According to Duckworth et al. (2007), grit is a non-cognitive element of Dweck's growth mindset theory, focusing on the process of change and adaptation in the face of resistance. This research team reported that grit is an essential tool for achieving success in both school and life, and that it can be taught or coached into students (Duckworth et al., 2007). This is an important area of research as higher levels of grit result in higher engagement, which then leads to greater academic achievement (Hodge, Wright, & Bennett, 2018).

The theory of and research about grit helps to inform the present study as grit enables the action of resilience in the face of struggles (Duckworth et al., 2017). Grit is the underlying connection between mindset and resilience. Just as the quality of grit is an element of mindset, so too is it an element of resilience. It should be noted that too much grit may be detrimental to

progress as individuals with too much grit are unable to make reasonable concessions in order to move forward productively in an effort (Morton, 2014). Therefore, resilient ELL students would possess enough grit to remain reasonably determined in their efforts toward academic success, but not so much grit that progress cannot be made until perfection has been achieved. Although grit is not a dimension measured on the Mathematical Resilience Scale, it is a component of mathematical resilience (Lee & Johnston-Wilder, 2017).

Recruiting support. The final element of mathematical resilience is that of student recognition in how and when to elicit assistance (Lee & Johnston-Wilder, 2017). That is to say, student awareness of when productive struggle has become unproductive. This balance can also be tied back to an appropriate implementation of grit. Seeking assistance may manifest in a variety of ways – to include leveraging textual support or online resources, asking an instructor for real-time intervention, and collaborating with peers to develop a shared knowledge base and engage in meaningful discourse (Lee, 2006; Lee & Johnston-Wilder, 2017).

Student use of course textbooks and textbook resources such as workbooks or online resources can be used to illustrate appropriate models and prior skills (Lee & Johnston-Wilder, 2017). This independent pursuit for assistance is closely related to leveraging the power of a search engine. Given the increasing adaptivity of informational technology and its ability to solve algorithmic problems, mathematics teachers must carefully design problems that require thinking skills that go beyond procedural computation (Lee, 2006). Asking students to perform error analysis and make generalizations can be an appropriate means of reinforcing mathematical concepts.

When students seek assistance from an instructor, the instructor must exercise caution on how he responds to the question so as to not give away the answer. Rather, the teacher should

assist students in recalling prior knowledge, narrowing down where a conceptual or computational mistake has occurred, or ask another question to help widen students' scope of ideas and considerations (Lee & Johnston-Wilder, 2017). Additionally, facilitating collaboration amongst students can help learners to articulate what they know versus what they wish to know while developing vocabulary and contributing to a shared pool of knowledge (Lee, 2006). "Expressing mathematical ideas and talking about mathematical learning within a mathematical community are both vital aspects of developing the resilience that allows for learning mathematics" (Lee & Johnston-Wilder, 2017, p. 15). The element of knowing how and when to leverage support is important to the present study as high school ELL students are in the process of acquiring English language proficiency and may frequently require peer support to better articulate ideas, offer critiques, and ask questions.

Related Literature

The purpose of this correlational quantitative study is to investigate the relationship between Hispanic high school ELL students' level of English language proficiency and mathematical resilience. The goal is for the results of this study to better inform teacher instructional practices for ELL students in mathematics courses. To better understand the development of instructional services created for the diverse ELL student population and how educational resilience has been developed and studied, the following will be an overview of said literature, to include educational legislature, historical data, the construct of mathematical resilience, and studies related to educational resilience.

Educational Legislature

In 2002, President Bush signed the No Child Left Behind (NCLB) act into law. This educational legislature was an effort to achieve total student proficiency in mathematics and

English language arts, and included all populations of students (Wong, Wing, & Martin, 2016). NCLB did had waivers and exemptions written into its language, and granted federal and state governments the power to directly influence and control public schools (Wong et al., 2016). The primary focus was on high-stakes testing results and schools making progress toward benchmark proficiency levels. The consequences for schools that did not meet the prescribed yearly progress were potential direct intervention from government-related education representatives or even closure (Wong et al., 2016).

Though there was a positive impact for African American students, there was no evidence that the legislature was positively influencing all students (Wong et al., 2016). When examining the impact of NCLB legislature on majority and minority students, it was determined to actually have negative cognitive outcomes for Hispanic students and white students (Wong et al., 2016). This is of particular concern in that the study indicated a bias toward one subgroup of students at the expense of other subgroups. If the objective of the legislature was to elevate the performance of all students and hold schools accountable for achieving said performance, then the target was being missed by a significant number of schools. Though the goal of the legislature was in the best interest of students, the methods implemented to reach the goal and the achievability of the goal needed revision.

Given its lackluster results and questionable expectations, coupled with educational stakeholder resistance and high levels of anxiety from public schools, President Obama signed the Every Student Succeeds Act (ESSA) into legislation in 2015. This act was NCLBs replacement and focused more on multiple pathways to student success while emphasizing the importance of evidence-based interventions (Darling-Hammond et al., 2016). Schools were granted more autonomy in selecting indicators for demonstration of student success and were

allowed to collect multiple measures of accountability to serve as evidence of learning (Darling-Hammod et al., 2016). The research regarding the success of ESSA is conflicting, but the overall message is clear. Student success is a priority in today's educational system – with a focus on minority and traditionally at-risk subgroups. With no end in sight to high-stakes testing and sensitivity to minority student achievement, schools are left with no choice but to find effective means of reaching all students in instructionally meaningful ways that lead to academic success and graduation. The current climate of public education is student-focused and becoming increasingly data-driven (Wong, Wing, & Martin, 2016).

Historical Data

According to the U.S. Department of Education, an ELL student is one who "did not grow up in a primarily English-speaking setting and lacks the skills necessary to learn in an English-only environment" (LeClair et al., 2009, p. 568). It has been well documented that the population of ELLs is the fastest growing population among U. S. school students (DePaoli, Balfanz, & Bridgeland, 2016; Durgunoğlu & Hughes, 2010; LeClair et al., 2009; Rivera & Waxman, 2011). In fact, researchers Durgunoğlu and Hughes (2010) stated that the growth of non-native language speaking students is increasing in schools around the world given the expanding reality of a global economy and strengthened partnerships between business and industry-leading countries. Studies by Rivera and Waxman (2011) and Waxman, Rivera, and Powers (2012) have illustrated the trend of native Spanish-speaking ELLs consistently performing at the bottom of their age and grade-level peers, solidifying the concern with Hispanic ELL instructional interventions.

The consistent underperformance of Hispanic ELL students is compounded by the fact that ELL students are more likely to be enrolled in statistically underperforming schools (LeClair

et al., 2009; DePaoli et al., 2016). They are also overrepresented in the amount of referrals for special education services, indicating that they are not appropriately screened or assessed (LeClair et al., 2009). This academic institution adversity has contributed to high ELL dropout rates, high levels of grade retention, and low levels of mobility post high school (LeClair et al., 2009; Waxman et al., 2012). In a report using 2014 U.S. graduation rate data, it was determined that 11 states had a Hispanic/Latino graduation rate less than 70% (DePaoli et al., 2016). This same report indicated a gain of 15% in the graduation rate of Hispanic/Latino students from 2006 to 2012, but also stated "Hispanic/Latino students made up more than 40 percent of student enrollment in large high schools with a 67 percent or less graduation rate" in nine states (DePaoli et al., 2016, p. 24). Though not all Hispanic/Latino students are classified as ELL, this data is a clear measure of the concentration of Hispanic students in low performing schools, which will be accompanied by high numbers of ELL students.

It could be posited that stronger teacher preparation programs that explicitly address research-based interventions for ELL students could help close the achievement gap demonstrated by this staggering data. The National Mathematics Advisory Panel reported that instructional and pedagogical differences among teachers account for 12-14% of variability in student performance (as cited by Rivera & Waxman, 2011). The literature went on to explain that the significance of this variability is compounded if a student receives a series of effective or ineffective teachers throughout subsequent years (Rivera & Waxman, 2011). During a study of pre-service teachers and their competence and willingness to dedicate effort and energy toward ELL students, Durgunoğlu and Hughes (2010) found that pre-service teachers did not call on ELL students or engage them on an individual level as often as their English fluent peers. According to the researchers, "the ELL students were not disruptive; they worked or acted as if

they were working on assignments that were given" and the pre-service teachers indicated that they "interpreted lack of participation as cultural/personal and did not make an effort to pull the student into the discussion" (Durgunoğlu & Hughes, 2010, p. 39). This is especially concerning because for many ELL students, the classroom teacher may be their only source for academic intervention or assistance (Durgunoğlu & Hughes, 2010).

Rivera and Waxman (2011) found similar results regarding a lack of teacher sensitivity toward ELL interventions, citing that teachers' instructional practices and resources do not differ for ELL and non-ELL students. This finding was published after Borman and Overman's (2004) research stating the need for "caring and supportive teachers, a safe and orderly school environment, positive expectations for all children, opportunities for students to become meaningfully and productively involved and engaged within the school, and efforts to improve partnerships between the home and school" (p. 180). In an effort to help address how to best achieve this, the present research aims to identify when ELL students are most resilient in mathematics. It is believed that knowing this can help to maximize and appropriately leverage school resources to provide meaningful interventions to ELL students.

Mathematics Resilience Construct

Educational research has developed a variety of constructs related to the subject of this study. The constructs of mathematics anxiety, mathematics avoidance, and learned helplessness focus on the negative aspects associated with mathematics (Lee & Johnston-Wilder, 2017), while the construct of general resilience focuses on the positive attributes involved in overcoming obstacles (Rutter, 1993). The need for a mathematical resilience construct was borne through the desire to combat the negativity that surrounds mathematics with "a positive image of agency, empowerment, and control" (Lee & Johnston-Wilder, 2017, p. 26). Additionally, Lee and

Johnston-Wilder (2017) witnessed students and individuals who were resilient in other aspects of academics or life, yet were unable to apply that resiliency toward the study of mathematics. According to Rivera and Waxman (2011), an individual with general psychological resilience can be characterized as attaining positive outcomes in spite of high-risk status, maintaining competence during a threat, and able to recover from trauma. They further specified that resilient children tend to engage in meaningfully positive relationships with adults, excel in learning and problem solving, and develop competence and efficacy (Rivera & Waxman, 2011). Borman and Overman (2004) echoed this and stated that resilient children exhibit autonomy, have strong interpersonal skills, develop and maintain realistic expectations, and remain highly active or involved in the learning process.

Figure 1. Growth zone model, as developed by Johnston-Wilder, Lee, Garton, Goodlad, & Brindley (2013).

Lee and Johnston-Wilder (2017) refined the construct of resilience to its application in the study of or process of learning mathematics. The researchers identified four components of mathematical resilience. A mathematically resilient individual possesses a growth mindset,

values the importance of mathematical competencies, understands the process of working to learn mathematics, and seeks support when struggling to navigate through the "growth zone" during mathematical struggle (Lee & Johnston-Wilder, 2016). The Growth Zone model (Figure 1) consists of three zones: comfort (green), growth (yellow), and danger (red). Lee and Johnston-Wilder developed the model from Vygotsky's (1978) Zone of Proximal Development model, but simplified the language and revised the scaffolding to help learners build awareness of their emotions when experiencing intellectual distress.

The three affective dimensions involved in developing mathematical resilience include an appreciation for the value of learning the subject, an understanding that all people experience struggle or discomfort when learning new mathematics, and a belief that everyone can learn mathematics given appropriate effort and support (Lee & Johnston-Wilder, 2016). Borman and Overman (2004) explained that the capacity for resilience differs from person to person; this resilience may progress or regress over time depending on the protective factors within the person. Protective factors are partially attributed to a person's resilience and come about because of the transactions a person engages in with the surrounding environment (Rivera & Waxman, 2011). Borman and Overman (2004) posited, "developing into a successful student may, in itself, shield children from adversity by enhancing self-esteem, efficacy, and a sense of belonging within the school" (p. 179).

In defining the construct of mathematical resilience, Lee and Johnston-Wilder (2017) described it as "the positive attributes which enable learners to engage with, learn, and use mathematics both at school and beyond" (p. 2). In their literary work, the researchers made several notable contributing points to justify this definition. First, mathematical resilience shares a variety of its attributes with the constructs of motivation, self-efficacy, and optimism. Second,

mathematics does not require vast amounts of memorization, but rather a skill for exploration, collaboration, and pattern development. And finally, the construct of mathematical resilience has been specifically designed to "work explicitly against negative influences" in mathematics (Lee & Johnston-Wilder, 2017, p. 7).

Educational Resilience

The research of educational resilience is relatively long-standing and conclusive in its findings. According to Williams (2003), resilience can be described in everyday language as the ability to rebound after trauma or exercise recuperative power. It has been well documented that resilience, as it relates to education, is not a fixed attribute, but rather is a fluid skill that can be improved or diminished in the face of student experiences and support received or withheld (Hutauruk & Priatna, 2017; Lee & Johnston-Wilder, 2017; Waxman et al., 2008; Waxman et al., 2012). The importance of developing student resilience cannot be understated. Studies have indicated that resilient students spend significantly more time on task (85%) than nonresilient students (61%) (Waxman et al., 2012) and that this discrepancy in time-on-task behavior is directly related to student performance, success, and even graduation (Hutauruk & Priatna, 2017; Johnston-Wilder et al., 2015; Waxman et al., 2012).

The most powerful factor influencing educational resilience is that of a supportive school community model that includes elements that actively shield or coach students through adversity (Borman & Overman, 2004; Rivera and Waxman, 2011). In fact, Waxman et al. (2012) argue that a classroom environment is one of the few variables impacting student resilience that can be manipulated by educators. Waxman et al. (2008) asserted that teachers can create classroom environments that facilitate educational success for all students, to include at-risk ELLs. As Borman and Overman stated, "The relative strength of our supportive school community model

is particularly appealing during an era when . . . traditionally communal institutions like families and neighborhoods have become less stable and supportive than they once were" (2004, p. 192).

The result of promoting resilience in the classroom echoes the work of Abraham Maslow and his Hierarchy of Needs (1943). Waxman et al. (2008) concluded that promoting educational resilience in the classroom lead to students experiencing a "sense of classroom belonging and connectedness, inclusion, active engagement and collaboration in learning, positive beliefs and expectations, and recognition" (p. 431). Moreover, students who possess or develop resilience maintain stronger supportive relationships with teachers and mentoring adults (Borman & Overman, 2004). Hutauruk and Priatna (2017) indicated that the negative effects of experiencing adversity while learning can be minimized or eliminated by developing resilience.

When students are faced with repeated failure, Johnston-Wilder, Lee, Brindly, and Garton reported that there are two possible paths in which students may proceed; students will either (1) increase their determination which leads to improved performance, or (2) experience emotional harm and anxiety, develop a sense of helplessness, and reduce the exerted effort resulting in lower performance (2015). This trend of repeated failure may be attributed to school programs failing to relate curricular materials to students' lives in meaningful ways (Waxman et al., 2012), but the concern circles back to the importance of training teachers in how to identify, develop, and employ appropriate academic interventions. Effective teachers are aware and sensitive to the social, economic, and minority identification factors that may negatively impact student success (Waxman et al., 2012). These teachers "focus on the affective domain and help students become resilient by providing caring and supportive relationships, positive and high expectations, and opportunities for meaningful participation" (Waxman et al., 2012, p. 68).

Mathematical Resilience

When reviewing the literature regarding resilience in mathematics, research has shown that there is an empirically measured advantage to possessing resilience toward mathematics, which is least likely to occur in minority subgroups. Hutauruk and Priatna (2017) began their study by acknowledging that studying mathematics is, in fact, a difficult journey given the need to think logically, systematically, reflectively, diligently, and thoroughly with an earnest effort. Mathematics as a culture has its own unique language, vocabulary, and subsets of knowledge necessary to achieve mastery and understanding (Rivera & Waxman, 2011). To effectively and sufficiently develop the skills and knowledge required to attain mastery in mathematics, students must view education as a life-long process (Rivera & Waxman, 2011). According to Johnston-Wilder et al. (2015), "mathematical resilience can be engineered within both formal and informal learning environments by a strategic and explicit focus on the culture of learning mathematics" (p. 1).

Mathematical resilience is defined as "a positive approach to mathematics that allows people to overcome any affective barriers presented when learning mathematics" (Duah, 2017, p. 2). It describes the "quality by which some learners approach mathematics with confidence, persistence, and a willingness to discuss, reflect and research" (Johnston-Wilder & Lee, 2010, p. 1). Thornton and Statton (2012) identified five key-aspects of mathematical resilience: (1) possessing and exercising a growth mindset, (2) metacognition to reflect on ones own work and proposed solutions, (3) adaptability and willingness to persevere, (4) interpersonal awareness to recognize ones own level of understanding and willingness to seek appropriate help, and (5) a meaningful purpose for learning the material (as cited by Hutauruk & Priatna, 2017). Additional research by Williams (2003) explored the symbiotic relationship between students' pursuit of

mathematical understanding and students' mathematical resiliency. Rivera and Waxman (2011) advised consideration toward "guided activities" in the classroom that lead students to "speak a common mathematical language" (p. 189).

Having a working understanding of how mathematical resilience is developed and facilitating collaborative mathematically-based conversations from a growth mindset platform can lead to increased mathematical resilience and, therefore, higher student achievement. Part of the explicit instruction recommended by research is that of the Growth Zone model.

> Drawing upon Dweck's notion of growth mindset, we have found it helpful for learners and coaches to think of mathematical resilience as what is needed to stay, safely, for as long as possible in the growth zone. This zone is immediately beyond what a person is able to do reliably, without aid or support . . . It is our experience that this idea of a growth zone needs explicit teaching, to help learners overcome their prior experiences of mathematical harm, to become aware of their emotions, attitudes and beliefs, and to learn actively to manage mathematics anxiety (Johnston-Wilder et al., 2015, p. 4).

By coaching students in the Growth Zone model and promoting mathematical resilience, students are better able to experience success in mathematics and further develop persistence in productively struggling through course material (Johnston-Wilder & Lee, 2010). Students who are mathematically resilient are better able to and more confident in assisting peers in moments of intellectual adversity (Johnston-Wilder et al., 2015, p. 1).

English Language Learner Classification

Students whose native language is other than English have been given many categorical names throughout the past few decades. Some of these titles include English as a Second

Language (ESL or ESOL), English as a New Language (ENL), Limited English Proficiency (LEP), English Language Learner (ELL), English Language Acquisition Student (ELAS), and Multilingual Learner (MLL). Regardless of the acronym used, this body of students shares the task of learning the English language in an effort to enter a mainstream American classroom. Additionally, these students participate in annual high-stakes testing across the nation, the scores of which are used to determine whether schools are making annual yearly progress (Ragan & Lesaux, 2006). Even though the National Assessment of Educational Progress (NAEP) does not directly define "ELL," it includes the scores of those ELL students who participate in the regular state assessments (Abedi, 2008, p. 18). Because these scores can affect the potential rating of a school, educational leaders and teachers are faced with the challenge of accurately determining ELL students' level of English language proficiency, providing supports and interventions to help students transition to English language mastery, and make grade-level content accessible despite language barriers.

Before language services and instructional opportunities can begin, students must be accurately identified and categorized. Title IX #25 of the No Child Left Behind Act outlines English language learning students to consist of the following:

> (a) age 3 through 21; (b) enrolled or preparing to enroll in an elementary or secondary school; (c) not born in the United States or whose native language is not English; (d) is a Native American, Alaskan Native, or a native resident of the outlying areas; (e) comes from an environment where a language other than English has had a significant impact on an individual's level of ELP; (f) is migratory and comes from an environment where English is not the dominant language; or (g) has difficulties in speaking, reading, writing, or understanding the English language that may deny the individual the ability to meet

> the state's proficient level of achievement and the ability to successfully achieve in classrooms where English is the language of instruction, or to participate fully in society (Abedi, 2008, p. 18).

Use of a standardized test designed specifically for stratifying ELLs into ability groups is the most common means of categorization amongst states and within districts, though use of multiple measures is ideal (Ragan & Lesaux, 2006).

A common issue that has lasting impacts on ELL students' academic achievement is that of misclassification or inconsistent criteria for receipt of varying degrees of language services across districts or states. According to studies, "Misleading results of inaccurate classification and invalid assessment may lead to disproportionately placing ELL students in special education classrooms where it may negatively affect their academic career and may take them a longer time to graduate" (Abedi, 2008, p. 17). Additionally, students may be placed in language support classes that are not commensurate with their actual ability levels, which may also prolong their time spent in secondary schools and delay graduation (Ragan & Lesaux, 2006). In a study of elementary schools with high levels of ELL students who were outperforming other elementary schools with similar demographics, it was determined that using real-time, multifaceted data is critical to ensure proper placement and appropriate language supports for ELLs to experience optimal success (Campbell Wilcox, Gregory, & Yu, 2017).

Another point of concern regarding ELL classification and supports provided stems back to the NCLB legislature. It states that ELL students must be assessed on the four modalities of language: reading, writing, listening, and speaking (2002). Each of the various standardized assessments used to determine students' level of English language proficiency have separate sections to test each modality. Each section is accompanied by carefully crafted rubrics to help

standardize the scoring process (Ragan & Lesaux, 2006). It is not unusual for students to score varying levels amongst the four modalities. These inconsistent scores on the four modalities can affect ELL categorization (Abedi, 2008; Ragan & Lesaux, 2006). With little guidance on how to validly determine which services various levels of ELL students qualify for, the ambiguity of NCLB, which was intended to give states the flexibility to provide appropriate services for their unique student population, has become a point of contention and frustration. Researchers stated, "a greater uniformity in federal identification and reclassification law and policy would more accurately operationalize the goal of NCLB" (Ragan and Lesaux, 2006, p. 18)

A growing concern regarding the classifications and services provided to ELL students is centered on the transient nature of these students and their families, and the inconsistencies that exist across school districts and state lines (Ragan & Lesaux, 2006). Many ELL students come from an interrupted formal education or educational systems that exercise standards that do not correlate to American educational standards. This, potentially followed by multiple relocations across school district or state lines, creates even more discontinuity in students' academic experience (Ragan & Lesaux, 2006). The issue is further compounded by inconsistent classification scales and arbitrary cut-off scores on standardized assessments (Abedi, 2008). Whereas many states use a four-tiered classification system for ELL students, some states use a five-tiered system instead. This can make it difficult for educators to use prior educational records independent of further data. Researchers warn that, "a lack of standardization and clarity of entry and exit criteria for ELL programs at the national, state, or district level has the potential to have [long-lasting] pronounced effects on the education of language minority learners" (Ragan & Lesaux, 2006, p. 2).

English Language Learner Resilience

The emphasis and attention toward at-risk groups of students and their academic performance, graduation rate, and post-graduation mobility has been of particular interest in education in past decades, especially since the passing of NCLB in 2002. Students who face the most impeding obstacles in becoming academically successful are most often the same as those who struggle in terms of resilience (Waxman et al., 2008, p. 431). With an increased focus on Science, Technology, Engineering, and Mathematics (STEM) initiatives, and mathematics being the language that binds the four content areas of STEM, it is no surprise that there is an emphasis on mathematics achievement for at-risk groups of students, to include Hispanic ELLs (Rivera & Waxman, 2011, p. 189). Research designed to understand student perceptions and attitudes toward classroom environments indicated the importance of developing educational resilience, stating that the act of building resilience in and of itself is a form of intervention that benefits all students – especially those who are high-risk (Rivera & Waxman, 2011, p. 186). Waxman, Padron, Shin, & Rivera (2008) concluded that resilient and nonresilient Hispanic students differed in both the level of interaction with the teacher and in behavior. They stated,

> Resilient Hispanic students spent significantly more time interacting with teachers for instructional purposes than nonresilient students. On the other hand, nonresilient Hispanic students spent significantly more time interacting with other students for social or personal purposes than resilient students . . . Resilient students were observed more often watching or listening, whereas nonresilient students were observed more often not attending to task (Waxman et al., 2008, p. 435).

As previously mentioned, a supportive school community has the strongest impact on student achievement and resilience (Waxman et al., 2008, p. 429). This is a concern for Hispanic

ELLs in that Borman and Overman's (2004) study indicated that this subgroup of student is more frequently found in school environments and communities that do not foster academic resilience when compared to other student subgroups. River and Waxman explained the importance of creating a protective environment for academically struggling Hispanic students; an environment capable of fostering resiliency and developing academic, social, and psychological growth (2011, p. 187). Instructional strategies such as explicit instruction, culturally responsive teaching, cooperative learning, technology-infused learning activities, and collaborative peer conversations have been proven to help narrow achievement gaps (Waxman et al., 2008, p. 436), yet Hispanic ELL students continue to remain at the lower rungs of achievement (Blazer, 2015; DePaoli et al., 2016).

In studies about Hispanic ELLs and their educational resilience, nonresilient students found classwork more difficult than their resilient counterparts (Rivera & Waxman, 2011; Waxman et al., 2012). Despite this measurable difference, there was no additional teacher time or effort expended on the nonresilient students. The researchers went on to explain that there were few opportunities for differentiated remediation or corrective activities offered for the nonresilient students (Waxman et al., 2012, p. 67). It was in this observation that the researchers conveyed a bleak outlook for the future of nonresilient Hispanic ELL students. But perhaps the most troublesome conjecture presented in the body of literature was that made by LeClair et al. (2009). Here, researchers postulated that ELL students might be aware of their low academic performance as compared to their non-ELL grade-level peers, making a clear pathway for Merton's self-fulfilling prophecy to take affect.

English Language Proficiency Tests

In response to the legislative requirements set forth by the No Child Left Behind Act of 2002, states have had to adopt, administer, and incorporate the results of assessments designed to measure students' level of English language proficiency (New America, n.d.). These tests consists of a battery of speaking, listening, reading, and writing sections, the results of which are combined into a composite score and then placed on a scale and categorized accordingly (New America, n.d.). There are two multi-state consortia that author the assessments employed by 42 states, with the remaining states utilizing their own locally developed exam (New America, n.d.). These states include Arizona, California, Kansas, Louisiana, Mississippi, New York, and Texas. The following is a brief overview of the various English proficiency assessments.

ACCESS. Used in 35 states, WIDA's ACCESS 2.0 for ELLs (Assessing Comprehension and Communication in English State-to-State for English Language Learners) is the most widely distributed English proficiency exam throughout the country (New America, n.d.). Funded by federal grant money, WIDA was founded in 2003 and named after the three original states participating in the consortium (Wisconsin, Delaware, and Arkansas) (Board of Regents of the University of Wisconsin System, 2018). Before creating their language proficiency test, the consortium began by developing standards for students' social language as well as language from the academic subjects of language arts, mathematics, science, and social studies (Board of Regents of the University of Wisconsin System, 2018). WIDA then completed the development of various versions of the ACCESS test, to include versions appropriate for students ranging from kindergarten through the twelfth grade and designed to accommodate various levels of English proficiency (New America, n.d.).

Aligned with these English language proficiency standards, the ACCESS test is offered in paper and electronic format, requires 60-185 minutes to complete depending on the grade-level band being assessed, and provides a summative overview of students' academic, social, and operational English language mastery (Board of Regents of the University of Wisconsin System, 2018). Based on the composite score of the test, students are placed into one of following six language proficiency categories: (1) Entering, (2) Beginning, (3) Developing, (4) Expanding, (5) Bridging, and (6) Reaching (WIDA Consortium, n.d.). Students classified as Bridging or Reaching are considered proficient and may no longer need formal language supports, interventions, or other specially designed services aimed toward assisting students grow in English language mastery (WIDA Consortium, n.d.).

ELPA21. Used in Arkansas, Iowa, Nebraska, Ohio, Oregon, Washington, and West Virginia, the English Language Proficiency Assessment for the 21st Century (ELPA21) is the second most popular test used to assess and monitor ELL students' level of English language mastery (New America, n.d.). The 10 standards upon which the test is based were developed through a collaborative effort of WestEd, the Council of Chief State School Officers, and the Understanding Language Initiative of Stanford University. The National Center for Research on Evaluation, Standards, and Student Testing (CRESST) authors the test and aims to inform instruction in an ongoing basis, despite ability level, disability, primary language, or subgroup classification (ELPA21, 2018). The test assesses the domains of reading, writing, listening, and speaking (ELPA21, 2018).

Like the ACCESS test, the ELPA21 can be completed in a paper or electronic format and requires an estimated 76-173 minutes to complete, depending on the grade and ability level of the student being assessed. Each domain score is placed into one of the following five

categories: (1) Beginning, (2) Early Intermediate, (3) Intermediate, (4) Early Advanced, and (5) Advanced (ELPA21, 2018). Students are then classified as "Emerging" if all domains are deemed a level 2 or below, "Proficient" if all domains are deemed at a level 4 or above, and "Progressing" for any variation in between (ELPA21, 2018). All students not categorized as "Progressing" are recommended for services and supports (New America, n.d.).

Non-Consortium tests. States that administer their own English proficiency tests include Arizona, which gives the Arizona English Language Learner Assessment (AZELLA), California which uses the English Language Proficiency Assessments for California (ELPAC), and Kansas which employs the Kansas English Language Proficiency Assessment 2 (KELPA2) (New America, n.d.). The state of Louisiana administers the Louisiana Connectors for English Learners to assess proficiency, while Mississippi utilizes the LAS Links test (New America, n.d.). Finally, Texas uses the English Language Proficiency Assessment System (TELPAS) and New York State gives the New York State English as a Second Language Achievement Test (NYSESLAT) (New America, n.d.). Each of these exams is similar in nature to the ACCESS and ESPA21 described above, with small categories that range from level 1 to levels 4, level 5, or level 6 depending on the specific test. It could be argued that assessments that use a greater number of levels give educators a better direction in the deficits and needs of students as they are clustered into smaller, more specific groups, but the overarching goal is to reliably identify and provide appropriate interventions for those students who need further English proficiency development (MetriTech Inc., n.d.).

Summary

There are a number of barriers that plague the growing Hispanic ELL population in the United States. Teachers are ill equipped, unwilling, or uncertain of how to properly provide

academic interventions to this subgroup (Durgunoğlu & Hughes, 2010). Hispanic ELLs continue to underperform when compared to the non-ELL peers, despite education legislature, reform, and measures of accountability (DePaoli et al., 2016). The measured differences between resilient and non-resilient students has substantially illustrated the importance and benefit of coaching students to develop resilience as it relates to mathematics, general education, and life overall; yet formal integration of resilience into curriculum or programs is slow-coming (Borman & Overman, 2004; Burton, 2014; Duah, 2017; Hutauruk, & Priatna, 2017; Johnston-Wilder et al., 2015; Lee & Johnston-Wilder, 2017; Pardon et al., 2000; Rivera & Waxman, 2011; Rutter, 1993; Thornton & Statton, 2012; Waxman et al., 2008; Waxman et al., 2012; Williams, 2003; Wong, et al., 2016; Zuill, 2016). The glaring need for further research into ELL students and their resilience toward mathematics in the face of STEM initiatives and continued accountability measures is the underlying support for the research proposed in this study.

It is the intent of this researcher to investigate the nature of the relationship between ELL students' English proficiency and mathematical resilience. Though studies have ben conducted regarding ELLs and educational resilience, the construct of mathematical resilience is new and has yet to be deeply examined. It is the researcher's desire to establish whether ELL students who have high levels of English proficiency possess high levels of mathematical resilience, while students who have low levels of English proficiency posses low levels of mathematical resilience thereby, establishing a positive correlation, or if ELL students who have high levels of English proficiency possess low levels of mathematical resilience while students who have low levels of English proficiency have high levels of mathematical resilience, establishing a negative correlation. Either outcome is plausible as higher proficiency of the English language may help to increase students' mathematical resilience; or, ELL students may be experiencing multiple

failures in math while working to attain English proficiency, leading to lower levels of mathematical resilience. The results of said study will help educators to determine how to effectively allocate and direct various types of instructional interventions to better serve the ELL subgroup to attain success in mathematics courses.

CHAPTER THREE: METHODS

Overview

The following chapter will be an explanation of the research study design, the research questions, and the research hypotheses. The chapter will define the participants and setting of the study, the instrumentation used to measure the predictor and criterion variables, and the procedures followed throughout the course of the study. The section will conclude with a detailed explanation of the data analysis methods used to interpret the collected results.

Design

In this non-experimental, correlational study, the researcher investigated the relationship between high school Hispanic ELL students' English language proficiency and students' level of mathematical resilience. High school Hispanic ELL students' New York State English as a Second Language Achievement Test (NYSESLAT) scores were used to measure students' English language proficiency, which served as the predictor variable. According to Genesee et al. (2006), English proficiency involves vocabulary acquisition, control over grammar, and an understanding of the subtle semantics of the English language. In the state of New York, English proficiency is defined in terms of students' results of the NYSESLAT. Students who earn a *Commanding* score on the exam are deemed proficient in English and are no longer categorized as English language learners (MetriTech, Inc., 2018). This would indicate that English proficiency is equivalent to testing out of an English language learner classification. This score is a compilation of comprehension, speaking, listening, reading, and writing subtests and includes language and syntax used in both academic and personal communication (MetriTech, Inc., 2018).

The Mathematical Resilience Scale (MRS) was used to measure students' mathematical resilience, which served as the criterion variable. Mathematical resilience is a positive disposition toward the learning of mathematics and consists of value, struggle, and growth subcomponents (Johnston-Wilder & Moreton, 2018). Resilience in mathematics occurs after students are faced with some type of adversity (Kooken et. al, 2016) and has a positive affect on student success in mathematical mastery (Johnston-Wilder & Moreton, 2018).

A correlational design was appropriate as it is used to examine the strength and nature of the relationship between two quantitative variables (Warner, 2013). Because the NYSESLAT and MRS scores are continuous in nature, they satisfied the requirements of a correlational design. A correlational study was also appropriate because this study did not aim to establish a causal relationship between the variables (Warner, 2013). Rather, the study aimed to determine if a statistically significant relationship existed between two continuous variables. According to Warner (2013), correlational research gives a good indication as to whether the subject material of the study merits further investigation. That is to say, if this study yielded a statistically significant correlational pattern, then further studies may be warranted to examine the relationship between the two variables at a deeper level.

Research Questions

RQ1: Is there a relationship between Hispanic high school English Language Learners' English language proficiency as measured by the NYSESLAT and mathematical resilience as measured by the Mathematical Resilience Scale?

RQ2: Is there a relationship between female Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

RQ3: Is there a relationship between male Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

Null Hypotheses

The null hypotheses for this study are:

$H_0$1: There is no statistically significant correlation between Hispanic high school English Language Learners' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

$H_0$2: There is no statistically significant correlation between female Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

$H_0$3: There is no statistically significant correlation between male Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

Participants and Setting

The participating school is located in a middle-class suburban region in a northeastern state and has a student population of approximately 2,700. The student demographics of the participating high school are listed in Table 1. Study participants consisted of 39 Hispanic males and 33 Hispanic females. Age, grade level, and race are not criteria for the selection of participation in this study.

Table 1

Site Demographics

Student Population	Caucasian	Hispanic	African American	Other Ethnicity	Economically Disadvantaged	English Language Learner
2,700	47%	25%	20%	8%	54%	5%

Note. Adapted from New York State Education Department. (2018). New York State education at a glance: Schools [Date File].

All students classified as ELL and enrolled in a mathematics course during the fall semester of the 2019-2020 school year within the participating high school were invited to complete the study. The participating school's cooperating math teachers were given a written prompt to read to students in both English and in Spanish which explained the purpose of the study, the importance of student participation, and the required student assent or parental consent forms. This prompt can be found in Appendix A. ELL students who were willing to participate in the study, attained and returned parental consent, or submitted written assent completed the survey, but only Hispanic ELL MRS surveys were included in the results (see Appendices B, C, D, E, F, and G respectively).

A sample of 72 students was acquired, which exceeded the minimum of 66 students to obtain a medium effect size with statistical power of .7 at the .05 alpha level (Gall, Gall, & Borg, 2007). The survey was administered during a 20-minute window during the first half or last half of students' math class, as determined by the classroom teacher. Surveys were completed in a traditional classroom setting, consisting of individual student desks arranged in rows. The cooperating math teachers from the participating high school were trained by the researcher on how to organize, administer, and collect the instrument. See Appendix H for training procedures.

Instrumentation

NYSESLAT

The New York State English as a Second Language Achievement Test (NYSESLAT) was the metric used to evaluate the level and growth of English proficiency of ELL students in the state of New York (New York State Education Department [NYSED], n.d.). The assessment was developed as a response to legislative requirements outlined by NCLB and has been in use since 2003 (NYSED, n.d.). MetriTech, Inc. has been the test developer since the first edition of the exam; they also provide a detailed technical report after each successive assessment administration (MetriTech, Inc., n.d.). In the most recently released NYSESLAT Operational Test Technical Report, the reliability statistics used was Cronbach's alpha. The statistic ranged from 0.79 to 0.96 for the various grade-level versions of the NYSESLAT (MetriTech, Inc., 2017). With an average of 0.89, the internal consistency was moderately high and the assessment was considered reliable (MetriTech, Inc., 2017). Validity statistics for the NYSESLAT were reported using internal correlations between each of the subtests. These internal correlations ranged from 0.57 to 0.81 and indicated a moderate correlation between each of the subtests (MetriTech, Inc., 2017). These results complied with what is theoretically expected and confirmed the instrument's validity.

Test administration occurred in the spring of the 2018-2019 school year. The exam consisted of four sections, one for each language modality (speaking, listening, reading, and writing). The speaking portion was approximately 15-minutes in length and was administered to students individually (NYSED, n.d.). The written portion (which was comprised of the other three modalities) was approximately 90-105 minutes in length for Kindergarten, approximately 105-165 minutes in length for grades 1-12, and administered in a group setting (NYSED, n.d.).

Student scores from each modality were then composited and scaled, after which students were placed in one of the following five categories: Entering, Emerging, Transitioning, Expanding, or Commanding (NYSED, n.d.). Scaled scores ranged from 120-360, with a 120 being the lowest score in the Entering category and a 360 being the highest category in the Commanding category. For a more detailed breakdown of scaled score ranges in each category for grades K-12, see Appendix I.

The use of five categories is unique as other English language proficiency tests – to include the Assessing Comprehension and Communication in English State-to-State for English Language Learners Test (ACCESS) result in student placement within four categories. The ACCESS test is the most widely used English proficiency assessment in the United States, administered by 35 states and the District of Columbia (New America, n.d.). Similar to New York, other states using more than four categorizations for ELL students include Arizona, Connecticut, and Mississippi. The purpose for additional categories is tied to helping teachers use the assessment results to better inform the accommodations and interventions provided within the classroom (NYSED, n.d.). For a description of each of the five categories used by NYSESLAT, refer to Appendix J.

As of 2015, the NYSESLAT was aligned to Common Core State Standards in a continued effort to ensure that the exam is accurately indicating ELL students' ability to access grade-level material and better inform teachers what levels of language supports students would need to meaningfully engage with curricular concepts (MetriTech, Inc., 2018). All students identified as ELL take the NYSESLAT, to include those with an Individualized Education Plan (IEP) (NYSED, n.d.). In the event that a student is unable to complete the grade-level assessment (as documented in the student's IEP), the student may take the grade-level

NYSESLAT assigned to the student's adjusted grade level (NYSED, n.d.). Of the students who took the NYSESLAT during the 2016 administration, 21.5% were ELL students with disabilities (NYSEDb, n.d.). A total of 65.4% of the test takers were new-ELLs, 23.3% were developing ELLs, 11.3% were long-term ELLs, and 4.5% were identified as Students with Inconsistent/Interrupted Formal Education (SIFE) (NYSEDb, n.d). Long-term ELLs are defined as students who have been enrolled in U.S. schools and received language services for at least seven years, but have not attained English language proficiency (Blazer, 2015).

Research using NYSESLAT test scores is limited as the instrument is unique to the state of New York. Two studies have used the NYSESLAT to establish students' levels of English language proficiency: Clark (2014) and DeCamps (2016). Clarke used students' NYSESLAT scores as a predictor variable in a correlational study of graphic organizers and ELL students' science achievement (2014). This is similar to the present study's use of NYSESLAT scores as a predictor variable. Similarly, DeCamps used students' NYSESLAT scores to establish English proficiency, and then further analyzed students' mathematics and English language arts state assessment scores in an effort to compare various models of English language learner programs (2016). Though the present study examined students' NYSESLAT scores, it was in comparison to mathematical resilience rather than mathematical achievement.

Mathematical Resilience Scale

The instrument used to measure Hispanic high school ELL students' mathematical resilience was the Mathematical Resilience Scale (MRS), developed by Kooken, Welsh, McCoach, Johnston-Wilder, and Lee (2016). According to the researchers, the scale is intended to "distinguish students who may be more likely to persist in the study of mathematics when they face setbacks from those who are not likely to persist" (Kooken et al., 2016). The MRS is a 5-

point Likert Scale questionnaire consisting of 24 questions. Responses to each question are as follows: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. Composite scores range from 24 – 120, with a 24 indicating a low level of mathematical resilience and a 120 indicating a high level of mathematical resilience. The MRS measures the following three components of resilience: value, struggle, and growth. Of the 24 questions, eight measure students' value of mathematics, nine measure students' willingness to persevere through mathematical struggle, and seven measure students' belief that mathematical intelligence can increase with time and effort (Kooken et al., 2016). A total of 18 questions are positive statements, and the remaining 6 are negative statements (Kooken et al., 2016).

University students perusing a degree in a STEM field were surveyed and indexed; their scores were compared to university students enrolled in remedial math courses. Multiple iterations of the survey were completed, and a series of ANOVAs were used to examine statistically significant results. The validity of each subscale was examined using exploratory and confirmatory factor analyses. (Kooken at al., 2016). The researchers reported a statistically significant covariance between the three factors ($p < .05$), and coefficient alphas of .94 for Value, .73 for Struggle, and .83 for Growth. The coefficient alphas were calculated using a 95% confidence interval (Kooken et al., 2016). These statistical measures confirmed both construct validity and internal reliability.

Because the authors of the MRS developed the instrument for university-level students, and because the instrument was translated and provided to study participants in Spanish, a pilot study was conducted to establish the validity and reliability for the Spanish version of the MRS. See Appendix K for permission to use the instrument. To date, the MRS has been cited in several published studies. Hafiz, Darhim, and Dahlan (2017) used the MRS to study the impact

of problem-based learning and guided discovery learning in comparison to students' mathematical resilience. Although the present study will not be quasi-experimental, it will use the same instrument to establish students' mathematical resilience. The MRS was also used in Hutauruk and Priatna's (2017) study to measure and report the mathematical resilience of university level Mathematics education students. The present study aims to do more than report the mathematical resilience of the participants, but rather, investigate the relationship between students' mathematical resilience and English language proficiency. This most closely resembles the work of Zanthy (2018) in a study that examined the relationship between university level Statistics students' mathematical resilience and academic ability.

Procedures

Before beginning the proposed study, approval from the Institutional Review Board (IRB) was secured (see Appendix L). The present study was conducted in the high school in which the researcher is employed and permission to conduct the study was granted by the superintendent of schools (see Appendix M). Mathematics teachers of ELL students were approached about facilitating the study during a period of instruction in the fall of 2019. All teachers verbalized willingness to facilitate the survey with the understanding that they had to be trained on how to administer and collect the surveys by the researcher.

Using the script provided in Appendix A, students were informed of the importance of the study, what was expected of participating students, and the absence of penalty for students whom chose to participate as well as those who chose to decline the opportunity to participate. All ELL students were given two letters of parental consent or two letters of assent. One of each letter was written in English and the second was written in Spanish (See Appendices B, C, D and

E). Students had three weeks to return an English or Spanish version of the consent or assent letters before the teachers were asked to submit the forms collected to the researcher.

Upon receiving parental or student permission forms, the researcher proceeded to conduct a pilot study of the instrument. The pilot study used a stratified convenience sample of 10 high school ELL students from the researcher's school of employment and was used to establish the validity of the Spanish translation of the MRS. This stratified sample included 5 male students and 5 female students. The researcher trained a colleague on how to conduct the pilot survey using the same training procedures described in Appendix H. The pilot study results were analyzed for validity using SPSS software. A Pearson's *r* was used to compare the results of the Spanish and English MRS surveys and a $p < .05$ was needed to proceed with the study.

Upon receiving desirable results for the pilot study, the researcher delivered and reviewed the training packet to teachers of participating students and provided additional support as needed to conduct the survey. This training packet defined the type of environment needed to survey students, identified prohibited behaviors, and listed the procedures to follow throughout the survey period. The survey environment needed to be a quiet classroom consisting of individual student desks, arranged in rows and columns. The survey environment was to be similar to that used when administering a standardized assessment. Student collaboration was to be prohibited. The packet also explained that each participant was to receive both an English version and a Spanish version of the instrument – regardless of students' ELL classification or verbally expressed preference. All participants were also given and English/Spanish dictionary as a reference upon request. Students were required to record all answers on one version, but asked to submit both versions upon completion of the survey. Both the completed and the blank surveys were collected at the time of completion. Both forms were placed in a manila envelope

in the presence of the participants. Once the final set of surveys were collected, the envelope was sealed in the students' presence. The survey facilitator concluded the session with a scripted dialogue that thanked the participants for their contribution to the body of research, reinforced the anonymity of the completed surveys, and dismissed them from the survey session (see Appendix N).

Once the researcher received the surveys, an audit of the forms was conducted. The researcher ensured that each participant completed one version of the instrument and sorted the completed forms from the blank forms. All blank surveys were filed and stored in a folder. Any instrument partially completed were omitted from results and filed in another folder. Completed survey data was then recorded in SPSS software, after which the completed surveys were stored in a third folder. In addition to organizing and storing the physical surveys, they were also scanned and saved in a cloud storage system for addition security measures.

Data Analysis

Using NYSESLAT scores as the predictor variable and students' corresponding Mathematical Resilience Scale scores as the criterion variable, the data was measured as continuous intervals and explored using Pearson's *r* test. A Pearson's *r* test was an appropriate statistic given that the study was non-experimental, the predictor and criterion variables were continuous and independent of one another, and the researcher aimed to examine a relationship between the quantitative variables free of concluding causation (Gall et al., 2007; Warner, 2013). Burton (2014) used a Pearson's *r* test in a study of student resilience and academic achievement. A Pearson's *r* test was also used in a study examining the relationship between student resilience and academic success among Bermuda foster care adolescents (Zuill, 1993). Khan (2018) used a Pearson's *r* test to verify the relationship between student grit and mindset scores.

Before running the Pearson's *r* test, the analysis process began with testing for various assumptions. First, SPSS software was used to run a Kolmogorov-Smirnov test or Shapiro-Wilk's test. These tests were used to check normality in the data when a sample size is greater than 50 or less than 50 respectively. (Gall et al., 2007; Green & Salkind, 2013). Next, the researcher created a scatter plot using SPSS software to check for extreme bivariate outliers as Pearson's *r* is susceptible to accurately describing bivariate data when there are one or more extreme outliers (Warner, 2013). Careful consideration was used to determine whether to retain or omit the outliers, as advised by Warner (2013). The scatter plot was also used for the assumption of linearity. The researcher affirmed that the bivariate data exhibited a non-curvilinear relationship, making Pearson's *r* an appropriate metric (Gall et al., 2007). Finally, the scatter plot was used to confirm the assumption of bivariate normality. Bivariate data that demonstrates a classic "cigar shape" is reasonably normally distributed and a candidate for Pearson's *r* (Gall et al., 2007; Warner, 2013).

Upon completing each assumption test described above, the relationship between Hispanic high school ELL English language proficiency as measured by the NYSESLAT and mathematical resilience as measured by the MRS was examined using the Pearson's *r*. Testing for this research used a statistical power of .7 and an alpha level of .05. The 72 participants attained exceeded the minimum of 66 participants to obtain a medium effect size (Gall et al., 2007) and provided enough statistical power to overcome the potential effects of outliers (Warner, 2013). A *p*-value less than .05 would have indicated statistically significant results (Gall et al., 2007, Green & Salkind, 2013) and the Pearson's *r* correlation coefficient was used to indicate if there was a strong positive, weak positive, strong negative, weak negative, or no correlation between the predictor and criterion variables (Warner, 2013).

CHAPTER FOUR: FINDINGS

Overview

This chapter will review and illustrate the statistical outcomes of the study. The chapter will begin with a review of each research question and null hypothesis. Next, the descriptive statistics will be presented, to include those from both the pilot study and the research study. After the descriptive statistics have been given, the results of the pilot study and each of the three null hypotheses will be presented. Outcomes of data screening, tests for linearity, and tests for normality will be concluded with a measure of Pearson's *r* between students' MRS and NYSESLAT scores. Tables summarizing statistical outcomes and scatter plots for each research question's data will be illustrated to help orient the data in a comparative manner. The researcher will end each null hypothesis with a rejection or failure to reject based on the aforementioned statistical outcomes.

Research Questions

RQ1: Is there a relationship between Hispanic high school English Language Learners' English language proficiency as measured by the NYSESLAT and mathematical resilience as measured by the Mathematical Resilience Scale?

RQ2: Is there a relationship between female Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

RQ3: Is there a relationship between male Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale?

Null Hypotheses

The null hypotheses for this study are:

$H_0$1: There is no statistically significant correlation between Hispanic high school English Language Learners' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale.

$H_0$2: There is no statistically significant correlation between female Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale.

$H_0$3: There is no statistically significant correlation between male Hispanic high school students' English language proficiency as measured by the New York State English as a Second Language Test and mathematical resilience as measured by the Mathematical Resilience Scale.

Descriptive Statistics

Pilot Study

The purpose of the pilot study was to establish the validity of the translated survey. With this intent, a group of ten students completed the English and Spanish version of the Mathematical Resilience Scale. The ten students invited to participate in the pilot study were high school seniors, enrolled in a Math for the College Bound course. All ten students identified Spanish as their primary language and were classified as a level 4 or level 5 English language learner, indicating that they have an advanced or commanding grasp of the English language. The convenience sample consisted of five male students and five female students. All students who were invited to participate submitted consent or assent forms and completed the Spanish

version of the Mathematical Resilience Scale during the second week of November. The English version of the Mathematical Resilience Scale was then completed a week later.

The mean student score on the English version of the MRS was 90.21 with a standard deviation of 2.78. The mean student score on the Spanish version of the MRS was 91.00 with a standard deviation of 3.46. Both versions of the MRS shared a minimum score of 85, but the English version had a maximum score of 94 while the Spanish version had a maximum of 95. The small amount of variation between the responses from the two versions was deemed negligible and the researcher was able to use the Spanish version of the MRS for further research purposes. See Table 2 for a summary of these descriptive statistics.

Table 2

Descriptive Statistics

Instrument	Mean	Standard Deviation	Median	Minimum	Maximum	Totals
English MRS	90.21	2.78	91.00	85	94	10
Spanish MRS	91.00	3.46	92.50	85	95	10
Total MRS	92.32	8.79	93.00	67	110	72
NYSESLAT	266.89	51.09	280.50	149	337	72
Female MRS	93.61	9.13	94.00	71	110	33
Female NYSESLAT	264.85	54.04	285.00	163	337	33
Male MRS	91.41	8.54	93.00	67	105	39
Male NYSESLAT	265.38	51.28	277.00	149	335	39

Research Study

Of the 131 students invited to participate in the study, 95 returned consent or assent forms and completed a Mathematical Resilience Survey. All consent and assent forms were sorted, alphabetized, and stored in a file. Of those surveys completed, 21 were incomplete or illegible. These surveys were omitted from the study and stored in a separate file. Responses from the remaining 74 surveys were recorded and totals were calculated using a Microsoft Excel sheet. Each student's MRS total was then coupled with students' corresponding New York State

English as a Second Language Achievement Test score and stored in a separate Microsoft Excel file. The results of the data collected from the surveys can be found in Appendix P. Student data was sorted by gender and imported to SPSS software. A scatter plot of MRS scores versus NYSESLAT scores indicated two outliers, both of which were omitted and resulted in a total of 72 data points for further statistical analyses. The two outlier surveys were added to the file containing the incomplete or illegible surveys.

Hispanic high school students' mean mathematical resilience score was 92.32 with a standard deviation of 8.79. The median of the data was a 93 with a maximum of 110 and minimum of 67. The corresponding data set of NYSESLAT scores had a mean of 266.89 with a standard deviation of 51.09. The median NYSESLAT score was a 280.50 with a maximum score 337 and minimum score of 149. When the data was restricted to female Hispanic high school students only, the mean MRS score was 93.61 with a standard deviation of 9.13. The median female MRS score was a 94.00 with a maximum of 110 and minimum of 71. The mean female NYSESLAT score was 264.85 with a standard deviation of 54.04. The median female NYSESLAT score was 285.00 with a maximum of 337 and minimum of 163. When the data was restricted to males only, the mean MRS score was 91.41 with a standard deviation of 8.54 and a median of 93.00. The maximum male MRS score was 105 and the minimum was 67. The mean male NYSESLAT score was 265.38 with a standard deviation of 51.28. The median male NYSESLAT score was 277.00 with a maximum of 335 and minimum of 149. See Table 2 for a summary of these descriptive statistics.

Results

Pilot Study

A Pearson's *r* was used to analyze the strength and nature of the results between the two versions of the survey. Using the English results as the predictor variable and the Spanish results as the criterion variable, a scatter plot was generated to test for linearity and inspect the data of significant outliers (see Figure 2).

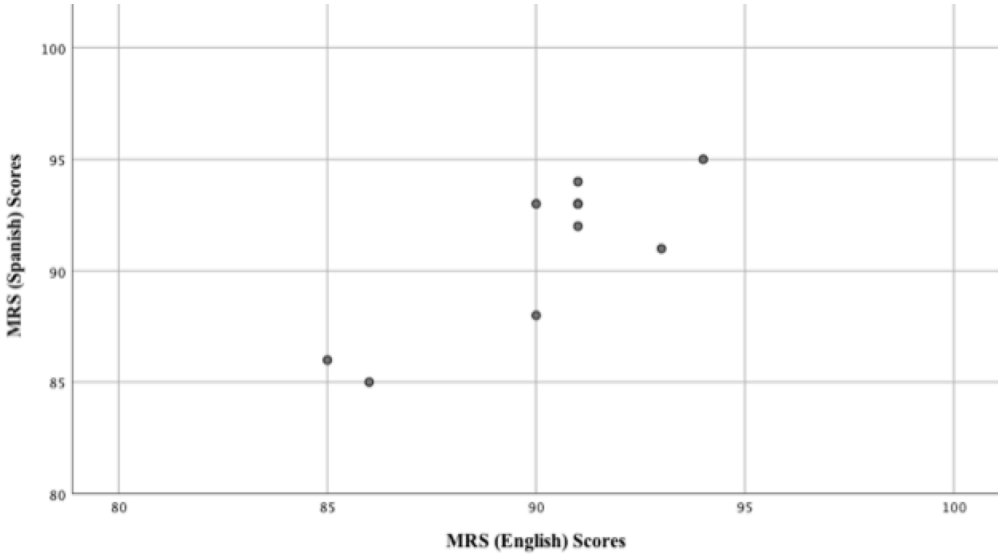

Figure 2. Scatter Plot of MRS (English) Scores and MRS (Spanish) Scores

The researcher determined that the data was appropriately linear in nature and concluded that there were no significant outliers in the data. The Shapiro-Wilk's test was used to analyze the data for normality. Both the English and Spanish survey results were normally distributed with *p*-values of .114 and .117 respectively. Finally, the data exhibited a strong positive correlation with $r = .842$. The pilot study was determined to have illustrated appropriate levels of validity of the translated Mathematical Resilience Scale and the researcher proceeded with formal study regarding students' mathematical resilience and English language proficiency.

Null Hypothesis One

Data screening. Before beginning the statistical analyses, MRS forms were screened for completion, legibility, and validity. Of the 95 surveys collected, 21 were incomplete or illegible and omitted from the study. These surveys were filed in a separate folder from the remaining surveys. Surveys that contained the same responses throughout the 24 questions (such as all 1's or all 5's) were considered invalid and also removed from the study. Two such surveys were found and filed with the incomplete and illegible surveys.

Assumptions testing. The collection of 72 data points representing Hispanic high school students' mathematical resilience versus English language proficiency demonstrated a linear relationship with graphed on a scatter plot (see Figure 3).

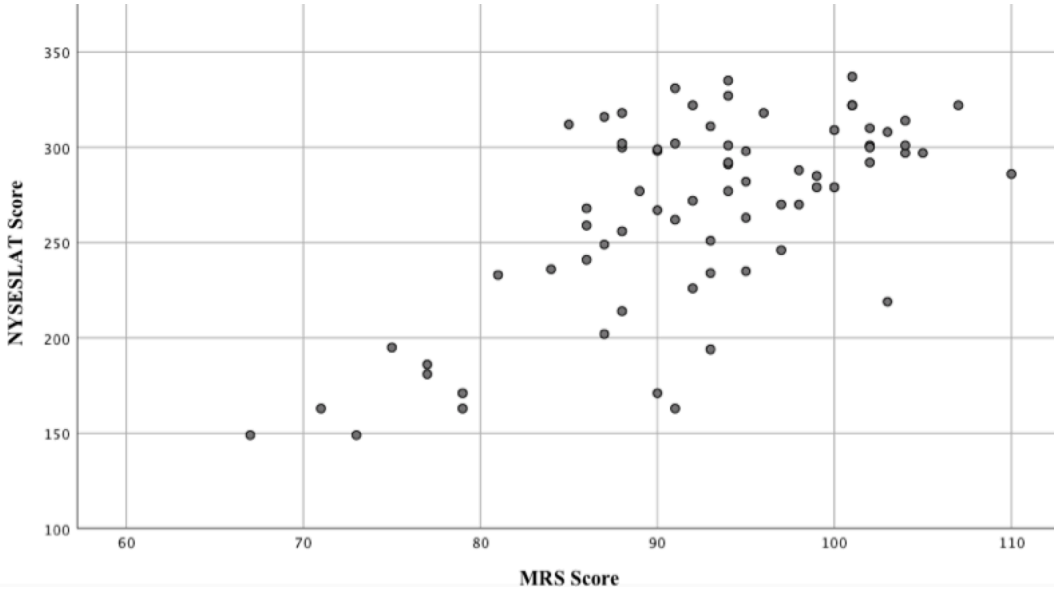

Figure 3. Scatter plot of MRS scores and NYSESLAT scores

This trend satisfied the test for linearity, after which the Kolmogorov-Smirnov test was used to test for normality. The results indicated that the MRS scores were normally distributed, with a *p*-value > .05, while the NYSESLAT scores were not normally distributed, with a *p*-value < .05

(see Table 3). This scatter plot was also used to inspect the data for bivariate outliers, of which none were detected.

Table 3

Normality Tests for MRS Scores and NYSESLAT Scores

Population	MRS *p*-value	NYSESLAT *p*-value	Totals
Whole	0.20	0.00	72
Female	0.82	0.01	33
Male	0.03	0.00	39

The assumption of bivariate normality was assessed using a scatterplot with a "cigar-shaped" overlay to assess normal distribution (See *Figure 4*). To meet the assumption of bivariate normality, all data points should fall within the outline of a basic "cigar-shape" (Warner, 2013). All data points except for three fall within this shape. The three outliers were very close to the trend of the rest of the data and did not significantly impact the overall significance of the correlation, so they were included for the purposes of this analysis.

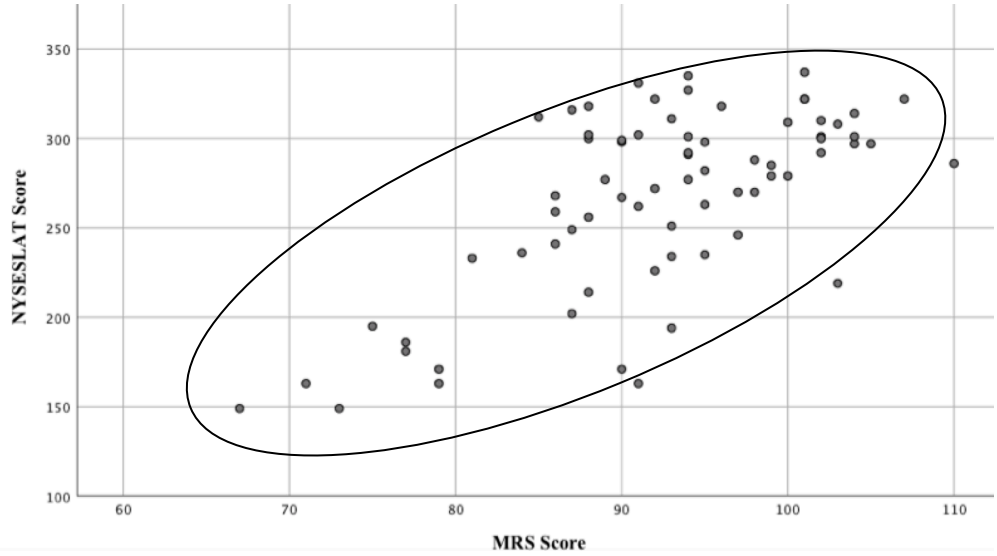

Figure 4. Bivariate normality scatter plot of MRS and NYSESLAT scores

Results. Because the NYSESLAT scores failed the normality test, the researcher determined that running a Pearson's *r* statistic as well as a Spearman's rank-order correlation

would be an appropriate means to examine the relationship between the variables, as student NYSESLAT scores were not expected to be normally distributed in such a relatively small sample, yet the data was monotonic in behavior. The Pearson's *r* statistic indicated a moderately positive relationship between students' MRS score and NYSESLAT score, with $r(72) = .67$, $p < .001$ (see Table 4). The Spearman's r_s correlation indicated a statistically significant moderately positive relationship with $r_s(72) = .53$, $p < .001$ (see Table 5). These results allowed the researcher to reject the null hypothesis and establish a moderately positive relationship between Hispanic high school students' level of English language proficiency and mathematical resilience.

Table 4

Pearson's r Correlation Coefficients

Population	Pearson's *r*	*p*-value	Totals
Whole	0.67	.000	72
Female	0.51	.002	33
Male	0.73	.000	39

Table 5

Spearman's r_s Correlation Coefficients

Population	Spearman's r	*p*-value	Totals
Whole	0.53	.000	72
Female	0.44	.011	33
Male	0.55	.000	39

Null Hypothesis Two

Data screening. Of the 72 viable data points collected, 33 represented female Hispanic high school students' mathematical resilience versus English language proficiency. Each of these had already been screened for completion and legibility, as well as validity in response

variation. The remaining 33 data points were used to examine the relationship between female Hispanic high school students' mathematical resilience and English language proficiency.

Assumptions testing. When arranged in a scatter plot, the 33 data points exhibited an approximately linear relationship (see *Figure 5*). The researcher determined that this data met the test for linearity, upon which the Shapiro-Wilk's test was used to examine normality. The results of this statistic indicated that the MRS scores were normally distributed, with a *p*-value > .05, while the NYSESLAT scores were not normally distributed, with a *p*-value < .05 (see Table 3). The scatter plot did not indicate any bivariate outliers that needed to be omitted.

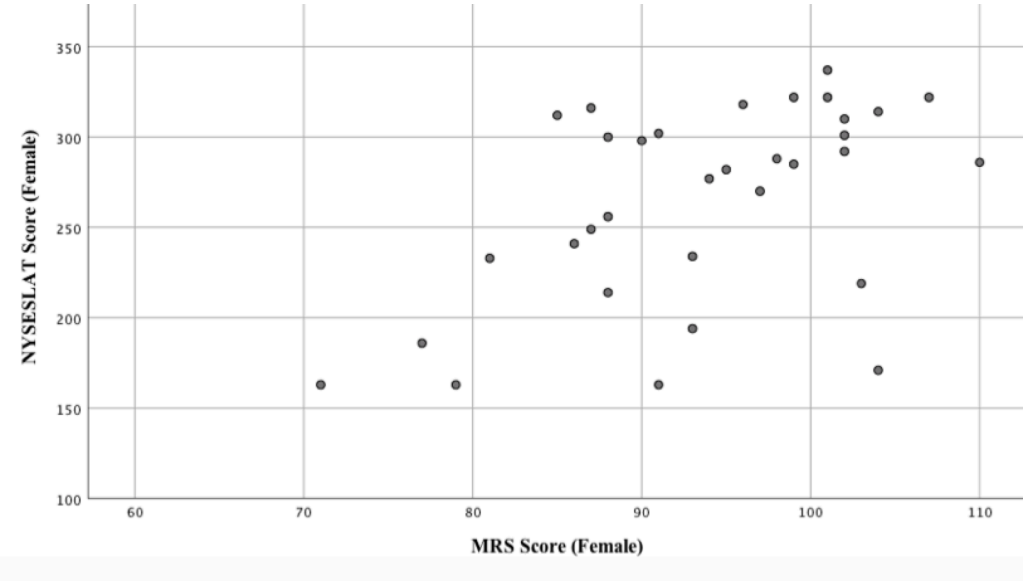

Figure 5. Scatter plot of female MRS scores and female NYSESLAT scores

The assumption of bivariate normality was assessed using a scatterplot with a "cigar-shaped" overlay to assess normal distribution (See *Figure 6*).

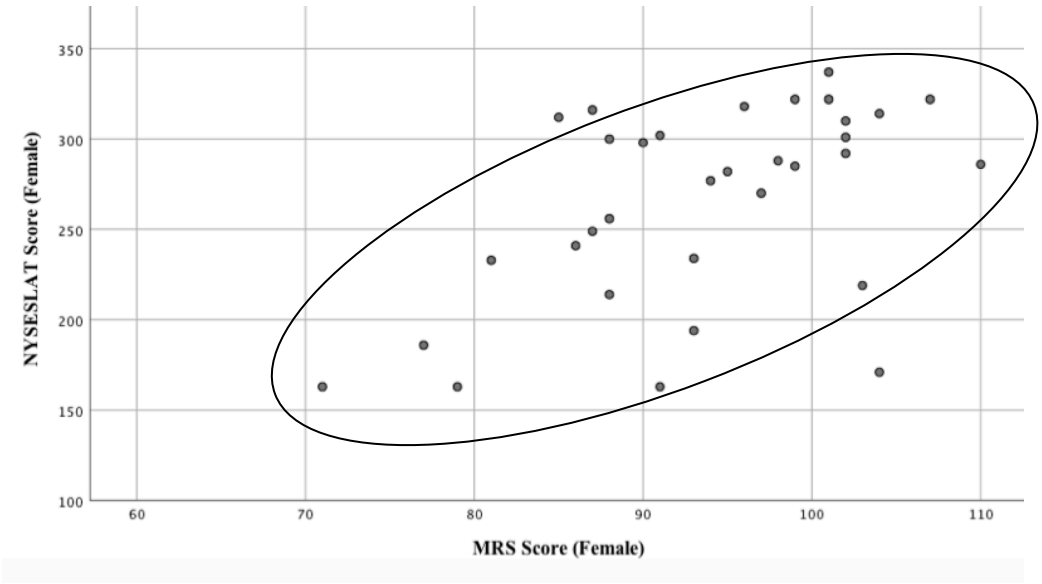

Figure 6. Bivariate normality scatter plot of female MRS and NYSESLAT scores

All of the data points except for three fell within this shape. Two of the outliers were very close to the trend of the rest of the data while one was substantially further. Given the small sample size, the researcher elected to include the outliers for the purposes of this analysis.

Results. Again, the researcher elected to complete a Pearson's *r* and Spearman's r_s correlation given that the small sample of female NYSESLAT scores failed the normality test, yet the data was monotonic in behavior. Pearson's *r* indicated a weak positive relationship between female students' MRS score and NYSESLAT score, with $r(33) = .51$, $p > .001$ (see Table 4). Spearman's r_s correlation also resulted in a weak positive relationship between the variables with $r_s(33) = .44$, $p > .001$ (see Table 5). Because both p-values were greater than .001, the researcher was unable to reject the null hypothesis and conclude the existence of a relationship between the mathematical resilience and English language proficiency of female Hispanic high school students.

Null Hypothesis Three

Data screening. The remaining 39 data points represented male Hispanic high school students' mathematical resilience versus English language proficiency. These data had already been screened for completion and legibility, as well as validity in response variation. The 39 data points were used to examine the relationship between male Hispanic high school students' mathematical resilience and English language proficiency.

Assumptions testing. When arranged on a scatter plot, these data points exhibited a reasonably linear relationship and no bivariate outliers were detected (see *Figure 7*). This set of data strongly passed the test for linearity, after which the Shapiro-Wilk's statistic was used to test for normality. The results indicated that neither the MRS scores nor the NYSESLAT scores were normally distributed, with both *p*-values < .05 (see Table 3).

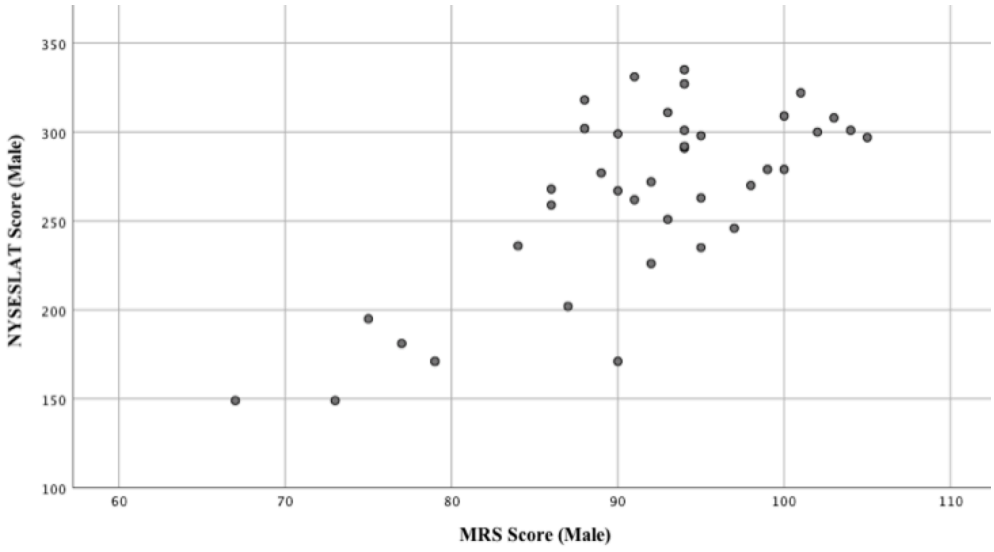

Figure 7. Scatter plot of male MRS scores and male NYSESLAT scores.

When completing the assumption of bivariate normality using a scatterplot with a "cigar-shaped" overlay, all data points fell within the shape (See *Figure 8*). The assumption for bivariate normality was met and all data points were used the purposes of this analysis.

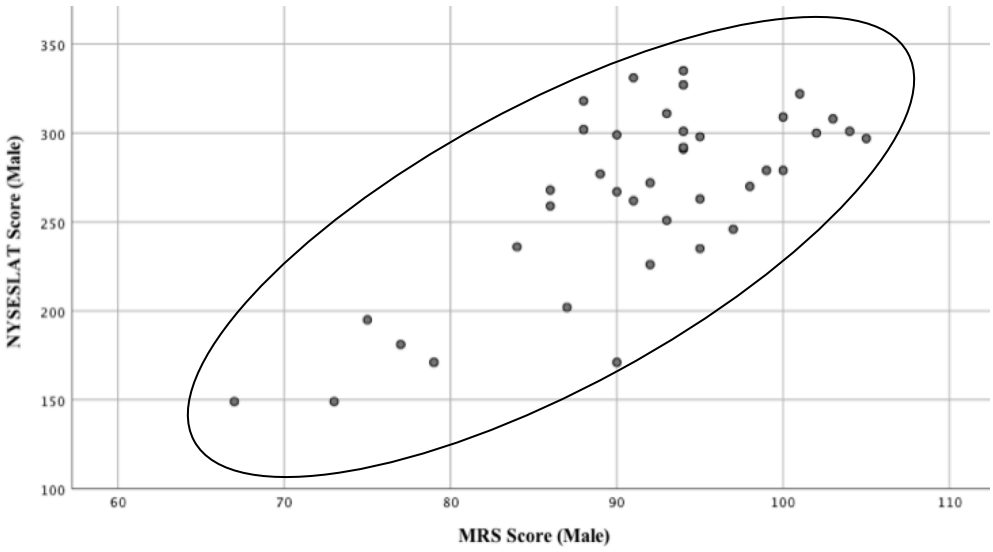

Figure 8. Bivariate normality scatter plot of male MRS and NYSESLAT scores

Results. Because both measures of data failed the normality test, yet the data exhibited a monotonic relationship, further analysis was completed by means of Pearson's *r* and Spearman's r_s correlation. The Pearson's *r* statistic indicated a strong positive relationship between male students' MRS score and NYSESLAT score, with $r(39) = .73$, $p < .001$ (see Table 4) while the Spearman's correlation concluded a moderately strong positive relationship between the variables, with $r_s(39) = .55$, $p < .001$ (see Table 5). These results allowed the researcher to reject the null hypothesis and establish a moderate to strong positive relationship between male Hispanic high school students' level of English language proficiency and mathematical resilience.

CHAPTER FIVE: CONCLUSIONS

Overview

The following is a discussion on how the results of this study relate to previous research and literature. It also describes the importance of the present study and how it relates to current educator practices. Limitations of the study are identified and described, concluding with recommendations for future research.

Discussion

The purpose of this research was to examine the relationship between Hispanic high school English language-learning students' level of English language proficiency and mathematical resilience. The results of this study reinforce the assertions of Waxman, Padron, Shin, & Rivera (2008) when they studied Hispanic students' education resilience in the context of reading and mathematics classrooms. Here, the researchers presented data that indicated a need for incorporating explicit instruction regarding student resilience and practices to grow resilience. This instruction could be integrated into specific course curriculum and spiraled throughout the school year, or offered in the setting of a skills or auxiliary class designed and offered specifically to English language-learning students (Waxman et al., 2008). With the results of each research question indicating a positive correlation between English language proficiency and mathematical resilience, regardless of gender, there is an illustration of the importance of mathematical resilience and the role it serves in student success.

Additionally, the results of the study indicate the potential need for differentiated instruction and intervention for students with various levels of English language proficiency. Research has shown that it is often the norm to provide the same or very similar interventions to English language learning students without regard to their actual level of language proficiency

(Rivera & Waxman, 2011). It is often believed that strategies that benefit some English language learners will benefit the rest, but little thought or investigation is given toward the appropriateness of such interventions (Rivera & Waxman, 2011; Turkan & de Jong, 2018). With a positive correlation between Hispanic high school students' NYSESLAT scores and MRS scores, there is a relationship between students' low score on the NYSESLAT and their low level of mathematical resilience. It could be posited that students with low levels of English proficiency are in greater need, or could benefit more deeply from incorporating student resilience into instruction and curriculum.

The difference in strength of correlation between male and female NYSESLAT and MRS scores may further indicate the need for a more targeted intervention approach toward ELL students. While interventions offered to students cannot be based on gender, educators can exercise mindfulness in personal bias, language used toward students, and developing goals with and for students regarding academic and skill-based progress. Research regarding teacher effectiveness demonstrated that teachers' gender and ethnicity positively impact their effectiveness for students of the same gender or ethnicity (Johnson & Wells, 2017). With that in mind, it is imperative that educators make a conscious effort toward recognizing potential bias, examining the tone, phrases, and positive or negative affirmations shared with students, and conduct an informal audit of the goals they have established or helped to develop for students. If gaps or inconsistencies are found, teachers should address the deficiencies in a discrete yet meaningful manner and be sure to clearly communicate to every student that he or she is capable of progress and that the teacher is there to help. This may serve as a platform to collaborate with students and revisit, revise, or develop new goals and potential interventions to help achieve success.

Implications

Allocating resources toward better understanding English language learners' diverse and changing needs is imperative toward diminishing the achievement gap and growing ELL students' graduation rates. In a global economy that demands STEM-related training and skills, educators must work toward understanding why ELL students continue to lag behind their non-ELL counterparts and develop practices to improve the learning experiences for this population. The integration of explicit growth mindset and resilience instruction into curriculum has become an increasingly popular practice, but new developments in educational pedagogy can be delayed in their incorporation of ELL classes. This is, in part, due to the overwhelming checklists of other interventions to use and also in part due to a lack of research to support its use with an ELL student population. The present study helps add to the literature toward promoting resilience in an academic setting and coaching students in the importance of resilience toward mathematics. The results of the study also indicate a need for further research into subpopulations of ELL students and special considerations for varying needs of a diverse group of learners.

Limitations

One limitation to this study is the restricted sample size. Though the sample population was adequate for a moderate effect size toward Hispanic high school students, the subpopulations of male and female were approximately half the size needed to achieve potentially meaningful results. Additionally, the population sample did not exhibit normally distributed NYSESLAT scores, indicating an imbalanced representation of students' English language proficiency. This skewed population sample could have affected the results of the study. It could also be considered a limitation to have the sample population coming from a single school as opposed to a number of schools, representing different demographics and

geographic locations. The amount of time that lapsed between students' completion of the NYSESLAT exam in the spring of 2019 and the administration of the MRS in the late Fall of 2019 may also be considered a limitation as there could be some discrepancy in how time may have impacted both criteria.

On a more controversial note, it became increasingly apparent that a number of students either declined or very reluctantly participated in the study due to the use of the term "investigator" in the assent and consent forms. In a political climate of increased legislature toward deportation and detainment of undocumented immigrants, using the word "investigator" rather than an alternative, such as "researcher" or "educator" lead to feelings of unease and wariness. Such societal realities must be carefully considered when developing a study for a population that has been targeted by authoritative officials. This researcher should have strived to better minimize or eliminate vocabulary that may have triggered emotional reactions or beliefs from students and parents.

Recommendations for Future Research

This particular segment of research could be expanded upon and improved in a variety of ways. The following should be given consideration for any related research that may follow:

1. Avoid using potential trigger words such as "investigator".
2. Informally monitor students while completing the MRS and offer assistance in decoding words they may struggle with and be too shy or embarrassed to utilize a translator.
3. Study ELL subpopulation beyond native Spanish-speakers.
4. Consider the potential affect mathematical resilience has on high school graduation rates.
5. Decrease the amount of time lapsed between students' completion of the NYSESLAT and MRS.

References

August, G. (2018). Educating English language learners: A review of the latest research. *American Educator 42*(3), 4-9.

Babinski, L. M., Amendum, S. J., Knotek, S. E., Sánchez, M., & Malone, P. (2018). Improving young English learners' language and literacy skills through teacher professional development: A randomized controlled trial. *American Educational Research Journal*, *55*(1), 117-143.

Becker, D. (2013). The impact of teachers' expectations on students' educational opportunities in the life course: An empirical test of a subjective expected utility explanation. *Rationality and Society, 25*(4), 422-469. doi:10.1177/1043463113504448

Becker, J. V., & Bonner, B. (1998). Sexual and other abuse of children. In R. J. Morris & T. R. Kratochwill (Eds.), The practice of child therapy (pp. 367–389), (3rd ed.). Boston: Allyn and Bacon.

Briggs, M. (2009). Self-fulfilling prophecies. In Bearman & Hedstrom (Eds.) The Oxford handbook of analytical sociology (pp. 294-314). Oxford, UK: Oxford University Press.

Borman, G., Overman, L. (2004). Academic resilience in mathematics among poor and minority students. *The Elementary School Journal, 104*(3), 177-195.

Burton, B. A. (2014). *A quantitative analysis of resiliency and academic achievement among multiracial students in urban high schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Global. (Order No. 3624769).

Campbell Wilcox, Gregory, and Yu. (2017). Connecting the dots for English language learners: How odds-beating elementary school educators monitor and use student performance data. *Journal for Leadership and Instruction,* 37-43.

Clinkenbeard, P. R. (2012). Motivation and gifted students: Implications of theory and research. *Psychology in the Schools, 49*(7), 622-630. doi:10.1002/pits.21628

Darling-Hammond, L., Bae, S., Cook-Harvey, C. M., Lam, L., Mercer, C., Podolsky, A., & Stosich, E. L. (2016). Pathways to new accountability through the Every Student Succeeds Act. *Learning Policy Institute.*

DeCamps, M. (2016). *A comparison of English language learner programs: A pilot study* (Unpublished doctoral dissertation). Fairleigh Dickinson University, New Jersey.

del Prado Hill, P., Friedland, E. S., & McMillen, S. (2016). Mathematics-literacy checklists: A pedagogical innovation to support teachers as they implement the Common Core. *Journal of Inquiry and Action in Education*, *8*(1), 23–38.

DePaoli, J. L., Balfanz, R., Bridgeland, J. (2016). Building a grad nation: Progress and challenge in raising high school graduation rates. *Civic Enterprises*.

Duckworth, A., Peterson, C., Matthews, M., & Kelly, D. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 92*(6), 1087-1101.

DuFour, R., DuFour, R., Eaker, R., & Karhanek, G. (2008). *Raising the bar and closing the gap.* Bloomington, IN: Solution Tree Press.

Durgunoğlu, A. Y., & Hughes, T. (2010). How prepared are the U. S. preservice teachers to teach English language learners?. *International Journal Of Teaching & Learning In Higher Education*, *22*(1), 32-41.

Duah, F. (2017). Mathematics resilience: What is known in the pre-tertiary mathematics education research and what we have found researching non-mathematics-specialist. *Proceedings of the British Society for Research into Learning Mathematics, 37*(2). University of York, United Kingdom.

Dweck, C. (1999). Self-theories: Their role in motivation, personality and development. Philadelphia, PA: Psychology Press.

Dweck, C. S. (2012). Mindset: The New Psychology of Success. Constable & Robinson Limited. Empire Center for New York State, P. (2015). What's Driving K-12 School Costs? 2015 Update.

Eccles, J. (1983). Expectancies values and academic behaviors. In J. Spence (Ed.), *Achievement and achievement motives: Psychological and sociological approaches* (pp. 75-145). San Francisco, CA: W. H. Freemen.

Editorial Projects in Education Research Center. (2011). Adequate Yearly Progress. *Education Week.* Retrieved March 14, 2019 from http://www.edweek.org/ew/issues/adequate-yearly-progress/

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational research: An introduction* (8th ed.). Boston: Pearson.

Genesee, F., Lindhold-Leary, K., Saunders, W., & Christian, D. (2006). *Educating English language learners*. New York, NY: Cambridge University Press.

Green, S. B. & Salkind N. J. (2013). *Using SPSS for Windows and Macintosh: Analyzing and Understanding Data.* Boston: Pearson.

Greenblatt, D., & O'Hara, K. E. (2015). Buyer beware: Lessons learned from EdTPA implementation in New York State. *Teacher Education Quarterly*, *42*(2), 57–67.

Hafiz, M., Darhim, & Dahlan, J. A. (2017). Comparison of mathematical resilience among students with problem based learning and guided discovery learning model. *Journal of Physics: Conference Series 895*. doi: 10.1088/1742-6596/895/1/012098

Hochbein, C., Mitchell, A. M., & Pollio, M. (2013). Gamed by the system: Adequate Yearly

Progress as indicator of persistently low-achieving school performance. *NASSP Bulletin, 97*, 270-289.

Hodge, B., Wright, B., Bennett, P. (2018). The role of grit in determining engagement and academic outcomes for university students. *Research in Higher Education, 59*. https://doi.org/10.1007/s11162-017-9474-y

Hoffman, M., Harris, W. (2018). *A complete guide to continuing education for teachers*. Retrieved from https://www.teachtomorrow.org/continuing-education-for-teachers/

Hutauruk, A. J. & Priatna, N. (2017). Mathematical resilience of mathematics education students. *Journal of Physics: Conference Series 895*. doi:10.1088/1742-6596/895/1/012067

Johnson, T., & Wells, L. (2017). English language learner teacher effectiveness and the Common Core. *Education Policy Analysis Archives*, *25*(23), 1-21.

Johnston-Wilder, S. & Lee, C. (2017). *Addressing the affective domain to increase effectiveness of mathematical thinking and problem solving*. Paper presented at Institute of Mathematics & Its Applications and Continuing Excellence in Teaching and Learning in Mathematics, Statistics and Operational Research 2017: Mathematics Education beyond 16: Pathways and Transitions, Birmingham University.

Johnston-Wilder, S., Lee, C., & Garton, B. (2015). *Developing mathematical resilience in school-students who have experienced repeated failure*. Paper presented at the 8th International Conference of Education, Research and Innovation: ICERI2015, Seville (SPAIN).

Johnston-Wilder, S. & Moreton, J. (2018). *Developing mathematical-resilience-promoting practices in teachers*. Paper presented at the 10th International Conference of Education,

Research and Innovation: ICERI2018, Seville (SPAIN).

Kooken, J., Welsh, M., McCoach, B., Johnston-Wilder, S., & Lee, C. (2016). Development and validation of the mathematical resilience scale. *Measurement and Evaluation in Counseling and Development, 49*(3), 217-242. doi: 0.1177/0748175615596782

LeClair, C., Doll, B., Osborn, A., & Jones, K. (2009). English language learners' and non–English language learners' perceptions of the classroom environment. *Psychology In The Schools*, *46*(6), 568-577.

Lee, C. (2006). *Language for Learning Mathematics: Assessment for Learning in Practice.* Buckingham, UK: Open University Press.

Lee, C. & Johnston-Wilder, S. (2017). The construct of mathematical resilience. In U. X. Eligio (Ed.), *Understanding emotions in mathematical thinking and learning* (pp. 269-291). Atlanta, GA: Elsevier Inc.

MetriTech, Inc. (2018). *New York State English as a Second Language Achievement Test (NYSESLAT) 2016 Operational Test Technical Report*. Retrieved from http://www.p12.nysed.gov/assessment/reports/home-tr-nyseslat.html

Mitchell, C. (2018). English-language learners often denied full access to STEM education. *Education Week, 38*(9).

Morton, J. M. (2014). Molding conscientious, hardworking, and perseverant students. *Social Philosophy & Policy, 31*(1), 60-80. doi:http://dx.doi.org.ezproxy.liberty.edu/10.1017/S0265052514000119

Murley, C. A. (2017). *Demographic characteristics of successful English language learners in rural communities*. Retrieved from http://ezproxy.liberty.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED575587&site=ehost-live&scope=site

New York State Education Department. (2018). *New York State education at a glance: Schools* [Date File]. Retrieved from https://data.nysed.gov/lists.php?type=school

New York State Board of Education (2015). Overview of the Spring 2015 English as a Second Language Achievement Test (NYSESLAT). Retrieved from https://www.engageny.org/resource/overview-new-york-state-english-a-second-language-achievement-test-nyseslat

No Child Left Behind Act of 2001, 20 U.S.C. § 6319 (2008).

Pappamihiel, N. E., & Lynn, C. A. (2016). Adaptations for English Language Learners: Differentiating between Linguistic and Instructional Accommodations. *Tesl-Ej*, *20*(3), 1-14.

Pardon, Y. N., Waxman, H. C., Brown, A. P., & Powers, R. A. (2000). *Improving classroom instruction and student learning for resilient and non-resilient English language learners* (Report No. CREDE-RB-7). Santa Cruz, CA: Center for Research on Education, Diversity, and Excellence of Houston University College of Education.

Peatfield, N. (2015). *Affective Aspect of Mathematical Resilience.* Adams G.(Ed.) Proceedings of the British Society for Research into Learning Mathematics 35(2).

Quintana-Toomey, M. E. (2018). *Teachers' sense of self-efficacy and its impact on English learner students' reading proficiency-level scores on a large-scale language proficiency test: A mixed-method design*. Retrieved from http://ezproxy.liberty.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED586924&site=ehost-live&scope=site

Rivera, H. & Waxman, H. C. (2011). Resilient and nonresilient Hispanic English language learners' attitudes toward their classroom learning environment in mathematics. *Journal*

of Education for Students Placed at Risk, 16(3), 135-200. doi: 10.1080/10824669.2011.585100

Rothman R. (2016). Accountability for what matters. *State Education Standard*, *16*(1), 10-13.

Rutter, M. (1993). Resilience: Some conceptual considerations. *Journal of Adolescent Health, 14,* 626-631.

Russell, F. A., & Von Esch, K. S. (2018). Teacher leadership to support English language learners. *Phi Delta Kappan*, *99*(7), 52-56.

Ryan, R. M., & Deci, E. L. (2000> Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68-78.

Seligman, M. (1995). *The Optimistic Child*. Adelaide: The Griffin Press.

Shi, Q. (2017). English Language Learners' (ELLs) Science, Technology, Engineering, Math (STEM) Course-Taking, Achievement and Attainment in College. *Journal Of College Access*, *3*(2), 45-61.

Steinberg, M. P. (2016). The future of teacher evaluation. *State Education Standard*, *16*(3), 6–12.

Thornton, S., & Statton, J. (2012). *Developing Mathematical Resilience among Aboriginal Students*. In J. Dindyal, L. P. Cheng & S. F. Ng (Eds.), Mathematics education: Expanding horizons (Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia). Singapore: MERGA

Turkan, S. & de Jong, E. J. (2018). An exploration of preservice teachers' reasoning about teaching mathematics to English language learners. *Teacher education quarterly,* 37-60.

Umansky, I. M. & Reardon, S. F. (2014). Reclassification patterns among Latino English learner students in bilingual, dual immersion, and English immersion classrooms. *American Educational Research Journal, 51*(5), 879-912.

Valencia, R. R. & Guadarrama, I. (1995). High stakes testing and its impact on racial/minority students. In L.A. Suzuki, P. J. Meller, J. G. Ponterrotto (Eds.). Handbook of Multicultural assessment: Clinical, psychological and educations. 561-610.

Wakeman S. (2013). *Using the ACCESS test as a predictive measure of English learner success on the biology End-of-Course-Test in Georgia.* Retrieved from http://ezproxy.liberty.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED566172&site=ehost-live&scope=site.

Warner, R. M. (2013). *Applied statistics: from bivariate through multivariate techniques* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Warner, Z. (2018, August). *NYSESLAT—Determining an English Language Learner's (ELL) English Language Proficiency Level*. Retrieved from http://www.p12.nysed.gov/assessment/nyseslat/archive-18.html

Waxman, H. C., Padron, Y. N., Shin, J., & Rivera, H. (2008). Closing the achievement gap within reading and mathematics classrooms by fostering Hispanic students' educational resilience. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering, 2*(4), 429-439.

Waxman, H. C., Rivera, H., & Powers, R. (2012). English language learners' educational resilience and classroom learning environment. *Educational Research Quarterly*, *35*(4), 53-72.

Williams, G. (2003). Associations between student pursuit of novel mathematical ideas and resilience. *Mathematics Education Research: Innovation, Networking, Opportunity: Proceedings of the 26th Annual Conference of the Mathematics Education Research*

Group of Australasia, held at Deakin University, Geelong, (p. 752-759). Deakin University, Geelong, VIC.

Willis, J. (2007). Research-Based Strategies to Ignite Student Learning. Alexandria, VA: Association for Supervision & Curriculum Development.

Wong, V. C., Wing, C., Martin, D., & Society for Research on Educational Effectiveness. (2016). Do Schools Respond to Pressure? Evidence from NCLB Implementation Details.

Yeager, D. & Dweck, C. (2012). Mindsets that promote resilience: When students believe that personal characteristics can be developed. *Educational Psychologist*, *47*(4), 302-314.

Zanthy, L. (2018). Contribution of mathematical resiliency to students' academic ability in mathematical statistics course. *Jurnal Mosharafa, 7*(1), 85-94.

Zuill, Z. D. (2016). *The relationship between resilience and academic success among Bermuda foster care adolescents* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Global. (Order No. 10036403).

APPENDIX A

STUDENT INVITATION SCRIPT

The italicized script below will be read verbatim to students.

"Students: You are being invited to participate in a study about ELL students and Mathematical Resilience. This study aims to understand the relationship between students' English proficiency and mathematical resilience. Participating students will be asked to complete a 24-item questionnaire about your feelings and beliefs about mathematics. There will be no math problems to solve on this questionnaire. The questionnaire will be completed during a regularly scheduled mathematics class on a date chosen by your mathematics teacher. Your participation in the study is voluntary and will have no impact on your mathematics class grade. Your personal information will be kept confidential and your responses will not be shared. The compiled results will be included in the researcher's dissertation and could be published in the future. If you wish to participate in this study, you must complete the Student Assent Form and your parents must complete the Parental Consent Form. Both forms must be completed to participate in the study unless you are 18 years or older. If you are 18 years or older, you may omit the Parental Consent Form. Students who complete and return the necessary forms will be entered in a raffle to receive one of ten $5.00 gift cards to Amazon, iTunes, and Dunkin Donut. Students who complete the questionnaire during the survey session will receive a store bought, pre-packaged snack such as chips, Takis, or cookies. Students who wish to opt out of the snack may choose a school supply item such as a pack of pencils, a notebook, or a binder instead. If you have questions about the study, Student Assent Form, or Parental Consent Form, please ask your teacher now. You are also able to ask the researcher any questions you may have in the future. Thank you for your consideration."

APPENDIX B

The Liberty University Institutional Review Board has approved this document for use from 10/25/2019 to 10/24/2020 Protocol # 3954.102519

PARENT/GUARDIAN CONSENT FORM

A Correlational Study of Hispanic High School English Language Learners' English Proficiency and Mathematical Resilience

By: Jettie Dush
Liberty University
Education Department

This research study is being conducted by Jettie Dush, a doctoral candidate in the School of Education at Liberty University. Your child was selected as a possible participant because he/she is a native Spanish-speaking English language learner at Longwood High School. Please read this form and ask any questions you may have before agreeing to allow your child to be in the study.

Why is this study being done?
The purpose of this study is to study the relationship between native Spanish-speaking students' English language proficiency and mathematical resilience because I believe the results will help improve the interventions provided to English language learners within the mathematics classroom.

What will my child/student be asked to do?
If you agree to allow your child to be in this study, he/she will be asked to mark his/her primary language and complete a 24-question survey. The survey should require approximately 25 minutes and will be administered during the regularly scheduled school day.

Agreeing to allow your child to participate in the study will also grant the researcher permission to retrieve the student's 2019 New York State English as a Second Language Achievement Test (NYSESLAT) scores and compare these scores to the survey results.

What are the risks and benefits of this study?
Risks: The risks involved in this study are minimal, which means they are equal to the risks your child would encounter in everyday life.

Benefits: Participants should not expect to receive a direct benefit from taking part in this study. Benefits to society include improved understanding of the diverse needs of English language learning students.

Will my child be compensated for participating?
All students who return a parental consent/assent form will be entered into a raffle where they will be eligible to receive one of ten $5.00 gift cards to Amazon, iTunes, or Dunkin Donuts. Raffle winners will be drawn after all forms have been collected.

All students in participating mathematics classes will be eligible to receive a store-bought, pre-packaged snack such as chips, Takis, or cookies, or a school supply item such as a pack of pencils, a notebook, or a binder by completing the Mathematical Resilience Survey (for those students who have completed and returned the parental consent/asssent form) or by completing a math vocabulary word find (for those students who have not completed and returned the parental consent/assent form and/or who wish to decline completing the survey).

How will my child's personal information be protected?
The records of this study will be kept private and stored securely. All data will be stored on a password locked computer and may be used in future presentations. After three years, all electronic records will be deleted.

Students will not be asked to provide their names on the survey, but rather, students will mark their native language and provide their school identification (ID) number. Students' school ID numbers will be used to verify that their native language is Spanish and also to look up and record students' New York State English as a Second Language Test (NYSESLAT) score. Students' school ID numbers will be seen by a research assistant who will then remove the ID numbers from the surveys before giving them to the researcher.

Conflicts of interest disclosure:
The researcher serves as a teacher at Longwood High School. To limit potential conflicts, a research assistant will ensure that all data is stripped of identifiers before the researcher receives it. This disclosure is made so that you can decide if this relationship will affect your willingness to allow your child to participate in this study. No action will be taken against an individual based on his or her decision to participate in this study.

Is study participation voluntary?
Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect his or her current or future relations with Liberty University or Longwood High School. If you decide to allow your child to participate, he or she is free to not answer any question or withdraw at any time prior to submitting the survey without affecting those relationships.

What should I or my child do if I decide to withdraw him or her or if he or she decides to withdraw from the study?
If you choose to withdraw your child or if your child chooses to withdraw from the study, he or she should communicate this to his or her mathematics teacher and abstain from completing the survey.

Whom do I contact if my child or I have questions or problems?
The researcher conducting this study is Jettie Dush. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at jamarshall1@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Jessica Talada, at javanderpool@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Declaration of Consent: I have read and understood the information above. I have asked questions and received answers. I agree to participate in the study.

_____

Signature of Minor Date

_____

Signature of Parent Date

_____

Signature of Researcher Date

APPENDIX C

The Liberty University Institutional
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Protocol # 3954.102519

FORMULARIO DEL CONSENTIMIENTO

Un Estudio Correlacional Sobre el Dominio del Inglés y la Resiliencia Matemática de Estudiantes de Inglés Hispanos en la Escuela Secundaria
Por: Jettie Dush
Liberty University
Departamento de Educación

Este estudio de investigación está siendo llevado a cabo por Jettie Dush, una candidata doctoral en la Escuela de Educación de la Universidad de Liberty. Su hijo/a fue seleccionado como posible participante porque él / ella es un estudiante nativo del idioma inglés que habla español Longwood High School. Lea este formulario y haga cualquier pregunta que pueda tener antes de aceptar y permitir que su hijo participe en el estudio.

Información Sobre el Estudio:
El propósito de este estudio es estudiar la relación entre el dominio del idioma inglés de los estudiantes nativos de habla hispana y la resistencia en la matemática porque creo que los resultados ayudarán a mejorar las intervenciones proveídas a los estudiantes del idioma inglés dentro de la clase de matemáticas.

Procedimientos:
Si acepta permitir que su hijo/a participe en este estudio, se le pedirá a su hijo/a que provee el número de identificación dado por la escuela, marque su idioma primario y complete una encuesta de 24 preguntas. La encuesta requiere de aproximadamente 25 minutos y se administrará durante el día escolar programado regularmente.

El aceptar permitir que su hijo participe en el estudio también le otorgará al investigador permiso para recuperar los puntajes de la prueba de inglés como segundo idioma del estado de Nueva York 2019 del estudiante (NYSESLAT) y comparar estos puntajes con los resultados de la encuesta.

Riesgos y Beneficios de Participar en el Estudio:
Los riesgos: Los riesgos involucrados en este estudio son mínimos, lo que significa que son iguales a los riesgos que se encontrarían en la vida cotidiana.

Los beneficios: Los participantes no deben contar con recibir un beneficio directo por participar en este estudio. Los beneficios para la sociedad incluyen una mejor comprensión de las necesidades distintas de los estudiantes que aprenden inglés.

Compensación:
Todos los estudiantes que devuelvan un formulario de consentimiento / consentimiento de los padres participarán en una rifa donde serán elegibles para recibir una de las diez tarjetas de regalo de $5.00 a Amazon, iTunes o Dunkin Donuts. Los ganadores del sorteo se sortearán después de que se hayan recogido todos los formularios.

Todos los estudiantes en las clases de matemáticas participantes serán elegibles para recibir un bocadillo preempaquetado comprado en la tienda, como papas fritas, Takis o galletas, o un artículo de útiles escolares, como un paquete de lápices, un cuaderno o una carpeta, al completar el Matemático Encuesta de resiliencia (para aquellos estudiantes que han completado y devuelto el formulario de consentimiento / consentimiento de los padres) o completando una búsqueda de palabras de vocabulario matemático (para aquellos estudiantes que no han completado y devuelto el formulario de consentimiento / consentimiento de los padres y / o que desean rechazar completar la encuesta).

Privacidad:
Los archivos de este estudio se mantendrán en privado y almacenados de forma segura. Todos los datos se almacenarán en una computadora bloqueada con contraseña y se podrán utilizar en presentaciones futuras. Después de tres años, todos los registros electrónicos serán eliminados. No se les pedirá a los estudiantes que den sus nombres en la encuesta, sino que marcarán su idioma nativo y su número de identificación (ID) de la escuela. Los números de identificación escolar de los estudiantes se utilizarán para verificar que su idioma nativo es el español, y también para buscar y registrar el puntaje de la prueba de inglés como segundo idioma del estado de Nueva York de los estudiantes (NYSESLAT). Los números de identificación de la escuela de los estudiantes serán vistos como un asistente de investigación, quien luego eliminará los números de identificación de las encuestas antes de dárselos al investigador.

Conflictos de Divulgación de Intereses:
El investigador se desempeña como profesor en Longwood High School. Para limitar los conflictos potenciales, un asistente de investigación se asegurará de que todos los datos se eliminen de los identificadores antes de que el investigador los reciba. Esta divulgación se hace para que usted pueda decidir si esta relación afectará su buena disposición para permitir que su hijo/a participe en este estudio. No se tomarán medidas contra una persona basándose en su decisión de participar en este estudio.

La Naturaleza Voluntaria del Estudio:
La participación en este estudio es voluntario. Su decisión de permitir o no que su hijo/a participe no afectará sus relaciones actuales o futuras con Liberty University o Longwood High School. Si decide permitir que su hijo/a participe, él o ella tiene la libertad de no responder ninguna pregunta o retirarse en cualquier momento antes de enviar la encuesta sin afectar esas relaciones.

¿Qué debo hacer yo o mi hijo/a si decido retirarlo o si él o ella decide retirarse del estudio?
Si elige retirar a su hijo/a o si su hijo/a decide retirarse del estudio, él o ella se lo comunicará a su maestro de matemáticas y se abstendrá de completar la encuesta.

Contactos y Preguntas:
El investigador que realiza este estudio es Jettie Dush. Puede hacer cualquier pregunta que tenga ahora. Si tiene preguntas más tarde, le recomendamos que se comunique con ella en jamarshall1@liberty.edu. También puede comunicarse con la asesora docente de la investigadora, la Dra. Jessica Talada en javanderpool@liberty.edu.

Si usted tiene preguntas o dudas sobre este estudio y si desearía hablar con alguien que no sea el investigador (o los investigadores), **se le anima** a que se comunique con la Institutional Review Board (la Junta de Revisión Institucional), 1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515 o mandar un correo electrónico a irb@liberty.edu.

Se le entregará a usted una copia de esta información para guardar en sus propios archivos.

Declaración de Consentimiento: He leído y he entendido la información arriba. He hecho preguntas y he recibido respuestas. Consiento participar en el estudio.

Firma	Fecha
Firma de Padre o Tutor	Fecha
Firma del Investigador	Fecha

APPENDIX D

The Liberty University Institutional
Review Board has approved
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10/25/2019 to 10/24/2020
Protocol # 3954.102519

INFORMED CONSENT FORM

A Correlational Study of Hispanic High School English Language Learners' English Proficiency and Mathematical Resilience

By: Jettie Dush
Liberty University
Education Department

This research study is being conducted by Jettie Dush, a doctoral candidate in the School of Education at Liberty University. You have been selected as a possible participant because you are a native Spanish-speaking student who is learning the English language at Longwood High School. Please read this form and ask any questions you may have before agreeing to be in the study.

Why is this study being done?
The purpose of this study is to study the relationship between native Spanish-speaking students' English language proficiency and mathematical resilience because I believe the results will help improve the interventions provided to English language learners within the mathematics classroom.

What will I be asked to do?
If you agree to be in this study, you will be asked to mark your primary language and complete a 24-question survey. The survey should require approximately 25 minutes and will be administered during the regularly scheduled school day.

Agreeing to participate in the study will also grant the researcher permission to retrieve your 2019 New York State English as a Second Language Achievement Test (NYSESLAT) scores and compare your score to your survey results.

What are the risks and benefits of this study?
Risks: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Benefits: Participants should not expect to receive a direct benefit from taking part in this study. Benefits to society include an improved understanding of the diverse needs of English language learning students.

Will I be compensated for participating?
All students who return a consent form will be entered into a raffle where they will be eligible to receive one of ten $5.00 gift cards to Amazon, iTunes, or Dunkin Donuts. Raffle winners will be drawn after all forms have been collected.

All students in participating mathematics classes will be eligible to receive a store-bought, pre-packaged snack such as chips, Takis, or cookies, or a school supply item such as a pack of pencils, a notebook, or a binder by completing the Mathematical Resilience Survey (for those students who have completed and returned the consent form) or by completing a math vocabulary word find (for those students who have not completed and returned the consent form and/or who wish to decline completing the survey).

How will my personal information be protected?
The records of this study will be kept private and stored securely. All data will be stored on a password locked computer and may be used in future presentations. After three years, all electronic records will be deleted.

Students will not be asked to provide their names on the survey, but rather, students will mark their native language and provide their school identification (ID) number. Students' school ID numbers will be used to verify that their native language is Spanish and also to look up and record students' New York State English as a Second Language Test (NYSESLAT) score. Students' school ID numbers will be seen and used by a research assistant who will then remove the ID numbers from the surveys before giving them to the researcher.

Conflicts of interest disclosure:
The researcher serves as a teacher at Longwood High School. To limit potential conflicts, a research assistant will ensure that all data is stripped of identifiers before the researcher receives it. This disclosure is made so that you can decide if this relationship will affect your willingness to participate in this study. No action will be taken against an individual based on his or her decision to participate in this study.

Is study participation voluntary?
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or Longwood High School. If you decide to participate, you are free to not answer any question or withdraw at any time prior to submitting the survey without affecting those relationships.

What should I do if I decide to withdraw from the study?
If you choose to withdraw from the study, you may communicate this to your mathematics teacher and do not complete the survey.

Whom do I contact if I have questions or problems?
The researcher conducting this study is Jettie Dush. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at jamarshall1@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Jessica Talada, at javanderpool@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Declaration of Consent: I have read and understood the information above. I have asked questions and received answers. I agree to participate in the study.

_____
Signature of Student Date

_____
Signature of Researcher Date

APPENDIX E

The Liberty University Institutional
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10/25/2019 to 10/24/2020
Protocol # 3954.102519

FORMULARIO DEL CONSENTIMIENTO

Un Estudio Correlacional Sobre el Dominio del Inglés y la Resiliencia Matemática de Estudiantes de Inglés Hispanos en la Escuela Secundaria
Por: Jettie Dush
Liberty University
Departamento de Educación

Este estudio de investigación está siendo llevado a cabo por Jettie Dush, una candidata doctoral en la Escuela de Educación de la Universidad de Liberty. Ha sido seleccionado como posible participante porque usted anda estudiando el idioma inglés en Longwood High School y también hablas español. Lea este formulario y haga cualquier pregunta que pueda tener antes de aceptar participar en el estudio.

Información Sobre el Estudio:
El propósito de este estudio es estudiar la relación entre el dominio del idioma inglés de los estudiantes nativos que hablan español y la resiliencia en la matemática porque creo que los resultados ayudarán a mejorar las intervenciones proveídas a los estudiantes del idioma inglés dentro de la clase de matemáticas.

Procedimientos:
Si acepta participar en este estudio, se le pedirá que provee el número de identificación dado por la escuela, marque su idioma primario y complete una encuesta de 24 preguntas. La encuesta requiere de aproximadamente 25 minutos y se administrará durante el día escolar programado regularmente.

La aceptación de participar en el estudio también le otorgará al investigador permiso para recuperar sus puntajes de la prueba de inglés como segundo idioma del estado de Nueva York 2019 del estudiante (NYSESLAT) y comparar su puntajes con los resultados de la encuesta.

Riesgos y Beneficios de Participar en el Estudio:
Los riesgos: Los riesgos involucrados en este estudio son mínimos, lo que significa que son iguales a los riesgos que enfrentaría en la vida cotidiana.

Los beneficios: Los participantes no deben contar con recibir un beneficio directo por participar en este estudio. Los beneficios para la sociedad incluyen una mejor comprensión de las necesidades distintas de los estudiantes que aprenden inglés.

Compensación:
Todos los estudiantes que devuelvan un formulario de consentimiento / consentimiento de los padres participarán en una rifa donde serán elegibles para recibir una de las diez tarjetas de regalo de $ 5.00 a Amazon, iTunes o Dunkin Donuts. Los ganadores del sorteo se sortearán después de que se hayan recogido todos los formularios.

Todos los estudiantes en las clases de matemáticas participantes serán elegibles para recibir un bocadillo preempaquado comprado en la tienda, como papas fritas, Takis o galletas, o un artículo de útiles escolares, como un paquete de lápices, un cuaderno o una carpeta, al completar el Matemático Encuesta de resiliencia (para aquellos estudiantes que han completado y devuelto el formulario de consentimiento / consentimiento de los padres) o completando una búsqueda de palabras de vocabulario matemático (para aquellos estudiantes que no han completado y devuelto el formulario de consentimiento / consentimiento de los padres y / o que desean rechazar completar la encuesta).

Privacidad:

Los archivos de este estudio se mantendrán en privado y almacenados de forma segura. Todos los datos se almacenarán en una computadora bloqueada con contraseña y se podrán utilizar en presentaciones futuras. Después de tres años, todos los registros electrónicos serán eliminados. No se les pedirá a los estudiantes que den sus nombres en la encuesta, sino que marcarán su idioma nativo y su número de identificación (ID) de la escuela. Los números de identificación escolar de los estudiantes se utilizarán para verificar que su idioma nativo es el español, y también para buscar y registrar el puntaje de la prueba de inglés como segundo idioma del estado de Nueva York de los estudiantes (NYSESLAT). Los números de identificación de la escuela de los estudiantes serán vistos como un asistente de investigación, quien luego eliminará los números de identificación de las encuestas antes de dárselos al investigador.

Conflictos de Divulgación de Intereses:
El investigador se desempeña como profesor en Longwood High School. Para limitar los conflictos potenciales, un asistente de investigación se asegurará de que todos los datos se eliminen de los identificadores antes de que el investigador los reciba. Esta divulgación se hace para que usted pueda decidir si esta relación afectará su buena disposición para permitir que su hijo/a participe en este estudio. No se tomarán medidas contra una persona basándose en su decisión de participar en este estudio.

La Naturaleza Voluntaria del Estudio:
La participación en este estudio es voluntario. Su decisión de participar o no participar no afectará sus relaciones actuales o futuras con Liberty University o Longwood High School. Si decide participar, tiene la libertad de no responder ninguna pregunta o retirarse en cualquier momento antes de enviar la encuesta sin afectar esas relaciones.

¿Qué debo hacer yo decido retirarlo del estudio?
Si elige retirarse del estudio, puede comunicarlo a su maestro de matemáticas y abstenerse de completar la encuesta.

Contactos y Preguntas:
El investigador que realiza este estudio es Jettie Dush. Puede hacer cualquier pregunta que tenga ahora. Si tiene preguntas más tarde, le recomendamos que se comunique con ella en jamarshall1@liberty.edu. También puede comunicarse con la asesora docente de la investigadora, la Dra. Jessica Talada en javanderpool@liberty.edu.

Si usted tiene preguntas o dudas sobre este estudio y si desearía hablar con alguien que no sea el investigador (o los investigadores), **se le anima** a que se comunique con la Institutional Review Board (la Junta de Revisión Institucional), 1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515 o mandar un correo electrónico a irb@liberty.edu.

Se le entregará a usted una copia de esta información para guardar en sus propios archivos.

Declaración de Consentimiento: He leído y he entendido la información arriba. He hecho preguntas y he recibido respuestas. Consiento participar en el estudio.

_____

Firma Fecha

_____

Firma del Investigador Fecha

APPENDIX F

TRAINING PROCEDURES

Trainees: Two teachers from each school, one mathematics teacher and one bilingual teacher.

Length of Training Session: 25 minutes

Training Prompt: *Good afternoon, and thank you for your participation in this training session. Your involvement in the facilitation is deeply appreciated. The purpose of this study is to establish a relationship between Hispanic high school ELL students' level of English proficiency and mathematical resilience. English proficiency will be established using students' NYSESLAT scores. Mathematical resilience will be measured using the Mathematical Resilience Scale (MRS). You will be responsible for facilitating successful student completion of the MRS. Your involvement in this facilitation will remain confidential and will not affect your relationship with Liberty University.*

The survey setting will consist of a traditional classroom with rows and columns of individual student desks. Students are not to collaborate on survey responses, and each response should be a reflection of their initial response. Students will receive two surveys – one version will be in English and the second will be in Spanish. Students may refer to both versions, but responses must be recorded entirely on one form. Students may also request a Spanish-English dictionary at any point throughout the survey.

To begin the survey, please seat students and follow the prompts provided in the survey packet. One prompt will be in English and the second will be in Spanish. One teacher will read the English version of the prompt, and then the other teacher will read the Spanish version of the prompt. Upon completing the prompt, please distribute a pencil (provided in the packet) to each student, an English MRS, a Spanish MRS, and a Spanish-English dictionary (if requested). Please encourage students to mark their first/initial response to each question and remind students to be sure that all answers have been marked entirely on one form. Answer any questions the students may have about the survey procedures. In the event a student has a questions that you have not been trained to answer, please direct them to my email address. Finally, please remind students that they may withdrawal from participation at any time with no penalty or adverse affects.

Once all questions and concerns have been addressed, please instruct students to begin the survey. While students progress through the survey, circulate the room and encourage students to reference their dictionary when needed. Upon survey completion, please collect all materials and place them in the packet provided. Then read the survey closure prompt provided in the packet.

Once all students have completed and submitted the survey materials, and the survey closure prompt has been read in English and in Spanish, each student may choose a snack from the assortment provided. Please do not allow students to choose a snack before all survey materials have been collected as this may disrupt the survey environment and cause some students to rush

through the survey. This, in turn, could affect the validity of student responses. Upon choosing a snack, students may be dismissed. Please be sure that all survey items have been replaced in the packet provided. The researcher will retrieve the items at this time and your responsibilities as a survey facilitator are complete.

Do you have any questions?

APPENDIX G

NYSESLAT 2018 SCALE SCORE RANGES FOR DETERMINING ENGLISH LANGUAGE PROFICIENCY

Grade	Entering	Emerging	Transitioning	Expanding	Commanding
	Scale Score	Scale Score	Scale Score	Scale Score	Scale Score
K	120-212	213-244	245-263	264-315	316-360
1	120-170	171-215	216-251	252-295	296-360
2	120-180	181-227	228-264	265-307	308-360
3	120-170	171-216	217-258	259-303	304-360
4	120-181	182-228	229-265	266-310	311-360
5	120-172	173-214	215-257	258-300	301-360
6	120-180	181-219	220-258	259-300	301-360
7	120-169	170-212	213-249	250-299	300-360
8	120-169	170-212	213-249	250-305	306-360
9	120-175	176-220	221-262	263-317	318-360
10	120-175	176-220	221-262	263-317	318-360
11	120-178	179-220	221-262	263-317	318-360
12	120-178	179-220	221-262	263-317	318-360

APPENDIX H

CATEGORY DESCRIPTIONS USED BY NYSELSAT

Entering (formerly Beginning)

A student at the Entering level has great dependence on supports and structures to advance his or her academic language skills. As measured by the NYSESLAT, a student at this level has yet to meet the linguistic demands necessary to demonstrate proficiency in a variety of academic contexts within this grade level.

Emerging (formerly Low Intermediate)

A student at the Emerging level has some dependence on supports and structures to advance his or her academic language skills. As measured by the NYSESLAT, a student at this level has yet to meet the linguistic demands necessary to demonstrate proficiency in a variety of academic contexts within this grade level.

Transitioning (formerly Intermediate)

A student at the Transitioning level shows some independence in advancing his or her academic language skills. As measured by the NYSESLAT, a student at this level has yet to meet the linguistic demands necessary to demonstrate proficiency in a variety of academic contexts within this grade level.

Expanding (formerly Advanced)

A student at the Expanding level shows great independence in advancing his or her academic language skills. As measured by the NYSESLAT, a student at this level is approaching the

linguistic demands necessary to demonstrate proficiency in a variety of academic contexts within this grade level.

Commanding (formerly Proficient)

A student at the Commanding level is now designated as a Former ELL, and entitled to receive two years of continued ELL services. As measured by the NYSESLAT, a student at this level has met the linguistic demands necessary to demonstrate proficiency in a variety of academic contexts within the grade level. (NYSED, n.d., pp. 8-9)

APPENDIX I

PERMISSION TO USE THE MATHEMATICAL RESILIENCE SCALE

Jettie Dush Jul 18, 2018

Thank you for sharing your research! Your work with student resilience in mathematics has created a new platform for research! Would you be open to sharing your instrument? I would like to examine the mathematical resiliency of English Language Learners at the high school level. Your instrument is nearly a perfect fit, but may need slight modifications depending on the Lexile levels. This would entail a pilot study in order to use it for dissertational purposes, but I would be more than happy to share everything and anything that came of it!

Thank you for considering.

- Jettie Dush

Sue Johnston-Wilder to you Jul 19, 2018

Hi Jettie

The instrument is public domain as long as due acknowledgement is made. However we would prefer that an additional set of questions is included about learning community - these havent been tested yet from a statistical point of view and I would welcome you exploring that

Shall we switch to email? sue.johnston-wilder@warwick.ac.uk

APPENDIX J

IRB PERMISSION TO CONDUCT STUDY

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

October 25, 2019

Jettie A. Dush
IRB Approval 3954.102519: A Correlational Study of Hispanic High School English Language Learners' English Proficiency and Mathematical Resilience

Dear Jettie A. Dush,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

> 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
Research Ethics Office

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APPENDIX K

SUPERINTENDENT OF COOPERATING HIGH SCHOOL PERMISSION TO CONDUCT STUDY

Jettie Dush <jettie.dush@longwoodcsd.org>

Dissertation Research Request
3 messages

Jettie Dush <jettie.dush@longwoodcsd.org> Tue, Sep 17, 2019 at 9:57 AM
To: Michael Lonergan <michael.lonergan@longwoodcsd.org>
Cc: Suzanne Iglio <suzanne.iglio@longwoodcsd.org>

Good morning Dr. Lonergan, I hope this email finds you well. It's hard to believe we already a few weeks into the school year! But I do hope everything has rolled out at smoothly at the district office level as it seems to have at the high school!

I wanted to touch base on the proposed research we had discussed late last spring regarding our Spanish-speaking English language learners and their mathematical resilience. I am moving forward with my IRB approval process and making my last few, small revisions. I was wondering if there might be a small amount of time in an upcoming Board meeting to elicit approval from our Board of Education.

I forwarded an approval business letter form to Ms. Iglio over the summer to help simplify the process, and would be happy to furnish it again if needed.

If there is anything else I can do to help gain formal approval, please do not hesitate to let me know! I am eager to begin my research and help our teachers gain a new perspective about our ENL student population.

Thank you for your time and support! It is deeply appreciated.

Sincerely,

Jettie Dush
Longwood High School
Mathematics

Michael Lonergan <michael.lonergan@longwoodcsd.org> Tue, Sep 17, 2019 at 1:37 PM
To: Jettie Dush <jettie.dush@longwoodcsd.org>

Hello Jettie... you are good to go.... keep me in the loop as you progress through your research...

Dr L

Jettie Dush <jettie.dush@longwoodcsd.org> Tue, Sep 17, 2019 at 1:45 PM
To: Michael Lonergan <michael.lonergan@longwoodcsd.org>

Thank you so much, Dr. Lonergan! I will be sure to do so!

Jettie

APPENDIX L

SURVEY DISMISSAL PROMPT

Thank you for participating in today's survey. Your results will remain anonymous and be used solely for the purpose of the research study described in the invitation you received. Your participation or non-participation will have no effect on your mathematics course grade, your relationship with your classroom teacher, or your relationship within the school. All surveys will be sealed in an envelope and returned to the researcher conducting the study. Your time and input are deeply appreciated. The survey session is now concluded.

APPENDIX M

ENGLISH AND SPANISH MRS DATA RESULTS

Table 6

Tallied Scores from English and Spanish MRS

Student ID Number	Gender	English MRS	Spanish MRS
326986	f	91	92
329363	f	86	85
330259	m	94	95
330443	m	89	93
330444	m	90	88
330567	m	85	86
331011	m	91	93
331190	f	91	96
332104	f	91	94
334378	f	93	88

APPENDIX N

SURVEY DATA RESULTS

Table 7

Raw Data Collected from MRS and NYSESLAT

Student ID Number	Gender	MRS Score	NYSESLAT Score
326986	f	92	322
329363	f	85	312
331190	f	96	318
332104	f	94	277
334378	f	88	256
333552	f	103	219
332996	f	110	286
333874	f	107	322
331083	f	88	214
334610	f	93	194
330804	f	97	270
327929	f	88	300
328315	f	87	316
333489	f	81	233
325361	f	102	310
334711	f	104	171
331329	f	93	234
336517	f	91	163
330881	f	99	285
332743	f	90	298
330467	f	102	301
334826	f	91	302
333590	f	102	292
334449	f	71	163
332145	f	87	249
330370	f	104	314
330718	f	101	337
331263	f	86	241
315992	f	95	282
332146	f	98	288
334449	f	79	163
334622	f	77	186
326990	f	101	322

315347	m	100	279
332973	m	95	263
334406	m	103	308
330259	m	95	235
330443	m	94	301
330444	m	88	302
330567	m	86	259
331011	m	93	311
333822	m	90	171
333927	m	93	251
325998	m	102	300
333550	m	73	149
331374	m	92	272
331454	m	91	262
334433	m	77	181
330216	m	84	236
318403	m	99	279
321982	m	105	297
327934	m	94	291
334649	m	89	277
330587	m	94	327
326131	m	90	299
316799	m	104	301
329935	m	86	268
331151	m	90	267
332175	m	98	270
330974	m	94	335
331452	m	91	331
328302	m	94	292
333500	m	67	149
331436	m	100	309
334583	m	92	226
332394	m	95	298
333822	m	79	171
328027	m	101	322
334411	m	87	202
326104	m	88	318
333951	m	75	195
333898	m	97	246