AN ABSTRACT OF THE DISSERTATION OF

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Abstract approved:

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Cass Dykeman

The Latino K-12 student population in the United States continues to increase. Estimates are that by 2025, one in every three students in the country will be of Hispanic/Latino origin. The challenges to the educational system from such growth are unprecedented. At no other time in U.S. history has there been such an increase in student population from a specific cultural group. This dissertation was composed of two arms, each of which examined an area of Latino students' academic development critical to post high school success. The data for the dissertation was drawn from the Program for International Student Assessment (PISA) database.

Arm A was a cross-sectional study exploring math anxiety. The U.S. sample included 6,111 students, 15 years of age. The specific research questions were: (a) What is the level of math anxiety in Latino youth?; (b) What is the level of math anxiety associated with different levels of math proficiency in Latino youth?; (c) When looking at Latino youth, does the level of math anxiety differ between boys and girls?; and (d) Among the (non-Latino) youth of the United States, does the level of math anxiety differ by race/ethnicity?. Results indicated that Latino youth reported a mean math anxiety level similar to the overall American average. The results also

demonstrated that students in the lowest two math-proficiency levels did not differ from each other in terms of math anxiety, nor did the students in the two highest proficiency levels. Another finding was that as the proficiency levels increased, the level of math anxiety decreased. Third, female Latino youth reported higher math anxiety than their male counter parts. Finally, race/ethnicity did not differentiate levels of math anxiety.

Arm B was a cross-sectional study exploring financial literacy. In the United States, 5,712 students participated in the PISA 2015 assessment; of these, 1,486 participated in the financial literacy section of the test. The research questions were the same as Arm A, except financial literacy and not math anxiety was the focus. Analysis yielded the following results. First, the level of financial literacy in Latino youth indicated that financial literacy score is normally distributed among the sample. Second, the level of financial literacy by math proficiency level in Latino youth demonstrated that students' math proficiency levels are associated with their financial proficiency level, and as math proficiency level increases, so does financial literacy levels. In addition, it was determined that students' math proficiency levels are associated with their financial literacy and that as math proficiency levels increase, so does the financial literacy levels. Third, there was a difference between female and male Latino youth in financial literacy. Finally, in determining if the level of financial literacy differed by race/ethnicity, the results suggested that race/ethnicity may partly explain variability in financial literacy. Hispanic students scored significantly higher than African American and lower than White, Asian and multicultural students.

The above-mentioned findings have implications for school counselors and for educators since their interactions with students tend to significantly influence students' career planning decisions and high school course enrollment. Furthermore, counselors also guide students through the process of financial aid and through the process of managing their finances after they graduate from high school. Understanding and supporting the needs and characteristics of Latino students are the keys for their academic and career success.

Math Anxiety and Financial Literacy among Latino Secondary Students in the United States

by

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Ernesto R. Guerrero, Author

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CONTRIBUTION OF AUTHORS

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DEDICATION

This dissertation is dedicated to all of the amazing women who had a significant impact in my life. To my grandmother, Margarita, who loved and cared for me. To my mother, Maria Antonieta, who showed me the value of hard work and compassion, and to my wife, Alicia, who has been a partner in my life and has helped me raise four amazing children.

Chapter 1: A General Introduction

The population of this nation has seen some significant shifts in the last couple of decades. One of these shifts is that the Hispanic population in the United States continues to grow. Educators need to pay special attention to the challenges and opportunities of this population because of the significant impact that their success will have in the development of this nation. The growth and acculturation of this community has been like no other. According to *Hispanic Map of the United States 2018*, there are several relevant characteristics that need to be taken into consideration when analyzing this population surge (Hernández & Moreno-Fernández, 2018). First, the Hispanic population of the United States represents about 18.1% of the total U.S. population, and it is expected to grow to 28.6% by 2060. Second, in 2017, there were 41 million Spanish speakers in the United States, making Spanish the second most spoken language after English. Third, there have been significant improvements in educational attainment for Hispanic students. In 2013, K-12 Hispanic enrollment in this nation was 25% of the total student population, and that figure is expected to grow to 29% in 2025. High school graduation rates for Hispanic students have increased dramatically from 59% in 1990 to 88% in 2015, whereas the high school dropout rate decreased 20 points from 1992 to 8.6% in 2016. Despite these successes in the educational arena, Latino college completion rates lag behind those of Whites and Asian students, and even though dropout rates have decreased significantly, Latino students still have the highest dropout rate of any other race in the nation.

These figures represent the potential aspirations of innumerable students in our schools. In this era of science and math promotion established by the rise of STEM and the increase in automatization and globalization, it is extremely important

for Hispanic students to have the necessary skills to compete not only with other students of this nation, but across the world. Two areas of consideration when dealing with this topic and that have a significant influence upon Hispanic students are math anxiety and financial literacy. The impact of math anxiety is important because studies have shown that math-anxious individuals tend to stay away from math and careers in which math plays a significant role (Namkung & Xin Lin, 2019). Financial literacy is also relevant to Hispanic students because they lack the financial literacy skills to access a college education, and there are not a lot of systems in place that support the development of financial literacy awareness among this population (Greenfield, 2015).

Rationale and Importance to the Counseling Profession

Despite the fact that the Hispanic population of students has increased over the last decades, the number of school counselors of color has not kept up with this increase. According to the *2011 National Survey of School Counselors*, 90% of school counselors identified themselves as non-Hispanic or Latino (Bridgeland & Bruce, 2011). This statistic, alongside the fact that the K-12 enrollment of Hispanic students stands at over 25% of the total student population, forces school counselors to understand the needs of Hispanic students to better advance their college and career aspirations and to promote their academic success. Efforts have been made to encourage school counselors to implement a culture that supports STEM career development of Hispanic students by providing leadership in their school sites, by involving and educating parents, by acknowledging students' potential for success and by constantly encouraging career interests (Shillingford, Oh, & Finnell, 2017).

Various professional organizations have highlighted the importance of supporting students and clients from different cultural backgrounds. The American School Counselor Association through its *Ethical Standards for School Counselors* (2018) has consistently promoted the need for school counselors to increase their understanding of multicultural and social justice practices. Furthermore, school counselors are challenged to understand their own personal beliefs and how they might differ from their students in order to support and motivate them by promoting a school climate that promotes diversity and understanding. The American Counseling Association in its *ACA Code of Ethics* (2014) specifically challenges practitioners to identify strategies to support individuals from different cultural backgrounds by recognizing their worth, dignity and potential. The Council for Accreditation of Counseling and Related Education Program (CACREP) developed the standards to encourage a strong professional counselor identity. Social and cultural diversity is one of the eight common core areas of foundational knowledge that entry level counselors must possess (CACREP, 2016). As it relates to this dissertation, the information presented allows school counselors the opportunity to identify and eliminate obstacles that impede Hispanic students from reaching their full academic and career potential. Professional organizations and accreditation bodies that promote excellence in counselor education challenge their members to become aware of and understand the various cultural backgrounds of students. This confirms the need for school counselors to hone their skills and promote the academic and career success of students of color – specifically, Hispanics.

Current State of Scientific Knowledge

A review of the scientific literature related to Hispanic students' math anxiety and financial literacy produces many key themes. These themes were: (a) the prevalence of math anxiety in Latino students, (b) the determining role that teachers play in heightening the math anxiety of Latino Students, (c) math anxiety results across 41 Programme for International Student Assessment (PISA) 2012 participating countries, (d) math anxiety as experienced among other populations and at different age levels, (e) the relationship between financial literacy and both mathematics and reading performance, (f) the definition of financial literacy and its influence on and relevance to high school students, (g) the findings within the *PISA 2015 Results* (OECD, 2017g), (h) the factors that contribute to the increase or decrease of financial literacy among high school students, (i) students' financial literacy around the world, and (j) financial literacy among Latino students in the United States.

It is difficult to accurately understand the prevalence of math anxiety of Latino students in the United States since at the time of this publishing, there are no studies that address math anxiety of this population. Worldwide, only one study from Colombia targeted this population. The findings indicate that there is a negative correlation between math anxiety and math performance; in addition, the results indicated that the correlation is stronger for girls than boys (Reali et al., 2016). Further information gathered from studies in the United States indicate that students begin to worry about math between the sixth and the ninth grade. Girls experience the same level of math anxiety as boys, but they have a higher affective reaction based on the results of the affective reaction scales as part of the Math Anxiety Questionnaire (Wigfield & Meece, 1988).

Studies have shown that teachers play a significant role in increasing Latino students' interest, self-efficacy, and math achievement (Riconscente, 2014). Conversely, students' math anxiety can be influenced by teachers' attitudes and perceptions. Bekdemir (2010) demonstrated that math-anxious teachers have a tendency to transfer their anxiety to their students by not using effective math teaching strategies. Furthermore, Furner and Gonzalez-DeHass (2011) indicated that math anxiety usually starts early in the students' educational journeys, and it is usually created by teachers' negative attitudes towards the subject. Finally, Oberlin (1982) identified pedagogical practices that promote math anxiety in students such as teachers' insistence that there is only one possible answer, or the practice of going through the textbook problem by problem, and the assignment of math problems as punishment. These examples clearly demonstrate the role that teachers play in developing math anxiety in students.

Math anxiety was assessed in the 2012 Program for International Student Assessment (PISA) which was conducted by the Organization for Economic Cooperation and Development (OECD). It assessed the math, reading, and science knowledge and skills of 15-year-old students. Forty-one OECD member countries participated in the 2012 iteration of the PISA assessment. One of the sections of the PISA test explored the relationship between mathematics and self-belief, with *belief* taking the forms of mathematics self-efficacy, mathematics self-concept, mathematics anxiety, and student engagement (PISA, 2013).

The PISA (OECD, 2013) findings yielded the following information related to math anxiety. First, the percentage of students who have experienced math anxiety tends to be high. Second, girls have experienced a greater level of math anxiety than

boys. Third, there was a slight increase in math anxiety between 2003 and 2012 for all students. Fourth, students from lower socioeconomic backgrounds tended to experience higher levels of math anxiety than students from higher socioeconomic backgrounds. Fifth, students in countries with the highest levels of math anxiety tended to perform less successfully than students in countries with lower levels of math anxiety. Sixth, on average, a higher level of math anxiety is associated with a 34-point-lower score—almost the equivalent of a year in school. The above-mentioned PISA (OECD, 2013) findings demonstrate the significant influence that math anxiety plays in the lives of students.

Math anxiety also has a profound influence on other populations and age levels. Nursing students tend to experience high degrees of math anxiety due to their reliance on numerical ability and the fact that they spend about 40% of their time doing drug calculations (McMullan, 2012). Due to the shortage of nurses, individuals have entered the profession with various degrees of anxiety because they have to perform drug calculations (Walsh, 2008). Social work students also experience high levels of math anxiety, especially when they take research methods and statistics classes (Royse & Rompf , 1992). Undergraduate finance students tend to experience high levels of math anxiety when taking finance courses due to their quantitative nature (Sizoo, Jozkowskia, Malhotra, & Shapero 2008). In conclusion, various groups are affected by math anxiety and math self-efficacy, and their experiences highlight the importance of these variables, as well as their influence in their respective fields.

The relationship between financial literacy and both mathematics and reading performance was demonstrated by the *PISA 2015 Results* (OECD, 2017g). These

results showed that students' performance in financial literacy assessment is correlated with achievements in both mathematics and reading performance. Other studies have discussed this relationship as well. In New Zealand, Cameron, Calderwood, Cox, Lim, and Yamaoka (2014) demonstrated that second-language learners had greater challenges than native speakers to achieve financial literacy. Baker and Ricciardi (2014) demonstrated that the comprehension of basic math is extremely important to the students' success in financial literacy. Lusardi, Mitchell, and Curto (2010) explained the relationship between financial literacy and cognitive ability as measured by the Armed Services Vocational Aptitude Battery (ASVAB). In summary, the higher the cognitive ability of high-school students, the higher their financial knowledge. The above-mentioned studies demonstrate that students' performance in financial literacy assessment is correlated to achievements in both mathematics and reading performance.

One of the most common definitions of financial literacy is the one offered by Vitt et al. (2000):

> Personal financial literacy is the ability to read, analyze, manage and communicate about the personal financial conditions that affect material well-being. It includes the ability to discern financial choices, discuss money and financial issues without (or despite) discomfort, plan for the future, and respond competently to life events in the general economy. (p. 2)

Financial literacy is relevant to high school students. McCann (2010) highlighted the importance of teaching financial literacy to high school students to help them deal with the financial challenges that they will eventually face. Furthermore, Williams, Grizzell, and Burrell (2011) explained the lack of savings and

the accumulation of unmanageable debt for millions of Americans as additional reasons to bolster financial literacy instruction within school systems. These studies highlight the relevance of financial literacy to high school students.

The *PISA 2015 Results* (OECD, 2017g) revealed the following facts about financial literacy of students in the United States. First, 1,486 students were assessed in financial literacy as part of the PISA battery of tests. Second, students in the U.S. scored around the average of student achievement in the 10 OECD countries, with students in China scoring the highest and students in Brazil scoring the lowest. Third, about 10% of U.S. students scored at the level of proficiency, while 21% scored at the lowest level. Fourth, about 53% of these students have a bank account, and 42% of those with an account scored higher than those who did not have an account. Fifth, about 70% of financial literacy performance correlates to skills that are assessed in math or reading. Sixth, 23% of students were either foreign-born or had foreign-born parents. Seventh, immigrant students who did not speak the assessment language at home scored 17 points lower than immigrant students who did speak the assessment language at home. Eighth, there is no national policy to teach financial education to high-school students; the decision to teach financial education is left to the individual states and, in some cases, to individual districts. The above-mentioned findings within the (OECD, 2017h*)* demonstrate the factors related to financial literacy in the country.

Increased financial literacy in high-school students is essential for several reasons. First, students start earning money and managing money without parental control, and usually they make short- and long-term financial decisions (Danes, Rodriguez, & Brewton, 2013). Second, societal factors, such as economic downturns,

the decrease in the personal savings rate, and the overdependence on credit, are some of the forces that underline the importance of financial literacy in high school (Angulo-Ruiz & Pergelova, 2013). Third, the *PISA 2015 Results* (OECD, 2017g) recognized numerous findings that demand greater financial literacy, such as the dwindling of both public and private welfare systems, the growing aging population in various countries, and the proliferation and sophistication of financial services. Fourth, student debt plays an increasingly determinative role in the lives of students in the United States (Friedman, 2018). The above-mentioned factors contribute to the increase or decrease in financial literacy among high school students.

The *PISA 2015 Results* (OECD, 2017g) compared financial literacy results from 15 participating countries. Nations receiving the highest scores were China, Belgium, and Canada, while Brazil and Peru received the lowest scores. Some of the results presented in the *Country Note, Beijing-Shanghai-Jiangsu-Guangdong (China*; OECD, 2017a) demonstrated that fewer than 10% of students fail to reach the baseline level of proficiency in financial literacy. Conversely, 33% of students scored at level 5, the highest score of the assessment. Students at this highest level can perform sophisticated mathematical operations, such as analyzing complex financial products, answering non-routine financial problems, and demonstrating an understanding of difficult financial problems. The results from this study revealed that 78% of students discuss money matters with their parents at least once a month.

Meanwhile, in terms of underperforming countries, the *Country Note, Brazil* (OECD, 2017b) showed that 53% of students scored lower than the baseline level, which was the highest percentage of any of the fifteen countries that participated in the PISA 2015 study. Furthermore, only 3% of Brazilian students scored at the

highest level of proficiency. These figures paint a global picture of financial literacy across the world.

To analyze the financial literacy of Latino students, one needs to closely examine the influence and relevance of the Latino student population in the United States (Gandara, 2017). Williams et al. (2011) emphasized several of the key issues relevant to assessing and improving financial literacy in Latino students. First, it is more difficult for students who speak another language at home to interact with the products and services of the financial landscape. Second, those students from immigrant backgrounds who achieve significant financial literacy proficiency are better able to integrate into their country of residency and, by default, they are able to take advantage of all of the benefits afforded to those who manage and understand financial products and services. Third, low-income families tend to be unbanked; by not having the benefit of such services, they often receive higher-interest loans and become vulnerable to predatory behaviors. Fourth, students from low-income and minority families often lack financial role models who can provide them with positive financial guidance and support. These issues provide a clear picture of the status of financial literacy of Latino students in this country.

Description of the Manuscripts

The study from the first manuscript examines math anxiety in the secondary Latino school age population in the United States based on the PISA 2012 results. Math anxiety plays a significant role in students' math achievement, according to Akin and Kurbanoglu (2011), who explained how math anxiety impacts learning by discouraging students from thinking positively about math or by inhibiting their ability to remain calm when engaged with math. Math-anxious students tend not to

pursue careers and professions that involve math (Scarpello, 2007). According to the Pew Hispanic Center (2002), the number of Hispanic students has increased significantly and so has their enrollment in colleges and universities. This surge challenges educators and policy makers to support and understand math anxiety in the Latino population, considering the fact that the United States ranks 10th in the quality of math and science education (Schwab, 2017).

This study is much needed to contribute to the field of math anxiety, as there is no study that addresses math anxiety in >>> secondary students in the United States. It is also needed to identify strategies and supports that can assist minority students in this country.

The target journal for this study was the *Journal of Latinos and Education* (JLE). JLE promotes a cross-, multi-, and interdisciplinary setting for scholars and writers that represent various disciplines and share a common interest in the analysis, discussion, critique, and dissemination of educational issues that impact Latinos. This journal was selected because it encourages novel ways of thinking related to the ongoing and emerging questions related to Latinos and education.

The audience for this journal is suitable for this manuscript since the topic relates to other scholarly professionals who engage in policy, research, and practice. The impact score for this journal is 0.481. A recent article that holds similarities to the current manuscript was published in the JLE by Gautreau, VanderVeldt, & Lunceford (2016). Those researchers investigated mathematics-related anxiety and attitudes among Latina preservice teachers.

Four research questions guided the first manuscript: (1) What is the level of math anxiety in Latino youth?, (2) What is the level of math anxiety associated with

different levels of math proficiency in Latino youth?, (3) When looking at Latino youth, does the level of math anxiety differ between boys and girls?, and (4) Among the (non-Latino) youth of the United States, does the level of math anxiety differ by race/ethnicity?

A cross-sectional design was employed (Mann, 2003). The data for this archival study was drawn from PISA 2012 Results (see Schleicher et al., 2016). The unit of analysis was individual students, and examined variables included (a) gender (a binomial grouping variable), (b) race/ethnicity (a multinomial grouping variable), (c) mathematics self-efficacy (a continuous variable), and (d) mathematics self-anxiety (a continuous variable). For the first two research questions, the following demographic statistics will be reported: mean, standard deviation, and skewness. For the third research question (gender differences), a *t*-test for independent groups will be used. For the fourth research question (race/ethnicity differences), a one-way ANOVA was employed. If the ANOVA is significant, post hoc tests will be conducted using Bonferroni adjusted alpha levels. Aside from the post hoc tests, the alpha level was 0.05. All analyses were conducted using R.

Manuscript two examines the financial literacy of the U. S. Latino youth by analyzing the PISA 2015 Results (OECD, 2017g). Increasing the financial literacy of students is a paramount task for educators in light of the fact that student debt is now the second largest type of debt behind mortgage loans, meaning it is even greater than loans associated with credit cards and automobile purchases (Friedman, 2018). Barros Lane and Pritzker (2016) identified that Hispanic students tend to have greater challenges than other students to achieve financial literacy due to the fact that they encounter societal challenges that are not present in other ethnic populations in the

United States. Furthermore, Latino students tend not to have as many opportunities to experience real world financial literacy scenarios. These realities highlight the importance of supporting the development of financial literacy in Latino students.

The target journal for manuscript two is the *Citizenships, Social and Economics Education* (CSEE). CSEE is the official journal of the International Association for Citizenship, Social and Economics Education. It is an online-only, peer-reviewed journal. The impact factor is 0.4. This journal was selected as it publishes professional studies in the field of education, socialization, curriculum development, and aspects of economics, sociology, politics, and social psychology. Jayaraman and Jambunathan (2018) published the most recent article that measured financial literacy levels among high school students in India and found low levels of performance on standard measures of financial literacy.

Four research questions guided this study: (1) What is the level of financial literacy in Latino youth?, (2) What is the level of financial literacy by math proficiency level in Latino youth?, (3) In Latino youth, does the level of financial literacy differ between boys and girls?, and (4) Among youth in the United States, does the level of financial literacy differ by race/ethnicity?

A cross-sectional design was employed (Mann, 2003), with archival data drawn from PISA 2015 Results (OECD, 2017g). The unit of analysis was individual students, and examined variables included (a) gender (a binomial grouping variable), (b) race/ethnicity (a multinomial grouping variable), (c) math proficiency level (ordinal variable), (d) financial literacy proficiency level (ordinal variable), and (e) financial literacy (a continuous variable).

For the first two research statistics, the following demographic information is reported: mean, standard deviation, and skewness. For the third research question (gender differences), a *t*-test for independent groups was used. For the fourth research question (race/ethnicity differences), a one-way ANOVA was employed. If the ANOVA is significant, post hoc tests will be conducted using Bonferroni adjusted alpha levels. Aside from the post hoc tests, the alpha level was .05. All analyses were conducted using SPSS 25.

Specialized Terms

Armed Services Vocational Aptitude Battery (ASVAB) - A timed multi-aptitude test, which is given at over 14,000 schools and Military Entrance Processing Stations (MEPS) nationwide and is developed and maintained by the Department of Defense. It measures four critical areas – arithmetic reasoning, word knowledge, paragraph comprehension, and mathematics knowledge.

Cross-sectional design - A study that employs a single point of data collection for each participant or system being studied.

Financial literacy - The ability to understand basic principles of business and finance

International Data Explorer (IDE) - An interactive online toll organized by the U.S. National Center for Education Statistics with data from five international studies including the Program for International Student Assessment (PISA) It allows users the ability to retrieve data, edit and build reports.

Math anxiety - Commonly defined as a feeling of tension, apprehension, or fear that interferes with math performance.

Program for International Student Assessment (PISA) - An international assessment that measures 15-year-old students' reading, mathematics, and science literacy every three years.

Organization for Economic Cooperation and Development (OECD) - An international organization whose goals are to establish international norms and find evidence-based solutions to a range of social, economic and environmental challenges. Specifically, this organization measures 15-year-old school pupils' scholastic performance on mathematics, science, and reading through PISA.

Self-efficacy - Commonly defined as the belief in one's capabilities to achieve a goal or an outcome. Students with a strong sense of efficacy are more likely to challenge themselves with difficult tasks and be intrinsically motivated.

Science, technology, engineering and mathematics (STEM) - The processes of critical thinking, analysis, and collaboration in which students integrate the processes and concepts in real world contexts of science, technology, engineering, and mathematics.

Thematic Link Between Studies

Themes exist across both studies. Manuscripts one and two address challenges to the Latino youth of the United States. Both manuscripts also utilize data from the PISA assessments. In terms of statistical analyses, the present studies apply both cross-sectional designs utilizing archival data. Both studies utilize gender and race/ethnicity as variables. Some of the differences among the students included the distinct administration of the PISA assessment (math anxiety in the 2012 administration and financial literacy in the 2015 administration). The financial literacy assessment was a one-hour computer-based test comprised of 43 items, while

math anxiety was measured through the PISA 2012–Math Anxiety (ANXMAT). The ANXMAT contains five items that measure mathematics self-efficacy.

Organization of the Dissertation

Chapter two (i.e., manuscript one) presents the recent review of scientific literature, which includes four themes. The first is the prevalence of math anxiety in Latino students. The second is the determining role that teachers play in heightening the math anxiety of Latino students. The third is math anxiety results across 41 PISA 2012 participating countries. The fourth is math anxiety as experienced among other populations and at different age levels. Following the literature review, this study attempts to answer two research questions. The first research question was, what is the level of math anxiety in Latino youth? The second research question was, what is the level of math anxiety associated with different levels of math proficiency in Latino youth? The third research question was, when looking at Latino youth, does the level of math anxiety differ between boys and girls? Finally, the fourth research question was, among the (non-Latino) youth of the United States, does the level of math anxiety differ by race/ethnicity?

Chapter three (i.e., manuscript two) presents the recent review of scientific literature, which includes the following seven themes: (a) the relationship between financial literacy and both mathematics and reading performance, (b) the definition of financial literacy and its influence on and relevance to high school students, (c) the findings within the *PISA 2015 Results* (OECD, 2017g), (d) the factors that contribute to the increase or decrease of financial literacy among high school students, (e) teachers' beliefs regarding and pedagogical practices supporting greater financial literacy, (f) students' financial literacy around the world, and (g) financial literacy

among Latino students in the United States. Following the presentation of the literature review the study aims to answer four research questions. The first question was, what is the level of financial literacy in Latino youth? The second question was, what is the level of financial literacy by math proficiency level in Latino youth? The third question was, in Latino youth, does the level of financial literacy differ between boys and girls? The fourth question was, among youth in the United States, does the level of financial literacy differ by race/ethnicity?

Chapter 2: A Research Manuscript

Math Anxiety in Latino Students: A Secondary Data of Analysis PISA 2012

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Abstract

Math anxiety has a remarkable influence in students' academic performance. Studies addressing math anxiety are present in the literature, but there are no studies that discuss secondary Latino students in the United States. To explore math anxiety among Latino students, an analysis of the data from a cross sectional study was conducted. The Programme for International Student Assessment (PISA) 2012, assessed the competencies of 15-year-olds in mathematics in 64 countries and economies. Several research questions guided this study including questions about the presence of gender differences of Latino youth and whether math anxiety differed by race/ethnicity of American youth. Results showed that female Latino youth reported higher math anxiety than their male counterparts and that race/ethnicity is not a factor associated with variability in math anxiety. These findings indicate the need to support and encourage Latino students who experience math anxiety. Due to the significant Latino student increase in the K-12 system in the United States in the last couple of decades, this discussion brings a sense of urgency to the academic development of Latinos and their future success in college and in the workforce.

Keywords: math anxiety, Latino, Hispanic, multicultural, PISA, STEM

Math Anxiety in Latino Students: A Secondary Data of Analysis PISA 2012

During the 2011 State of the Union address, President Barack Obama reminded Americans that the Soviet Union won the space race by launching the Sputnik satellite. This event unleashed a wave of innovation and creativity that spurred new industries, encouraged job growth, and propelled the United States to a position of technological supremacy. President Obama used this example to make the case for a contemporary "Sputnik moment," arguing that the U.S. government should invest in research, infrastructure, and education to contain China's surging economic power and global influence. Despite the President's optimism, the reality is somber.

The World Economic Forum's (WEF) Global Competitiveness Index ranks the United States 10th out of 137th nations, with respect to the quality of its math and science education. This is an unsustainable position for a nation that expects to continue growing and innovating in the future. Zeng and Poelzer (2016) showed how the United States is ill-prepared to meet the demand of careers in the fields of science, technology, engineering, and mathematics (STEM). Improving America's placement within such rankings as those of the WEF calls for greater emphasis on STEM training.

According to the National Academy of Science's book, *Rising Above the Gathering Storm*, the United States has thus far managed to maintain a position of influence in the STEM arena due to foreign-born individuals who come to America for their studies and who remain in the country once they've completed their education (Augustine, 2005). The National Science Foundation's *The Science and Engineering Workforce* emphasized similar points but also highlighted critical upcoming challenges confronting the fields of science and engineering in America,

such as the large number of projected retirements within these fields, the growth anticipated within these domains over the next two decades (three times the rate of all other occupations), and the flattening or even reduced number of students pursing bachelor's degrees in these areas (National Science Board, 2003). Maintaining competitiveness in the international arena calls for a reinvestment of time, resources, and energy into STEM fields. Only then can the United States provide the talent to meet what is an evident and increasing demand.

Data from the U.S. Census Bureau (2010) point to challenges in evaluating how these trends will affect Latino students, especially as Latinos have increased their presence within the U.S. educational landscape. Hispanic high school students are enrolling in college at a higher rate than their White counterparts, and Hispanics now account for one-fourth of all public-school students (Pew Hispanic Center, 2002). Even more pertinent, the divide in enrollment trends for high school math and science courses has widened, with White and Asian students on one end of the spectrum, and Hispanic and African American students on the other end. The Programme for International Student Assessment (PISA), in its *PISA 2012 Results* (OECD, 2013), analyzed students' participation in mathematics-related activities. Because students' self-belief correlates with greater facility in mathematics, seeking improvements in math performance requires attention to this variable.

Student self-belief can take various forms, but the most relevant to this study is math anxiety or emotions, such as heightened concern and even despair that students must navigate while attending to mathematical tasks. The Association for the Study of Higher Education (ASHE), in 2011, issued *The ASHE Higher Education Report*, detailing some of the barriers to success confronted by racial and ethnic

minority students pursuing STEM career fields (Museus et al., 2011). Some of their findings included: the practice of tracking students into remedial courses, students facing lower expectations from teachers, students facing stereotypes, and students enduring an oppositional culture. Conversely, some of the factors that can support students interested in such fields include parental involvement and support, bilingual education, self-efficacy in STEM domains, and exposure to careers in associated domains.

In reviewing the literature related to the issue of math anxiety in Latino high school students, four areas related to this issue emerged: (a) the prevalence of math anxiety in Latino students; (b) the determining role that teachers play in heightening the math anxiety of Latino students, (c) math anxiety results across 41 PISA 2012 participating countries, and (d) math anxiety as experienced among other populations and at different age levels. After the aforementioned literature is examined, the specific research questions for this study will be presented.

Math achievement is a concern for educators worldwide as STEM education becomes more important than ever. One of the factors that prevents students from succeeding in math is math anxiety. Anxiety is the experience of physio-emotional reactions about performing or thinking about performing a task (Lee, 2009). Akin and Kurbanoglu (2011) explained how math anxiety hampers learning by discouraging students from thinking positively about math or by inhibiting their ability to remain calm when engaged with math. Evidence of students experiencing math anxiety can include, but is not limited to, doubt, fear, difficulty breathing, and an inability to concentrate, among other responses. Students who experience math anxiety tend to feel impotent when faced with math problems; they may also avoid

math classes altogether and are often not successful at math, even though they might enjoy the skills or capacity to be successful.

There is, as of this writing, no published research on math anxiety specifically in Latino middle school or high school students in the United States, and there is only one study that addresses Latino students' math anxiety outside the United States—research that looked at data from Colombia (Reali et al., 2016). The Reali et al. study reported a negative correlation between math anxiety and math performance, and the findings of these researchers also demonstrated that this association was stronger in girls than in boys. Some studies have focused on math anxiety in the United States, as experienced by non-Hispanic middle and high school students, but most of the literature has attended to elementary school students, college students, and adults. Wigfield and Meece (1988) conducted a longitudinal investigation of children's beliefs, attitudes, and values related to mathematics. Their findings demonstrated that students began worrying about math between sixth and ninth grade, with ninth graders usually experiencing the greatest levels of worry and sixth graders experiencing the least. In addition, Wigfield and Meece found that girls experience a greater negative affective reaction than boys do, while girls experience the same level of math anxiety as boys.

Math anxiety can have a lasting effect on students and can profoundly influence their post-secondary plans. Scarpello (2007) concluded that high school students who experienced math anxiety tended not to pursue careers that involve math, which therefore limited their career choices. His findings also demonstrated that students who are apprehensive about math usually stop taking math courses in the tenth grade. The above-mentioned studies demonstrate the significance of math

anxiety in American students; the lack of attention to Hispanic students, in particular, necessitates greater scholarly attention to Latino populations in the United States.

Teachers play a significant role in decreasing math anxiety in Latino students. This influence is extremely important in light of studies indicating the lower-than-average levels of academic achievement, college attendance, and high school graduation rates for Latino students, as compared to their Asian and White counterparts. Several factors can promote self-efficacy and decrease math anxiety. Specifically, attention and care from teachers can profoundly influence Latino students. Pupils who experience positive engagement often work harder to achieve their academic goals, while maintaining higher levels of positive health and noting a decrease in negative behaviors. Another beneficial intervention is effective and meaningful instructional practices to engage and inspire Latino students. As Riconscente (2014) demonstrated, students' opinions of the ability of their teachers to successfully explain mathematical concepts had a positive effect on achievement, interest, and self-efficacy. The study also demonstrated the positive influence that the evident care and concern of teachers can have on the academic performance and achievement of Latino students. Students' perceptions of this variable had a significant influence on their success.

Students' math anxiety can be influenced by teachers' attitudes and perceptions. Bekdemir (2010) demonstrated that this influence is crucial to decreasing math anxiety in students. As the Bekdemir study showed, math-anxious teachers usually transfer anxiety to their students, while also tending to use less effective teaching methods to encourage their students to take an interest in math. Furner and Gonzalez-DeHass (2011) indicated that a student's math anxiety usually

begins in the early years of schooling, and it is fostered by teachers' negative attitudes toward the subject, especially in terms of its difficulty and the fact that math ability is inborn rather than learned, a product of nature rather than nurture. Oberlin (1982) determined that the following five teaching strategies contribute to the development of math anxiety in students. First, the teacher assigns the same classwork for everyone in the classroom. Second, the teacher proceeds through the book problem-by-problem. Third, the teacher gives written work every day. Fourth, the teacher is adamant about the fact that there is only one correct answer to a problem. Lastly, the teacher assigns math problems as punishment. Teachers can discourage math anxiety in their students by not fostering the above-mentioned activities and attitudes in the classroom.

The PISA is conducted by the Organization for Economic Cooperation and Development (OECD), and it assesses the math, reading, and science knowledge and skills of 15-year-old students. Seventy-two countries participated in the 2012 iteration of the PISA assessment. One of the sections of the PISA test explored the relationship between mathematics and self-belief, with *belief* taking the forms of mathematics self-efficacy, mathematics self-concept, mathematics anxiety, and student engagement (PISA, 2013). This study demonstrated that these four different mathematical self-beliefs are interrelated but still conceptually different (Pajares & Kranzler, 1995). Mathematical self-belief exerts a tremendous influence on students' lives, because, once established, it plays a role in the growth and development of math skills and competencies (Markus & Nurius, 1986). Furthermore, its influence can affect students' life choices and career decisions (Wang, Eccles, & Keanny, 2013).

The PISA (2013) report showed the influence of math anxiety on students' lives. Overall, students tend to feel anxious about math (Ashcraft & Ridley, 2005). Those who experience high levels of math anxiety usually feel tense and apprehensive (Zeidner, 2007). Poor performance in mathematics is usually associated with math anxiety (Ma & Xu 2004). Moreover, students who experience math anxiety tend to not perform the assigned tasks because they spend a good amount of time worrying about them (Beilock, Kulp, Holt, & Carr, 2004). Math anxiety can manifest as a painful experience. Students who experience math anxiety often avoid math career pathways and higher-level math courses (Ashcraft & Ridley, 2005).

The PISA 2013 findings (OECD, 2013) yielded the following information related to math anxiety. First, the percentage of students in OECD countries that have experienced math anxiety tends to be high. Nearly 60% of students worry about the difficulty of their math classes, while 31% worry about math problems, 33% fear math homework, and 61% worry about receiving a low grade in mathematics. In the nine countries discussed in the assessment, 75% of students worried about the difficulty of their math classes. Second, girls have experienced a greater level of math anxiety than boys. Third, there was a slight increase in math anxiety between 2003 and 2012. Fourth, students from lower socioeconomic backgrounds have tended to experience higher levels of math anxiety than students from higher socioeconomic backgrounds. Fifth, countries with the highest levels of math anxiety tend to perform less successfully in the PISA assessment, than countries with lower levels of math anxiety. Sixth, on average, a higher level of math anxiety is associated with a 34-point-lower score in the PISA assessment —almost the equivalent of a year

in school. The above-mentioned PISA (2013) findings demonstrate the significant influence that math anxiety plays in the lives of students.

Math anxiety has a profound influence on professionals in other fields, such as nursing and social work, as well as on university students pursing various degrees. This impact begins with the university experiences of students. Perez-Tyteca, Castro, Rico, and Castro (2011) determined both that Spanish university students seeking technical degrees have tended to feel more comfortable with math and that students seeking careers in the health fields have generally displayed the highest levels of math anxiety. This research also determined that those students pursuing architectural or engineering degrees have maintained a neutral attitude towards mathematics.

Nursing students struggle with numerical ability, and, as a result, they experience high levels of math anxiety when doing drug calculations. These feelings are extremely relevant to nurses because these professionals spend about 40% of their time performing drug calculations (McMullan et al., 2012). Walsh (2008) found that the current nursing shortage has supplied the profession with individuals enjoying various degrees of problem-solving abilities and mathematical facility. McMullen et al. (2012) explained the relationship between self-efficacy and math anxiety in terms of its effect on nursing students. Nursing students with lower self-efficacy feel more anxious about performing drug calculations. Conversely, a student with a higher level of self-efficacy will not be as affected by math anxiety or will be able to overcome it more easily through a belief in self-efficacy.

Like nursing students, university students pursuing degrees in social work experience a high degree of math anxiety, especially when preparing to take research methods and statistics classes (Royse & Rompf, 1992). Indeed, the Royse and Rompf

study found that social work students suffer from higher levels of math anxiety than do other university students. Sizoo et al. (2008) focused on math anxiety and self-efficacy in undergraduate finance students and found that finance courses are usually one of the most challenging classes in a business education curriculum, given the quantitative nature of the material. As a result, students feel anxious and usually postpone remediation. At the same time, the Sizoo et al. (2008) study revealed that students who feel they can do well tend to perform better than those who feel they are not competent.

In conclusion, various groups are affected by math anxiety and math self-efficacy, and their experiences highlight the importance of these variables, as well as their influence in their respective fields. The above-mentioned examples demonstrate the influence that math anxiety has on students and on professionals representing various occupations. Given the aforementioned gaps in the literature, four research questions were developed to guide the present research study:

1. What is the level of math anxiety in Latino youth?
2. What is the level of math anxiety associated with different levels of math proficiency in Latino youth?
3. When looking at Latino youth, does the level of math anxiety differ between boys and girls?
4. Among the (non-Latino) youth of the United States, does the level of math anxiety differ by race/ethnicity?

Method

Design

This study employed a cross-sectional design (Mann, 2003). The data for this archival study were drawn from PISA 2015 Results (OECD, 2017g). The unit of analysis was individual students, and examined variables included (a) gender (a binomial grouping variable), (b) race/ethnicity (a multinomial grouping variable), (c) mathematics self-efficacy (a continuous variable), and (d) mathematics self-anxiety (a continuous variable).

For research questions two and four, an a priori power analysis for a one-way ANOVA was conducted using G*Power 3.1.9.3 (Faul, Erdfelder, Buchner, & Lang, 2009). The effect size used for this power analysis was obtained from Primi, Busdraghi, Tomasetto, Morsanyi, and Chiesi (2014). The Cohen's *d* reported by Primi et al. (*d* = .49) was converted into the Cohen's *f* needed for a one-way ANOVA power calculation in G*Power 3.1.9.3. An online effect size conversion calculator was used for this transformation (Lenhard & Lenhard, 2016). The input parameters were: (a) test family = *f* tests; (b) statistical test = ANOVA: fixed effects, omnibus, one-way; (c) type of power analysis = a priori: compute required sample size - given α, power, and effect size; (d) effect size *f* = .245: (e) power (1-β err probability) = 0.80; (f) α = .05; and (g) number of groups = 6. The G*Power 3.1 output included a sample size of 222 and an actual power of 0.81.

For research question three, a power analysis for an independent-samples *t*-test was performed to ascertain a required minimum sample size. The proper effect size for such an analysis is Cohen's *d*. The effect size used for this power analysis was obtained from Primi et al. (2014). The power analysis was conducted using

G*Power 3.1.9.2 (Faul et al., 2009). The following input parameters were used: (a) test family = *t* tests; (b) Statistical test = means: difference between two dependent means (independent); (c) type of power analysis = a priori: compute required sample size - given α, power, and effect size; (d) two-tailed; (e) $d = 0.49$; (f) power (1 − β err probability) = 0.80; and (g) allocation ratio N2/N1 = 1, and (h) $\alpha = .05$. The G*Power 3.1.9.2 output indicated that a sample size of 128 with an actual is needed to detect a medium effects size of .5 with power of 0.80.

Participants

The 2012 PISA assessment included 510,000 students. Participants were between the ages of 15 years, 3 months and 16 years, 2 months at the time of the assessment, and all had completed at least six years of formal schooling. In addition, they were enrolled on either a full- or part-time basis, and they represented academic or vocational programs in either public or private schools. In the United States, 5,316 students took part in the assessment, with testing occurring in the following states and with the total number of participants per state included in parentheses: Connecticut (1,697), Florida (1,896), and Massachusetts (1,723).

Measures

Gender. Gender was reported using the categories female (a), male (b), or (c) missing, and dummy coding was as follows: two dummies were used if missing data were present, and one dummy was used if there was no missing data.

Race/ethnicity. Race/ethnicity was a U.S.-specific background variable and was reported using the following categories: White, Black, Hispanic, Asian, other, and more than one race.

PISA 2012–Math Anxiety (ANXMAT). The ANXMAT contains five items that measure mathematics self-efficacy. Four responses were possible for each item, with "strongly agree" equaling 1, "agree" equaling 2, "disagree" equaling 3, and "strongly disagree" equaling 4. Total scores could, therefore, range from 5 to 20, with a higher score indicating greater math anxiety. Over 60% of students strongly agreed with the statement, "I worry that I will get poor <grades> in mathematics," while approximately 30% agreed with the notion, "I feel helpless when doing a mathematics problem" (OECD, 2014). The scale reliability for ANXMAT indicated a high degree of internal consistency across all OECD countries, with Iceland and the United States receiving the highest rate of consistency, 0.84, and with Chile receiving the lowest, 0.70. The median across OECD countries was 0.84. There was also a high degree of internal consistency across participating countries, with the highest rate arising in China, at 0.86, and with the lowest occurring in Thailand, at 0.63. The median across partner countries and economies was 0.79 (OECD, 2014).

Apparatus

The International Data Explorer (IDE) is a web-based application implemented by the U.S. National Center for Education Statistics (NCES). This interactive online tool allows users to access large-scale education studies, such as the Program for International Student Assessment (PISA), the Progress in International Reading Literacy Study (PIRLS), the Trends in International Mathematics and Science Study (TIMSS), the Program for the International Assessment of Adult Competencies (PIAAC), and the Teaching and Learning International Survey (TALIS). So, too, does the IDE contain information from the following PISA administration cycles: 2000, 2003, 2006, 2009, 2012, and 2015, with reading,

mathematics, and science literacy having been assessed in each of these cycles and with problem-solving and financial literacy having been assessed in selected cycles. The IDE allows researchers to choose criteria by identifying measure(s), year(s), and jurisdiction(s), and it also allows scholars to select variables from various categories and subcategories. Furthermore, the application allows users the opportunity to edit and build reports.

Procedures

For the PISA, students took a paper-based assessment that lasted two hours. Students in some countries took an optional 40-minute computer-based assessment of math, reading, and problem-solving skills. The assessment included two types of responses: multiple-choice items and students' constructed responses. Items were organized based on passages involving real-life situations. Students also completed a 30-minute background questionnaire about themselves, their homes, and their school and learning experiences.

Data Analysis

To address the first research question, the following descriptive statistics will be reported: mean, standard deviation, and skewness. For the second research questions, One-way ANOVA with math anxiety as the independent variable and math proficiency levels (i.e., five levels) as the independent variable were used. For the third research question (gender differences), an independent sample *t*-test for independent groups was used. For the fourth research question (race/ethnicity differences), a one-way ANOVA was employed. For both t-test and ANOVA, the respective statistical assumptions were tested. If significant differences were found in

ANOVA, post hoc tests were conducted. Aside from the post hoc tests, the alpha level was set at .05. All analyses were conducted using R.

For the first two research questions, the following statistics were reported: mean, standard deviation, and skewness. For the third research question (gender differences), a *t*-test for independent groups was used. For the fourth research question (race/ethnicity differences), a one-way ANOVA was employed. If the ANOVA was significant, post hoc tests were conducted using Bonferroni adjusted alpha levels. Aside from the post hoc tests, the alpha level was 0.05. All analyses were conducted using SPSS 25.

Results

The first research question sought to determine the level of math anxiety among Latino youth. To address this research question, descriptive analysis was used. The results showed that the mean math anxiety score of Latino youth is 2.38 (on a scale of 1-4) with standard deviation of 0.72. Math anxiety appears to be normally distributed in the Latino youth sample as indicated by skewness (Statistic = .17, *SE* = .09) and kurtosis (Statistic = -.34, SE = .18) values.

The second research question focused on examining whether the level of math anxiety among Latino youth differed by levels of mathematics proficiency. Based on PISA 2012's description of mathematics proficiency levels, seven levels of proficiency were created. Because of a very small sample size (i.e., only 6) for the upper most level (i.e., level 6), the proficiency levels were recoded such that levels 5 and 6 were categorized into one group. A one-way ANOVA was conducted to compare if mean levels of math anxiety differed by mathematics proficiency levels. Table 1 presents mean and standard deviations for math anxiety by math proficiency

levels. The ANOVA results are summarized in Table 2. The results indicated that there was a statistically significant difference among the six proficiency levels, $F(5, 758) = 39.57$, $p = .000$). The pairwise comparisons for the main effect of math proficiency levels corrected using Bonferroni adjustments are presented in Table 3. The table indicates that the significant main effect of math proficiency on math anxiety is reflective of significant differences between each pair of proficiency levels except for the mean differences between level 1 and below level 1, as well as mean differences between level 4 and level 5+. This suggests that students in the lowest two math proficiency levels do not differ from each other in terms of math anxiety. By the same token, students' highest two math-proficiency levels differed from each other in terms of math anxiety. Overall, the table indicates that as proficiency levels increase math anxiety levels decrease.

The third research question was aimed at determining whether there was a statistically significant difference between female and male Latino youth. To address this question, an independent sample t-test was employed. Table 4 presents mean and standard deviations for math anxiety for both female and male students. The analysis results indicated that there was a statistically significant difference in math anxiety between female and male Latino youth.

The last research question was concerned with whether there were statistically significant differences in math anxiety levels by race/ethnicity of U.S. youth. A one-way ANOVA was conducted to compare if mean levels of math anxiety differed by race/ethnicity. Table 5 presents mean and standard deviations for math anxiety by race/ethnicity. The ANOVA results are summarized in Table 6. There was a statistically significant difference between race/ethnicity categories as determined by

one-way ANOVA ($F(5, 3163) = 3.65$, $p = .003$). The pairwise comparisons for the main effect of race/ethnicity on math anxiety corrected using Bonferroni adjustments are presented in Table 7. None of the mean differences between the race/ethnicity pairs were statistically significant (the range was $p = .06$ to $p = 1.00$; $n = 30$).

Discussion

The first research question that this study addressed was the determination of mean math anxiety level of Latino youth. The findings indicated that Latino youth reported a mean math anxiety level of 2.38 (on a scale of 1-4), which was similar to the overall American average (i.e., 2.31). One possible explanation for the obtained results is that race/ethnicity is not a factor in math anxiety levels. Such a conclusion is supported by similar findings reported in the literature (Ahmed, 2018; Cheema & Sheridan, 2015; Graham & Morales-Chicas, 2015; Suinn, Taylor, & Edwards, 1989). An alternative explanation is that Latinos generally report moderate levels of math anxiety as a racial/ethnic group. However, there is very little literature that focuses exclusively on this ethnic group. Between the former and the latter, the former is most likely because of the preponderance of literature suggesting that race/ethnicity is not a moderator of math anxiety levels.

The second research question in this study was whether there is a statistically significant difference in math anxiety among students of different math proficiency levels among Latino youth in the PISA 2012 assessment. The ANOVA results showed that students in the lowest two levels did not differ from each other in terms of math anxiety, nor did the students in the two highest levels. The result also indicated that as the proficiency levels increased, the level of math anxiety decreased. One possible explanation for the findings is that higher achieving students tend not to

have high degrees of math anxiety. This conclusion is shared by various studies (Chowdhury, 2014; Engelhard, 1990; Lee, 2009: Ma & Xu, 2004; Uysal, 2015; Yüksel-Şahin, 2008). An alternative explanation is that students with the lowest proficiency levels have not experienced success in math and therefore have not developed math competence (Jensen et al., 2013). Between these two explanations, the most probable is the first one due to the overwhelming number of studies demonstrating that math anxiety decreases as math achievement increases.

Turning to the third research question which focused on gender differences in math anxiety among Latino youth, the independent sample *t*-test results indicated that female Latino youth report statistically significantly higher math anxiety than their male counterparts. One possible reason is that math competency beliefs, such as math self-concept and math self-efficacy, influence math anxiety (Carey et al., 2016), and females tend to score lower than males in self-perceived competence. This is consistent with literature that reports negative associations between math anxiety and competency beliefs in females (Ahmed et al., 2012; Frenzel et al., 2007; Hoffman, 2010). Another reason could be that in cognitive psychology there are gender differences that relate to spatial processing ability (Gardner, 1983). Successive studies have found similar findings, specifically in the role that spatial processing ability plays in female students (Maloney et al., 2012; Sokolowski et al., 2019).

Finally, the last research question focused on determining whether math anxiety differed by race/ethnicity of American youth. The main comparison between groups was statistically significant however none of the post hoc pairwise comparison were so. Multiple reasons exist for why post hoc tests are non-significant while the global effect is significant. First, the pair-wise comparison results could suggest that

race/ethnicity may not be an important predictor of math anxiety. This finding is at odds with previous research on the topic. Several studies have demonstrated differences in math anxiety among races (Ahmed, 2018; Cheema & Sheridan, 2015; Hembree, 1990). Along similar lines, it is possible reason is that Steele's (1997) stereotype-threat, which emphasizes that Latino students' fear of conforming to negative stereotypes regarding their performance in mathematical tests, which further contributes to math anxiety (Osborne, 2001), may not be accurate. Another possible reason is that the conservative nature of post hoc test employed lead to Type II errors that obscured actual differences (XLSTAT, 2020). Between the former and the latter, the latter is the most likely explanation for it is most aligned with the current research literature.

When considering the results of this study, two limitations should be kept in mind. First, despite the results that race/ethnicity is not a factor in math anxiety levels, there are very limited studies that explored math anxiety levels among Latino youth. Second, the PISA 2012 index of math anxiety is limited to five items, which may not capture the components of math anxiety as measured in other commonly used instruments, such as the Math Anxiety Rating Scale (Alexander & Martray, 1989).

Four implications for school-counselor practice emerge from the results of this study. First, school counselors provide support and guidance to students throughout their educational growth and development. Therefore, counselors need to be aware of the role that math anxiety plays in the lives of their students, and they need to provide opportunities for students to engage in activities that expose them to successful math experiences (Sun, 2018). Second, according to the American School Counselor

Association (ASCA, 2016) school counselors' professional responsibilities include collaboration with stakeholders to promote student achievement and success. Counselors can provide teachers with strategies to support students experiencing math anxiety (Furner et al., 2005). Third, school counselors can support parents to promote math success and reduce math anxiety in their children. Some of these activities can include organizing informational meetings, sharing strategies in individual and group meetings, and training school personnel to identify the needs of parents to support them effectively (Davis & Lambie, 2005). Finally, school counselors are charged to take a leadership role in the development of curricular materials to promote positive self-beliefs in students especially in the area of mathematics (Falco et al., 2010).

Two implications for research are suggested by the obtained results. First, further studies must include a greater number of participants and from various regions of the United States to provide more accurate results of the influence of math anxiety among Hispanic students. Second, studies must consider the fact that Hispanics in the United States are not a homogenous group, but a combination of various cultures that represent different countries and that students also have various levels of acculturation and second language acquisition. These cultural variations, have a significant influence in the development of math anxiety in addition to other affective variables, which have significant impact in students' academic development.

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Table 1

Descriptive Statistics for Math Anxiety by Math Proficiency Levels

Proficiency Level	N	Mean	SD
Below Level 1	83	2.88	.61
Level 1	171	2.64	.67
Level 2	258	2.43	.67
Level 3	135	2.13	.62
Level 4	89	1.87	.57
Level 5+	28	1.62	.57

Table 2

One-Way Analysis of Variance of Math Anxiety by Math Proficiency Levels

Source	SS	Df	MS	F	Sig.
Between Groups	81.23	5	16.24	39.57	.000
Within Groups	311.18	758	1.18		
Total	4710.88	764			

Table 3

Pairwise Comparison of the Effect of Math Proficiency Levels on Math Anxiety

Proficiency Level (I)	Proficiency Level (J)	Mean Difference (I-J)	SE	Sig	95% Confidence Interval	
					LB	UB
Below Level 1	Level1	.24	.09	.07	-.01	.50
	Level2	.45*	.08	.00	.21	.69
	Level3	.75*	.09	.00	.49	1.02
	Level4	1.02*	.10	.00	.73	1.30
	Level5+	1.26*	.14	.00	.85	1.67
Level1	Below Level 1	-.24	.09	.07	-.50	.01
	Level2	.21*	.06	.02	.02	.39
	Level3	.51*	.07	.00	.29	.73
	Level4	.77*	.08	.00	.53	1.02
	Level5+	1.02*	.13	.00	.63	1.40
Level2	Below Level 1	-.45*	.08	.00	-.69	-.21
	Level1	-.21*	.06	.02	-.39	-.02
	Level3	.30*	.07	.00	.10	.50
	Level4	.57*	.08	.00	.33	.80
	Level5+	.81*	.13	.00	.43	1.18
Level3	Below Level 1	-.75*	.09	.00	-1.02	-.49
	Level1	-.51*	.07	.00	-.73	-.29
	Level2	-.30*	.07	.00	-.50	-.10
	Level4	.26*	.09	.04	.01	.52
Level4	Below Level 1	-1.02*	.10	.00	-1.30	-.73
	Level1	-.77*	.08	.00	-1.02	-.53
	Level2	-.57*	.08	.00	-.80	-.33
	Level3	-.26*	.09	.04	-.52	-.01
	Level5+	.24	.14	1.00	-.17	.65
Level5+	Below Level 1	-1.26*	.14	.00	-1.67	-.85
	Level1	-1.02*	.13	.00	-1.40	-.63
	Level2	-.81*	.13	.00	-1.18	-.43
	Level3	-.51*	.13	.00	-.90	-.12
	Level4	-.24	.14	1.00	-.65	.17

Note. SE = standard error; Sig = significance; LB = lower bound, UB = upper bound.

Table 4

Descriptive Statistics for Math Anxiety by Gender

Group	N	Mean	SD
Female	375	2.47	.74
Male	389	2.29	.69

Table 5

Descriptive Statistics for Math Anxiety by Math Proficiency Levels

Race/Ethnicity	N	Mean	SD
White	1656	2.29	.74
Black or African American	408	2.34	.73
Hispanic	764	2.38	.72
Asian	151	2.19	.73
Multiracial	129	2.20	.76
Other	62	2.45	.57

Table 1

One-Way Analysis of Variance of Math Anxiety by Race/Ethnicity

Source	SS	Df	MS	F	Sig.
Between Groups	9.73	5	1.95	3.65	.003
Within Groups	1687.40	3164	.53		
Total	18614.88	3170			

Table 7

Pairwise Comparison of the Effect of Race/Ethnicity on Math Anxiety

Race/Ethnicity (I)	Race/Ethnicity (J)	Mean Difference (I-J)	SE	Sig	95% Confidence Interval	
					LB	UB
White	Black or AA	-.05	.04	1.00	-.17	.07
	Hispanic	-.09	.03	.07	-.18	.00
	Asian	.10	.06	1.00	-.09	.28
	Multiracial	.09	.07	1.00	-.11	.28
	Other	-.16	.09	1.00	-.44	.12
Black or AA	White	.05	.04	1.00	-.07	.17
	Hispanic	-.04	.04	1.00	-.17	.09
	Asian	.15	.07	.47	-.05	.35
	Multiracial	.14	.07	.85	-.08	.36
	Other	-.11	.10	1.00	-.40	.18
Hispanic	White	.09	.03	.07	.00	.18
	Black or AA	.04	.04	1.00	-.09	.17
	Asian	.19	.07	.06	.00	.38
	Multiracial	.18	.07	.15	-.03	.38
	Other	-.07	.10	1.00	-.35	.21
Asian	White	-.10	.06	1.00	-.28	.09
	Black or AA	-.15	.07	.47	-.35	.05
	Hispanic	-.19	.07	.06	-.38	.00
	Multiracial	-.01	.09	1.00	-.27	.25
	Other	-.26	.11	.28	-.58	.06
Multiracial	White	-.09	.07	1.00	-.28	.11
	Black or AA	-.14	.07	.85	-.36	.08
	Hispanic	-.18	.07	.15	-.38	.03
	Asian	.01	.09	1.00	-.25	.27
	Other	-.25	.11	.40	-.58	.08
Other	White	.16	.09	1.00	-.12	.44
	Black or AA	.11	.10	1.00	-.18	.40
	Hispanic	.07	.10	1.00	-.21	.35
	Asian	.26	.11	.28	-.06	.58
	Multiracial	.25	.11	.40	-.08	.58

Note. SE = standard error; Sig = significance; LB = lower bound, UB = upper bound.

Chapter 3: A Research Manuscript

Financial Literacy in U.S. Latino Youth: Analysis of the PISA 2015 Results

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Abstract

Financial literacy among secondary students can be the solid foundation upon which to build a healthy and successful financial future. Studies addressing financial literacy are present in the literature, but there are no studies that address secondary Latino students' financial literacy in the United States. To explore financial literacy among secondary Latino students, an analysis of the data from a cross sectional study was conducted. The Programme for International Student Assessment (PISA) 2015, assessed the competencies of 15-year-olds' ability to use their collected knowledge for real-life situations involving financial issues and decisions. Four research questions focusing on financial literacy prevalence rates, as well as gender and race/ethnicity differences, guided this study. The results indicated that students' math proficiency levels are associated with their financial literacy and that race/ethnicity may partly explain variability in financial literacy. The limitations and implications of the results were discussed.

Keywords: financial literacy, Latino, Hispanic, multicultural, PISA

Financial Literacy in the U.S. Latino Youth: Analysis of the PISA 2015 Data

Researchers have demonstrated that young people have poor financial literacy skills and that this lack of knowledge can lead to dire consequences, such as bankruptcy, insufficient retirement savings, and family and relationship conflicts, among other negative outcomes (Viera, 2012). Consider, too, that student debt has reached desperate proportions in the United States, amounting to an outstanding $1.52 trillion crisis, according to one source (Friedman, 2018). Indeed, student debt is now the second largest type of debt behind mortgage loans, even greater than loans associated with credit cards and automobile purchases. Furthermore, there are 44.2 million borrowers holding student debt in the United States, a number representing one eighth of the U.S. population. Baun (2017) identified some factors contributing to the surge of student loan debt in the past few decades. One of them is a general lack of guidance and education, which results in students making the wrong financial decisions and facing dire consequences, such as difficulty making payments and encountering abusive collection procedures. Another factor is the currently lower college completion rate, a problem that could be solved by providing greater education about the different options and the dangers of accumulating more debt as students change from one program of study to another.

These trends affect Latino students in the United States more severely than others. Barros Lane and Pritzker (2016) demonstrated that Latinos encounter obstacles unique to their experiences. Only 56% of Latino immigrants, for example, have a bank account, and few have established pension plans. Furthermore, they tend to become easy targets of predatory lending practices; they tend to have lower rates of home ownership, and, those who own their homes tend to endure higher interest rates.

Finally, as Barros Lane and Pritzker showed, if these financial statistics do not improve, over 90% of Latino senior citizens will not have enough money to support themselves during the late years of life. These practices certainly have an influence in the lives of Latino students because of the lack of role models and experiences.

With respect to Latino youth in particular, Williams, Grizzell, and Burrel (2011) found that, while schools have made recent efforts to increase the financial education of minority students, the reality is that the life-application element is missing for many of these young people. Minority students are often unable to pursue real-world experiences and the kind of regular exposure that might make this information more meaningful. Affective and societal factors also make it challenging for minorities, and especially Latino students, to increase their financial literacy skills. Across the United States, financial institutions are underrepresented in minority communities, and oftentimes the cost and inconvenience associated with maintaining a relationship with a financial institution discourages Latinos from accessing such services. Furthermore, Latinos have different learning preferences than Whites, oftentimes preferring to receive financial education in group or communal settings, as opposed to the sorts of one-on-one meetings offered by most financial institutions. Limited financial information is especially problematic when it affects young people in the United States because they are the consumers of the future, even as they lack many of the basic skills and proficiencies necessary to capably manage transactions, portfolios, and related life plans (Northwood & Rhine, 2017).

Research addressing financial literacy among Latino/Hispanic 15-year-old students and the overall performance in mathematics and reading of 15-year-old

students in the United States invites attention to eight areas: (a) the relationship between financial literacy and both mathematics and reading performance, (b) the definition of financial literacy and its influence on and relevance to high school students, (c) the findings within the *PISA 2015 Results* (OECD, 2017g), (d) the factors that contribute to the increase or decrease of financial literacy among high school students, (e) teachers' beliefs regarding and pedagogical practices supporting greater financial literacy, (f) students' financial literacy around the world, and (g) financial literacy among Latino students in the United States. These areas of focus are the context for the research questions that drive this work (outlined below), questions that grow out of the following review of the literature.

The relationship between financial literacy and both math and reading performance is an important one, and the *PISA 2015 Results* (OECD, 2017g) highlight some of the characteristics of this bond, demonstrating a correlation between performance in math and reading, financial literacy, and students' expectations for the future. Connections between financial literacy and successful performance in mathematics and reading have also been identified as determining factors that encourage students to complete a university education, while also significantly influencing their career expectations. Finally, the PISA report demonstrated that students' performance in financial literacy assessment is correlated to achievements in both mathematics and reading performance.

Other studies have discussed this relationship. Cameron, Calderwood, Cox, Lim, and Yamaoka (2014) identified factors associated with financial literacy in New Zealand, and their research stressed the challenges second-language learners encountered on their way toward English financial literacy, as well as how these

challenges encouraged less proficiency than that experienced by native English speakers. The Cameron et al. study also demonstrated that students' self-reported mathematics ability yielded an increase of 6.5 points on a financial literacy assessment. These findings indicated that a high level of financial literacy is positively related to overall academic ability in high-school students. Baker and Ricciardi (2014) observed that some studies compare numeracy, the ability to execute basic mathematical calculations, to financial literacy, making the comprehension of basic math skills paramount to the success of financial literacy. Lusardi, Mitchell, and Curto (2010) explained the relationship between financial literacy and cognitive ability as measured by the Armed Services Vocational Aptitude Battery (ASVAB). As a result, the higher the cognitive ability of high-school students, the higher their financial knowledge. The *PISA 2015 Results* (OECD, 2017g) stressed, in much the same way, that success in financial literacy usually translates to success in other academic subjects. The above-mentioned studies highlighted the relationship between financial literacy and both mathematics and reading performance, concluding that literacy and academic accomplishments support each other in encouraging success for high-school students.

There are many definitions of financial literacy, but the one offered by Vitt et al. (2000) is the most common:

> Personal financial literacy is the ability to read, analyze, manage and communicate about the personal financial conditions that affect material well-being. It includes the ability to discern financial choices, discuss money and financial issues without (or despite) discomfort, plan for the future, and respond competently to life events in the general economy. (p. 2)

The *PISA 2015 Results* (OECD, 2017g) defined literacy as:

> knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts to improve the financial well-being of individuals and society, and to enable participation in economic life. (p. 26)

Both definitions highlight the importance of financial literacy. McCann (2010) indicated the importance of teaching financial literacy to high school students because most young people are unprepared to deal with finance upon graduation, and teaching it in schools can improve their knowledge, behavior, and level of self-efficacy. The *PISA 2015 Results* (OECD, 2017g) also underscored the importance of financial literacy for students in light of the changing economic climate, the reduction of public welfare systems, and the sophistication and growth of financial services throughout the world. For their part, Williams, Grizzell, and Burrell (2011) explained the lack of savings and the accumulation of unmanageable debt for millions of Americans as other reasons to bolster financial literacy instruction within school systems.

The Programme for International Student Assessment (PISA), conducted by the Organisation for Economic Co-operation and Development (OECD), assessed, in 2015, the level of financial literacy of 48,000 students from 10 OECD countries. *Country Note, Key Findings from PISA 2015 for the United States* (OECD, 2017e) revealed the following important facts related to the financial literacy of U.S. students. First, 1,486 students were assessed in financial literacy as part of the PISA battery of tests. Second, U.S. students scored around the average of the 10 OECD

countries, with China students scoring the highest and Brazil students scoring the lowest. Third, about 10% of students scored at the level of proficiency, while 21% scored at the lowest level. Fourth, about 53% of students have a bank account, and 42% of those with an account scored higher than those who did not have an account. Fifth, about 70% of financial literacy performance correlates to skills that are assessed in math or reading assessments. Sixth, 23% of students were either foreign-born or had foreign-born parents. Seventh, immigrant students who did not speak the assessment language at home scored 17 points lower than immigrant students who did speak the assessment language at home. Eighth, there is not a national policy to teach financial education to high-school students; the decision to teach financial education is left to individual states and, in some cases, to individual districts. The *PISA 2015 Results* (OECD, 2017g) also presented information relevant to this discussion, with findings showing that students who discuss money matters with their parents tend to have a higher level of financial literacy. On the one hand, financially literate students are likely to earn a university degree and eventually work in a high-skill occupation.

Increased financial literacy in high-school students is essential for several reasons. First, students encounter unique experiences as they go through high school. For the most part, this is when they form social meanings and realties, but it is also the time when young people start earning and managing money without parental control. So, too, it is when students make short- and long-term financial decisions (Danes et al., 2013). Second, societal factors significantly influence this need. According to Angulo-Ruiz and Pergelova (2013), such factors underlining the importance of financial literacy of high-school students include the economic downturns and their influence in society as a whole, the decrease in the personal

savings rate, the overdependence on credit, and the difficult process that young adults experience in achieving financial independence. Third, the *PISA 2015 Results* (OECD, 2017g) recognized societal trends that demand greater financial literacy, such as the dwindling of both public and private welfare systems, the growing aging population in various countries, and the proliferation of and sophistication of financial services. Fourth, student debt plays an increasingly determinative role in the lives of students in the United States. Friedman (2018) shared some dispiriting statistics related to this problem, finding that the amount of student debt has reached an outstanding $1.5 trillion, second only to mortgages in terms of consumer debt. About seven in 10 college graduates in the class of 2015 graduated with student-loan debt, and the average debt of a student in the class of 2016 reached $37,172.

According to the *Survey of the States* (2018), financial literacy in the United States has increased over the last twenty years. The council conducting this biennial survey of the states assesses financial literacy in America, and since the first survey was conducted in 1998, there has been significant progress, although that progress has slowed recently. One challenge is that the quality of instruction varies from state to state. The Center for Financial Literacy at Champlain College, in its *2017 National Report Card on State Efforts to Improve Financial Literacy in High Schools*, evaluated benchmarks related to financial literacy and assigned a grade to each state (Pelletier, 2013). When evaluating degrees of success within the states, these researchers focused on the number of hours of instruction, the types of courses offered, and the requirements for graduation.

Five states received an A grade: Alabama, Missouri, Tennessee, Utah, and Virginia. Of these, only Utah received an A+. This grade was based on the

requirement that every student takes a half-year course dedicated to financial literacy, in addition to sitting for a state assessment at the end of the course. Teachers are also required to hold a special financial literacy endorsement, and the state also provides tools, resources, and professional development opportunities. Eleven states received an F grade. Alaska, California, Connecticut, Delaware, the District of Columbia (treated as a state), Hawaii, Massachusetts, Pennsylvania, Rhode Island, South Dakota, and Wisconsin received this lowest mark because students in these states can graduate from high school with very little or no financial literacy education.

In a similar vein, the *Country Note, Key Findings from PISA 2015 for the United States* (OECD, 2017e) explained how the lack of direction from some states in implementing state standards is critical to increasing financial literacy in the United States. Numerous states allow districts to implement various levels of financial education, instead of enforcing the standardization of financial literacy information. Furthermore, national standards for teaching financial literacy in the K–12 system are still being developed. The Jump$tart Coalition for Personal Financial Literacy devised the 2015 edition of the *National Standards in K–12 Personal Finance Education* to assist school districts and educators in teaching financial literacy (Jump$tart Coalition, n.d.). These standards were created to teach students in an incremental way in kindergarten, fourth grade, eighth grade, and twelfth grade, and they emphasize issues such as spending and saving, credit and debt, employment and income, investing, risk management and insurance, and final decision-making. These areas of emphasis come with knowledge statements and benchmarks to develop students' financial literacy. In conclusion, while research indicates substantial progress in increasing financial literacy in high-school students, individual states

must increase the standardization of financial literacy education so that all students can enjoy the same access to and quality of instruction.

The *PISA 2015 Results* (OECD, 2017g), looking at the financial literacy of 15-year-olds, compared results from fifteen participating countries. The assessment assigned five levels of proficiency, and students' and countries' scores fell into one of these levels. The lowest level, level 1, assessed basic literacy skills; level 2 was the baseline; and level 5 contained the most difficult items in financial literacy. Those nations receiving the highest scores were China, Belgium, and Canada, while Brazil and Peru received the lowest scores. The *Country Note, Beijing-Shanghai-Jiangsu-Guangdong (China;* OECD, 2017a) demonstrated that fewer than 10% of students fail to reach the baseline level of proficiency in financial literacy. Conversely, 33% of students scored at level 5, the highest score of the assessment. Students at this highest level can perform sophisticated mathematical operations, such as analyzing complex financial products, answering non-routine financial problems, and demonstrating an understanding of difficult financial problems. The results from this study revealed that 78% of Chinese students discussed money matters with their parents at least once a month.

Results from other countries are enlightening. The *Country Note, Canada* (OECD, 2017b) indicated that around 22% of students scored at the proficient level for financial literacy, and 13% of students did not achieve the baseline level of proficiency. Note, too, that in Canada, 78% percent of students had a bank account. The *Country Note, Russian Federation* (OECD, 2017d) showed that 11% percent of students did not reach the baseline for financial literacy; but, conversely, 11% of Russian students scored at the highest level of financial literacy. Meanwhile, in terms

of underperforming countries, the *Country Note, Brazil* (OECD, 2017b) showed that 53% of students scored lower than the baseline level, which was the highest percentage of any of the fifteen countries that participated in the PISA 2015 study. Furthermore, only 3% of students scored at the highest level of proficiency. For purposes of comparison, in the United States, 22% of students failed to reach the baseline of financial literacy, and only 10% scored at the proficiency level of financial literacy (OECD, 2017e).

Analyzing the financial literacy of Latino students means closely contemplating the influence and relevance of the Latino student population in the United States. Gandara (2017) revealed important statistics that make this topic of paramount importance. Latinos now comprise 17.6% of the U.S. population and 25% of the student population in the United States. The National Center for Education Statistics estimates that by 2023, more than half the student population in the United States will be of Latino descent. Currently, Latinos account for more than half the student population in three states, California, New Mexico, and Texas.

Williams et al. (2011) emphasized several of the key issues relevant to assessing and improving financial literacy in Latino students. First, it is more difficult for students who speak another language at home to interact with the products and services of the financial landscape. Second, those students from immigrant backgrounds who achieve significant financial literacy proficiency are better able to integrate into their country of residency and, by default, they are able to take advantage of all of the benefits afforded to those who manage and understand financial products and services. Third, low-income families tend to be unbanked; by not having the benefit of such services, they often receive higher-interest loans and

become vulnerable to predatory behaviors. Fourth, students from low-income and minority families often lack financial role models who can provide them with positive financial guidance and support.

When it comes to the lives of students, the *PISA 2015 Results* (OECD, 2017g) identified various topics related to the influence of being an immigrant. The results of this assessment showed that countries with a lower percentage of students from immigrant backgrounds performed better than those countries with a higher percentage of students from immigrant backgrounds. Having an immigrant background is significant in Australia, Canada, and the United States; in each of these countries, one in five students who took the assessment had an immigrant background. In addition, when assessing financial literacy, on average and across all countries that participated in the study, immigrant students scored 26 points lower than native-born students of the same socioeconomic status. These are just some of the challenges Hispanic students face in their efforts to become more financially literate.

In light of the literature discussed above and the demonstrated significance and salience of the topic, four research questions were generated to direct the present study:

1. What is the level of financial literacy in Latino youth?
2. What is the level of financial literacy by math proficiency level in Latino youth?
3. In Latino youth, does the level of financial literacy differ between boys and girls?
4. Among youth in the United States, does the level of financial literacy differ

by race/ethnicity?

Method

Design

This study employed a cross-sectional design (Mann, 2003), with archival data drawn from PISA 2015 Results (OECD, 2017g). The unit of analysis was individual students, and examined variables included (a) gender (a binomial grouping variable), (b) race/ethnicity (a multinomial grouping variable), (c) math proficiency level (ordinal variable), (d) financial literacy proficiency level (ordinal variable), and (e) financial literacy (a continuous variable).

Before the data analysis was conducted, a power analysis for an independent samples *t*-test was performed. The Cohen's *d* effect size for the power calculation was drawn from the main analysis reported by Förster et al. (2017). An a priori power analysis using G*Power 3.1.9.2 (Faul et al., 2009) was performed. The following input parameters were used: (a) test family = *t* tests, (b) statistical test = means: difference between two dependent means (matched pairs), (c) type of power analysis = a priori: compute required sample size - given α, power, and effect size, (d) two-tailed, (e) $d = 0.27$, (f) power ($1 - \beta$ err probability) = 0.95, (g) allocation ratio N2/N1 = 1, and (h) $\alpha = .05$. The G*Power 3.1 output contained a sample size of 110 and an actual power of 0.80.

Participants

The 2015 PISA assessment included 540,000 students, and around 48,000 students were assessed in financial literacy. The United States collected subnational-level data in financial literacy for two states. The difference in performance between Massachusetts and North Carolina was 28 points, with Massachusetts scoring above

the national average by 36 points. In the United States, 5,712 students completed the PISA 2015 assessment; of these, 1,486 students were assessed in financial literacy. These 1,486 students form the population for the present study, where 50% of the participants were female and 50% were male. The ethnic breakdown of the participants was as follows: 45% White, 13% Black, 30% Hispanic, 4% Asian, 1% percent other, and 6% more than one race.

Measures

Gender. Gender was item ST004 on the Student Common Part Questionnaire-English (OECD, 2017f) . Students were asked to respond to the prompt "Are you a female or male?," and they were offered the following options: female ST004Q01TA01 or male ST004Q001TA02.

Race/ethnicity. Race was item ST802 on the Student Common Part Questionnaire-English (OECD, 2017f) Students were asked to respond to the prompt, "Which of these categories best describes your race?," and they were offered the following options: White ST802A01NA01, Black or African American ST802A02NA01, Asian ST802A03NA01, American Indian or Alaska Native ST802A05NA01, and Native Hawaiian or Other Pacific Islander ST802A05NA01. In addition, item ST801 asked students to respond to the prompt "Which best describes you?" and offered them either "I am Hispanic or Latino" ST801A01NA01 or "I am not Hispanic or Latino" ST801A01NA01.

Financial literacy. The financial literacy assessment was a one-hour computer-based test comprised of 43 items. The assessment included items in the following four content categories: money and transactions, financial landscape, risk and reward, and planning and managing finances. In addition, items offered one of

four processes—analyze information in a financial context, evaluate financial issues, identify financial information, and apply financial knowledge and understanding—while including the contexts of home and family, society, individual, and education and work. Students' responses were either constructed response (expert and manual), complex multiple choice, or simple multiple choice. The scale for financial literacy was created in 2012. It has a standardization to an Organisation for Economic Co-operation and Development (OECD) mean of 500 and a standard deviation of 100 (using an equally weighted, pooled database). PISA 2012 scaled score = ((L-0.2554)/ 1.0731) x 100 + 500 OECD (2012) technical report. The U.S. distribution of student performance in financial literacy was as follows. The mean score was 487, SD =108, and SE =3.8. For the state of Massachusetts, the mean score was 523, SD =103, and SE = 6.7, and for the state of North Carolina, the mean score was 496, SD =104, and SE = 5.5.

Financial literacy proficiency level. Based on strong statistical principles, the single continuous scale of financial literacy for the PISA 2015 assessment was divided into five levels. Level one included scores under 400. Level two (the baseline) included scores from 401 to 475. Level three included scores from 476 to 550. Level four included scores from 551 to 625. Level five included scores above 626, an accomplishment reserved for students who could complete the most difficult items in the financial literacy domain. Across the 10 OECD countries, only about 12% of students, on average, were proficient at level five, and across the 10 OECD countries, about 22% of students, on average, performed below the baseline. At each level, students needed to be proficient at the preceding level, as well.

Apparatus

The International Data Explorer (IDE) is a web-based application implemented by the U.S. National Center for Education Statistics (NCES). This interactive online tool allows users to access large-scale education studies, such as the Program for International Student Assessment (PISA), the Progress in International Reading Literacy Study (PIRLS), the Trends in International Mathematics and Science Study (TIMSS), the Program for the International Assessment of Adult Competencies (PIAAC), and the Teaching and Learning International Survey (TALIS). So, too, does the IDE contain information from the following PISA administration cycles: 2000, 2003, 2006, 2009, 2012, and 2015, with reading, mathematics, and science literacy having been assessed in each of these cycles, and with problem-solving and financial literacy having been assessed in selected cycles. The IDE allows researchers to choose criteria by identifying measure(s), year(s), and jurisdiction(s), and it also allows scholars to select variables from various categories and subcategories. Furthermore, the application allows users the opportunity to edit and build reports.

Procedures

The financial literacy assessment was designed as a one-hour computer-based exam comprised of 43 questions. The assessment was structured into units, where items shared a common stimulus. The financially focused stimulus materials included prose, diagrams, tables, charts, and illustrations. The items utilized two types of questions: constructed-response items, which required students to generate their own answers, and selected-response items, which required students to choose one or more alternatives from options provided. The financial literacy assessment

included items in the four content categories, the four processes, and the four contexts. The content categories included money and transactions, financial landscape, risk and reward, and planning and managing finances. The four process categories included the abilities to analyze information in a financial context, to evaluate financial issues, to identify financial information, and to apply financial knowledge and understanding, while the four context categories included home and family, societal, individual, and education and work.

Data Analysis

For the first two research statistics, the following demographic information is reported: mean, standard deviation, and skewness. For the third research question (gender differences), a *t*-test for independent groups was used. For the fourth research question (race/ethnicity differences), a one-way ANOVA was employed. If the ANOVA is significant, post hoc tests were conducted using Bonferroni adjusted alpha levels. Aside from the post hoc tests, the alpha level was .05. All analyses were conducted using SPSS 25.

Results

The first research question was aimed at determining the level of financial literacy among Latino youth. Descriptive analysis was used to address this research question. The results showed that the mean financial literacy score of Latino youth is 463.31 with a standard deviation of 102.11. The minimum and maximum financial literacy scores among Latino youth are 105.01 and 802.36, respectively. The skewness (Statistic = .01, *SE* = .06) and kurtosis (Statistic = -.01, *SE* = .12) values indicate that financial literacy score is normally distributed among the Latino youth sample.

The second research question focused on examining whether the level of financial literacy among Latino youth differed by levels of mathematics proficiency. Based on PISA 2015 conceptualization of mathematics proficiency levels, seven levels of proficiency were created. The number of students (n = 6) in the upper most level (i.e., level 6) was too small and therefore levels 4 and 5 were merged into one level. A one-way ANOVA was conducted to compare if mean levels of financial literacy differed by mathematics proficiency levels. Table 1 presents mean and standard deviations for financial literacy by math proficiency levels. The ANOVA results are summarized in Table 2. The results indicated that there was a statistically significant difference among the 6 proficiency levels, $F(5, 1755) = 402.03$, $p = .000$). The pairwise comparisons for the main effect of math proficiency levels corrected using Bonferroni adjustments are presented in Table 3. The table indicates that the significant main effect of math proficiency on financial literacy is reflective of significant differences between each pair of proficiency levels. This suggests that students' mathematics proficiency levels are associated with their financial literacy. Overall, the table indicates that as proficiency levels increase so does financial literacy levels.

The third research question was aimed at determining whether there was a statistically significant difference between female and male Latino youth in financial literacy. To address this question, an independent samples *t*-test was employed. Table 4 presents mean and standard deviations for financial literacy for both female and male students. The analysis results indicated that there was a significant difference with a small effect in financial literacy between female and male Latino youth. More specifically, female students reported statistically significantly lower (*M*

= 468.27, *SD* = 106.21) than male students (*M* = 458.74, *SD* = 98.01); *t*(1759) = -1.96, *p* = .05.

The last research question was concerned with whether there were statistically significant differences in financial literacy levels by race/ethnicity of U.S. youth. A one-way ANOVA was conducted to compare if mean levels of financial literacy differed by race/ethnicity. Table 5 presents mean and standard deviations for financial literacy by race/ethnicity. The ANOVA results are summarized in Table 6. The results indicated that there was a statistically significant effect of race/ethnicity on financial literacy *F*(5, 5648) = 168.25, *p* = .000). The pairwise comparisons for the main effect of race/ethnicity on financial literacy corrected using Bonferroni adjustments are presented in Table 7. The table indicates that the significant main effect of race/ethnicity on financial literacy reflects significant differences between each race/ethnicity pair in a large number of pairwise comparisons. Hispanic students scored significantly higher than Black or African American and lower than White, Asian, and multicultural students, but did not differ significantly from "other" racial ethnic group. White students scored significantly higher than any race/ethnicity except Asians. The results suggest that race/ethnicity may partly explain variability in financial literacy.

Discussion

The main objective of this study was to increase our knowledge of financial literacy among Latino youth. In particular, the study examined financial literacy, how math literacy is related to financial literacy, and gender and race/ethnicity differences in financial literacy. To address these research questions different

analytic tools were utilized. In what follows, the results of the analyses are discussed in conjunction with previous literature.

In reference to the first research question (financial literacy level), two possible reasons for the obtained results should be considered. One possible explanation for the obtained results is that the levels of financial literacy among different Latino populations yield average results, obscuring subpopulations where the literacy lags (Greenfield, 2015; Sprow, 2013; Williams et al., 2011). Another possible reason for the results on the level of financial literacy among Latino youth is that nationwide there is not a standardized system to implement, teach, and evaluate the effectiveness of financial literacy education in this country (Beck & Garris, 2019; Hite, Slocombe, Railsback & Miller, 2011; Maier, Figart, & Nelson, 2014; Walstad et al., 2017). In considering the former and the latter, the latter is more applicable to this discussion because of the lack of standardization of financial literacy education, which impacts the financial literacy among Latino youth.

With regard to the second research question (math proficiency & financial literacy), two probable explanations for the findings exist. The first explanation is that performance in mathematics has a positive correlation to financial literacy proficiency (Attard, 2018; Cameron et al., 2014; Fernández Carazo & Brey Sánchez, 2012). An alternative explanation is that financial literacy education has to be based on the implementation of math skills that are relevant to students and based on real-life financial experiences and opportunities (Crawford & Wiest, 2011; Ferrari, 2007). Between these two explanations, the most probable is the first due to the overwhelming evidence supporting this argument.

Turning to the third research question (gender differences), one reason for this difference is that males and females view money and finances differently (Cera & Tuzi, 2019; Fonseca et al., 2012; Niederle & Vesterlund, 2007). This is consistent with literature that suggests that females tend to have fewer opportunities for financial education or financial transaction experience (Bucher-Koenen, Lusardi, Alessie, & Van Rooji, 2017; Chen & Volpe, 2002; Clark et al., 2018; Moon et al., 2014). This last statement demonstrates the differences between males and females. Another probable explanation is the influence that the home environment plays in the development of financial literacy in both genders – specifically, the relevant and prevalent discussions around finances involving males (Agnew & Cameron-Agnew, 2015). The first explanation is more plausible in this case because a multitude of studies have demonstrated that males and females view money and finances differently.

Concerning the fourth (financial literacy differences by race/ethnicity), this result may be explained by studies that demonstrate that Whites have a greater understanding of financial literacy than minorities (Al-Bahrani, Weathers, & Patel, 2019; Chen & Volpe 2002; Greenfield, 2015). The pair-wise comparison results suggest that race/ethnicity may be an important predictor of financial literacy. Another possible reason is that Latinos tend to have less access to financial services and experiences with financial products (McKernan, Ratcliffe, Steuerle & Zhang, 2013; Rhine & Greene, 2006). Between the former and the latter, the former possesses great explanatory sway because financial information is readily accessible to individuals of the mainstream culture, whereas low income minority populations usually do not have access to the same level of financial services and information.

When considering the results of this study, three limitations should be kept in mind. First, there was a significant difference with a small effect in financial literacy between female and male Latino youth. This slight difference does not have a significant impact, nor is it substantial enough to influence any practical applications. Second, the PISA 2015 assessment of financial literacy is a cross-sectional study. As such, we do not know how financial literacy develops over time among Latino youth and how math literacy contributes to the development of financial literacy. Thus, longitudinal studies are needed. Third, Hispanic/Latino populations in the United States are not a homogenous group. They represent the fourth largest concentration of Spanish speaking populations in the world after Mexico, Colombia, and Spain. They tend to identify themselves by national ancestry and usually are very connected to the customs and traditions of their country of origin. Furthermore, Latinos have different levels of acculturation, which plays a significant role in their responses to both the dominant culture and their own cultural background (Arreola, 2004).

Two implications for school counselor practice emerge from the results of this study. First, school counselors play an integral part of the social/emotional development of students. A key skill to share with students is the ability to manage their finances successfully. This process is particularly important for high school seniors, as they are confronted with the financial aid process and the reality of joining the workforce (Greenfield, 2015). Second, school counselors that service the needs of Hispanic students need to develop culturally responsive school counseling strategies and skills to be able to better serve the needs of this growing population (Smith-Adcock, Daniels, Lee, Villalba, & Indelicato, 2006).

Two implications for research are suggested by the obtained results. First, further studies need to include a larger sample of students from a greater number of states in the nation that have a high percentage of Hispanic students. Second, further consideration has to be afforded to the cultural differences of Hispanics in the United States when analyzing this topic, since not all Latinos possess the same characteristics. Studies could focus on the financial literacy of new immigrant students and their struggles as they maneuver the acculturation process. Other studies could focus on the financial literacy of Latinas from upper income households and compare their levels of financial literacy with that of Latinas in the inner city.

The results for the first research question can be found in Table 1, with results for the second research question appearing in Table 2. In terms of the third research question, female students achieved higher math-anxiety scores ($\overline{x} = 20$, $SD = 4.2$) than their male counterparts ($\overline{x} = 17$, $SD = 1.3$), $t(2) = 1.23$, $p = .09$. Regarding the fourth research question, the obtained results were significant: $F(2,26) = 8.76$, $p = .012$. The post hoc pairwise comparisons that were significant included Hispanic and Black and Hispanic and White.

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Table 1

Descriptive Statistics for Financial Literacy Math Proficiency Levels

Proficiency Level	N	Mean	SD
Below Level 1	229	344.31	75.66
Level 1	417	408.05	72.29
Level 2	504	461.11	69.38
Level 3	383	518.31	64.66
Level 4	178	586.35	68.09
Level 5+	50	632.14	69.34

Table 2

One-Way Analysis of Variance of Financial Literacy by Math Proficiency Levels

Source	SS	Df	MS	F	Sig.
Between Groups	9797134.95	5	1959426.99	402.03	.000
Within Groups	8553460.44	1755	4873.77		
Total	396363455.50	1761			

Table 3

Pairwise Comparison of the Effect of Math Proficiency Levels on Financial Literacy

Proficiency Level (I)	Proficiency Level (J)	Mean Difference (I-J)	SE	Sig	95% Confidence Interval	
					LB	UB
Below Level 1	Level1	-63.73*	5.74	.00	-80.61	-46.86
	Level2	-116.79*	5.56	.00	-133.14	-100.44
	Level3	-174.00*	5.83	.00	-191.14	-156.86
	Level4	-242.03*	6.98	.00	-262.54	-221.53
	Level5+	-287.83*	10.90	.00	-319.86	-255.80
Level1	Below Level 1	63.73*	5.74	.00	46.86	80.61
	Level2	-53.06*	4.62	.00	-66.64	-39.47
	Level3	-110.27*	4.94	.00	-124.79	-95.74
	Level4	-178.30*	6.25	.00	-196.67	-159.93
	Level5+	-224.09*	10.45	.00	-254.80	-193.38
Level2	Below Level 1	116.79*	5.56	.00	100.44	133.14
	Level1	53.06*	4.62	.00	39.47	66.64
	Level3	-57.21*	4.73	.00	-71.12	-43.30
	Level4	-125.24*	6.09	.00	-143.13	-107.35
	Level5+	-171.04*	10.35	.00	-201.46	-140.61
Level3	Below Level 1	174.00*	5.83	.00	156.86	191.14
	Level1	110.27*	4.94	.00	95.74	124.79
	Level2	57.21*	4.73	.00	43.30	71.12
	Level4	-68.04*	6.33	.00	-86.65	-49.42
	Level5+	-113.83*	10.50	.00	-144.68	-82.97
Level4	Below Level 1	242.03*	6.98	.00	221.53	262.54
	Level1	178.30*	6.25	.00	159.93	196.67
	Level2	125.24*	6.09	.00	107.35	143.13
	Level3	68.04*	6.33	.00	49.42	86.65
	Level5+	-45.79*	11.17	.00	-78.63	-12.95
Level5+	Below Level 1	287.83*	10.90	.00	255.80	319.86
	Level1	224.09*	10.45	.00	193.38	254.80
	Level2	171.04*	10.35	.00	140.61	201.46
	Level3	113.83*	10.50	.00	82.97	144.68
	Level4	45.79*	11.17	.00	12.95	78.63

Note. SE = standard error; Sig = significance; LB = lower bound, UB = upper bound.

Table 1

Descriptive Statistics for Financial Literacy Gender

Group	N	Mean	SD
Female	916.00	458.74	98.01
Male	845.00	468.27	106.21

Table 5

Descriptive Statistics for Financial Literacy Math Proficiency Levels

Race/Ethnicity	N	Mean	SD
White	2498	524.81	99.54
Black or African American	790	420.69	94.85
Hispanic	1761	463.31	102.11
Asian	207	523.38	105.71
Multiracial	336	491.52	101.75
Other	62	442.99	100.21
USA	5712	487.46	107.45

Table 6

One-Way Analysis of Variance of Financial Literacy Race/Ethnicity

Source	SS	Df	MS	F	Sig.
Between Groups	8426300.34	5	1685260.07	168.25	.000
Within Groups	56573510.42	5648	10016.57		
Total	1412469657.00	5654			

Table 7

Pairwise Comparison of the Effect of Race/Ethnicity on Financial Literacy

Race/Ethnicity (I)	Race/Ethnicity (J)	Mean Difference (I-J)	SE	Sig	95% Confidence Interval	
					LB	UB
White	Black or AA	104.12*	4.09	.00	92.13	116.12
	Hispanic	61.50*	3.11	.00	52.36	70.65
	Asian	1.44	7.24	1.00	-19.82	22.69
	Multiracial	33.29*	5.82	.00	16.22	50.37
	Other	81.82*	12.87	.00	44.04	119.61
Black or AA	White	-104.12*	4.09	.00	-116.12	-92.13
	Hispanic	-42.62*	4.29	.00	-55.20	-30.03
	Asian	-102.68*	7.81	.00	-125.63	-79.74
	Multiracial	-70.83*	6.52	.00	-89.97	-51.69
	Other	-22.30	13.20	1.00	-61.06	16.46
Hispanic	White	-61.50*	3.11	.00	-70.65	-52.36
	Black or AA	42.62*	4.29	.00	30.03	55.20
	Asian	-60.07*	7.35	.00	-81.66	-38.47
	Multiracial	-28.21*	5.96	.00	-45.70	-10.71
	Other	20.32	12.93	1.00	-17.66	58.29
Asian	White	-1.44	7.24	1.00	-22.69	19.82
	Black or AA	102.68*	7.81	.00	79.74	125.63
	Hispanic	60.07*	7.35	.00	38.47	81.66
	Multiracial	31.86*	8.84	.00	5.89	57.82
	Other	80.38*	14.49	.00	37.84	122.93
Multiracial	White	-33.29*	5.82	.00	-50.37	-16.22
	Black or AA	70.83*	6.52	.00	51.69	89.97
	Hispanic	28.21*	5.96	.00	10.71	45.70
	Asian	-31.86*	8.84	.00	-57.82	-5.89
	Other	48.53*	13.83	.01	7.91	89.15
Other	White	-81.82*	12.87	.00	-119.61	-44.04
	Black or AA	22.30	13.20	1.00	-16.46	61.06
	Hispanic	-20.32	12.93	1.00	-58.29	17.66
	Asian	-80.38*	14.49	.00	-122.93	-37.84
	Multiracial	-48.53*	13.83	.01	-89.15	-7.91

Note. SE = standard error; Sig = significance; LB = lower bound, UB

Chapter 4: A General Conclusion

A General Conclusion

There is limited information in the literature that targets math anxiety and financial literacy of Latino Students in the United States. Studies have addressed math anxiety primarily among pre-service teachers and in elementary school-age students. Some studies around the world have addressed math anxiety with high school age students. Financial literacy studies do not address race/ethnicity as a factor. The lack of studies that address Latino students creates a significant gap in the literature that needs to be addressed in light of the growth of Latinos in the K-12 population. This chapter will address findings, relationships, and next steps for the present studies. First, a brief summary of the two manuscripts will be presented. This will include the findings, limitations, discussion, and recommendations. Second, thematic links will also be presented including similarities and differences among the manuscripts and contributions to the literature. Finally, an agenda for future research will include expounding the topics discussed in this dissertation, and identifying opportunities to share these findings with the school counseling community.

Summary of the Findings

The following studies fulfill a need in the fields of secondary Latino math anxiety and Latino students' financial literacy. The first study, entitled, "Math Anxiety in Latino Students: Analysis of the PISA 2012 Results," used descriptive statistical methods. The following outcomes were gathered as a result of this analysis. First, the findings indicated that Latino youth reported a mean math anxiety level that was similar to the overall American average. Second, an ANOVA test was used to determine if there was a statistically significant difference in math anxiety among students of different math proficiency levels. The results indicated that

students in the lowest two levels did not differ from each other in terms of math anxiety nor did the students in the two highest levels. The results also demonstrated that as the proficiency levels increase, the level of math anxiety decreased. Third, an independent sample *t*-test was used to determine if gender differences in math anxiety occur among Latino youth. The results demonstrated that female Latino youth report statistically and significantly higher math anxiety than their male counterparts. Finally, a pairwise comparison was used to determine whether math anxiety differed by the race/ethnicity of American youth. The findings showed that race/ethnicity is not a factor that explains variability in math anxiety, and that race/ethnicity may not be an important predictor of math anxiety.

Further research on the first manuscript should include a greater number of participants from various regions of the United States to provide more accurate results of the influence of math anxiety in Hispanic students. Moreover, studies must consider the fact that Hispanics in the United States are not a homogenous group, but a combination of various cultures that represent different countries. In addition, students also have various levels of acculturation and second language acquisition. These have a significant influence in the development of math anxiety including affective variables that have significant impact in the academic development of students.

The second study, "Financial Literacy in U.S. Latino Youth: Analysis of the PISA 2015 Data," also applied descriptive statistics. The following results came out of this analysis. First, regarding the level of financial literacy among Latino youth, it was determined that the financial literacy scores are normally distributed among Latinos. Second, a one-way ANOVA test was used to identify whether the level of

financial literacy among Latino youth differed by levels of mathematics proficiency. The results demonstrated that there was a statistically significant difference among the proficiency levels. In addition, it was determined that students' mathematics proficiency levels are associated with their financial literacy and that as math proficiency levels increase, so do the financial literacy levels. Third, an independent samples *t*-test was used to determine whether there was a statistically significant difference between female and male Latino youth in financial literacy. The results demonstrated that there was a marginally statistically significant difference. Specifically, female students reported a lower statistically significant difference than males. Finally, a one-way ANOVA was used to determine if there were statistically significant differences in financial literacy levels by the race/ethnicity of U.S. youth. The results indicated that there was a statistically significant effect of race/ethnicity on financial literacy. Hispanic students scored significantly higher than Black or African American and lower than White, Asian, and multicultural students. The results also suggested that race/ethnicity may partly explain variability in financial literacy.

Further research on the second manuscript should include longitudinal studies that identify how financial literacy develops over time among Latino youth and how math literacy contributes to the development of financial literacy. In addition, consideration needs to be made regarding the fact that Hispanic/Latino populations in the United States are not a homogenous group, and as such, cannot be treated and identified as a single cultural group but as a combination of cultural backgrounds and levels of acculturation.

Limitations

The two studies employed in this study, the PISA 2012–Math Anxiety (ANXMAT) and the PISA 2015 Financial Literacy Assessments, are both cross-sectional studies and, as such, have their own limitations. Some of these limitations are inherent to cross-sectional studies. Mann (2003) expounded some of these restraints. Inherently, one of the challenges is to differentiate cause and effect from simple association. As it relates to these studies, there is no specific information regarding the causes of math anxiety or financial literacy in Latino secondary students in the United States, nor is there any information about the development of financial literacy in the Latino population. Longitudinal studies need to be conducted to gather as much information about these topics and their influence in the Latino population. According to Mann, another limitation is the lack of explanation for the findings. These limitations provide an accurate understanding of these challenges to the Latino community. Considering the relevancy in the areas of Latino student participation in the STEM fields, it is extremely important to gather more information to be able to accurately understand the causes and effects of both math anxiety and financial literacy in the Latino student population of the United States.

Regarding the limitation of external validity, Bracht and Glass (1968) highlighted the importance of external validity. One of the threats to external validity is population validity, which plays an important role in the interpretation of these studies. Some of the factors to consider are the following. One, studies that target Latino students need to include participants from various areas of the United States, particularly from states where the Latino population is significant. Two, the rich diversity within the Latino population has to be considered. Latinos comprise

individuals from different backgrounds and even cultural perspectives. Upper middle-class Cuban Americans are lumped together with unaccompanied minors that just arrived in this country and are struggling to learn the language. Three, both studies assessed 15-year-old students in order to get a more accurate picture of both math anxiety and financial literacy; other ages need to be considered and assessed. In summary, there are various limitations that occur as a result of the utilization of cross-sectional studies such as the PISA studies, and these limitations need to be considered when the results are interpreted and when the results are utilized to make recommendations to the school systems, researchers, and policymakers.

Thematic Links

Manuscripts one and two both utilized cross-sectional research design and gathered data from the various countries that participated in the PISA assessment. Math anxiety was included in the 2012 administration and financial literacy was included in the 2015 administration. Research questions from both manuscripts considered gender and racial differences, as well as the levels of financial literacy and math anxiety by math proficiency in Latino youth, and the levels of both math anxiety and financial literacy. For the math anxiety manuscript, a power analysis for a dependent-samples *t*-test was performed to ascertain a required minimum sample size. For the financial literacy manuscript, a power analysis for an independent samples *t*-test was performed. For both manuscripts, the following input parameters were used: (a) test family = *t* tests, (b) statistical test = means: difference between two dependent mea1ns (matched pairs), (c) type of power analysis = a priori: compute required sample size - given α, power, and effect size, (d) two-tailed, (e) $d = 0.27$, (f)

power (1 − β err probability) = 0.95, (g) allocation ratio N2/N1 = 1, and (h) α = .05. The G*Power 3.1 output contained a sample size of 110 and an actual power of 0.80.

Differences in the input parameters for the math anxiety manuscript included (a) d = 0.49, (b) power (1 − β err probability) = 0.80, (c) allocation ratio N2/N1 = 1, and (d) α = .05. The G*Power 3.1 output contained a sample size of 35 and an actual power of 0.80, and for the financial literacy manuscript (a) d = 0.27, (b) power (1 − β err probability) = 0.95, (c) allocation ratio N2/N1 = 1, and (d) α = .05. The G*Power 3.1 output contained a sample size of 110 and an actual power of 0.80.

Contribution to the Literature

These two studies contribute to the literature in multiple ways. First, there is, at the time of this publication, no academic literature that addresses math anxiety and financial literacy in secondary school Latino students in the United States. The information gathered through the math anxiety manuscript provides a platform to share these issues and provides an opportunity for researchers, educators, and policymakers to support the academic development of Latinos in this country. This information can be utilized by teacher education programs since there are plenty of studies that highlight the prevalence of math anxiety in college students participating in the teaching preparation programs. In addition, this information allows teachers and school district personnel to understand the need to support Latinos and other students who experience math anxiety in school. Furthermore, the participation of Latinos in the STEM fields can be increased if math anxiety is acknowledged and remediated in Latino students. The financial literacy manuscript's contribution to the literature challenges researchers to understand societal challenges and affective variables that affect the Latino community and Latino students in particular. Another

contribution could be offering financial literacy education to both Latino students and parents to promote college saving, the completion of the Free Application for Federal Student Aid (FAFSA), and the non-dependence of student loans and other predatory lending practices.

Research Agenda

This process has given me the opportunity to gain insights into the research process, its applicability, and its value to the different disciplines studied. This opportunity will be an asset since I am committed to continue researching populations of color, particularly as it relates to the school K-12 school system. Several themes that are related to this research agenda are: motivation, college access, college and career readiness, STEM readiness and support, barriers to success, high school completion, mental health, immigration, acculturation, social justice, and multiculturalism, among others.

As a former high school counselor and current high school administrator, I have witnessed and experienced challenges related to the themes outlined in the preceding paragraph, and I am committed to supporting the needs of all students particularly those of color since they often come to school with societal deficits that White students do not experience. Understanding these challenges and seeking research-based remediation is the key to successfully support some of the obstacles that affect students of color. As a future professor in the field of school counselor education, I will use my position to encourage, inspire, and challenge future school counselors to support the needs of all students but, in particular, the needs of students of color. As a university professor, I am planning on presenting information related

to my research agenda at conferences and to school districts and organizations that are interested in increasing the success of students of color.

Considering the relationship between the research agenda and this dissertation, this process has provided me with the foundation to expand my skills in both content and methodology. The two manuscripts are aligned with my research interests and are opportunities to expand in my understanding of these topics and to expose me to further research methodologies. The two manuscripts utilized data from the PISA study in both the 2012 and 2015 administrations. While this method of gathering data was useful, in the future I would like to become more familiar with other research methodologies to be able to gather data and present information to the different audiences with greater confidence in the results and to be able to make recommendations with a greater level of understanding. Specifically, I would like to approach research questions from other perspectives such as through longitudinal studies.

Regarding the content of the manuscripts, I would like to continue to expand my understanding of both topics. I want to further explore math anxiety in Latino students, focus more on the cause and effect of this phenomena, and identify strategies and supports to remedy this situation. I would like to partner with teacher preparation programs at local universities or with school districts that would like to decrease math anxiety in Latino students to further increase their math proficiency scores.

Concerning the financial literacy manuscript, I would like to partner with curriculum development organizations and with small districts to develop and implement financial literacy curriculum to increase the financial literacy of Latino

students. Since California is one of the states that does not require high school students to take a financial literacy course as a requirement for graduation, working with smaller districts will provide me with the necessary data to try to make a change at the state level.

This process has certainly provided me with some challenges, while at the same time it has opened my eyes to the meaningful steps to gather data and present the findings. I am looking forward to continuing this professional growth as I transition to a new chapter of my professional career.

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Appendix

Appendix A: IRB Determination of Non-Human Subjects

Oregon State University
Research Office

Human Research Protection Program
& Institutional Review Board
B308 Kerr Administration Bldg, Corvallis OR 97331
(541) 737-8008
IRB@oregonstate.edu
http://research.oregonstate.edu/irb

Date of Notification	April 11, 2019	Study Number	IRB-2019-0127
Notification Type	Oversight Determination		
Principal Investigator	Cass Dykeman		
Study Team Members	Guerrero, Ernesto R		
Study Title	Math Anxiety and Financial Literacy in Latino Youth: A Secondary Analysis of the Public PISA 2012 and 2015 Data Sets		
Funding Source	None	Cayuse Number	N/A

DETERMINATION: RESEARCH, BUT NO HUMAN SUBJECTS

It has been determined that your project, as submitted, does meet the definition of research but **does not** involve human subjects under the regulations set forth by the Department of Health and Human Services 45 CFR 46 because the dataset will be publicly available, pre-existing, and de-identified.

Additional review is not required for this study.

Please do not include HRPP contact information on any of your study materials.

Note that amendments to this project may impact this determination. Please submit a *new* request if there are changes (e.g., funding, data sources, access to individual identifiers, interaction with research subjects, etc.).

The federal definitions and guidance used to make this determination may be found at the following link: Human Subject