Dissertations   Theses and Dissertations

2018

Examining the Experiences of Latinx Stem Baccalaureates

Marlene Chavez
Loyola University Chicago

LOYOLA UNIVERSITY CHICAGO

EXAMINING THE EXPERIENCES OF LATINX STEM BACCALAUREATES

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE GRADUATE SCHOOL OF EDUCATION

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF EDUCATION

PROGRAM IN CURRICULUM AND INSTRUCTION

BY

MARLENE CHAVEZ

CHICAGO, ILLINOIS

MAY 2018

ACKNOWLEDGEMENTS

I want to acknowledge the people that encouraged and supported me throughout this arduous dissertation process. First, I have to thank my mother, who was and still is my rock. Any time I doubted myself, she would remind me to keep trying. Writing this dissertation was extremely challenging. But any time I felt like the mountain was too high, I thought of her raw, but encouraging words, "No seas cobarde, sigue." "Don't be a coward. Keep going." Education was very important to her and she instilled in me a high regard for it.

To my dissertation chair, Dr. Aurora Chang, I thank you for your high standards and encouragement. You held high expectations during this dissertation process and helped me realize what I am capable of achieving. You are a role model. Words cannot express my gratitude. To my committee members, and also role models, Dr. Yvonne El-Ashmawi and Dr. Blanca Torres-Olave, I thank you both for your incredible insight on Latinx education attainment. I am grateful for your feedback and support. I was so blessed to have a team of highly, intellectual and accomplished women. It was an honor to have you on my committee.

To my father, and my siblings, thank you for always encouraging me and listening to 'dissertation talk'. There was never a moment when I felt like you could not understand me. Thank you for your love and support.

I want to thank my husband, Gabriel. I can't imagine getting through this entire doctoral process without your love and support. You stood by me every step of the way. I started this journey when we were not even engaged, and now, here we are five years later, preparing for the next steps after this dissertation. When it came time to write my last two chapters and we had to make a difficult decision so that I could dedicate my time to finish my dissertation, you stood by me and encouraged me to do what I needed to accomplish this very important work.

I also want to thank my friend, Dr. Ingrid Colon, for her positivity and guidance. Thank you. You were my cheerleader throughout this entire process. Si se puede! Another person that stood by my corner and checked in with me every week, actually more like several times a week, was Dr. Katie Lakasky. Thank you, Katie for being my writing partner. I don't know how I would've gotten through this experience without your support and feedback. Also, Elwanda, thank you for listening to me and cheering me on. Yari, thank you for your encouraging words and for helping me recruit participants. This definitely felt like a community effort.

Thank you to my 10 Latinx participants who participated and shared their stories of commitment and determination to complete STEM. I am so grateful for your stories and resilience, also for your time in helping me accomplish this dissertation.

DEDICATION

I dedicate this dissertation to my mother; my rock.

TABLE OF CONTENTS

APPENDIX

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Examining the Experiences of Latinx STEM Baccalaureates is a qualitative

research study of Latinx who graduated with a bachelor's degree in an area of Science,

Technology, Engineering, and Math (STEM). The purpose of this dissertation was to

learn about the experiences of Latinx who have attained a STEM degree at a four-year

university. This study holds implications for educational institutions, policymakers, and

educational researchers that serve Latinx populations. More importantly, this dissertation

will share the voices and knowledge of Latinx that have attained STEM.

This dissertation examined the following questions: What are the undergraduate

educational experiences of Latinx students who major in STEM? What factors impact

Latinx students' decision to pursue STEM degrees? What factors drive Latinx students'

persistence in STEM? How do various forms of capital, specifically those identified in

Yosso's (2005) theory of Community Cultural Wealth, impact Latinx STEM

undergraduates in their pursuit of a STEM degree?

The design methods, rooted in Latino critical theory and Community Cultural

Wealth, included: (1) semi-structured interviews of ten Latinx participants that graduated

with a STEM degree and (2) data analysis that focused on students' challenges as well as

the cultural assets they identified and applied in attaining STEM.

CHAPTER I

INTRODUCTION TO THE STUDY

Even at a time in U.S. and world history, when formal sanctions of slavery and

Jim Crow have long since ended, there are still deeply ingrained social realities

that disallow certain populations of students to reach their full capacity to learn.

The question is: why? (Milner, 2010, p. 4)

Currently, the Latinx population of the United States is 56.6 million, which is

17.6% of the nation's population and the largest racial/ethnic group in the country

(United States Census Bureau, 2016). While they represent the fastest growing

racial/ethnic group in the United States, Latinx tend to have higher instances of living in

poverty and the lowest educational attainment of any racial or ethnic group (Burtless,

1990; Darder & Torres, 2014; Levy, 1995; Villalpando, 2004). Latinx have a desire to

improve their lives (Murrillo, 2010; San Miguel & Kim, 2015), but race, ancestry,

nativity, and citizenship are all major factors that impact their opportunities to advance

socially and economically (Hout, 2015; Massey, 2010; Solorzano & Yosso, 2002;

Sanchez, 1997). A particular challenge to opportunities include Latinx representation in

Science, Technology, Engineering, and Math, (STEM). This issue has been examined by

previous research studies that have utilized quantitative methods, with a focus on

amplifying student failure and deficits (Harper & Newman, 2010), instead of describing

the experiences of Latinx.

1

Previous research on educational attainment of Students of Color (SOC), including Latinx, has mainly focused on academic deficits (Elliott, Strenta, Adair, Matier, & Scott, 1996; Landale, Oropesa, & Noah, 2017; Portes & Rumbaut, 2006) using quantitative data to draw conclusions. Quantitative studies point to a lack of capital, college preparation and low socioeconomic status as the main culprits in Latinx attrition from STEM (Beasley, & Fischer, 2012; Bonous-Hammarth, 2000; Ro, Knight, & Loya, 2016). Latinx begin college with the intention to major in STEM, but enter with less exposure to college preparatory and Advanced Placement courses in high school than their White and Asian peers. Limited exposure to college preparatory classes has been linked to socioeconomic status (SES) (Rogers-Chapman, 2014) and tracking and ability grouping (Kao & Thompson, 2003; Mueller, Reigle-Crumb, Schiller, Wilkinson, & Frank, 2010). In addition, literature shows that efforts have been made to improve enrollment and retention with a focus on persistence (Gonzalez & Morrison, 2016). However, much of the research on persistence has been on general students, using quantitative methods, rather than a qualitative examination of STEM majors, particularly Latinx students. There is limited evidence regarding the role of student motivations and social support on college outcomes for SOC first-generation college students (Dennis, Phinney, & Chuateco, 2005) and even less for Latinx. Latinx culture is comprised of multilayered identities within the group that are rooted in life experiences as Americans, immigrants, bilingual, and gender (Castellanos & Jones, 2004; Hernandez-Truyol, 1997; Núñez, 2013; Trucios-Haynes, 2000) therefore, it is important to take a qualitative approach to the Latinx STEM experience as well as to encourage their perspective and

voice. Qualitative approaches can emancipate and empower Latinx (Delgado Bernal, 2018).

Students of Color (SOC) deserve equal access to STEM professions, and our entire society benefits when they can serve as role models for younger members of their racial/ethnic groups (Grandy, 1998). Through this qualitative study, I focused on Latinx experiences completing a degree in STEM, including the meaning they made of their experiences, and their unique voice. In the following section of this chapter, I provide an overview of the social, political, and economic context that situate and condition the educational attainment and pursuit of STEM for Latinx. Then, I discuss Latinx' access and specific challenges to higher education, followed by the importance of STEM for Latinx.

Social and Political Context

Inequalities

Segregation. Racialized inequalities within education have influenced the lives of Latinx students, as they are more likely to attend segregated schools by race and class (Noguera, 2006; Orfield & Eaton, 1996). Race is a social concept and a means to classify people that can shift and develop in light of historical and cultural contexts (Clark, 2017). In the widely known case of 1954, *Brown v. Board of Education of Topeka, Kansas,* African Americans argued for equal educational opportunities for all, no matter race or color. But it was *Mendez v. Westminster* (1946) in which a federal court ruled "separate but equal" to be unequal, the predecessor to *Brown* (Gandara & Contreras, 2010). This case challenged the rejection of Mexican children in White schools in

Orange County, California. Mexican parents believed that education was the key to upward mobility for their children (Strum, 2014) and therefore challenged the school system. This case eventually was taken to federal court, and now I will discuss events that led to *Mendez v. Westminster*.

In 1935, an amendment was made to an 1885 California Law that gave school districts the authority to create separate schools for Native American, Chinese, Japanese or Mongolian children. However, Mexican children were not mentioned and in 1929 the California attorney general issued an advisory that the law did not cover Mexicans and therefore no separate schools should be organized for them (Gandara & Contreras, 2010). Mexican children were eventually provided separate "Mexican" schools, but parents challenged the remedial curriculum their children were given, such as gardening, carpentry, sewing, and other low paying trades that tracked students. Garcia, Yosso, and Barajas (2012) documented the pervasiveness of racism in the United States from 1900 to 1940 to demonstrate how education has been used as a tool of systematic subordination of Mexicans in California. Curricula within segregated schools consisted of tracking Mexicans into domestic and labor roles. In California and the entire Southwest, schools facilitated the "reproduction of a cheap labor force and the marginalization of Mexican communities" (Garcia et al., 2012).

Segregation of Latinx continued as was shown in *Lau v. Nichols* of 1974. The courts ruled that the San Francisco system violated the Civil Rights of 1964 by excluding non-English speaking Chinese children from an education (Martinez & Woods, 2007). This case suggested educating all bilingual children, including Latinx that at the time

were also being excluded because of language. However, this ruling did not end

segregation. Latinx continue to attend schools separated from their Black and White

counterparts (Lee & Klugman, 2013), with unequal resources and few opportunities for

advancement.

According to Gandara and Contreras (2010) approximately half of all Latinx

students in Texas and California attend highly segregated (90% or more) and high

poverty schools. The rationale for segregating Latinx has been language, as the lack of

proficient English skills has portrayed Latinx deficient (Gandara & Contreras,

2010). Most Latinx students today are Native born, and this population is growing at a

faster rate than Latinx immigrant communities (Gandara & Contreras, 2010) and so

educational attainment no longer can be attributed simply to language barriers as it was in

the past. Instead, it is the result of circumstances in our country, including the limiting of

access to opportunities based on color and class (Milner, 2010).

Resurgence of nativism. Hostility toward racial groups is heightened when

marginalized peoples and immigrants are identifiable and "fit established racial

categories in the 'American psyche'" (Sanchez, 1997, p. 1013). Whether recent

immigrants or American born, Latinx have been the target of racism and nativism. For

example, accessing education to achieve a better life has been more difficult for Latinx in

the United States compared to the early European immigrants of the early 20th century,

and currently amongst other ethnic groups (Sanchez, 1997). The early Europeans gave up

many of their traditions and culture to assimilate, but eventually reaped the benefits of

education. Whether or not they assimilate, Latinx experience inequities that persist

aggravated by racism and nativism. Kouyoumdjian, Guzman, Garcia, and Talavera-Bustillos (2017) argue that while research has shown that the general experience of second-generation college students, compared to their first-generation counterparts is most likely filled with less challenges, this is not the case for Latinx. The resurgence of a nativism, unparalleled to that of the early 20th century has negatively impacted education and social mobility for Latinx (Sanchez, 1997). Despite increasing college enrollment, both first and second-generation Latinx students are dropping out at higher rates than any other ethnic groups in the United States (Borus, Crowley, Rumberger, Santos, & Shapiro, 1980; Fry & Taylor, 2012).

Cultural hegemony. Education has served as both access to a better life and to reproduce a highly-stratified society aimed at ensuring the political and cultural hegemony of the dominant group and socioeconomic subordination of Latinx (San Miguel & Kim, 2015; Michelson, 2003; Fernandez-Kelly & Schauffler, 1996; Oboler, 1995). Whites are a part of a dominant group in the United States that has been associated with privileges whose status has been favored over others within societal hierarchies. The dominant group tells a majoritarian story of Latinx, which include the following: (1) Latina/o students are generally 'urban'; (2) Latina/o students are academically deficient; and (3) Latina/o students speak Spanish, are bilingual and/or are ELLs (Chang, 2017, p. 243). These stories "distort and silence the experiences of People of Color" (p. 243).

The dominant group is viewed as demonstrating the 'cultural orientation' needed to succeed (Kao & Thompson, 2003) and therefore assimilation is pushed on Latinx and

other Students of Color. Classic assimilation perspective implies that as immigrants spend time in United States they learn English and become familiar with the dominant culture (Johnson, 1997). The idea is that the native-born majority eventually become more accepting and thus, full integration can occur (Landale et al., 2017; Lichter, Ziliak, García, & Schmalzbauer, 2017). In more recent years, an opponent to affirmative action, Linda Chavez has advocated for a "new theory" of assimilation and argued that Latinx could reach equal status as past White immigrants, of the early 20th century, if they adopted American values, culture, and language. However, it is not that simple and actually impossible, as phenotypes, surnames and culture are discriminated against in the United States (Landale et al., 2017; Michelson, 2003). The intersection of racial/ethnicity and generational status create different educational experiences (Lutz, 2007) for Latinx.

Affirmative action. To address educational inequalities, the civil rights movement of the 1960's was responsible for integration of all students, and for affirmative action (Martinez & Woods, 2007), in which SOC and Women were afforded the full extent of participation as their White, male counterparts (Horowitz, 1987; Tierney, 1997; Wright, 1990). There were alternatives, of course, such as traditionally Black institutions or women's colleges. However, segregated institutions that served Black students, included limited resources and less rigorous curriculum. African Americans, Hispanics, Asian and Pacific Islanders, and Native Americans, including women, have always been included as target populations of affirmative action). Affirmative action does not simply recognize or identify discrimination, instead it calls

for plans that create change (Tierney, 1997). Tierney compares affirmative action to equal opportunity:

> Equal opportunity is based on the assumption that the world will work in a fair and just manner and that an organization is not systemically racist or sexist. Individuals might act unjustly, but the system is basically fair. Affirmative action is based on the opposite assumption: In order to have a just world, we must develop systemic plans. Institutional structures impede action.
>
> (p. 172)

Affirmative action has proven beneficial to Latinx and Black students, however opponents of the policy claim that it treats Whites unfairly and is a form of "reverse racism." Lawsuits such as *Regents of the University of California v. Bakke (1978), Gratz v. Bollinger* (2003) and *Grutter v. Bollinger (2003)* have challenged the validity of affirmative action, arguing against the consideration of race in college admissions. According to Martinez and Woods (2007), these "post-*Brown* rulings have jeopardized many universities' affirmative action programs and subsequently impeded many African Americans' and Hispanics' chances for educational advancement" (p. 32). More recently, *Fisher v. University of Texas* (2015) fought against affirmative action in which the case reached the Supreme Court twice. Although judges ruled in favor of affirmative action, these battles demonstrate the constant threat to higher education for Latinx and other Students of Color. Next, we will look at the impact of the economy on Latinx in the United States.

Economic Context

Latinos and African-Americans with master's degrees earn nearly the same in their lifetimes—roughly $2.5 million—as white workers who have bachelor's degrees. (Burnsed, 2011, p. 1)

Latinx and the Labor Market

Earning a bachelor's degree becomes critical for Latinx and other SOC. Studies have looked at the labor market and poverty levels of Latinx as factors that have impacted their educational attainment, but Gradin (2012) has pointed to "specific characteristics" of the families in which they live. According to Gradin, one characteristic in particular is that Latinx are mostly immigrants who arrived in the United States after the 1980's from Latin America, especially Mexico, settling mainly in southern and eastern states of the country. Due to their status as immigrants, Gradin claimed that Latinx and in general, "minorities, are more likely to live in the poorest areas, have more children, live in single-mother families, work fewer hours and be employed in low-paid occupations" (p. 3795). Large families, living in poverty, and low educational levels are viewed as the main reasons for Latinx have not reached economic parity with Whites and other ethnic groups. However, Gradin's study dismisses the economic disparities that have influenced educational attainment for Latinx, many who are from immigrant families that were not able to recover from downturns in the economy.

Tienda (1995) examined trends in Latinx economics and American social inequality of the 1970's and 80's. While earning growths slowed, inequality rose

between 1974 and 1979. Latinx household income declined and stayed stagnant from 1972 to 1992. White family incomes increased nearly 10% over the same two-decade period, whereas Black and Latinx family incomes actually decreased 2% and 7%, respectively (Tienda, 1995). In turn, child poverty increased for Latinx, as it stood at 40% in 1992. Possible reasons for this point to structural changes in job demands, such skills-based labor that have affect Latinx workers. Tienda argued that while technical reports pointed out the trends in income and poverty, they did not make recommendations to prevent or reverse the inequities experienced by Latinx. The failure of the economy to recover in the late 1980's to reduce poverty significantly impacted Latinx.

In 2008, the Great Recession had profound effects on the American population, and Latinx suffered even more than other racial/ethnic groups. Immigrant populations had higher rates of unemployment, lower wages, and higher poverty rates (Vesely, Goodman, Ewaida, & Kearney, 2015). Many Latinx immigrant families did not receive the necessary resources they needed to thrive (Dolan, 2016) both financially and in education. After the Great Recession, many opportunities were terminated with the closure of industrialized manufacturing companies (Ayala, 2012).

According to Correa and Giron (2013), eight percent of Mexican immigrants are entrepreneurs, but they were greatly affected during the Great Recession due to debt-deflation. These financial constraints were difficult for Latinx families to recover from. The loss of jobs, increased economic pressure and hardships, which in turn impacted the educational system. Lower family income and poverty influence the schools Latinx attend, thus, impacting Latinx youth's opportunities for educational attainment

(Arellanes, Viramontez Anguiano, & Lohman, 2017). Education is consequential (Kingston, Hubbard, Lapp, Schroeder, & Wilson, 2003) and can open many doors for Latinx. Still, since the Great Recession, the U.S. labor market has changed with the need for a skilled labor force, in which there is a growing number of Latinx with the potential to fulfill future professions that require the specialized skills of today's and the future economy. But Latinx have not been able to access higher education as they have been segregated from other racial groups and usually live in areas that lack access to quality jobs and education (Ayala, 2012). The next section discusses the challenges Latinx face in accessing higher education.

Challenges to Higher Education for Latinx

There has been some improvement between educational and occupational disparities for some racial/ethnic groups, while others, including Latinx have lagged behind **(**Ayala, 2012; Perry, Martinez, Morris, Link, & Leukefeld, 2016). Anti-immigrant, anti-affirmative action, and anti-bilingual education policies have posed broader socio-historical and political obstacles for Latinx postsecondary opportunities (Núñez, 2013).

Latinx Aspirations

Since the 1960's, the United States has experienced an influx of immigrants from Mexico, Latin America and Asia (Portes & Fernandez-Kelly, 2008). According to Massey (2011), "Among all foreigners living in the United States in 2009, 54% were from Latin America and 27% came from Asia, compared with just 12% from Europe. Mexico alone accounted for about a third of all immigrants present in the

nation" (p. 1288). Many immigrants seek greater opportunities; employment (Cooper, 1996) and access to education (Hill & Torres, 2010; Reese, 2002) are major factors in deciding to immigrate to the United States. Attending college is often the initial step for first-generation students (children of immigrants) to achieve a higher social and economic status (Lubrano, 2003). An education, in particular, a college degree can provide access to "high-status careers that offer increased income levels, autonomy and political power" (Rios-Aguilar & Kiyama, 2012; Schueths & Carranza, 2012; Quintana, Vogel, & Ybarra, 1991). In 2016, the National Center for Education Statistics (NCES) reported, from 2003 to 2013, the total college enrollment rate for Hispanic 18- to 24-year-olds increased from 23% to 34%. At the bachelor's degree level, the number of degrees conferred to Hispanic students more than doubled between academic years 2002-03 and 2012-13 (a 110% increase, from 89,000 to 187,000). These numbers indicate the importance of education to Latinx people. However, enrollment has been the focus of many studies, rather than completion of STEM degrees for Latinx. College enrollments for Latinx have increased, but completion rates have not (Bordes-Edgar, Arredondo, Kurpius, & Rund, 2011; Gandara & Contreras, 2009).

Latinx parents living in this country and those that come to the United States want their children to have a better life (Azmitia & Brown, 2002), and they want them to go beyond a high school education (Goldenberg, Gallimore, Reese, & Garnier, 2001). While Latinx parents may have high aspirations for their children, the reality of the Latinx student trajectory to college has been examined and found to be "leaky".

The Chicana/o Pipeline

First coined by Sólorzano, the Chicana/o Pipeline (Sólorzano, Villalpando & Oseguera, 2005) has been used to present the (a) educational realities of Mexicans and other Latinx groups, (b) demonstrate a predictable pattern of educational outcomes, (c) and make recommendations for policy makers in transforming the educational attainment of Latinx (Covarrubias, 2011). One trend in the pipeline is how Latinx are often excluded from college preparatory classes through tracking (Kao & Thompson, 2003). The lack of resources, overcrowding, high student-to-teacher ratio have been used to justify tracking of Latinx and other SOC (Yosso; 2006; Valencia, Menchaca, & Donato, 2002; Oakes, 1985). Such practices keep Latinx from the path toward higher education.

Examining the Chicana/o pipeline. A bachelor's degree can help Latinx learn important skills and become more marketable. However, Latinx tend to drop out of college at higher rates than other racial/ethnic groups (Swail, Cabrera, & Lee, 2004) and only one-third of Latinx enroll in a four-year university. Using Census data from 2009, Covarrubias (2011) examined the education outcomes of Chicana/os. He found that 44% of Chicana/os are pushed out of the educational pipeline before they can complete a high school diploma. Of the 56% students who do graduate high school, 27% enroll in school, including community college and others in 4-year universities. Of the 27% that go on to college, 5% end their educational track with an associate's degree, whereas 10% attain a bachelor's degree. Of the 10% of Latinx baccalaureates, only two earn a graduate or professional degree, and 2% complete a doctorate. Covarrubias claimed this was an improvement compared to 2000 Census data that was examined by Solorzano and Yosso

(2002). Nonetheless, these numbers indicate the need to examine the Latinx experience in higher education to understand their experiences in attaining STEM degrees.

Particular structures, including educational institutions impact the aspirations of Latinx. One study was completed in the state of Montana to examine the development of a program designed to help Latinx bridge the gap between the dream of college and living in rural Montana (Kevane & Schmalzbauer, 2016). According to Kevane and Schmalzbauer, the state of Montana was chosen for the study as it has a rising Latinx population, but is also one of the "whitest states" in the United States; in other words, it has very little diversity. The authors found that many Latinx students and their parents highly value education and perceive college as a major key to upward mobility, however, they do not have support in high school. In the study, school guidance counselors shared that simply pushing an application was enough in encouraging Latinx to apply for college. This lack of encouragement is an example of what McIntosh (2015) described as resistance from Whites: "resistance comes from a pervasive and intractable lack of trust by white society regarding the worth, abilities and deservedness of people who are not white" (p. 238). Students of Color are not taught in schools to be able to name privilege systems that thwart their educational aspirations and if they were taught to do so, it would blow away the American idea of "meritocracy" or the "myth that everyone gets what they deserve" (p. 238). Pew Hispanic Center data showed that in 2000, 28% of Latinx high school students dropped out of high school, whereas in 2011 the dropout rate was half that at 14%, Latinx continue to experience obstacles to complete four-year university degrees (Fry & Taylor, 2013).

Cultural and Social Capital

Human capital theory asserts that education increases an individual's marketability and earning potential (Kingston et al., 2003). Attending college enhances individual skills and ability, and education can be a vehicle for social mobility and overall well-being. Cultural and social capital are commonly used in college access research to demonstrate how students acquire or lack opportunities to completing every step of the college pipeline (Welton & Martinez, 2014). Cultural capital theory is based on the premise that the capital of White middle-class students and their families are the standard for academic success and the pursuit of college opportunities (Bourdieu, 1977; Welton & Martinez, 2014). Bourdieu (1977) argued that the educational system produces a culture that reflect the dominant culture of society that use a pedagogy that require initial familiarity with the dominant culture. In addition, academic success often require a predisposed cultural competence gained through family upbringing (Cole & Espinoza, 2008).

Social capital entails college access through social agents via social networks (i.e., social connections) (Bourdieu, 1977; Lin, 2001; Stanton-Salazar, 2001; Welton & Martinez, 2014). Many Latinx students have not been exposed to middle-class, White culture and may not have social connections, especially if their parents did not attend college. As a result, emphasis is often placed on Latinx students and their families for reasons of underachievement, rather than underlying challenges, including racism and unequal educational access (Ochoa, 2016; Sanchez, 1997).

The argument for cultural and social capital dismiss the assets that Latinx bring to school (Welton & Martinez, 2014; Yosso, 2005). Valenzuela's (1999) theory of subtractive assimilation, argued that schools subtract resources from Latinx youth in two major ways. First, schools devalue the notion of education that Latinx groups hold. Second, schools dismiss the assets and culture Latinx bring to school. Thus, making it appear that Latinx have cultural and social deficits.

According to García and Guerra (2004), deficit approaches to education begin with overgeneralizations about family background and are exacerbated by a limited framework to interpret how individuals perceive parental involvement and support. Schools most often work from the notion that race and the socioeconomic background of SOC has left them lacking the necessary knowledge, social skills, abilities and cultural capital to succeed (see Valenzuela, 1999, as cited in Yosso, 2005). Many of the schools Latinx attend are composed of inexperienced teachers, many who bring preconceived notions of Students of Color and this influences how they teach (Wideen, Mayer-Smith, & Moon, 1998; Sheets, 2005; Sugrue, 1996). Educators most often assume that what they are doing works and that students, parents, and the community need to conform to the system.

In contrast to assimilation and cultural deficit approaches, Landale et al. (2017) propose "ethnic resilience perspective" as an explanation for why Latinx have not conformed to the dominant ideology. Over time, immigrants or marginalized groups notice the upward mobility of certain groups and become aware of stratification (Landale et al., 2017; Portes & Rumbaut, 2006). Despite some improvement of their position over

time, marginalized groups begin to interpret negative experiences in terms of

discrimination (Oropesa & Jensen, 2010) and they notice the disparities. This results in

resisting assimilation as they learn that despite emulating the dominant culture, the idea

of meritocracy is not real. According to Valenzuela (1999), Mexican-American students

feel pressured to assimilate and instead resist the dominant group's ideologies (p. 62), in

which actions to "schooling" and not education are viewed as a lack of interest in

education. This resistance stems from sentiments of a loss sense of culture for Latinx

students, in which they feel that their cultural assets are not valued by educational

systems.

In addition to resisting the dominant culture differences between parental

education, such as the highest level of completion has been explored in the achievement

gap between Latina/o and White college enrollment. For instance, Alon, Domina, and

Tienda (2010) used statistical analysis and simulations to examine Latinas/os' low

postsecondary attendance. Based on three national longitudinal studies, parental

education differences were cited as the most influential factor. According to Alon et al.,

Latinx students have higher chances of succeeding in college, if their parents have more

than an eighth grade or high school diploma.

While deficit-based models attempt to explain and justify the lack of educational

attainment for Latinx, using the argument of cultural capital, instead stratification theory

looks at how Latinx and other marginalized groups are blocked from higher

education. According to Kao and Thompson (2003), students are stratified within

schools according to ability levels, groups or "tracks". Several studies show that poor

children and those belonging to racial/ethnic groups are disproportionately placed in low-ability groups, starting in early grades (Kao & Thompson, 2003). Latinx experience stratification as they are often tracked into lower-level classes (Mueller et al., 2010). Placement in low-ability groups can negatively impact the opportunities (Rogers-Chapman, 2014) for Latinx in attaining STEM because they do not receive exposure to college level courses and Science, Technology, Engineering, and Math (STEM) high schools.

Arguments have even been made for the homogenous grouping of Latinx, including placing Latinx in segregated schools, and also tracking by ability. Lee and Klugman (2013) report on how schools that service high concentrations of Latinx can have positive outcomes as they are able to include more teachers and mentors of the same racial/ethnic background. This is not a helpful source because access to resources are limited, especially in areas of high SOC representation with low SES and these factors influence the outcome of Latinx in STEM (Rogers-Chapman, 2014).

The Importance of STEM for Latinx

As the largest racial/ethnic group in the country, Latinx educational equity and upward mobility are directly intertwined with the fate of the United States (Gandara, 2006; Sanchez, Usinger, & Thornton, 2015; Schueths & Carranza, 2012). To remain competitive in the global market, Americans will have to develop higher-level skills and continually adapt so that they can occupy the new jobs that are created (Sullivan, 2007) and Latinx, in particular, will need to be able to specialize in STEM. Since 2000, underrepresented racial-ethnic groups' graduation rates have flat-lined in engineering and

physical sciences, and their numbers have dropped particularly in mathematics and statistics (Lent, Brown, Fouad & Santana, 2017; NSF, 2015). In 2012-13, the percentage of STEM bachelor's degrees conferred to Asian students (30%) was almost double the average conferred to all students (16%). In contrast, the percentages of bachelor's degrees in STEM fields conferred to Black (11%), Hispanic (14%), American Indian/ Alaska Native (14%), and Pacific Islander students (15%) were lower than the average conferred to all students (NCES, 2016; Santiago & Soliz, 2012). In addition, when SOC declare a STEM major, they are at a greater risk of switching majors (Griffith, 2010) due a lack of support. The failure to support Latinx in attaining higher education in STEM is consequential. STEM occupations can provide Latinx social mobility and that is why this study is necessary in understanding the experiences of Latinx that have completed a STEM degree.

Degrees in STEM fields can yield advantages for Latinx. The Department of Education (2015) examined four years of data on college graduates and found that those with a STEM degree on average earn $65,000 while non-STEM majors earned about $15, 500 less. Students studying science or math are more marketable than other fields as there is a need to fill job positions with people that have STEM skills. In addition, STEM majors are more likely to be employed. It is important to understand the factors that impact Latinx' experiences as STEM majors in order to create a more sustainable path for them.

Increasing STEM Access for Latinx

A report from the National Science Foundation (2016) shows the number of

Latinx freshmen intending to major in Science and Math (S&E) from 1998-2014, and the

number rose from 33.7% to 45.1%, respectively. These numbers support the rising

interest of Latinx in STEM. In response to increasing the representation of

underrepresented groups in STEM majors, many interested in science advancement have

issued recommendations to strengthen the STEM pipeline for Latinx. In 2016, at the U.S.

News STEM Solutions Conference, Executive director for the White House's initiative

on educational excellence for Hispanics, Alejandra Ceja stated that high school

graduation rates had increased and that the next step was to improve college

completion. However, it is still not well understood what factors contribute to the

retention or persistence of STEM majors in college, particularly among Women and

SOC, thus blurring where the focus should be placed in order to improve STEM

persistence (Griffith, 2010). Metcalf (2014) argued that research, policy and program

efforts for addressing the participation of underrepresented populations in STEM have

claimed equity-related goals, yet they rely heavily on the focus of the "pipeline", such as

workforce supply and competitiveness of the United States, dismissing equity of

resources. Intentions to increase retention of Latinx become engrossed in assumptions

about what works, thus the framing of the problem may be counter to equity

goals. Nonetheless, I argue that it is problematic when the young, Latinx population,

eager for social mobility, is underrepresented in STEM.

Many Latinx students tend to enroll in community colleges, two-year programs rather than four-year institutions that can provide advanced degrees in fields that offer more earning potential (Sullivan, 2007). It is critical that we explore how we can help Latinx achieve in attaining STEM. Between the 2000 and 2013, the share of science and engineering (S&E) degrees awarded to Latina/o students increased from 7% to 11% (NSF, 2016), however this number can be significantly improved. The challenges Latinx experience in college while pursuing STEM can be partly addressed by improving and providing more equitable access to more STEM preparation programs in high school. However, existing literature generally discuss how to help Latinx prior to college; we must also look at how to support Latinx who enter college with the intent to complete a STEM degree.

College and STEM Persistence

Some universities have adopted traditional responses to increasing college retention, such as providing special college outreach and transition programs, enhancing academic support services, and recruiting Latino college graduates as mentors and role models (Villalpando, 2004). This approach can be replicated in STEM as Latinx that have graduated with a STEM degree can serve as role models for other Latinx studying STEM. Bonous-Hammarth (2000) sought to understand the factors that influence retention of Science, Engineering, and Math (SME) majors during college and examined socialization and institutional climate. While K-12 experiences and pre-college courses affect long-term retention of SME, the academic setting may also influence persistence. Weidman (1989) suggested that parents, peers, and faculty shape the

perceptions of college students prior to and during school. If students' parent(s) or peers relate negative experiences, this may in turn influence the SME's attitude toward school. Furthermore, Astin (1993) suggested that socialization may provide opportunities to various reference groups that model the skills needed to succeed in college. Knowledge of these recommendations to improving the path to STEM for Latinx can be helpful, but even more so than is learning directly from Latinx STEM baccalaureates.

I propose the following research questions to help address Latinx STEM attainment and they are the following:

1. What are the undergraduate educational experiences of Latinx students who major in STEM?

   a. What factors impact Latinx students' decisions to pursue STEM degrees?

   b. What factors contribute to students' persistence of STEM?

2. How do various forms of capital, specifically those identified in Yosso's (2005) notion of Community Cultural Wealth (CCW), impact Latinx STEM undergraduates in their pursuit of a STEM degree?

Contributions to the Field

Despite efforts on federal and state levels, Latinx continue to be underrepresented in STEM professions. The experiences of Latinx with a STEM degree can reveal the factors that contribute to persistence to completion/graduation (Keels, 2013). Universities may have Latinx organizations, but they need to understand what Latinx have to say about these resources. Without a local understanding of experiences in STEM by Latinx, we will base approaches on assumptions and guesswork. The importance of

this research study is imperative in contributing to the body of knowledge about what is working and how this success can be replicated by other Latinx aspiring to STEM.

During the interviews, Latinx STEM baccalaureates explained many times that they often felt alone in the STEM classroom. For example, they felt like they were rare in biology and engineering classes, and that their classmates were unapproachable. This created a sense that Latinx couldn't ask for help because they would be judged as non-deserving by their peers. Universities can create more welcoming environments and opportunities for students from different races/ethnicities to learn about each other.

To support Latinx in attaining STEM, policy makers need to provide more financial assistance. Many Latinx students are first-generation college students and their parents may not have the monetary resources to pay for college. Grants and other funding have been cut for Latinx and SOC, however, this must be provided in order to create more equity and opportunities for underrepresented groups in STEM.

I also propose that we continue to study Latinx in STEM through a qualitative approach. In order to understand what Latinx experience as both an underrepresented group in STEM and as SOC, I sought to determine their perspectives about their college experience. However, there is a lot more to learn. These perspectives can inform key decision makers in the education system about how to better serve Latinx populations.

Personal Relevance

My experiences with STEM are central to how my positionality as a researcher impacts my epistemology (Takacs, 2002). In the following section, I share my educational experience, as this time in my life fueled my search for understanding the

inequalities I saw in my own experience as a Latina; as a student; and as a science teacher of Latinx students.

I am a Chicana from a working-class family and the third to graduate college. I was born and raised in a predominantly Mexican neighborhood in Chicago, Illinois. My six siblings and I were raised in a neighborhood where two groups could be found: working-class and immigrant families. The working-class in the area typically included a handful of Mexican families, but mainly Polish, Italian, and Puerto-Rican, who had been in the area, most for about a generation. The immigrant families included parents born in Mexico with native-born children.

My father worked while my mother stayed home to take care of the house and kids. My mother was responsible for all matters related to school. My mother's fluency in English and Spanish helped her navigate the school system, in addition to her familiarity with it. She graduated high school in Chicago and her younger siblings attended elementary school in the area. Although my mother did not attend college, she saw it as the key for advancing economically. A high respect for education and a love for learning was fostered by my parents. While my father wasn't as optimistic about the educational opportunities for Latinx in the United States, my mother encouraged my siblings and I to pursue college. She stayed informed and connected with my teachers and looked for opportunities to help my siblings and I to get on the track for college.

High School Experience

I was automatically placed in honors courses when I entered high school, due to achievement scores, with the exception of math. Honors classes were a step above

regular courses, and were supposed to be more rigorous. (I later learned that my achievement scores would've only placed me into regular classes at a magnet or competitive school.) By the end of my freshmen year, I earned both a D in math and in biology. These were two subjects I loathed, at the time. The teachers at my high school taught in lecture style and most had the attitude of 'sink or swim', and there was rarely any support. By sophomore year I realized I needed to focus on preparing for college. I saw how my friends, some that graduated from high school and were not interested in college, or those that dropped out by 11th grade, wound up with stressful jobs that paid minimum wage. They were still dependent on their parents' for financial support. I knew that my parents weren't going to be able to provide for me once I turned 18. With my older sister's and guidance counselor's help, I enrolled in all the Literature/English, history, science and math courses to get on the college track.

My chemistry teacher, Mr. Bokowy made science interesting, as he avoided lecturing, and instead kept lessons active through hands-on labs. He encouraged students to explore and pursue science. I don't remember ever hearing any condescending remarks from him, as I did with the other Caucasian teachers at the school. I also appreciated when he shared advice for college as I only had my older brother, at the time, for a reference. Through Mr. Bokowy's recommendation, I joined a science club for girls that was led by him and the physics teacher, and I attended workshops at the Argonne Laboratories in Illinois. While I enjoyed advanced placement chemistry, I didn't pursue a major in it. I could not envision a career in chemistry. My love for becoming a teacher was greater than my interest in chemistry.

Experience as a First Generation Latinx College Student

The year is 2000. I am a senior at the University of Illinois at Urbana-Champaign. I'm studying with a group of friends, all science or accounting majors. I am the only Latina and education major in the group. As we take a break for snacks and chit-chat, Jaelyn sighs. She complains about how hard she has to work to get into medical school. Then, she turns to me and looks me straight in the eye, "Marlene, your people don't have to work as hard as us. You can earn C's and still get into medical school. Not fair". The rest of the girls nod, then look my way, waiting for a response. I have no response. After three years at UIUC, I have only met one Latinx student pursuing pre-med as a major. No, I'm wrong. I knew of two other Latinx students desiring to become doctors. But they switched majors.

My memories of college are bittersweet. I made lifelong friends that modeled good study habits, but at the same time I experienced many challenges, including intense coursework, blatant racial/ethnic stereotypes, and the loss of good friends. Attending a pre-dominantly, White institution was challenging as I did not have the 'cultural capital' that would've helped me make connections easily with other students, especially those from White, suburban or rural homes. My Chicagoan, urban accent was distinguishable and any time I shared with others I was born and raised in Chicago, the immediate response was "Did you grow up the in ghetto?" followed by, "yeah, but where are you really from? Like Mexico?" When I would vent to my mother, she reminded me of the importance of having pride, cultural pride and the faith that I was as capable of completing college and beyond, if I worked hard. Nonetheless, my dark hair, brown eyes

and Spanish surname immediately set me apart on campus. Anywhere I went, whether to class or lunch, I knew I was the 'other' on campus.

I remember how overwhelmed I felt when I received my first four-page writing assignment. In high school, I was exposed to the literature I needed for college, but I rarely was assigned an essay more than a page in length to complete. While friends went to parties on the weekend, I spent my Friday nights catching up on writing papers. The majority of my friends were other Latinx students and Black students. Most White students spoke to me in class, but never socialized with me outside of the classroom. I thought I was having a challenging experience in college, but my Latinx friends pursuing STEM, dropped out or transferred to community colleges. I once attended a meeting with a friend majoring in STEM that was going to plead for another chance to stay in college. She had received previous warning that she would be dropped from the university, if she did not improve her GPA. I accompanied her to the meeting with the school dean because she was too ashamed to tell her parents and she didn't know how they would be able to help her. I remember being there for moral support, but silently asking myself, what did the university do besides tell her to attend tutoring sessions? I felt powerless and confused as I sat there, even more so, I was furious. My friend and I attended the same high school and so I questioned: Was my high school experience rigorous enough? Did my so-called advanced placement/college prep courses prepare me, us for college? I realized that there wasn't much support on campus for Latinx to persist in college, especially in STEM.

Berta-Ávila (2003) describes the process that many Xicana/Xicanos undergo to break their silence as conscientization, which was first coined by critical theorist, Paolo Freire. I reached a level of conscientization when I realized that my K-12 experience was inadequate and that there was a lack of support in college. This fueled me to question my experience and seek answers as a researcher.

For many, this anger becomes a fire of motivation that "fuels the desire to resist, create change, and continue the fight (J. Cintrón, personal communication, March 10, 2002). Freire (1998) stated that it is understandable to have this anger, but as Xicanas/Xicanos cannot let it get out of control. If the anger controls the situation, then the Xicanas/Xicanos are not allowing room for reflection, possibly demonstrating reactionary as opposed to critical attitudes (Freire, 1998)…… Xicanas/Xicanos cannot process the experiences if they do not reflect. When the anger is processed and let go, Xicanas/Xicanos can come to an understanding of who they are in this world. (p. 123)

As I've reflected on my educational experiences, I learned that something was not right with the education system. It wasn't until I entered the field of teaching that I realized how much I could do to help other Students of Color.

Experience as a Science Teacher

I graduated college with a bachelor's degree in elementary education and an endorsement in middle school language arts in May, 2000. However, I was hired as a middle school science teacher, due to a need at the time, in Chicago Public Schools. I immediately fell in love with teaching science. I eventually completed a master's in

science education and over my tenure as a science teacher, I taught varying levels, from bilingual to regular to gifted bilingual students, as well as different socioeconomic levels. There were some students that had just arrived from Mexico, however, the majority of my students were born in the United States to immigrant families. Even so, my teaching philosophy consisted of the idea that no matter what generational status or language skills my students possessed, they were going to have the educational experience that would influence their decision to pursue college and the major of their choice. It filled me with joy any time students returned years later after middle school to tell me how well they were doing in high school and in science. I experienced how empowering it was to be a teacher and how I could help make a difference.

I did my best to teach and inform my students of the choices they had, however, many would return to share that they transferred or chose not to continue as STEM majors or to persist in college. They found the courses too difficult, especially in STEM areas. Why was history repeating itself?

I recognize my positionality and subjectivity as a researcher. As a person of Latinx ancestry, I have first-hand knowledge of being the target of racial micro-aggressions and I understand what it is like to be a person of color on a PWI. In representing my participants' stories, they can be added to the literature of what people have to say about college; literature that has been dominated for too long by the experiences of Whites.

Research Delimitations

A qualitative approach provided rich data about Latinx student's attainment of a

STEM degree. I wanted to examine what Latinx had to say about their experience

aspiring to STEM. The study included 10 participants, between the ages of 21-40, that

attended a four-year university in the Midwest. I chose to select students, Latinx, age 21

and over, that have graduated with STEM and not students currently studying this area.

The reason for this is that I wanted to examine the experience of students that have

reached the point of graduation in the effort to avoid anything that happened in

between. The main source of data came through two 60-90 minute interviews that were

recorded with participants' formal consent. During the interviews, notes were taken to

record important moments, questions, and additional notes.

Organization of Dissertation

This dissertation is arranged into five sections. Chapter II is organized into two

main parts: The Literature Review and Theoretical Framework. First, the literature

review begins with some context of the persistent unequal education of Latinx and an

overview of the literature that discusses factors that influence Latinx STEM

attainment. The second section of Chapter II provides a description of my theoretical

framework, which draws on Latino critical theory (LatCrit), and Community Cultural

Wealth (CCW) (Yosso, 2005) theory to examine the experiences of Latinx in STEM. I

proposed that a CCW framework can help us understand the assets that Latinx use to

navigate STEM in undergraduate years. Chapter III discusses the research methodology I

chose to apply to this study, including the qualitative method of interviewing, followed

by a description of the participants, setting, and data analysis.

Chapter IV captured profiles of each of the 10 participants, with findings from the

study, including emerging themes and Yosso's (2005) six forms of capital (CCW).

Chapter V discusses the findings, with a section highlighting how the findings were

aligned with my theoretical framework of LatCrit Theory and CCW, and a section on

implications and recommendations.

CHAPTER II

REVIEW OF LITERATURE

In 2010, Latinx made up 16% of the overall U.S. population, but only earned 8%

of STEM degrees (Gándara, 2015; Hernandez, Rana, Alemdar, Rao, & Usselman,

2016). The growth of the Latinx population and their disproportionate representation in

STEM concerned me and influenced my examination of the literature that addresses the

educational attainment of Latinx. In the literature, cultural deficit approaches typically

point to lack of parent involvement, knowledge of college access, financial resources, and

college readiness (Arellano & Padilla, 1996; Kouyoumdjian et al., 2017), overall low

enrollment rates of Latinx in math and science classes (Schneider, Broda, & Burkander,

2013) and college attrition (Hernandez et al., 2016; NSF, 2013; Fry, 2002). Literature

that has addressed attrition of Latinx, has focused on persistence in higher education,

however, at times overlooking structural factors in the context of racial inequality, such

as inequitable access to college level coursework in pre-college years for Latinx. In

addition, many of these studies propose best practices for elementary and secondary

teachers in preparing Latinx for STEM, limiting their focus to pre-college years or

general college enrollment and retention. The literature in this chapter has addressed the

obstacles to educational attainment, showing the research that reinforces a deficit model,

focusing on what these students lack in order to be successful in obtaining bachelor's

degrees in STEM. However, it is important to understand the capitals Latinx utilize to complete college.

The following section is organized into two main parts: The Literature Review and Theoretical Framework. First, the literature review begins with context of the persistent unequal education of Latinx. Then, I discuss an overview of the literature that attempts to explain Latinx cultural challenges in educational attainment. Next, I highlight the structural challenges for Latinx. After, I address studies that have explored the persistence of Latinx undergraduates in STEM. The second section of this chapter provides a description of my theoretical framework, which draws on Latino critical theory (LatCrit) and Community Cultural Wealth (CCW) (Yosso, 2005) theory to examine the experiences of Latinx in STEM. I propose that the CCW framework can help educators understand the assets that Latinx use to successfully navigate STEM in undergraduate years.

<div align="center">

Literature Review

</div>

The Unequal Education of Latinx

According to Darder and Torres (2014), public schools epitomize the notion of meritocracy and equal opportunity. Meritocracy is a Eurocentric perspective that everyone can get what they deserve based primarily on personal merit and how hard they work, regardless of race, class or gender (Delgado Bernal, 2018). This is not the reality of Latinx for the public schools they attend continue to be segregated and unequally funded (Corra, Scott, Carter & Carter, 2011; Covarrubias, 2011; NCES, 2003; Valencia, 2001). Segregation is a result of racism that overtly shaped U.S. social institutions at the

beginning of the twentieth century and continues, although more subtly to impact schools in the twenty-first century (Yosso, 2005). Race is a social construction (Leonardo & Grubb, 2014) that has been used as a basis to segregate SOC from Whites. Two major arguments for segregation include: biological racism, the notion that Whites are more intelligent and capable, and cultural racism, suggesting that SOC, in particular, Black and Latino students do not value education (Leonardo & Grubb, 2014). Several studies have discredited biological reasons for achievement (Delpit, 2012), and now cultural racism has been at the forefront of segregating and limiting resources to children of color, however in a more covert manner compared to open racism of the past (Yosso, 2005).

The "new face of segregation" includes working-class, bilingual Latinx children who are most likely to be segregated from their Black and White counterparts and live in areas with high poverty rates (Darder & Torres, 2014; Lee & Klugman, 2013). Dominant groups often attempt to "legitimate their position via an ideology (or a set of beliefs that explains or justifies some actual or potential social arrangement)" and racism is the ideology that warrants the dominance of one race over another (Solorzano & Yosso, 2002, p. 24). As cited by Goldsmith (2009), in-depth interviews with Whites have shown that they do not value integration with Blacks and Latinx (Bonilla-Silva 2001; Massey & Denton, 1993; Orfield & Eaton, 1996; Renzulli & Evans, 2005).

Latinx educational attainment in higher education has been attributed to two main premises: (1) Latinx lack cultural capital to succeed and (2) persistence. I will examine these two ideas more closely in the following section.

Deficit-Based Approach

Cultural capital. Deficit-based approaches are used by those in power who maintain the idea that groups that lack the characteristics of the dominant group are lacking in cultural capital (Harper & Newman, 2010; Irizarry, 2009; Samuelson & Litzler, 2016). This power is exercised in educational institutions that uphold the value system of the dominant culture with an unequal distribution of resources (Ladson-Billings 2001; Leonardo & Grubb, 2014; Liebman and Sabel 2003; Sleeter 2017). Justification for low Latinx educational achievement often takes on a deficit-based/mind-set approach.

Milner (2010) used "deficit mind-set" as an explanatory lens for analyzing low expectations and the watering down of rigorous curriculum for students. Schools function from the assumption that they must structure ways to help 'disadvantaged' students whose culture, race or class background has left them lacking the knowledge, social skills, abilities and cultural capital (Valenzuela, 1999; Yosso, 2005, p. 70). A leading explanation of deficits has been Bourdieu's concept of social reproduction. This notion is based on cultural capital as the social and cultural resources and habits of the dominant group (White, middle class standards). If a child is not born into a family whose knowledge is deemed as valuable, they can access the knowledge of the middle and upper classes and have the chance for social mobility through formal schooling (Samuelson & Litzler, 2016; Yosso, 2005, p. 70). According to Gaddis (20123

> Cultural capital (social, cultural, economic,) represents the resources that an individual has at her disposal that are valued in the game…… and a field represents the social world within which an individual plays a particular game. In the education field, students are one set of actors whose goal in the game is to meet the standards of teachers in order to move to the next level of the game (i.e., grade level or tier of schooling). To achieve success, students must use the capital they have received from their families, communities, and prior experiences. Proper use of capital typically results in success and positive feedback from teachers and also builds students' confidence…. (p. 2)

The notion of cultural capital suggests Latinx enter school lacking capital. This assertion has been based partly on the lower rates of schooling among the parents of first generation children that contribute to a lack of 'cultural capital' to pass on (Auerbach, 2004; Rice, Lopez, Richardson, & Stinson, 2013). According to Rice et al., 40% of Latinx youth are born into households with parents who did not attain a high school diploma, compared to 4% of White children. However, Rice et al. presented an argument that dismisses the assets Latinx and other children of color bring to school (Yosso, 2005). It is necessary to acknowledge the resources Latinx utilize, such as the role of individual agency in Latinx attaining educational opportunities (Giroux, 1983; Núñez, 2013). In this next section, I will analyze factors that impact Latinx' educational attainment.

Family presence. According to Dennis et al. (2005), there is limited evidence regarding the role of student motivations and social support on college outcomes for SOC first-generation college students. In this section I review literature on Latinx student

motivations and social support on college completion. Parental involvement has been considered a key component to better educational outcomes for children (Berger, 1995), including academic performance, higher test scores and lower dropout rates (Christenson & Hurley, 1997; Hoover-Dempsey & Sandler, 1995). However, parental involvement literature usually refer to "parents" in a homogeneous manner, while neglecting the experiences of immigrant parents (Carreón, Drake, & Barton; Ruiz-de-Velasco, 2005) and urban families. In addressing the educational attainment of Latinx, deficit based literature maintain the notion of a disinterest among Latinx families and lack of involvement in academics and higher education. In particular, Hill and Torres (2010) identify parental involvement as a 'cultural misstep' between Latinx parents and schools, due to the differences in how involvement is perceived. Cultural differences are considered as a source of deficiency in parenting (Casanova, 1996; Rios-Aguilar & Kiyama, 2012; Trumbull, Rothstein-Fisch, & Hernandez, 2003) and many Latinx students are children of immigrant parents and/or working class families, and the cultural capital that their parents draw on differs from the forms of capital recognized and valued in the schools (Carreón et al., 2005; Fix & Clewell, 2000).

Carreon et al. (2005) focused on how Latinx immigrant parents in high-poverty urban communities navigated schools to build relationships and participate in their children's schooling. They looked at the Latinx immigrant population because of their rising student representation in the United States. Through the stories of three immigrant, working-class parents, the authors argue that parental engagement should be understood through parents' *presence* in schooling, rather than presence in a formal school setting or

"in more personal, informal spaces, including those created by parents themselves" (p. 466). Latinx parents drew on multiple experiences and their own capital/resources to be engaged in their children's education. Sometimes this engagement included participation in school events, and other times parents' schooling presence was demonstrated in conversations they had with their children or even help with homework (Epstein, 1995; Pizarro, 2005; Trumbull et al., 2003). Latinx parents may not have the social networks or cultural capital of the White, middle class, but they are involved in their children's education.

In addition to parental involvement, parents' educational aspirations have been identified as key predictors of higher educational attainment (Behnke, Piercy & Diversi, 2004; Langenkamp, 2017; Otto & Haller, 1978). Buriel and Cardoza (1988) and Hernandez and Vargas-Lew (1994) found that children's aspirations were strongly tied to achievement across three generations of Latinx mothers and daughters. Although the study focused on gender, the findings are still applicable. Using a qualitative approach, Langenkamp found that Latinx parents were very optimistic about their children's future because of the better educational opportunities they have in the United States compared to what they had back in their homeland. However, high aspirations coupled with cultural traditions, such as high respect for schools and not questioning or challenging the classroom teacher, may leave Latinx with a lack of input in schools. As a result, middle class families attain higher rates of education because they intervene more. This form of intervention entail requesting accommodations for their children in the classroom, and accessing information for college (Lareau, 2011). Langenkamp (2017) suggests that

rather than placing the emphasis on Latinx culture, educational institutions can be more inclusive to racial/ethnic students, such as informing Latinx about, for example the steps for applying and transitioning to college.

Hernandez et al. (2016) studied Latinx parent interest in education, particularly their interest and knowledge of STEM. Fifty-two parents expressed a holistic view of education, such as wanting their children to be good citizens and to pursue college. Parents attended STEM workshops with the interest to learn more about how to help their children. Hernandez et al. even mentioned that Latinx parents expressed an awareness in the lack of "minorities in STEM careers." The interest of Latinx parents in STEM workshops show that rather than make assumptions that Latinx do not care about education, schools can reach out to Latinx families.

A strong attachment to cultural values, regardless of acculturation level (Rueschenberg & Buriel, 1989) has been linked to positive outcomes for Latinx college students, such as academic performance (Gonzales, Germán, Kim, George, Fabrett, Millsap, & Dumka, 2008). According to Morgan Consoli and Llamas (2013), cultural values can be a source that influences resilience. *Familismo* is the cultural value most studied with relation to positive outcomes and it has also has been found to be an important "source of inspiration during adversity, a contributor to academic motivation and self-esteem, and encourages the desire to repay parents for sacrifices made in immigrating to the United States" (Ong, Phinney, & Dennis, 2006; Parra-Cardona, Bulock, Imig, Villaruel, & Gold, 2006). Familismo has also been described as a belief that family is "fundamental and takes precedence over individual needs" (Losada,

Márquez-González, Knight, Yanguas, Sayegh, & Romero-Moreno, 2010) suggesting that, at times, family can impede the path to college.

Structural Factors

A focus on deficits and the achievement gap place too much onus on Latinx students as individuals and not enough attention on why gaps and disparities exist in schools across the country. Opportunity gap, on the other hand, forces us to think about how systems, processes, and institutions are overtly and covertly designed to maintain the status quo and disparities in education (Milner, 2010).

Lack of knowledge of the school environment and procedure for accessing higher education are major challenges for Latinx students (Hill & Torres, 2010; Pstross, Rodriguez, Knopf, & Paris, 2016; Valenzuela, 1999; Yosso, 2005). A significant volume of the literature on SOC educational experiences has focused on the achievement gap between Whites and SOC, only highlighting the "crisis" or differences, but does not address the lack of opportunities or what's not working in schools that serve poor, ethnic communities (Ladson-Billings, 1995). In *The Flat World and Education*, Linda Darling-Hammond (2010) acknowledged five major factors that contribute to inequitable education in the United States. These five factors include: (1) early learning opportunities, (2) socioeconomic status, (3) lack of resources, (4) quality of teachers, and (5) curriculum and factory model school designs. These factors impact students and continue the vicious cycle in which SOC fall behind their White counterparts. In the following section I will examine these factors within the Latinx K-12 experience; their precollege years and how this impacts STEM preparation.

K-12 Latinx STEM Preparation

According to Chang (2014), the underrepresentation of racial/ethnic minorities is not a lack of interest in science, but rather poor degree completion rates. Latinx face many complex challenges to college attendance, including poverty, racism, immigration, language acquisition, and inequitable educational opportunities (Darder & Torres, 2014; Gandara, 2006; Villalpando, 2004; Levy, 1995). In addition, challenges in college completion experienced by undergraduates majoring in Science, Math and Engineering (SME) majors are tied to experiences in K-12 classrooms (Bonous-Hammarth, 2000).

Early learning. Gandara (2006) suggested that to move Latinx students successfully from high school into college, interventions need to be established long before students enter high school or even middle school. Family resources, including parents' educational levels and occupations, home literacy and numeracy proficiency Latinx children acquired prior to kindergarten can affect their later mathematics achievement in elementary and middle school (Lopez, Gallimore, Garnier, & Reese, 2007). Similarly, significant gaps exist in science knowledge at kindergarten between lower and higher SES students, due to a lack of formal exposure to the natural world, and these gaps persist through elementary school (Morgan, Farkas, Hillemeier, & Maczuga, 2016). Latinx tend to have higher instances of living in poverty (Burtless, 1990; Darder & Torres, 2014; Levy, 1995; Villalpando, 2004), with parents that hold low paying jobs. Poor financial circumstances impact access to educational resources in the home that can attribute to literacy and numeracy skills at an early age (Lopez et al., 2007) and students

need strong literacy skills on which to build the foundation for math and science learning (Gandara, 2006).

Latinx students enter school significantly behind their Asian and White peers, and achievement gaps tend to persist over time (Gandara, 2006; Puma, Karweit, Price, Ricciuti, Thompson, & Vaden Kiernan, 1997). Interventions to strengthen the educational pipeline has been evident in the emphasis on preschool. Preschool experiences can expose Latinx children to the skills they need. The creation of head start programs was intended to address the achievement gap between Black, Latinx, low-income and White children (Gandara, 2006). While Latinx showed gains over time from early preschool exposure, they are less likely to be enrolled in preschool (Fuller, Eggers-Piérola, Liang, & Holloway, 1996). Cultural beliefs, such as a concern over the preservation of speaking Spanish are important to Latinx parents. According to Gandara, a lack of preschool exposure can put Latinx at a disadvantage to STEM. However, Fuller et al. argued that the availability of child care and preschool tend to be lower in Latinx communities, thus limiting opportunities to STEM.

Elementary years. As cited by Olszewski-Kubilius, Steenbergen-Hu, Thomson, & Rosen, (2017) longitudinal data over the past 20 years (Rampey, Dion, & Donahue, 2009) suggest that while average scores on both mathematics and reading assessments have generally improved since 1990 for all groups, the gaps between the average scores of Black, Latinx, and low-income students compared to White students and higher income students have stagnated. For example, the Black-White and Latinx-White achievement gaps in both math and reading at the fourth- and eighth-grade levels have

narrowed since the first assessment year for NAEP (1990), however there have been minimal improvements (Hemphill & Vanneman, 2011; NAEP, 2015).

Access to rigorous curriculum continues to be a critical issue for Latino and other SOC. Latinx (and other underrepresented) students are more likely to be assigned to low curriculum tracks independent of their test scores when compared to White students (Arellano & Padilla, 1996; Hill & Torres, 2010). Mathematics courses, particularly algebra continues to be the major gatekeeper to accessing a college preparatory path (Gamoran & Hannigan, 2000; Paul, 2005).

Secondary years. Students decide to major in STEM fields while they are in high school (Maltese & Tai, 2011) and one of the strongest determinants of this choice is interest in STEM subjects, rigorous high school courses, and students' self-efficacy in STEM, which is typically fostered in grades K-12 by classroom teachers (Arredondo & Castillo, 2011; American Council on Education, 2007; Gándara, 2006). Several longitudinal studies suggest that students who persist in SME majors were found to enter college with adequate mathematical and academic preparation (Astin, 1993). Chajewski, Mattern and Shaw (2011) used data taken from NCHMES in 2009 and found that of students who at least took one AP exam, 83.33% enrolled in a four-year university compared to the national rate of 61.60% in 2006. Of students who did not take any AP exams, the percentage of enrollment into a four-year postsecondary institution significantly dropped to 45.45%. Oftentimes, students intend to major in STEM fields and peak by high school, and eventually exit from college or SME (Bonous-Hammarth,

2000). These decisions to exit can be influenced by what happens in the K-12 experience.

Other influential factors in pursuing and completing STEM, include confidence in ability. Sciarra and Whiston (2007) found ability and locus of self-control as significant predictors of students' success and interest in math. These two variables are influenced by exposure to higher-level coursework in high school that influence a student's self-esteem and confidence in their ability to take on college and STEM.

Limited STEM Opportunities

"Science is both racialized and gendered with women and [people of color] being underrepresented and gender structures varying across race/ethnic groups" (Hansen, 2013, p. 215).

Lapayese (2009) contends that global capitalism in the United States has required a highly stratified labor force, in which Latinx have become the "perfect workforce", which include low wages, multi-tasking and willingness to work part-time, but few to no benefits. The classroom is where the stratifying of people begins.

Stratification theory (Rogers-Chapman, 2014) suggests that access to opportunity may be limited to 'the haves' such as schools defined by high socioeconomic status (SES), with low-minority enrollment, that tend to have better access to resources. Affluent parents are more likely to push for AP courses and have their demands met by school districts (Klugman, 2013). Low SES students, many who are SOC, become unable to compete with students that complete several more AP courses; and therefore struggle to gain access to college. Overall, Latinx students are underrepresented in

Advanced Placement classes and are more likely to be placed on a vocational rather than on a college preparatory one, regardless of their academic background (Hill & Torres, 2010). Latinx students are tracked into remedial or vocational programs because they are perceived as lacking language skills, or because they are viewed suitable for labor fields (Flores, 2011). Tracking of students into low-achieving areas contribute to the overall achievement gap between Latinx, White, and Black students (Arellano & Padilla, 1996; Hill & Torres, 2010).

Solórzano and Ornelas (2004) shed light on civil rights cases brought on by SOC in California that argued there was a lack of availability of AP courses at their high school and little encouragement from the high school to enroll in AP courses and exams. Lower expectations of SOC can lead to their underrepresentation in STEM courses in high school, thus impacting preparation into college coursework (Sciarra & Whiston, 2007). Based on data from a school district that had open enrollment for honors and AP courses, Corra et al. (2011) documented the underrepresentation of Black students in advanced high school courses and how it may have less to do with intelligence than social factors. White students, regardless of gender, tend to enroll in advanced academic courses at a higher rate than do Black students (Corra et al., 2011). Data was collected on Black students' enrollment figures, and they were lower than expected based on their average SAT scores. Blacks had not enrolled in AP for reasons other than not feeling competent enough. These findings point to inequities and stereotypes that discourage capable Black students from taking challenging courses. Some research has cited that Black males do not want to appear to be acting

'White' and so they avoid AP courses, however, Harper and Davis (2012) found that Black students don't view success as something 'White', rather SOC can be found supporting each other academically. Harper and Davis point to how 'acting White' can be dismissive of what actually works to support students for success. This study focus can be applied to Latinx students in STEM.

Latinx, many of who are from low-income families, also have limited information about finding financial resources (Ceja, 2004; Hill & Torres, 2010; Lareau, 2015). Federal grant programs, including the Pell Grant and Perkins loan are becoming scarce (Flores, 2011; Perna, 2006) and this can be a major challenge for Latinx in pursuing STEM, let alone a bachelor's degree. In a study completed by Kouyoumdjian et al. (2017), the authors found that Latinx students reported financial struggles, including lack of a job to pay for college and budget cuts that limit financial aid. Pursuing a degree in STEM is expensive, and many students have to commit to massive loans and minimal financial aid. Perna (2006) analyzed the literature on college access and choice. Using College Board data from 2004, Perna found that students received about $122 billion in financial aid from all sources, but students with low family incomes, whose parents have not attended college, including African-Americans, and Hispanics are less likely than other individuals to enroll in college. SOC from low-income families are more likely to have limited knowledge and access to financial aid compared to their White, affluent counterparts. Perna stated that "continued gaps in educational opportunity are primarily due to the inadequacy of existing financial aid programs" (p.100).

Quality of teachers. Higher expectations, challenging assignments, cooperative learning opportunities, high-engagement teaching strategies, and the presence of guidance and counseling programs lead to higher enrollments in advanced level coursework in high school (Brown & Campbell, 2009). In addition, U.S. schools need to place high quality teachers in classrooms, serving vulnerable students (Noguera, 2006), including low-income and diverse student populations. Teacher knowledge and instructional practices promote achievement in students and are most commonly cited as the main ingredients to closing the achievement gap (Battey, 2013). For example, research indicates that effective teachers of Latinx are fully credentialed, have more than adequate training prior to becoming a teacher, and have an average of seven years of teaching experience (Murrillo, 2010). In addition, effective teachers of Latinx students are knowledgeable of the subject matter they teach, create relevant lessons for students, connect to parents and the community, and are knowledgeable about second language learning.

While the research I discussed above provided a brief understanding of effective teachers, existing literature has noted that many teachers bring preconceived notions of students and this influences how teachers learn to teach (Wideen, Mayer-Smith, & Moon, 1998; as cited in Sheets, 2005) thus, disadvantaging SOC. Williams and Lemons-Smith (2009) investigated teacher quality and the underachievement of Latinx and Blacks in science and math subjects. They argue that teacher quality and better instructional practices alone will not close the achievement gap, but rather an equity-focused, culturally relevant pedagogical approach. While schools can hire competent educators,

teachers' views and confidence in their students also impact curriculum choices. To achieve a quality education for SOC, Ladson-Billings (1995) offers culturally relevant pedagogy as a solution using three propositions: a) students must experience academic success b) students must develop and/or maintain cultural competence c) students must develop a critical consciousness through which they challenge the status quo of the current social order.

Curriculum designs. While teacher quality can be addressed by preparing teachers to change their pedagogical approach, Apple's (2014), *Official Knowledge: Democratic Education in a Conservative Age* presents a critique about who legitimates the knowledge, often in the form of curriculum or textbooks that are taught to children in schools. Apple argues how increasing demands on teachers is a form of control by Conservatives who want to advance a political agenda that involve private and business interests. Teachers become mandated to meet high-stakes assessments, rather than creating engaging environments for students. Textbooks often exclude diverse perspectives and perpetuate stereotypes of Latinx and other marginalized groups. SOC are impacted by these political agendas that seek to produce good workers rather than critical thinkers. Apple provides examples of schools and cities that have challenged policies and practices successfully, thus providing hope in a time when budget cuts and increasing demands impact children and educators. Central Park East School in New York City and other examples were included to show the results of active parents and community members who wanted to have a say in the curriculum being taught to their children.

Rigor of curriculum. Understanding the obstacles to STEM, such as the lack of resources or STEM preparation is critical. Ohrt, Lambie and Ieva (2009), referred to College Board data from 2008 and the enrollment of Latinx and Blacks in AP courses and completion of exams. They found that Latinx and Blacks scored significantly lower than Caucasian students on AP exams. According to Ohrt et al., such discrepancies support and reaffirm the evidence of barriers preventing equity in access to higher education for Latinx and Black students, which include poor school preparation and lack of rigorous curriculum prior to enrollment into AP courses. Research has cited resources, including higher-level courses in secondary school, and college preparatory curriculum lead to greater academic achievement, college enrollment, and attainment (Cabrera & LaNasa, 2000a, 2000b; Choy, Horn, Nunez, & Chen, 2000; Roderick, Nagaoka, & Coca, 2009; Schneider 2007; Welton & Martinez, 2014).

Shiu, Kettler, and Johnsen (2009) highlighted how the participation in rigorous coursework for Latina/o may increase their view and determination to succeed and enroll in AP coursework and beyond. Cammarota and Romero (2006) also point to college eligibility as a major issue for the underrepresentation of Latinx in universities. The authors propose using a socially relevant curriculum to promote critical consciousness and active participation of Latina/o students in their lives, communities, and futures. The study modeled and encouraged students on how to analyze and address social conditions that undermine their future opportunities. The use of a socially relevant curriculum can help Latinx see the obstacles they will face and in turn, learn how to prepare in advance for them. For instance, education reforms, such as No Child Left Behind (NCLB)

negatively impacted Latinx and other marginalized groups. Once a proponent of the efficiency mode, Diane Ravitch (2010) argued against the unrealistic goals of No Child Left Behind (NCLB). NCLB held schools accountable, without considering all the circumstances, and when testing objectives weren't met, neighborhood schools were closed down, impacting students, especially those that attended schools in need. Teach for America (TFA), that was created in the 1990's took advantage of NCLB and provided young and willing Ivy league students to teach students in the poorest areas (Ravitch, 2010). As a result, inexperienced college graduates were sent into some of the most vulnerable schools to replace teachers. Ravitch called this model of TFA, a factory model. Large, urban cities serving many low-income students, as well as diverse populations, are often the targets of curriculum and education reforms. On December 10, 2015, Congress passed the Every Student Succeeds Act (ESSA), replacing its predecessor, the *No Child Left Behind* (NCLB) Act, thus reauthorizing the Elementary and Secondary Act of 1965. Similar to NCLB, in that it is federal law, ESSA is intended to provide a quality education for all children. Both bills share roots in Bobbitt's social efficiency ideology of curriculum making based on scientific management, including a standards-based focus as well as accountability. Even with education reforms that claim to focus on student's achievement, the path to education for Latinx and other SOC continues to be complicated.

While I have examined the factors Darling Hammond attributed to inequitable education for marginalized groups, Sanchez et al. (2015) claim that even when Latinx are given access to college prep courses and financial aid, they do not pursue college. The

authors came to this conclusion after conducting a study that mainly looked at differences between college eligibility and college readiness among high school Latinx students through a discretionary federal grant program that provide educational (informative) opportunities for college readiness. The study concentrated on communicating that Latinx are not interested in college, thus another example of how the onus is put back on SOC for not taking accountability of their education. Sanchez et al. failed to examine institutional or structural factors, other than accessing college level courses in high school. We must also look at the systems in place that hinder Latinx from being successful in college as these obstacles may not be visible and therefore, a critical lens is necessary in examining such challenges. Sanchez et al. did not explore educational inequalities in the context of why Latinx did not apply to college and therefore it is important to examine how we can help Latinx make STEM a reality.

Existing research has heavily focused on understanding the best predictors of college success for students of color enrolled in STEM majors, including GPA, standardized tests, and college prep work, including AP credits and dual coursework (Gipson, 2016). Pre-college GPA and AP credits have been found to have the strongest correlation to cumulative college GPA. Gipson suggests that admissions officers should consider enrollment with AP courses and standardized test scores as important predictors of academic success for students of color enrolled within STEM majors (p. 133). Still, according to Chajewski et al. (2011), what is missing is information on the actual completion of college. In the following, I will discuss retention and persistence within the STEM pipeline for Latinx.

Latinx Persistence in STEM

Research on college retention and persistence has mainly focused on explaining why students stay or leave. Most research has focused on individuals' academic knowledge, achievement scores, and other skills to navigate educational institutions (Lareau, 2015). While understanding the factors that impact pre-college experiences is important in addressing the opportunity gap, there is limited work on the factors associated with STEM outcomes (Crisp, Nora, & Taggart, 2009; Ro et al., 2016) focusing on Latinx students.

Particular theoretical models, such as integrationist models assume that in order for students to be successful in college, they must assimilate to campus and its academic and social domains (Tinto, 1987, 1993). Tinto focuses on the students' background and individual attributes that influence her/his commitment to college completion. Level of institution, such as community college or four-year university, quality and class size are recognized by Tinto, however, the individual student was the culprit. The onus is put on the individual student to integrate into campus life, academic and social systems, while ignoring structural barriers. One of the specific issues with Tinto's model, however, even after later revisions to include Students of Color, is that it assumes that SOC must reject their own cultures to be successful in college (Rendón, Jalomo, & Nora, 2000).

While parent and family members have an influence on a student's attitude toward school, environmental factors also have an impact on Latino academic outcomes. These environmental factors include students' beliefs, values, and attitudes toward education, student-teacher relationship and the general school climate to which the

student is exposed (Arellano & Padilla, 1996). In the following discussion, I examined factors that impact Latinx STEM outcomes as related to college persistence.

Factors that Impact Latinx STEM Persistence in College

  Cultural congruity. Although the growing Latinx community has changed the demographics in the United States, many Latinx continue to attend a predominantly White institution (PWI) (Cerezo & Chang, 2013). Cole and Espinoza (2008) examined factors that impact the academic performance of Latinx majoring in STEM. This longitudinal study was based on prior research that suggest Latinx will have greater success when they have cultural congruity with their chosen academic major (Gloria & Robinson Kurpius, 1996; Pascarella, Pierson, Wolniak, & Terenzini, 2004). Cultural congruity is the alignment between the student's home culture and university culture, and has been linked to the persistence of Latina/o students as well as other underrepresented groups in higher education (Castellanos & Jones, 2004; Gloria, Castellanos, & Orozco, 2005; Gloria & Robinson Kurpius, 1996, 2001). According to Cole and Espinoza (2008), cultural capital that is developed prior to college influences academic success of students, and the higher levels of cultural capital students possess, equal higher levels of cultural congruity felt by students.

  Fiske (1988) looked at the stress Latinos feel when balancing two cultures, one tied to their cultural background and the other to the university campus culture. Latinos seek cultural congruity and thus, gravitate toward majors where they find other Latinos. For example, the tendency for Latinos to major in the humanities and social sciences occurs due to higher representation of Latinx in these areas of study (Fiske, 1988). One

major component of this premise of cultural congruity is the students' interpretation of the campus climate

Campus climate. Campus climate has been tied to the persistence of college students, and suggest that associations between students' perceptions of a positive or negative environment influence feelings of belonging, integration, and retention (Hurtado, 2002; Hurtado, Milem, Clayton-Pedersen, & Allen, 1999; Nunez, 2013). Previous research by Seymour and Hewitt (1997) suggest that the first two years of undergraduate study in STEM are unfriendly and competitive for SOC. In addition, courses that are designed to 'weed out' STEM majors are typically extremely difficult classes. Thus, students either leave the sciences or persist. Hurtado et al. (1999) posit that the percentage or representation of SOC on campus, students' perceptions of the campus climate, and student-staff interactions are interrelated and influence Latinx students' participation in college.

Using a similar framework related to campus climate, Bonous-Hammarth (2000) studied Science, Engineering and Math (SME) student majors during college and examined socialization and institutional climate. While K-12 experiences and pre-college courses may affect long-term retention of SME, academic setting and socialization influence academic persistence. Weidman (1989) suggested that parents, peers, and faculty shape the perceptions of college students prior to and during the college experience. If a college students' parents or peers relate a positive or negative experience, this may in turn influence the SME's attitude toward school. Smedley, Myers, and Harrell (1993) found that Latinx students on predominantly White college

campuses experience significant psychological stressors and social tensions with White

peers and faculty. Latinx are more likely to have anxiety, receive lower grades, and

perceive themselves as less competent academically than their peers (Alva & de Los

Reyes, 1999) when they are the minority in STEM classes. Stereotype threat, which is

often confused with a more general anxiety (Beasley & Fischer, 2012), is an influential

factor in the experiences of Latinx on college campuses. Stereotype threat is an anxiety

that stems from negative stereotypes about a particular group of people (Steele, 1997)

that in turn, causes the person experiencing the threat to defend their self-esteem in some

form, whether that be withdrawing from a task or can result in physical stress, such as

high blood pressure (Beasley & Fischer, 2012; Smith, 2000). Stereotype threat has been

applied in research to explain academic performance of Latinx and other

underrepresented groups in STEM. Negative assumptions about Latino students'

academic abilities can powerfully and adversely shape their experiences. Even at the

most selective universities in the country, Latinx students who are more self-conscious

about stereotypes tend to have lower levels of academic "self-concept" and "academic

performance in college" (Massey, Charles, Lundy, & Fischer, 2003; Smedley et al.,

1993).

Along with stereotype threat, literature has also looked at self-critical

perfectionism, which is another stressor that impacts the ability of SOC. According to

Slaney, Rice, and Ashby (2002), a core feature of self-critical perfectionism is

discrepancy, or the perceived gap between expected levels of performance and the

perception of one's ability in meeting those expected performance levels; larger

perceived gaps correspond to higher levels of self-critical perfectionism. Although not directly addressing self-critical perfectionism, Dasgupta (2011) described how the experience of underrepresentation in a negatively stereotyped performance context, or in this case, STEM, is likely to activate stereotype threat-related and often self-critical attributions (e.g., self-doubt regarding adequacy and belongingness). Studies on racial micro-aggressions, defined as subtle acts of racism indicate that when these microaggressions occur on the campus climate, Latino students can experience isolation and alienation from the academic environment (Yosso, Smith, Ceja, & Solórzano, 2009; Solórzano & Villalpando, 1998).

Racial microaggressions. Much can be learned from the resilience of Latinx who often face isolation and racism and embedded within their experiences are crucial lessons about how educational institutions need to change to create more harmonious and supportive environments (Minikel-Lacocque, 2013). Racism include both attitudinal and behavioral elements (Torres-Harding & Turner, 2015) that can mitigate the academic achievement of Latinx in college (Rivas-Drake & Mooney, 2008). Acts of overt and hostile racism have become rarer, however, covert and subtle racial microaggressions (Solorzano & Villalpando, 1998), including comments made by peers, advisors or even professors that denote a student's abilities or exclusionary practices of Latinx continue to exist.

As cited by Yosso et al. (2009), Chester Pierce (1974) introduced the concept of microaggressions, which are insidious, hard to identify, subtle racist remarks and insults that we must be able to readily identify if we are to understand and challenge racism in

the classroom. Pierce (1989) warns that a "crucial debilitating factor in dealing with racial assaults is the inability to decipher critical micromessages" (p. 310). Sue, Capodilupo, Torino, Bucceri, Holder, Nadal, and Esquilin (2007) provide guidance in understanding Pierce's types of "micromessages" by identifying three forms of microaggression messages:

> (1) microassaults, or intentionally and explicitly derogatory verbal or nonverbal attacks; (2) microinsults, or rude and insensitive subtle put-downs of someone's racial heritage or identity; and (3) microinvalidations, or remarks that diminish, dismiss, or negate the realities and histories of People of Color. (p. 274)

For example, the invalidation or dismissal of racial identity in history books can be minimized or made insignificant through exclusion, such as neglecting to include literature that represents various racial groups (Sue et al., 2007).

The experience of racial microaggressions have major implications for Latinx, and according to Sue et al. (2007),

> It creates psychological dilemmas that unless adequately resolved lead to increased levels of racial anger, mistrust, and loss of self-esteem for persons of color; prevent White people from perceiving a different racial reality; and create impediments to harmonious race-relations (Spanierman & Heppner, 2004; Thompson & Neville, 1999).

According to Yosso et al. (2009), Latinx students construct counter-spaces, which are 'spaces' or 'areas' on PWI campuses in order to preserve their culture and create a sense of belonging. Counter-spaces can be student centers, fraternities, relationships with

faculty, student organizations, more importantly, they help Latinx gain a feeling of belonging to help minimize alienation experienced on PWI's. Even more so, counter-spaces also represent a form of resistance, in which Latinx create them to resist hostile or unwelcoming environments.

Focus on Success of Latinx in Higher Education

Harper and Newman (2010) sought to emphasize STEM success among SOC who perform well at institutions that were "perceivably overmatched" (p. 63); meaning they attended schools with rigorous STEM programs, in which SOC were the minority. In this study, Harper and Newman reviewed 'anti-deficit frameworks' that counter deficit achievement frameworks. Harper and Newman argued that researchers should oppose deficit-based research with approaches that look at how SOC: overcome lack of preparation through cultivating relationships with STEM faculty and other professions; use strategies to conquer internalization of discouraging misconceptions about their racial group. In addition, Harper and Newman recommended it is important to also identify attributes that contribute to SOC success, rather than simply focusing on barriers and attrition.

Fries-Britt, Younger, and Hall (2010) examined the academic, social and racial experiences of 110 Students of Color who were succeeding in physics at various institutions, including White majority, historically Black, as well as Latino serving institutions. Success was measured by good academic standing and verification from the university that the students were in route of STEM degree completion. The study revealed some encouraging experiences that SOC majoring in physics shared. SOC

found professors helpful when they showed interest by acknowledging students'

academic abilities, inviting them to participate in research projects, and even discussing

their own experiences in STEM. The study also noted that participants at historically

Black, and Hispanic Serving Institutions (HSI's) with positive relationships with peers

were also impactful. These relationships were fostered during labs, in which students

interacted in and outside of the classroom with their lab partners. Moller et al. (2015)

presented qualitative results that suggest that teachers and courses prior to college are

influential in Latinx students' decisions to declare a STEM major. Students pointed to

the importance of teachers' passion for teaching (an indicator of satisfaction), as well as

the student-centered teaching practices, as motivators. However, students at PWI's were

less likely to report feeling close to their peers. Latinx continue to attend a

predominantly White institution (PWI) (Cerezo & Chang, 2013).

  Community college route. Latina/os are more likely than other racial/ethnic

groups to report that earning a college degree is important for "getting ahead in life"

(Pew Hispanic Center, 2009). Many Latinx, first-generation STEM students tend to take

the community college route in attaining their STEM bachelor's degree (Malcolm, 2010).

Using NSF data on STEM graduates, Malcolm found that 61% of Latinx STEM

bachelor's degree holders attended a community college at some point in their

educational career, and 18% earning an associate's degree before attaining their

bachelor's. A large percentage of Latinx STEM bachelor's degree holders are non-

traditionally aged college students, and those who also earn an associate's degree at a

community college are more likely to have these characteristics. According to the

Integrated Postsecondary Educational Data System (IPEDS) 2014 survey, community

colleges enrolled proportionally more Latinx students than four-year institutions with

only 15% of students in four-year public institutions being Latinx. Even more so,

Adelman (2005) reported that Latinx students are more likely to begin at a community

college and then transfer over to a four-year university, than students from other racial

backgrounds. Community colleges can serve as a bridge to STEM. However,

assumptions should not be made that this is the route Latinx should take to be able to

complete STEM. Understanding the experiences of Latinx that completed STEM degrees

at four-year universities is necessary in order to provide information about their

experiences versus what is already known about Latinx at community colleges.

Latinx Students' Capital

Parent motivation and expectations to attend college can counteract the academic

lack of preparation Latinx students face (Dennis et al., 2005). As cited in Rios-Aguilar

and Kiyama (2012), funds of knowledge are the social and cultural resources that

working-class families employ to support themselves (Pacheco & Guiterrez, 2009; Vélez-

Ibañez & Greenberg, 1992). The theoretical framework of funds of knowledge has

primarily been used by K-12 researchers, to study the wealth of knowledge existing in

low-income households, to help educators link the school curriculum to students' lives

(Rios-Aguilar & Kiyama, 2012), and to challenge the deficit model that has characterized

low-income children and families (Olmedo, 1997). According to Luna and Martinez

(2013), CCW serves as a tool to move toward social and racial justice by demonstrating

the need to inform and reform educational systems, to include the knowledge, skills, abilities and networks of SOC.

Social capital is the network of people and social resources (Thompson et al., 2016; Stanton-Salazar, 2001; Yosso, 2005) that are also influential in the educational outcomes of Latinx. The peer and social contacts Latinx make are essential as support to navigate educational and non-educational institutions. Garcia and Bayer (2005) reported a variety of ways Latina students used social capital for their educational achievements. Students had reported taking the initiative to become informed of college preparatory classes, the college application process and accessing financial aid by reaching out to school counselors and doing research of their own. In addition, students had mentioned seeking out peers; others that they could connect with on a cultural level. Garcia and Bayer's study highlighted the importance of relationships and how Latinx seek out support through other students. Relationships are a form of social capital that enable Latinx to reach their goals.

Ways to build social capital. Granovetter (1973) refers to an individual's relationships with friends and family as strong ties, while acquaintances, including business contacts are weak ties. These types of ties can impact social capital, such as accessing information about college as well as navigating institutions and beyond. According to Granovetter, it is important for individuals to build their weak ties. Weak ties can be crucial in forming groups of strong ties together. They bring different networks into contact with each other, strengthening relationships and forming new bonds between existing ones. Latinx may rely on strong ties to access knowledge and

information from family and friends. While this may be helpful, the resources within

groups of friends and family can be limited. Few weak ties can deprive Latinx of

particular knowledge and social support systems, such critical information about classes,

and job opportunities. Latinx students can learn to cultivate new relationships (Saunders

& Serna, 2004) and even share their information with other Latinx.

Current Latinx Participation in STEM

Growing STEM Enrollments, Stagnant in STEM

College Board (2016) data shows more students are participating in AP programs

nation-wide, particularly low-income and SOC, however, Latinx score on average lower

on AP exams in computer science, physics I and II. This difference is about a 1-point

average compared to White students.

Table 1

College Board Data from 2016

AP Exam	Computer Science	Physics I	Physics II
Latinx Total number of students: Average score:	6, 256 2.28	31, 644 1.66	3, 176 2.34
White Total number of students: Average score:	26, 698 3.06	83, 702 2.51	13, 320 2.88

A special report from the National Science Foundation (NSF) and National Center

for Science and Engineering Statistics (NCSEC) since 1995, identified Latinx as having

the greatest share of bachelor's degrees in psychology and social sciences than any other

science and engineering field. In the past 20 years, that number has doubled, but in

mathematics and statistics, the Latinx percentage only increased from 3.77% to 7.90%

and engineering, 5.76% to 9.56% in 2014. These figures can be viewed in Figure 1.

FIGURE 3-B. Science and engineering bachelor's degrees earned by Hispanics, by field: 1995–2014
(Percent)

Year	Biological sciences	Computer sciences	Mathematics and statistics	Physical sciences	Psychology	Social sciences	Engineering
1995	4.87	5.31	3.77	4.13	6.26	6.25	5.76
1996	5.14	5.24	4.26	4.39	6.82	6.60	5.91
1997	5.28	5.23	4.40	4.32	7.07	7.16	6.62
1998	5.77	5.31	4.99	4.66	7.40	7.37	6.77
1999	NA	NA	NA	NA	NA	NA	NA
2000	6.11	5.74	5.11	5.42	8.21	7.87	6.85
2001	6.49	5.50	5.46	5.67	8.33	7.83	6.78
2002	6.36	5.58	5.48	5.56	8.66	8.08	6.82
2003	6.80	6.20	5.22	5.43	8.63	8.16	6.83
2004	6.46	6.27	4.94	5.61	8.82	8.16	6.93
2005	6.50	6.46	5.54	5.74	8.96	8.55	7.00
2006	6.35	6.98	5.75	5.56	9.30	8.63	7.22
2007	6.42	6.97	6.08	5.54	9.40	9.13	7.27
2008	6.93	7.51	5.83	5.98	9.55	9.38	7.49
2009	7.02	7.79	6.03	6.18	10.15	9.55	7.90
2010	7.38	7.79	5.97	6.06	10.65	10.01	7.99
2011	7.73	8.12	6.39	6.30	11.49	10.57	8.09
2012	8.24	8.78	6.44	6.66	12.17	11.33	8.61
2013	8.99	9.15	6.97	7.34	13.34	12.43	9.00
2014	9.78	9.74	7.90	8.02	14.85	13.23	9.56

NA = not available.

NOTE: Hispanic may be any race.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey.

Figure 1. Science and engineering bachelor's degrees earned by Hispanics, by field: 1995-2014

Many Latinx, first-generation STEM students tend to take the community college

route in attaining their STEM bachelor's degree (Malcolm, 2010). A large percentage of

Latinx STEM bachelor's degree holders are nontraditionally aged college students, and

those who also earn an associate's degree at a community college are more likely to have

these characteristics.

According to the Integrated Postsecondary Educational Data System (IPEDS)

2014 survey, community colleges enrolled proportionally more Latinx students than four-

year institutions with only 15% of students in four-year public institutions being

Hispanic. Even more so, Adelman (2005) reported that Latinx students are more likely to begin at a community college and then transfer over to a four-year university than students from other racial backgrounds.

To better understand why college enrollment rates have increased for Latinx, but not college graduation rates for Latinx, it was necessary to employ a theoretical framework that analyzed trends in data and existing studies, as well as the capital Latinx use to complete college.

Theoretical Framework

In this section, I explain my theoretical framework. I employed Latino critical theory (LatCrit) and Community Cultural Wealth (CCW) (Yosso, 2005) to analyze and understand the experiences of Latinx STEM baccalaureates. Creswell (2014) explained that researchers use theoretical lens or perspectives in qualitative research as,

> [A]n overall orienting lens for the study of questions of gender, class, and race (or other issues of marginalized groups). This lens becomes a transformative perspective that shapes the types of questions asked, informs how data are collected and analyzed, and provides a call for action or change. (p. 64)

A LatCrit lens can be used to analyze patterns of racial exclusion and other forms of discrimination against college students (Villalpando, 2004). Studies have documented the college attrition rates of Latinx STEM majors, pointing to lack of cultural capital, and dismissing the ways higher education institutions fail to support Latinx student populations. That is why it is critical to examine these experiences because I wanted to understand the journey of Latinx students that made it to the completion of STEM. In

addition, CCW legitimates and validates the assets Latinx bring to school (Yosso, 2005) and therefore I will apply this theory in understanding the experiences of Latinx STEM attainment.

Latino Critical Theory

While overt racial discrimination may seem like it no longer exist, it occurs in more covert and subtle ways in educational institutions (Tierney, 1997; Villalpando, 2004) and that is why it is crucial to utilize a LatCrit lens to understand the experiences of Latinx majoring in STEM. LatCrit illuminates the role of race and culture in education settings, "particularly as it pertains to the pervasiveness of institutions to privilege one set of racial experiences over another" (Gonzalez & Morrison, 2015, p. 89).

The rationale for using LatCrit lens comes from my interest in understanding the lived experiences of Latinx STEM majors as I will be able to examine patterns, practices and policies that impact their STEM attainment. In addition, I drew from Chicana feminist epistemology (Anzaldúa, 1987; Berta-Avila 2003; Delgado Bernal, 1998; Sandoval, 1991) to look critically at issues of power, and question the values and standards of the dominant culture. Utilizing the experiences of Latinx STEM baccalaureates, the use of LatCrit theory enables the researcher to understand "how other aspects of race, ethnicity, language, and national origin converge to "otherize" and politically disenfranchise Latinx in the United States" (Lynn & Dixson, 2013). It is important naming things, such as White privilege, and to talk about them as this is critical to the tenets of LatCrit (Gonzalez & Morrison, 2016). LatCrit challenges the idea of

cultural capital as it highlights the experiences of POC and brings their knowledge from the margins to the center (Delgado Bernal, 2002; Yosso, 2005).

Background on LatCrit theory LatCrit is rooted in CRT, a theory that arose from two previous movements, legal studies and radical feminism (Delgado & Stefancic, 2013). First, CRT uses from legal studies the idea of 'legal indeterminancy', the idea that not every legal act has a correct one. Derrick Bell, who is referred to as the father of CRT, was highly skeptical of cases that impacted People of Color, in particular, *Brown v. Board of Education* and its aftermath. Many critical theorists saw that the *Brown* case brought very slow improvements for African Americans and questioned the courts' true intentions. From feminism, CRT borrowed the insight into the relationship between power and the construction of social roles looking at patriarchy and other forms of domination (Delgado & Stefancic, 2013). Feminist theory is also emancipatory as it also focuses on social justice (Mossa-Mitha, 2005). Paolo Freire (1970) is a notable theorist that has been influential in the examination of power relations in society. He examined how oppression has been justified and how it is reproduced through a mutual process between the "oppressor" and the "oppressed" (Darder, 2011). Freire argued that the intentions of the oppressor are to create standards that the oppressed must strive to achieve. These standards are unrealistic when nothing is done to change the situation or circumstances of the oppressed. LatCrit is complementary to CRT (Villalpando, 2004), but address issues that are broader than race/ethnicity in the case of Latinas and Latinos.

LatCrit is a theoretical branch of CRT, concerned with the intersection of identities, including immigration status, ethnicity, language, sexuality, phenotype, accent,

and surname of Latinx that are overlooked by CRT (Peralta, Caspary, & Boothe, 2013; Solorzano & Bernal 2001). LatCrit incorporates the following four key functions (Valdes, 1999): (1) the production of critical and interdisciplinary knowledge; (2) the promotion of substantive social transformation; (3) the expansion and interconnection of anti-subordination struggles; and (4) the cultivation of community and coalition among outsider scholars. Together with CRT, LatCrit recognizes covert racism and exposes practices in educational institutions that privilege certain groups over others. LatCrit theory forces the researcher to examine and challenge deficit-based approaches that surround issues of race, language and socioeconomic status of Latinx.

In the introduction of Lopez's (1998) essay, "Learning About Latinos" he states his recommendation for increasing the visibility of Latinx in this nation,

> To really matter, Latinos must be recognized. And to some degree, we must be understood too, yes, in all our complexity, and yet so as to be seen as a force sufficiently coherent to exercise clout. ……Knowledge about Latinos may in the near future be as profound as it is sweeping. (p. 363)

Utilizing LatCrit, I can help recognize the experiences of Latinx STEM baccalaureates, and to help understand their unique experiences. In addition, CCW was a good fit for my study as it incorporated LatCrit to examine the STEM experiences of Latinx. LatCrit theory is conceived as an antisubordination and antiessentialist project (Solorzano & Bernal (2001).

In the pursuit of understanding 'what works' for Latina/os in STEM majors, Yosso et al. (2009) expanded on previous works and employed critical race theory (CRT)

to explore and understand the subtle, yet racial micro-aggressions as experienced by

Latina/o students at three selective universities. Yosso et al. found that while the micro-

aggressions saddened students, at the same time it encouraged them to 'prove' their

professors and peers wrong. The article referenced previous work by Yosso, in which she

utilized Chester Pierce's definition and explanation of micro-aggressions and how Blacks

have to work to 'decipher' the comments/insults and prepare to respond. Solorzano and

Delgado Bernal (2001) explored transformational resistance through a Critical Race

Theory (CRT) and LatCrit theoretical framework. Specifically, they employed CRT and

LatCrit to gather a race-gendered analysis on different methods that students choose to

resist oppression, particularly for Chicana/o students. They argued that educators must

understand student resistance, which can be 'fluid, multifaceted, and empowering in

order to best serve and understand students' needs' (p. 319). According to Solorzano and

Delgado Bernal, most research, in the past, focused on self-defeating resistance, a

negative perspective of how students engage in resistance. However, the authors draw on

CRT and LatCrit to demonstrate how Chicana/o students engaged in transformational

resistance that should be seen in a positive light.

CCW Theory

According to Rios-Ellis, Rascón, Galvez, Inzunza-Franco, Bellamy, and Torres

(2015), Latinx are perceived as lacking the cultural capital to navigate college and

therefore, culturally congruent models and academic success programs seek to 'correct'

individual academic performance without making an attempt to understand the cultural

assets Latinx bring to college. The framework of community cultural wealth (Yosso,

2005) challenges cultural capital, as defined discourses and draws on LatCrit to identify

resources that go "unnoticed, are marginalized, or sometimes are framed in deficit terms

by dominant cultural standards, yet serve as assets for Latino students" (Nunez, 2013).

Yosso (2005) incorporates LatCrit theory that employ intersectionality; addresses

'intragroup differences' to address the unique experiences of Latinx. A critical

component of LatCrit is its recognition of the experiential knowledge of People of Color

(POC). Experiential knowledge is rooted in the experiences of students. This is a

component that is evident in CCW, as Yosso seeks to recognize the group of capitals and

funds of knowledge SOC acquire from their communities that help them succeed in

privileged environments (Hauser, 2013).

CCW is a set of knowledge, skills, and abilities possessed and utilized by SOC to

survive and resist macro and microforms of oppression (Yosso, 2005). Yosso's CCW

framework challenges Bourdieu's cultural capital theory that has been sustained by

hegemonic thought that SOC lack the cultural wealth to achieve. Using CRT as an

analytical lens, Yosso argues that Communities of Color nurture cultural wealth through

at least six forms of capital such as aspirational, navigational, social, linguistic, familial,

and resistant capital (Parker, Ledesma, & Calderon, 2015; Solórzano & Delgado Bernal,

2001; Yosso, 2005). The six assets of CCW are further explained in the following.

- Aspirational capital refers to the hopes and dreams students have despite the
  obstacles in place. At times aspirational capital can be viewed as a form of
  resistance.

- Linguistic capital is defined as the language and communication skills students bring with them to college. These language skills include student's capabilities to tell stories that are influential to their experiences, such as storytelling, memorization and even dramatic enactments.

- Familial capital involves the social and personal human resources Students of Color draw from for support in college.

- Social capital is a form of capital that involves the social networks that students have to rely on for contacts that can help them navigate college. D'Amico, Rios-Aguilar, Salas, and González (2012) point to this asset as being possibly the most influential in achievement for any college student.

- Navigational capital is defined as the ability of students to maneuver educational environments, in some cases, hostile environments.

- Last, resistance capital is founded on the experiences of Communities of Color in fighting for equal rights and access to education.
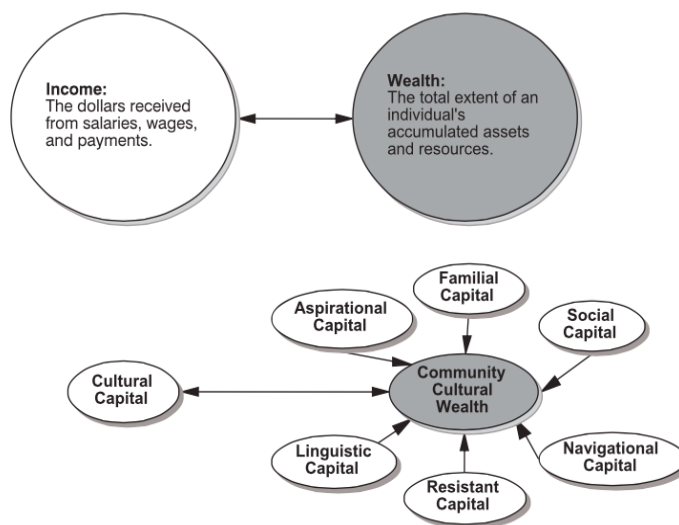
Figure 2. A model of community cultural wealth. Adapted from: Oliver & Shapiro, 1995

Figure 2. A model of community cultural wealth

Using CCW as a conceptual framework, Peralta et al. (2013) tried to understand how Latinx students successfully persist in college despite adversity in White-dominated campuses. Along with CCW, Peralta et al. used LatCrit as a lens to examine inequalities that exist in access to preparation and enrollment into college. According to the authors, a three-year study conducted by the University of South California (USC) Center for Urban Education revealed Latinx students make the decision to enter STEM fields long before they enter college. Using LatCrit, Peralta et al. were able to uncover the underlying challenges to STEM for Latinx, such as a lack of support at the school level that impacted their decisions to declare STEM majors. Denicolo, González, Morales, and Romani (2015) engaged bilingual students with *testimonios,* or personal narratives, guided by Yosso's CCW (2005) framework, in which the authors explored how students identify their own cultural and linguistic wealth they develop in their homes and communities. Using observation notes, interviews, discussions and written work,

DeNicolo et al. looked for patterns and identified themes related to CCW capital. Their findings showed the complexity of knowledge acquired outside of school and the role it plays in shaping students' identities as learners. The authors acknowledge that there are systems in place, such as school policies, curricular decisions and instructional practices that disparage the assets students bring to school.

Kouyoumdijan et al. (2017) applied a critical lens and utilized CCW to study the educational experiences of Latinx at four-year institutions, specifically Hispanic Serving Institutions (HSI) to examine the context of the college experience and to explain the successes and challenges of first and second-generation Latinx students in higher education. Survey responses were analyzed for emerging data and then key themes. Students identified various forms of CCW. Family was interpreted as both a hindrance and, at the same time, a form of support for students. Family illness or responsibilities of looking after younger siblings can impact Latinx. However, family can also provide the emotional support to continue in school.

Using CCW, Rojas and Liou (2017) described the various ways Latinx use their assets to build relationships with adults who believe in their academic success. In doing so, Latinx learn to navigate the system, such as acquiring information about preparing for college, which can be limited or non-existent outside of the school setting in low-income areas. The different types of CCW Black and Latinx students drew upon to complete an engineering program were examined by Samuelson and Litzler (2016). The authors examined interviews and generated codes to determine the assets Latinx applied in college. They found that students likely entered college possessing these assets, and how

these different types of capital interact with each other. But students may not be fully

aware of the assets they apply. Latinx students should be taught before and during college

that they have resources they can rely on within themselves.

Conclusion

This chapter included the literature review and theoretical framework that were

applied in this study. I reviewed existing literature about the deficit-based models that

have been used to explain the educational attainment of Latinx. I also summarized the

structural factors that create racial inequalities. While existing studies recognize the

challenges Latinx experience, this study addressed the gap in the literature about the

unique experiences of Latinx STEM baccalaureates.

In this chapter, I concluded by explaining that within the context of this study,

LatCrit theory and CCW were appropriate in addressing the literature gap in

understanding the experiences of Latinx that have majored in STEM and successfully

completed the degree. In the following chapter, I drew upon the data that was gathered

from Latinx STEM baccalaureates using interviews as a methodology to answer the

research questions:

1. What are the undergraduate educational experiences of Latinx students who

   major in STEM?

   a. What factors impact Latinx students' decisions to pursue STEM degrees?

   b. What factors contribute to students' persistence of STEM?

2. How do various forms of capital, specifically those identified in Yosso's (2005) notion of Community Cultural Wealth, impact Latinx STEM undergraduates in their pursuit of a STEM degree?

CHAPTER III

RESEARCH METHODS

Chapter II examined the trends in literature that address previous research on

Latinx educational attainment and described the theoretical approaches that were

employed to understand the experiences of Latinx STEM baccalaureates. In Chapter III,

I will explain why I chose phenomenological in-depth interviewing as a method to

explore the educational experiences of Latinx STEM baccalaureates. I employed a

LatCrit lens to analyze patterns of racial exclusion, marginalization and other forms of

discrimination against Latinx college students (Villalpando, 2004) in the interviews I

collected. To complement LatCrit, I employed CCW to understand the assets Latinx

bring to school (Yosso, 2005) to attain STEM degrees.

I begin this section of the chapter with a brief explanation of the appropriateness

of qualitative research methods for this study. Then I provide a rationale for using in-

depth interviewing as a primary method to study the experience of Latinx STEM

baccalaureates. I conclude with a description of the data gathering and analysis methods,

including: participants, procedures, my positionality and role as a researcher, and

potential strengths and weaknesses of the research design.

Research Design

Often on PWI campuses, SOC encounter challenging college experiences as a

result of limited perceptions of race and ethnic identity, which in part can impact student

persistence (Cavazos, Johnson, & Sparrow, 2010; Cerezo & Chang, 2013; Gloria &

Castellanos, 2012; Rodriguez, 2010). Qualitative research can be used to address social problems experienced by marginalized groups (Denzin & Lincoln, 2017). In particular, qualitative researchers influenced by critical theory are interested in how social values and organization get reproduced in society, including schools (Lutrell, 2010). Studies that focus on social reproduction examine how educational institutions, such as universities, sort, select, and favor, and even silence or privilege particular groups of people. Critical theorists are interested in how marginalized groups negotiate these reproductive structures and advocate for themselves. My epistemological approach is grounded in LatCrit and CCW, which both have roots in critical theory and that is why a qualitative study was a good fit as this approach involves exploring and understanding the meaning (Creswell, 2014) Latinx give to their experience as an underrepresented group in STEM.

According to Rivas-Drake (2008), there is relatively little known about Latino college students' own perceptions of ethnic and socioeconomic barriers to opportunity. I believe it is crucial to understand the obstacles Latinx identify as well as the meaning they give to their experiences. The assets they bring to college to achieve in STEM need to be studied in order to make better recommendations to future Latinx STEM majors about what can help them succeed. Therefore, I integrated a phenomenological approach to this study.

In-depth Interviewing

In-depth interviewing is a phenomenological approach interested "in understanding the lived experience of people and the meaning they make of that experience" (Lutrell, 2010; Seidman, 2006; Smith, Flowers, & Larkin, 2009). In-depth interviews are purposeful interactions with participants to learn what they know about a topic/experienced/what he or she thinks or feels about it/what meaning might it have (Arthur, Waring, Coe & Hedges, 2012).

Interviewing allows the researcher to put behavior into context and provides access to understanding their action. Collecting interviews about the Latinx STEM experience will make what works in their lives visible so that I may be able to inform universities, policy makers and other stakeholders.

 Valenzuela (1999) argues that the dominant narrative that reflect negative views about immigrants and Latina/os impact their relationships with schools, undermining collaborative possibilities for educational attainment. CRT recognizes the narrative as a way of giving a voice to marginalized groups (Delgado & Stefancic, 2001). The sharing of Latinx STEM baccalaureates' journeys can also serve as counter-narratives about their value of education and the assets they possess to navigate college. Using LatCrit we go beyond identifying 'best practices' for the classroom and shift the focus on acknowledging the educational inequalities and what we can do to eliminate them and in recognizing the assets SOC bring to school.

Phenomenological interviewing. The phenomenological interviewing approach has roots in psychology and the positivist ideology that asserts reality is rational, ordered,

and logical (Reiners, 2012). The founding principles of phenomenological inquiry are mainly embedded in the works of Husserl and Heiddeger (as cited in Herrmann & Maly, 2013). Husserl was a German mathematician who believed in descriptive phenomenology, where "everyday conscious experiences were described while preconceived opinions were set aside or bracketed." Husserl's student, Heidegger, did not agree with Husserl's view of phenomenology, and instead saw this approach as an interpretive stance. Heidegger's phenomenology is grounded in hermeneutics, the philosophy of interpretation.

Phenomenology can provide a rich source of information to understand lived experiences (Smith et al., 2009). I employed a phenomenological approach to my research as I intended to interpret the experiences I listened to and transcribed them from interviews to create a narrative that challenge deficit based models. In addition, I followed Seidman's model (2006) of this phenomenological approach as it aligns with the theoretical framework guiding this study.

Data Gathering and Instrumentation

Participants

Seidman (2006) suggests that prior to selecting participants to interview, the researcher must establish access to them and make contact. During a pilot study in the Fall of 2016, I contacted and established rapport with Loyola University Chicago (LUC) and University of Illinois at Chicago (UIC) student organizations to gather participants, in this case, Latinx students in their senior year of college. In addition, initially I stated in my research question that I would be looking for Latinx that successfully completed

STEM. However, for this study, I changed my criteria and recruitment method and interviewed Latinx that graduated with a STEM degree. I chose to do so because I found that there was a significant volume of literature on what constitutes success and failure in higher education, often categorizing Latinx (Rios-Ellis et al., 2015). While I used success to also mean completion, I chose not include the word in my research questions because I did not want the research questions to shape my study and findings. Success has been previously defined, but due to the multi-layered experiences of Latinx, it was more appropriate to frame my research questions in regard to Latinx that have completed STEM. In doing so, Latinx participants informed this study. The criteria for the study was as follows: (1) majored in STEM, (2) of Latinx origin, and (3) graduated with a bachelor's in STEM. I also posted my recruitment flyer in coffee houses in the Chicago area. Students were able to email me for participation. I gathered ten participants that fit the criteria, even number of females and males.

This research study focused on one subject group, Latinx who graduated with a STEM degree. Purposive sampling was appropriate for this study because after I recruited participants, I needed to select who would participate. Purposive sampling was utilized to ensure that the participants experienced the phenomenon I studied.

Setting

Interviews were completed via in-person at a café, Skype meetings and on the phone. I asked participants to meet me at a particular coffee house I chose for its private, see-through glass rooms available for conferences and meetings. The coffee house is located in Lincoln Park with access to a Red Line train stop just a block away. In

addition, I offered Skype meetings as an alternative. However, a few participants were not able to complete the second interview in person and requested Skype or phone interview.

Interviews can facilitate rich description and detailed accounts of the participants' experiences and perspectives of a phenomenon (Baumbusch, 2010) and that is why I have selected interviewing to explore the experiences of Latinx STEM baccalaureates. The purpose of this section is to describe the specific interviewing style for this study, as I used Seidman's model of in-depth interviews with semi-structured questions.

Seidman (2006) uses a series of three interviews in order for participants to "place their understanding and the meaning they make of their experiences in the context of their lives and the lives of those around them" (p. 17). The first interview in Seidman's model establishes the context of the participants' experience. The second interview allows the participants to describe the details of their experience within the context in which it occurs while giving the experience meaning. A third interview encourages the participants to reflect on the meaning their experiences hold for them. However, to be flexible and considerate of participant's personal lives, I asked two separate interviews, but I addressed all three areas of exploration as suggested in Seidman's model. Seidman acknowledges that some researchers will have reasons for exploring alternatives to the structure and procedures he has outlined. However, he reminds us that "as long as the structure of the interviews allow for participants to reconstruct and reflect upon their experiences within the context of their lives" (pp. 21-22) then alterations to the three-interview structure and the duration and spacing of interviews can be modified. The first

interview I completed focused on life history and the second gathered a description of the participants' experience along with the meaning they made of the phenomenon in question: What was your experience as a Latinx STEM major? Table 1 list the participant demographics

Table 2

Participant Demographics

Participant	Pseudonym	Gender	STEM Major/Degree	Ethnicity and Generational Status
Participant 1	Elizabeth	Female	Biology/Chemistry	Mexican-American/First generation
Participant 2	Michael	Male	Mathematics (and International Business)	Mexican-born/First Generation
Participant 3	Sofia	Female	Biology	Mexican-American/First generation
Participant 4	Hector	Male	Manufacturing engineering	Mexican-American/First generation
Participant 5	Edgar	Male	Mechanical Engineering	Mexican-American/First generation
Participant 6	Maggie	Female	Informational Technology	Mexican-American/First generation
Participant 7	Beatriz	Female	Biology	Mexican-American/First generation
Participant 8	Fernando	Male	Civil engineering	Mexican-American/First generation
Participant 9	Henry	Male	Civil Engineering	Puerto Rican
Participant 10	Natalia	Female	Industrial engineering	Puerto Rican

Data Collection Procedure

I conducted in-depth interviews with 10 participants (even number of male and female) that graduated with a bachelor's degree in STEM and I used the same procedure with each one. Interviews can take between 30 minutes to several to complete, however the semi-structured interview questions I used required about 60-90 minutes. I employed iterative questioning and probes to elicit from participants detailed descriptions of their experiences and perspectives (Samuelson & Litzler, 2016; Shenton, 2004). These questions included, "Tell me about when you first decided to major in STEM" "What was your family's role in your choice in majoring in (STEM area)?" I considered the time it would take to collect the data, therefore, I asked participants for two 60-90 minute sessions on different days, as suggested by Seidman (2006).

During a semi-structured interview, the researcher has a topic and a set of questions. The interview questions I designed apply Seidman's method of interviewing, and the integration of LatCrit theory and Yosso's CCW. I combined these two as I believe CCW can be applied to different periods of a person's life. These are the following questions.

Table 3

Interview Protocol Questions

INTERVIEW II: Life History	I will open the interview with sharing background about my personal experience in STEM, including friends that did not attain and those who did. I will explain that this personal story motivated me to examine Latinx in STEM.
Type of CCW Capital	60-90 minutes

	Prompts
	    1. What do you mean by?
	    2. Would you explain . . . ?
	    3. What did you say when...?
	    4. Give me an example of...
	    5. Tell me about the time...
	    6. Take me through the experience when . . .
	Opening questions:

Familial/Aspirational	1. I'm interested in learning how you came to be a STEM major. First, tell me about your family. Probe: How did you grow up? How did your family support you during college? Probe: What were their expectations of you regarding school/college? Or values they stressed about education. 2. What influenced your interest in (field they are working in) _____? Probe: What do you think was the most influential
Familial/Navigational/resistant	factor in your decision to major in _____? Probe: Give me an example of the moment when you knew STEM was your calling.
Social	3. Would you say your community, such as school, neighbors, and friends were supportive or involved in your decision to attend college? Please explain.
Social/Aspirational/ **navigational**	4. What are some things you learned from your family and community that benefited your education? Pursuit of STEM? Probe: Were there any strategies you learned in K-12 years that were useful in college? 5. Was it important for you to stay connected to your community during college? If yes, tell me why this was important?
Social/Aspirational/ **navigational**	6. Why did you choose to attend _____college/university? 7. Think back to your undergraduate experience, how would you describe yourself as a student?
Aspirational/navigational	Probe: What are your feelings about your ability to complete the coursework you took In high school in preparation for college.
Aspirational	8. What kind of career/life plans did you make when you decided to major in _____?

Aspirational **Resistant**	9. Tell me about an experience that stands out as discouraging you toward majoring in {your major} prior to attending college, if any.
INTERVIEW II **Aspirational/Navigational/ resistant**	10. Take me through your experience as a Latinx STEM major. Probe: What it was like being a Latinx student on campus/in classes at your university? How did you view your abilities? Do you think high school prepared you for college level STEM? Explain.
Linguistic	Are you bilingual? Do you think being bilingual is valuable as a STEM major? Explain. 11. How would you describe your college climate and setting? Give me some examples.
Social/Resistant	How do you think your peers and instructors/professors viewed your abilities to complete the coursework? Describe a typical STEM major at your college. Did you socialize with other STEM majors? If yes, how so? Roughly, what percent of students in your major are like you In regard to race? Did this impact your comfort level in class?
Aspirational/navigational/ **resistant** **Social/navigational** **Navigational/resistant** **Navigational/resistant** **Navigational/resistant**	12. Tell me about a challenging time in college. Probe: What experiences stand out as discouraging you toward majoring in…? 13. What support did you have on campus, if any, as a Student of Color/Latinx student? Latinx STEM major? Probe: Who did you reach out to you when you had questions or concerns about school/college? How did they help? 14. Describe what life has been like since graduation. Probe: how was the job interviewing process, did you feel prepared to pursue STEM jobs? 15. What advice would you give to new Latinx students in a STEM program to help them persist in the program? 16. What recommendations do you have for universities who want to help improve Students of Color student's/Latinx retention in STEM programs?

Data Analysis Procedures

After I collected the data from participants, I transcribed the interviews from the audio recordings using Express Scribe software. To study the experience of undergraduate engineering student experiences, Samuelson and Litzler (2006) gathered data from interviews and applied CCW concepts and their research questions to guide coding generation. Open and focused coding methods allowed for additional categories to emerge inductively from the data (Emerson, Fretz, & Shaw, 2011; Samuelson & Litzler, 2016). Seidman (2006) suggests organizing excerpts from the data into categories and for connections between the various categories. I read the transcripts and marked where I found interesting comments or reflections. Using interviews, Chang (2017) examined the manipulation of language by high school Latinas and how it demonstrated "the insidious nature of racism both in its daily imposition and in its far-reaching effects" (p. 248). I applied LatCrit to interpret Latinx' responses and keywords to see the language participants used that reflected power and racism. Pre-existing categories were formed and I listened for the themes emerge.   After identifying codes, then units of data, I created categories. Seidman (2006) recommends after reading two to three interviews, that that the researcher pause to consider whether they can be labeled. For example, after reading the first three interviews, were there phrases that kept appearing? This is a form of classifying or coding data from interviews.

Kouyoumdijan et al. (2017) collected surveys and examined the challenges and supports students identified that impacted first and second-generation students' college completion. They looked for key categories in the responses students provided to the

survey. Categories were clustered into key themes. For example, financial problems were reported most frequently, while some students reported no challenges. Latinx students may not be aware of structures of power or how certain experiences were actually subtle forms of racism or power. This is why it is so important to have a critical lens to examine the transcripts I produced from interviews. I used a web-based data analysis software called Dedoose to review the data to identify findings.

My theoretical framework of LatCrit and CCW served as a guide to organize the data I collected. Using LatCrit, I looked for emerging themes related to institutional structures that impacted the Latinx experience in STEM.

Validity

To address the validity of my study, the three-interview structure incorporate features that ensure validity, placing participants' comments in context (Seidman, 2006). Using Seidman's three-interview model, I connected participants' experiences and checked the comments of one participant against those of others. More importantly, the way I structured the interview with semi-structured questions allowed for participants to understand and make sense of their experiences. Data was recorded and transcribed carefully to ensure it would not be misrepresented.

<center>**Positionality**</center>

It is necessary to recognize where we stand as researchers in respect to power (Takacs, 2002) and it is an essential skill for social change agent. As a result, we have a standpoint from which to challenge power and transform ourselves. In regard to a researcher's positionality, Takacs says:

We spend our time trying to convince others to understand us or to adopt our

view. Simply acknowledging that one's knowledge claims are not universal truth-

that one's Positionality can bias one's epistemology-is one step forward toward a

world of possibilities. (p. 169)

I was open to the possible findings from my proposed study and that is why I was

cognizant of the various factors that would impact the participant's responses. I

recognized that (1) I was born and raised in the United States; (2) my ancestry is

Mexican; (3) I attended predominantly Latino public schools in the City of Chicago; (4) I

graduated from a predominantly White university; and (5) I believe that our country has

the means to provide equality and educational opportunities for every child and person.

Limitations

This study has limitations as related to the data collection type. The interviews

were face-to-face or via Skype/phone depending on the participants' availability. Due to

the small number of participants, I was be limited in making generalizations outside of

the study and phenomena I am examining. However, I do not plan to generalize findings

from this study to broader theory.

Researcher Role

Prior to interviewing the participants, I practiced asking the questions to norm the

interviewing process such as establishing the setting, timing of questions or pauses and

creating some rapport with the participants. My role in this study was to create a space

where Latinx students felt comfortable sharing their experiences. I shared with

participants some of own experience as a student and as a science teacher. I think this helped create some rapport with them.

Conclusion

Through this research methodology and the application of LatCrit and CCW, the design accomplished my goal of sharing the experiences of Latinx, who are underrepresented in STEM. An important aspect of my methodology is the opportunity to listen to the experiences of Latinx students with the recognition of my epistemological stance.

CHAPTER IV

FINDINGS

In this chapter, I provide a description of each of my participants, using

pseudonyms to maintain confidentiality, to better understand the diverse experiences they

brought to this study. Next, I answer the research question that guided this study: What

are the undergraduate educational experiences of Latinx students who major in STEM? In

addition, I answer the following sub-questions: What factors impact Latinx students'

decisions to pursue STEM degrees? What factors contribute to students' persistence in

STEM? How do various forms of capital, specifically those identified in Yosso's (2005)

theory of Community Cultural Wealth, impact Latinx STEM undergraduates in their

pursuit of a STEM degree? I employed Latino critical theory and the Community

Cultural Wealth theory to analyze participants' interview responses. After categorizing

and coding key phrases, then, I checked for themes related to each research question. I

conclude this chapter with a summary of the study.

Description of Participants

Elizabeth

Elizabeth is the daughter of Mexican immigrants and the youngest of four girls.

Her mother earned a teaching certificate while raising her children, and became a public

school teacher in Chicago, Illinois. During the interview, Elizabeth shared how staying

after school while her mother worked exposed her to the importance of education. She

also stated that it was an expectation in her family to attend college as her three older sisters had all received bachelor's degrees. Elizabeth's father and mother stressed the importance of education throughout her entire life.

Elizabeth chose a small university in Wisconsin because she preferred smaller class sizes and was offered access to a federal outreach and student services program. Despite support through the program and other sources, Elizabeth did not feel prepared for the science courses she attended in college. Her high school offered some experiences in labs, but the classes and content were not rigorous enough. She described a break down she had in her sophomore year when she realized the limited content and exposure she had to biology and chemistry, two essential subjects for her degree. Elizabeth was able to grasp concepts easily, but she felt she had a lot of catching up to do. She even supported her Latinx peers that struggled in organic chemistry and other science courses and felt it was critical to help them succeed as Latinx. She expressed throughout the interview, how lucky she felt that she had financial support, but her Latinx friends worked long hours to finance their college education. Despite, some struggles, Elizabeth graduated with good grades and a biology-chemistry degree. Familial support, both emotionally and financially were essential in helping Elizabeth complete her major. She currently serves as a scientist for a lab testing company. Elizabeth helped recruit another Latina biology major for this study.

Maggie

Maggie is pursuing a double major in informational technology and accounting. She is 21 years-old, and while she has not graduated, she completed her coursework in

technology, therefore she was interviewed because she finished the STEM portion of her degree. In addition, Maggie was the only participant with a focus on technology. She became a participant after one of the other participants shared my recruitment flyer with her. Maggie expressed, prior to the interviews that she really wanted to share her story as she saw very few Latinx in her science and technology classes and so it was important for her to share her experience.

Being the youngest of the three children, Maggie described herself as confident and competitive. Her parents came to the United States from Mexico, and while they did not attend college, they supported her emotionally and financially. Maggie expressed her familial support as a blessing, and at the same time, she pressured herself to take on core classes during freshmen year because she wanted her parents' financial support to be "worth something." However, she found herself not feeling successful in science. Instead she gravitated toward business and informational technology. She enjoyed coding and web development classes in high school and thus, chose to pursue a degree in this area, along with a double major in accounting. Maggie expressed how important it was for her to share her story because she has mentored other Latina/os in college and she has a desire to see "more of us", meaning Latinos, succeed, and not merely enroll in STEM.

Beatriz

Beatriz was recruited by Elizabeth as they know each other from a Latina sorority they joined post-college. She is a recent college graduate (2017) who can easily be mistaken for a high school student. She has the friendliest smile and looking at her, you wouldn't notice the hardships this young lady has endured to complete a biology degree.

Due to her brother's illness that required around the clock care from her parents, Beatriz was partially raised by her neighbor, Mami Carmen. Because of immigration restrictions, her brother does not qualify for medical assistance and so her parents have provided his 24-hour medical care. This experience was influential in Beatriz's decision to pursue a biology degree because she often had to translate and explain complicated medical procedures and conditions to her parents during her brother's doctor's appointments. In addition, this created stress for Beatriz as she struggled to balance school and her family's needs.

A desire to stay close to home and to have easy access to her family and neighbor's emotional support, Beatriz chose a university she could commute to on a daily basis. Beatriz had been set on community college due to her aptitude scores, but she received encouragement from two high school teachers and an advisor that convinced her to look past her "remedial scores", as she referred to her ACT scores, and apply for universities. Beatriz shared that when she was not in class or commuting to and from campus, she was seeking tutoring and opportunities to earn extra credit as she was determined to graduate with a bachelor's in biology. She has chosen to pursue a job as a clinical researcher with her degree.

Fernando

Through amnesty back in the 1980s, Fernando's father became a legal resident of the United States. Fernando's mother became a resident as well. His father stopped going to school at the second grade, and his mother at the third grade. They sought a better life in the United States and settled themselves in Milwaukee, Wisconsin. Education was

highly praised and emphasized to Fernando and his siblings, and while his parents weren't able to help him with school work, going to college became an unspoken expectation.

Fernando graduated with a bachelor's degree in civil engineering in May of 2017. He attended a university in Wisconsin. He made many friends through a fraternity and other Latinx organizations, and while he described his campus as diverse, he found that his White, male classmates in his engineering courses were not approachable. During his time living in a dorm, as a freshmen, Fernando found an offensive sticker on his room door. He believed that the boys on his floor placed it. Fernando described that experience as a time when he felt ready to "shut down." He did not seek out support for the difficult time he was having and he blamed his "machismo" for feeling too proud to get help. However, he eventually found Latinx organizations that provided him a sense of kinship. Family and friends were very important to Fernando as he worked toward his degree. He is currently an engineer and travels often for his job.

Rick

Rick moved to Milwaukee, Wisconsin from Puerto Rico with his mother, two older brothers and a younger sister. In response to how he grew up and what values were taught at home, Rick shared that job security was emphasized and not college. During high school, Rick worked on a farm to help his family pay bills. The costs of college discouraged his family from thinking about it. He often heard his mother and brothers say that college was "meant for other people." These 'other people' meant families with two-parent homes and financial stability. This did not discourage Rick from pursuing his

dream of higher education. When he applied to college, Rick did so without telling his family to avoid upsetting them. However, despite his feeling that he would upset his family by attending college, Rick's mother was the first person he turned to when he experienced hardships in college.

Visits from university students that had graduated from his high school motivated Rick to apply as he was motivated by seeing people from his neighborhood 'make it', and he saw that opportunity for himself. After hearing about civil engineering at a career fair, Rick was intrigued and made it his goal. He graduated with a bachelor's degree in civil engineering and has chosen this career path.

Natalia

College was highly emphasized in Natalia's home. She has a sister at Stanford working on a doctorate and her parents did everything they could to support Natalia, from hiring tutors to support her while she was at an International Baccalaureate high school. They wanted to do everything to make sure she achieved. Natalia was motivated to pursue engineering because she believed she was very good at it in high school. She earned a scholarship to attend a university in Wisconsin. While she thought she was prepared for college coursework, she found herself struggling to keep up during her four years there. Overall, Natalia described engineering courses as very difficult for anyone. She shared that she had to seek mental health and counseling due to the anxiety she experienced. She eventually learned not to pressure herself. She graduated with an engineering degree and was immediately hired in her field.

Sofia

Sofia is Mexican-American and from Chicago, Illinois. She was raised in a working-class, neighborhood and attended public schools throughout her K-12 and college education. Her parents came to the United States for better opportunities and while Sofia's mother completed some college courses, she did not finish a degree. Thus, Sofia and her five siblings are first-generation college graduates. The public high school Sofia attended has been considered a highly competitive school on a national level. Sofia attributes her secondary experience as influential in helping her complete college. However, Sofia saw that the university she attended was not very welcoming to Students of Color and this created issues for her ability to focus on school work.

Sofia graduated with a bachelor's degree in biology and was determined to become a doctor. Sofia had the grades and aptitude to attend medical school, but eventually chose not to follow this career plan. Sofia described the basis of this decision on family and cultural expectations that influenced her to return home after graduation. Sofia is an IRB administrator for a medical hospital in Chicago. She has not crossed medical school off her list of career and life goals. During the interviews, Sofia stressed the importance of community and returning home to make a difference. She returned to her neighborhood to mentor other Latina/os interested in college and STEM. Out of the entire group of participants, she was the only person to say high school helped prepare her for college.

Michael

Michael is the second youngest of 11 in his family, yet the first to graduate with a college degree from a four-year university. His mother was a single parent from Mexico with a ninth-grade education that immigrated to Chicago, Illinois. Due to financial hardships and raising 11 children, his mother stressed securing a job rather than college. His older sister attended a community college, but discontinued due to not qualifying for financial aid as a non-U.S. citizen. Michael became determined to attend college as he wanted better opportunities and a desire to support his family financially.

As a high school student, Michael was involved in academics and athletic clubs. He was a part of a select group of students at his school that were enrolled in honors and advanced placement classes. He believed that his high school experience provided him with adequate preparation for college coursework. His high school teachers were very involved in his pursuit of higher education and guided him in the college application process. Community was also important to Michael, such as staying in touch with his former teachers and keeping them informed of his progress in school. Michael attended a private university and shared that he received more individualized attention from university advisors. He majored in math and business. While he did not mention experiencing any racial biases, as he was often mistaken for European, he noticed differences in socio-economic status, as many of his peers could afford cars and other luxuries as college students, however he struggled financially. Michael eventually took a semester off from school to help support his mother after she lost her job. It was an unspoken expectation that he help his family. However, Michael returned to school and

persisted in his studies and managed to graduate from his university in less than four years with a high GPA.

Hector

Hector is a first generation Mexican-American, born and raised in a surrounding suburb of Chicago, Illinois. While Hector's parents did not receive a high school education, they encouraged him to do his best in school and pursue college. They did not want him to work hard, manual labor. Although, Hector did not see many peers in his neighborhood aspire to higher education he had some Latinx friends that applied to community college and viewed it as realistic and attainable, and they in turn, encouraged Hector to enroll. About 20% of his graduating class in high school enrolled in college.

Hector was motivated to attend a fout-year university because of his cousin that was majoring in finance at a nearby school. In addition, the experience at a career fair influenced Hector's decision to pursue engineering instead of finance like his cousin. Until this day, Hector is more than happy that he chose engineering. Despite struggling academically at the beginning of college, trying to balance school work and a full-time job to finance his education, Hector graduated with an engineering degree. He immediately found an internship during his final year that exposed him to the engineering company he currently works at a managerial level. Hector reflected on his experience during the interview and shared that his high school, K-12, experience did not prepare him for college-level coursework. He worked hard and achieved his goal.

Edgar

Edgar is the youngest of four children to graduate with a STEM degree. His parents immigrated to the United States and settled in a suburb of Chicago, Illinois. While Edgar's parents had not achieved a high school education, his older siblings served as role models and provided support in academics. Due to full-time jobs and late shifts, Edgar's parents were not able to be as involved and instead his two older sisters and brother supervised his school work and encouraged him to pursue an engineering degree. One sister is an accountant and the other a doctor. His older brother earned an engineering degree from an Ivy League university by the time Edgar applied to college. However, Edgar chose to attend a public university to stay close to home and save money. During the interview, Edgar expressed the role of religion in his childhood and how it kept him connected to his community. Many of his neighborhood friends did not seek college, but he stay connected through visiting the same church.

Edgar shared that he did not feel prepared for college-level coursework, despite being in advanced placement courses in high school. He believed that what he learned from high school was to adapt quickly to his college environment. Edgar attended a racially diverse high school and this experience helped him quickly form bonds in his college classes with different students. While he noticed differences in students' socioeconomic status and backgrounds, such as coming from affluent homes or having experienced college-level coursework in their high schools, Edgar felt confident and determined to pursue engineering. Edgar expressed that Latinx in his engineering classes were so few, usually less than one to two per engineering course, but he did not let this

discourage him. Edgar realized that it would take a little longer to complete an engineering degree, but he eventually did and has been working as an engineer for more than ten years.

Overview of the Study

The purpose of this study was to examine the experiences of Latinx baccalaureates to better understand the factors that contributed to their attainment of STEM. Through descriptions of the racial breakdown on campus and classes, participants noted the sparse representation of Latinx in biology, engineering, technology and math. In addition, participants identified key elements that were believed to be supportive or suppressive in their pursuit of STEM.

The interpretation of the data and findings are organized around the research questions: What are the undergraduate educational experiences of Latinx students who major in STEM? What factors impact Latinx students' decisions to pursue STEM degrees? What factors contribute to students' persistence in STEM? How do various forms of capital, specifically those identified in Yosso's (2005) theory of Community Cultural Wealth, impact Latinx STEM undergraduates in their pursuit of a STEM degree?

Profiled through direct quotations, participants' responses are used to emphasize major themes that emerged throughout the interviews. One of the key components of LatCrit theory, the framework used in this study, is that it can be used to analyze patterns of racial exclusion and other forms of discrimination against college students, and how other aspects of race, ethnicity, language, and national origin that converge to "otherize" Latinx (Lynn & Dixson, 2013; Villalpando, 2004). Participants encountered difficult

situations as college students that called them to question the role of race/ethnicity and cultural differences.

For this study, data was gathered through phenomenological interview techniques using a modified version of Seidman's Method, including one interview for life history and the other for making meaning of their experiences. Two separate 60-90 minutes interviews were scheduled with each participant. The data consisted of audio-recorded interviews paired with notes taken by the researcher. This research afforded participants the opportunity to engage in sharing their unique experiences as Latinx STEM baccalaureates, to improve the understanding of the different aspect that intersect for Latinx.

The Undergraduate Educational Experiences of Latinx

Students who Major in STEM

In this section, I address the research questions: What are the undergraduate educational experiences of Latinx students who major in STEM? What factors impact Latinx students' decisions to pursue STEM degrees? What factors drive Latinx students' persistence in STEM? How do various forms of capital, specifically those identified in Yosso's (2005) theory of Community Cultural Wealth, impact Latinx STEM undergraduates in their pursuit of a STEM degree?

The following themes emerged from the participants' experiences as Latinx students STEM majors: (1) familial schooling presence (2) financial hardships (3) a sense of belonging Of the three themes, family schooling presence emerged as the strongest, with participants identifying the significant role their parents and siblings played in their

educational decisions, as well as the obligation they felt to complete STEM so that they could show other Latinx that it can be done.

Familial Schooling Presence

Familial schooling presence (Carreón et al., 2005) focuses on the type of family engagement, whether participation in school events, homework support, advice, and parent aspirations. Participants in this study described different ways in which family played a key role in their pursuit and persistence in STEM. During the life history interview (Part I), participants were asked about how they grew up, and what values were stressed at home. Immediate responses revolved around how higher education was constantly encouraged by family. Eight of the ten participants mentioned that despite their parents having no higher than an eighth or ninth grade education in Mexico, a college degree was viewed by family as a bridge to better opportunities.

Family emphasis on education. All participants lived with their parents and siblings throughout their childhood. Parents and siblings were often present and played essential roles in the participants schooling experiences, such as setting expectations for college. Elizabeth's initial decision to pursue college was influenced by the fact that her mother is a teacher and her three older sisters all graduated from four-year universities. She said in regard to family values:

> I feel like in our family, it was definitely a given that I was going to go to college. There was no not going, it was something that it just came nicely, you go to elementary, you go to high school, you go to college. There was no doubt in my

mind that I wasn't going to go. I was like okay, I was pretty good at school. It was

just part of life.

Although her family was not able to advise her in science, they reached out to others who

could support Elizabeth. Several times during the interview, Elizabeth mentioned how

adjusting to campus was difficult, but her family kept her motivated. She expressed,

My mom was talking to her friends to get more information and be more

knowledgeable about how the experience is going and how to comfort me, or

what came next, or both, as a guide. Yeah, so it was that, and my aunts also

helped a lot. They would call all the way from Texas and try to comfort me and

think how amazing it was what I was doing.

Education was also emphasized in Edgar's home. He shared that his parents were not

able to be as involved due to limited knowledge of college, and long work hours.

Therefore, his older siblings stepped in and supervised his school work, and also served

as role models. Edgar said in reference to having three older siblings that were college

graduates even before he finished high school, two that were also STEM majors: "it just

became the norm for me. That became like oh, I'm gonna go to college." Edgar's siblings

were able to guide him in choosing a university and major. Edgar mentioned that during

his sophomore year, the rigor of his STEM classes increased and it became

overwhelming. He expressed: "I think the family support that I had and the expectations

that my brothers and sisters set up for me just kind of like … I gotta finish." Edgar

persisted in spite of the difficulty of his engineering classes.

Both Elizabeth and Edgar had older siblings that provided guidance in the area of college. Despite financial struggles, Fernando shared that his parents did not expect him or his younger sisters to work during high school. Instead they wanted him to focus on school. He commented,

> We grew up pretty low class in a sense where we didn't have that much, but yet even that, they didn't force us to go, me and my other two sisters, to work because they wanted us to focus on school and study and pretty much do as much as we can.

According to Fernando, going to college was an 'unsaid expectation', where his parents did not discuss it in detail, but Fernando said he inherently knew that he and his sisters would need to pursue higher education because his parents desired better opportunities for their children.

Sofia's parents both had high school educations and instilled a high value of education, and encouraged her to attend college. All, but one of her six siblings completed a four-year university degree. She had many role models at home and expressed:

> My parents always said that we have to study, we have to study, we have to study, so that was ingrained in us already. My siblings would try to help pitch in if I needed help with homework or something, to help me out with that so I could do well in school.

In other situations, participants did not have a reference for higher education at home, but a college education, nonetheless, was emphasized. Hector mentioned that although his

parents and younger siblings had no idea about college or how to help him in the application process, they supported his decision to pursue a degree, and he commented, "They totally supported me 100%. My parents have always stressed since I was little that education is key and really that's what you need." His parents were not able to support him academically, but the expectation of going to school was unsaid, and according to Hector, they trusted his decision to pursue college.

After initially being hesitant to apply to four-year universities because of her ACT score, Beatriz was happily surprised to find she was accepted to two state schools, however she chose the school closest to home. She described her decision as the following:

> The main reason why I picked [this university] versus [the other university] because anyone can get where they want to be as long as they have a support system or someone who's helping them. To me, those people are my parents, my brother, my neighbors, and if she were still here, my Mami Carmen.

Beatriz commuted every day during her undergraduate years so that she could return home daily and "vent" to her parents. She found her parents' *consejos*, as she called them, a source of relief due to discouraging times on campus majoring in biology as a Latina.

Differences in family expectations. Not all participants' families directly encouraged college. Rick mentioned that his mother never spoke of higher education and did not see it as "obtainable" for her family. She had lived in Puerto Rico and moved to Milwaukee, Wisconsin to provide a better life for her children. Rick's mother was the

sole provider and held several jobs to support her three sons and daughter. However,

Rick was expected to never make his mother "look bad" in school. Rick interpreted this

as "get good grades and don't misbehave". He said of his educational experience:

> Yeah, so for us there was no college expectations. My brothers did not go to
>
> college. For us, my two older brothers barely made it out of high school. The only
>
> expectation for us really was you get a high school diploma. Not graduate high
>
> school with honors. My mom really just did not want us to make her look bad, so
>
> the only reason I had good grades is so I didn't make my mom look bad. If I
>
> would have brought my mom in to parent/teacher conferences and I was getting
>
> C's and D's, I would have gotten my [butt] beat when I got home. I was a great
>
> student, more of not because I enjoyed school. It was more just so I didn't
>
> embarrass my mom.

Rick shared that he grew up in a poor Latinx neighborhood and that in general, education

was not encouraged. However, when I asked Rick if there was any other support from

family and community in his decision to pursue STEM, he responded:

> There was obviously the same values that are I guess, very typical. They
>
> [opportunities] were always there, it was just more of for somebody else, if that
>
> kind of makes sense. I guess I'm struggling to word this. Education is always the
>
> key to earn respect, right of the bat. It's the key to have a very good job, a good
>
> position, good quality of life. But, it was never, "Well I can obtain that. Our
>
> family is capable of obtaining that." It was never, for whatever reason growing
>
> up, that correlation was never there. It was never, "Yes, you can have that." We

> were just a very poor family in the 'hood'. We just didn't necessarily think we
> could achieve that. No one growing up told us, "Hey, the value of education can
> bring this, this and that and you could do it." We always highly respected it,
> treated people that had it very well, it was just never thought that we could
> achieve it as well.

Despite not hearing words of encouragement directly meant for him, Rick saw value in education as it was communicated as a key to better opportunities by his mother's expectations of not 'embarrassing her'. He said that he became motivated to "to show them," his family and community, that college was obtainable.

Similar to Fernando's experience, Michael also grew up in a single-parent home, with a mother that had to provide for eleven children. She earned a 9th grade education in Mexico and relied on her children to help support the family when they came of working age. College was never encouraged at home, but Michael was an excellent student throughout his school years. He was in the top 10% of his class and he excelled in math. When it came time to graduate high school, his mother and brothers communicated the idea that college was expensive and a 'selfish' act, however, Michael became the first to attend and graduate college. While his mother never spoke of college, Michael said that when he informed her of his decision to pursue a math degree, she expressed that he was on his own to pay for school, but she would be able to afford him a home to return to from college.

Fernando noted that when times were difficult in college he knew he could rely on his family for emotional support. At his university, there was a very small Latinx

population and Fernando described that he did not have peers in engineering classes during his first two years in college to connect with that could understand his experience. He described this experience as:

> There were times where I thought I wasn't going to make it and things seemed really gloomy and things were just extremely hard, but [my family] would always have my back. There were nights where I would call my mom and tell her what was going on with my exams and this and that, and she would just tell me she would pray for me and help me. It hurt a little too because they would always say, "I'm sorry I can't help you, but just me thinking of you is all I can really do for you." That in and of itself I guess was them, themselves, was the motivation that I needed in STEM…

Having that emotional support influenced Fernando's decision to attend a university not far from home.

Financial Hardships

Financial realities. Concerns over the costs of college was a common theme in the interviews and was often the focus of responses to the question: "Tell me about a discouraging time in college." However, the concerns to finance an education were experienced at different levels. Michael stated that college was not discussed at home because his mother knew it was expensive. She raised eleven children as a single parent and needed their assistance as they came of age to work. To mitigate concerns over college costs, Michael applied for various scholarships and received a good financial

support package from his university. However, an unfortunate event occurred that put a hold on Michael's college plans for a little while. He noted,

> There were circumstantial family things that were happening at home, that sometimes made me think of dropping out of college and helping out financially at home and getting a job. For example, the year when my mother was laid off her job, made it very difficult, it was my second year of college. I actually did take a semester off from school to work and come home and help pay and contribute to the mortgage.

Michael added:

> Going back to that year when my mother was laid off and hearing the fact that they were having a difficult time. It almost made me feel selfish because I wasn't contributing to the family income or any of that. So, that was my sophomore year. It was quite challenging to hear of the struggles they were going through, and I felt privileged.

The pressure to balance completing a degree and financing college was also experienced by other participants. Fernando was torn between helping his family after his father was laid off two weeks prior to his very first semester of college,

> …I had this family situation where the main breadwinner of the family [was] not working anymore and I'm about to leave and I guess starting up college is a huge cost. There's a lot of things that go into that that I didn't realize. Just buying bedding and all this other stuff, right? That was now another thing that was on top of my mind. That was the first time where my parents almost asked me ... They

didn't necessarily ask me, but it was kind of almost implied like, you might want

to start working now, because I was 18 at the time now. That was discouraging in

a sense where now I had to really work and help out the family.

Eventually Fernando's father regained employment, but this was a discouraging event for

a young person to experience.

The commitment to support family financially was also mentioned by Rick who

shared how as early as when he was able to "I could pass off as an 18 year-old" he was

expected to work to help provide for his family. During high school, he and his brothers

worked on a farm to earn money to help his mother pay bills. His mother worked 2-3

jobs, but still struggled financially. Rick even applied to college without his family's

knowledge because the concern over how to finance his education would've caused an

issue. However, once he began college, his family did not interfere with his plans for

higher education.

Elizabeth and Maggie had different experiences in that their families were able to

provide some financial support. During college, Elizabeth participated in a work study

program to help pay for her education, however, her parents assisted her as well. She

described that she witnessed her peers often struggle financially, "Obviously, most of the

minorities had to do work-study as part of the financial aid package." "All of my friends,

they were struggling." Elizabeth was bothered by how hard she and her Latinx peers had

to work to balance school and a job. She said in reference to her middle class peers,

People don't understand what it takes for some people, some of us to get here. I

know it just felt like they were taking it for granted that they were there, and I was

over here like, "My mom had to do all of this and all of that, and if it wasn't for them I wouldn't be here."

Along with scholarships and financial aid, Maggie's parents were able to help her finance her education. However, Maggie felt pressured to complete core science courses during her first semester of college. While Maggie's parents did not pressure her, she described a need to make sure she "invested" their financial help wisely. This led to some frustration and the realization that biology was not Elizabeth's passion. She switched majors, then took more than the allowed amount of courses per semester to finish her degree within four years.

Financial hardships were shared by all the participants. They are all first-generation college graduates with parents that immigrated to the United States for better educational and job opportunities. A theme within financial hardships was that participants never mentioned anyone outside of the home that advised them regarding paying for college. Students' persistence to remain in school despite financial hardships was evident in these interviews.

The values participants were raised with and the emotional support families provided was communicated as essential in the interviews. Participants emphasized the low Latinx population on campus and how they felt that they couldn't connect with others that is why it was critical for them to reach out to family for emotional support.

A Sense of Belonging

A theme that emerged throughout the interviews included participants' descriptions of the need for a sense of belonging that was triggered by feeling 'out of

place' due to challenging moments. Participants said they either felt underprepared or disconnected from the rest of their classmates during STEM courses. By 'underprepared' participants meant that they had not been exposed to rigorous STEM content in high school, as they thought they had. Many had taken AP courses in their secondary years, yet they struggled to keep up in class. They recounted experiences when they had questions during class, but feared the embarrassment of asking people they felt couldn't connect with on a cultural level. Elizabeth expressed feeling discouraged to participate because her classmates often mentioned how they were familiar with the content being taught and so she questioned her place in STEM, "I felt out of place." I was like, "What am I doing here? What's going on?" She added:

> The other thing that was really discouraging was just seeing everybody else
>
> succeed so easily and feel like I had to work twice as hard to get half of what they
>
> had accomplished. That was discouraging, and what I went through all four years.

Participants also described moments in which they struggled with unfamiliar coursework as "breakdowns." Elizabeth expressed how during her sophomore year she was ready to give up because the class assignments became difficult to keep up with. She recalled: "My first breakdown I think was my sophomore year, once I started getting to those upper level courses. That was really hard, I felt like I couldn't do it." She communicated that classmates were a lot more prepared. She would hear her middle-class peers relay how their parents were in science fields. She felt discouraged by the lack of exposure she had to biochemistry coursework and that her classmates had an 'advantage' because their parents were coming from science fields. The absence of Latinx in her classes made her

feel even more intimidated to ask professors or her peers for help because she felt they couldn't understand 'where she was coming from'.

Hector also used 'out of place' to describe his experience during his first years in college. He attended a similar high school with minimal resources and lack of college preparatory classes, similar to Elizabeth's experience. During college, he noticed how his classmates claimed that they had been exposed to similar content as the one being taught, while it was Hector's first time seeing the course material, thus he had to ask more questions. In response to the question of his experience as a Latinx STEM student, Hector noted

> For me, immediately I felt out of place. I attended school about maybe an hour and a half away from home, so I could go home in the weekends if possible with homework and projects and other stuff. It wasn't always possible. Immediately, I felt out of place and it didn't feel like I belonged.

The sentiment of feeling out of place or not belonging was depicted in different ways by participants. As a high school student, Maggie was a part of a group of students that received advanced level courses. She described how she entered college feeling like she was going to be a top student, but she came to find that many of her classmates were coming from honors programs too and were even more prepared.

> Sometimes I honestly feel like I [was] surrounded by people that are so much smarter than me and sometimes I do feel like or maybe I don't read enough on news or maybe I don't do this enough. Sometimes I used to really feel self-conscious about asking questions because like I was dumb or stupid or

uninformed….It's just being in a classroom with different people that probably

had already done these assignments in high school and realizing that maybe

you're set up to fail because you didn't have these opportunities when you're in

high school now you're getting them thrown at you during college.

Another participant with a similar experience, attended a culturally diverse International

Baccalaureate high school that offered advanced level coursework. Fernando felt

prepared to go to college, but once in his engineering classes, he became uncomfortable

seeking help. He expressed:

Early on didn't really have many friends of color in engineering in my field, so it

was kind of hard just going to ask, "Hey, can you help me out here and there?"

Because I felt like they were going to judge me right away and I was scared to do

that so I struggled and I didn't have a study group, so that hurt me as well.

It was very important for Fernando to have some kind of cultural connection while living

on campus. He eventually joined a fraternity and a Latino-based organization for

engineers.

In college I did tutoring. I joined a fraternity as well. A Latin-based fraternity. I

also was a part of SHPE, the Society of Hispanic Professional Engineers. Just

because those small communities helped me and we grew as a family and we

preached familia so much in all those different organizations. It felt like a home

away from home.

He added at the end of the interview, when asked, if there was anything else he wanted

the researcher to know about his experience and himself, Fernando said:

I couldn't have done it without my parents, and then ... I'm sorry, I started

laughing because I was going to start saying this, I thought of my Facebook post

that I wrote. Once I graduated, I was waiting years to write that post, and it was

just really thanking my parents, my friends, my communities such as SHPE and

my fraternity. It really, it felt like it was a community ... a community diploma,

you know?

Paving the way for others was also a key factor in Fernando's pursuit of STEM.

The confidence to approach others and make friends came naturally to Fernando,

however this was not the case in his engineering courses. He recalled that the Caucasian

males in his class were not friendly or approachable. As the oldest child, with no

brothers, Fernando expressed that after he learned how to navigate college on his own, he

joined a fraternity because he felt the need to have brothers and other Latinos to connect

with. He saw how his 'brothers', peers in his fraternity 'gave back to the community' by

setting examples and supporting each other in academics. Fernando sought to do the same

and eventually took on a leadership role to help other Latinx interested in STEM,

> ...we would go back to high schools and bring them on to campus and kind of just
>
> show them around campus. Show them, hey there's people out there studying this
>
> material that look like you. That just planted a seed really on helping them, and
>
> then kind of once they're there taking them under your wing and understanding
>
> and helping them out with coursework and what not.
>
> I was tutoring for them and there was a couple of students who were
>
> interested in college and wanted to be engineers so I pushed myself to teach them.

It's like, this is what you gotta do, this is what your application looks like. I even

peer edited their applications, their essays. It was really nice and I felt really good,

and once they got accepted, and once they actually went into Madison and I was

able to see them there.

I want to see more people of color doing what I'm doing as well. I know

how hard it can be to get a degree and I know all the possible things that can come

up, all the problems that will happen throughout your life that could happen. It's

just nice to have someone there to have your back.

As a commuter, Beatriz found it difficult to become part of an organization or to

even join a sorority for a cultural connection on campus. Like Fernando, having a cultural

connection was also important to her. She sought out other Latinx in biology, but she said

it was rare to find them. She recounted how she cried many times in college because her

classmates, that came from more affluent homes and schools with advanced level classes,

appeared carefree in her eyes, whereas Beatriz's high school was poor in resources.

Beatriz found it difficult to connect with her peers. She described this feeling as:

"Why are these people just hanging out?" Like I told you, they would go over

[science content] in their high school. I was like why are they hanging out and I'm

suffering? Is it going to be the same in medical school?

In addition, Beatriz said that she made only one friend her freshmen year, another Latinx

STEM major. She said of her experience as one of campus climate,

him and I would sit in the front of our class and he was Latino too but I didn't

really meet anyone else because there weren't a lot of Latinos in STEM classes.

Not that I had to only have Latino friends but other people were kind of hard to

approach because they already knew each other from high school.

Instead, Beatriz chose to make friends through the tutoring center that was available on

campus for Latinx. She established strong friendships at the tutoring center and

explained why she found the center: "I think we all try to look for our people. By our

people I mean Latinos that you can relate to."

Beatriz and Natalia shared that they experienced anxiety and depression during

their time as undergraduates and found that there were no counselors available on campus

that understood their experiences. For example, Beatriz was dealing with the challenges

of college coursework and supporting her very ill brother. She had been experiencing this

throughout her entire life, such as attending doctor's visits to translate for medical terms

for her parents. She also mentioned that even her decision to pursue a graduate degree or

choose a job close to home so she could help her brother was critical to her. However,

when she met with mental health counselors, they were not able to relate to her cultural

background. Natalia's engineering courses were very challenging and she had the added

pressure of maintaining a certain grade point average to keep her scholarship. Similar to

Beatriz, Natalia also found it difficult to talk with counselors that understood her

experience. She even suggested more mental health counselors that particularly can

connect or understand where Latinx are coming from.

The theme of feeling alone or a sense of belonging was noted by eight participants

that described they were not prepared for college, but Sofia had a different experience in

that she felt that her high school did a good job and provided her with demanding

coursework. She attended a high school recognized for competing academically on a national level. However, she did not feel comfortable in her classes at a PWI as they lacked diversity and other Latinx students. She desired someone she could relate to, "In my freshman year, I think I struggled in general because I was new to college, I was new to it, but then I just didn't feel like I was part of the community at the university." Sofia expressed that it was very important for her to have friends she could relate to and understand her struggle as a first-generation college student. She was capable of going to medical school, but was torn between family expectations of getting married and then her own dreams of becoming a doctor. Her older sister attended college with her, but she was majoring in journalism, and this left Sofia feeling alone.

Rick also reported instances in which he felt out of place because he felt underprepared in college. Rick said:

> So, I would like to say that, in my high school years, I took as much advantage as I could from there, like taking AP classes and honors and being in sports and different clubs. So I feel like I did as much as I could in my senior year, or like my high school years ... and even with all of that, you get to university where you're compared, at the end of the day you're competing with other students that had way better educational systems that they grew up in. So Milwaukee public schools, even though they offer, let's say five AP classes ... you get to compete with other people that had 15 to 20 at their disposal.

In response to the question about what kind of support Rick had on campus, he responded

that he relied on the Latinx organizations on campus because there was not a supportive

environment and added that:

> So when you're a minority where you're a small part of that, you don't necessarily
>
> get the same love and attention. So again, I felt supported at the groups that I
>
> sought out, but as soon as you step out from those groups, you're back into that
>
> war zone and you're out on your own.

Similar to other participants, Michael described feeling 'isolated' when he was around

other students in his math classes. His classmates were from affluent homes, in which

their parents had professions. While Michael said he never felt discouraged in class, he

found himself socializing with the international students, and not the 'mainstream' White

students in his class. These interactions may have resulted from differences in

socioeconomic status, as indicated in Michael's response to the question, "Tell me about

a discouraging time in college":

> I came from a very low-income family versus students in my university that were
>
> from middle to, high middle to very wealthy families. I felt inferior to them in the
>
> sense that I didn't have the BMW or the clothes that they wore or could not easily
>
> afford to go eat at the steakhouse that was around the corner.

When Michael was asked to clarify what he meant by 'inferior' he said that he preferred

to interact with students that would not look down at him because he came from a poor

family. Therefore, the international students became his network of friends.

Many participants experienced situations in which they called upon on parents, siblings or Latinx organizations that encouraged them to continue in STEM, but they still found themselves craving a sense of belonging. The need to have someone understand what they were going through as STEM majors and as Latinx was communicated in these interviews.

Factors that Impact Latinx Students' Decisions to Pursue and Persist in STEM

The findings indicated that resilience was the second strongest theme that emerged. Participants described individuals' dreams and the determination to complete school that was often fueled by negative experiences.

Resilience

The findings in the previous research question communicated that participants were underprepared in STEM college courses was common throughout the interviews, however, participants also identified hopes and dreams.

Hopes and dreams. Every single participant responded when asked about their career and life plans/goals, with a variety of reasons why they chose a STEM path, such as being good at science and math, traveling, owning a business, supporting their families, and showing their family and community that college is possible for Latinos.

At the start of his journey, Fernando was inclined to engineering because, as he described it, he was good at math and curious about how things work. He wanted to "help build something" and is interested in one day owning a consulting firm in engineering. However, securing a job to help his family was another motivator in addition to his personal goals.

> I just kind of thought of just getting a job. That was the main thing. That was the
> main focus, was to get a job, make some money to help out my family. Then I've
> always thought, back then my thought was to eventually open up my own
> business, my own consulting firm.

Fernando added,

> The very first Christmas after I got my job I was excited to give presents. That
> was one of the main biggest things for me. Ever since then being able to go buy
> my family big dinners and what not. Just giving back to my family, that's the
> biggest thing for me. Being able to help them out.

Participants' hopes and dreams revolved around careers that aligned to their goals, and at the same time brought them the satisfaction of 'giving back' to their families.

Michael shared that he was also strong in math and this strength influenced his decision to seek a double major in math and business. He dreamt of traveling around the world and thought a business degree would allow him to combine his love for traveling and secure a job. He said about his minor in business: "this would be an opportunity for me to see the world through a career that could possibly open doors for me to do that." In addition to traveling the world, Michael was also motivated "to get a college degree and be the first to graduate from college." Michael explained that during his time at his university, he often felt the pressure to help his family financially and at the same time he wanted to pursue a degree. His siblings didn't see the value of college. Michael became convinced to show his family that he could be the first of eleven children to attain a

college degree. He said he wanted to inspire them as well. Even after he took a semester off from school to help his family, Michael returned even more determined.

> That same year, I decided to go back to school, and did what most people could not do. I actually took 23 credit hours in one semester and actually it was my highest GPA ever. I worked really hard to recover, because I was determined to graduate.

After graduating, Michael received a job offer from a well-recognized automobile company. He expressed that he wanted to show his family and even his neighborhood that a college education was possible for anyone. Eventually his older sister went on to complete a teaching degree and became an elementary school teacher.

Other motivating factors that were shared during the interview included helping sick family members. One key factor that motivated Beatriz to major in biology was her experience growing up with a very ill brother that did not qualify for day-to-day care as he is not a U.S. Citizen and not entitled to these health benefits. Since she could remember, her brother had special medical needs and this sparked her curiosity in understanding his illness. Beatriz mentioned that with a degree in biology she learned to better understand her brother's condition and has been able to translate complex terms in Spanish to her parents. In addition, Beatriz mentioned that opening a facility or organization to support immigrants with medical conditions that don't qualify for medical services was important for her. Beatriz said:

> I'm interested in, hopefully, finding a way of developing some type of group or organization to support people with disabilities, specifically people who are

undocumented, so that they'll have benefits. You know how people that have

benefits, they could apply to have someone to help them at their house.

Beatriz does not see medical school in her future, but she hasn't ruled it completely out.

She struggled keeping up with the coursework in her STEM classes, but her commitment

to learn more about her brother's condition and to help the Spanish-speaking community

understand medical terms motivated Beatriz to complete a biology degree in four years.

Dreams of pursuing graduate school to continue advancing is on Elizabeth's list

of things to do in the future. During her sophomore year, Elizabeth told her advisor

during a meeting that she was thinking of pursuing graduate school after graduation. Her

advisor immediately responded that she disagreed with Elizabeth's future pursuits.

Elizabeth expressed,

She basically discouraged me that [science] wasn't for me, and I probably

wouldn't ... I had her for my first bio course in college and I didn't do very well, I

had gotten a C. It was really hard. It was my first semester freshman year, first bio

course, and based off of that, she told me that I wasn't able to really go on to

qualify to grad school. She wasn't mean about it, but she just truly believed it.

After earning one C in college, Elizabeth never earned anything lower than a B in the rest

of her courses, yet her advisor discouraged her. Elizabeth explained that she did not take

it personally, but that it was hurtful to hear that from her advisor because of one class.

Despite the discouraging advice, Elizabeth persisted and is currently a scientist and is

preparing to take the GRE for graduate school.

Determination

The notion of starting "behind the line" was often stated by participants. Part of Hector's resilience stemmed from acknowledging a lack of college preparation that set him "behind the starting line" in college, but that motivated him to prove to himself and his Latinx community that he could graduate and become an engineer. While his friends in high school encouraged him to apply for community college, Hector set his sights on a four-year university because he explained he believed it had more potential. Initially, balancing a full-time job and going to school became extremely challenging for Hector during his second year in college. He was eventually asked to leave his university after his GPA dropped below his college's requirements. Hector returned home to continue working full-time and considered that he was meant to go to community college. Eventually, he realized that while his employer offered him a decent salary, he would not be able climb 'the ladder", as he said, and make more money. Hector's supervisor encouraged him to return to school and finish his degree. He expressed:

> If I made it this far this quick, and I was still young at the time... I finished off that
> summer and then next fall, the third year, I went back, I talked to the dean at [the
> university]. I took some summer courses at the community college that I made
> sure would transfer to the curriculum that I was taking at [the university], and
> when the dean gave me a second chance I got back to [the university], started
> doing better.

Hector advocated for himself by returning to his school and talking with the dean. He eventually completed his degree and went on to work for a manufacturing company as an

engineer and later became the president of a Hispanic Leadership Forum to help out other Latinx and minorities pursue and complete STEM degrees. Hector provides opportunities for his co-workers to bring their children to work to see what they do in engineering. He commented: "We do a very good job of helping parents out here in this company expose their children to the things that we do here and what it is to really do engineering."

Sofia recalled a particular experience in which she was inspired to pursue STEM. As a high school student she worked a summer job in a neighborhood clinic, in which she assisted Latinx professionals in the medical field. She was surprised and at the same time inspired by one of the doctors at the clinic and his connection to her community, as she described her reaction:

> He was Mexican American. He also grew up on south side so I was like, oh my gosh, if he could do it, I could do it! So that was something that was new and because he was also Latino, that made it more believable, like more attainable that there were Latino doctors because all I had seen up to that point were White and Asian doctors.

In addition to being inspired, Sofia said that this experience also influenced her persistence to pursue a college degree in biology. She shared that being an example to other Latinas and Latinos drove her to complete her degree. Even to this day, 14 years after she graduated college, Sofia believes Latinx children are not exposed to STEM role models of the same ethnic and cultural background. While she had several family members that completed degrees at four-year universities, they were non-STEM majors,

and Sofia found it difficult to get support and someone to understand what she was going

through as the only Latinx person in her college science courses. Sofia shared,

> I encourage kids, you know, if I speak to someone that says that they're thinking
>
> about going to school, even if they're older, I always encourage them to go
>
> forward with it, to push, to sacrifice, to work hard, because it's worth it. I can't
>
> imagine my life without having gone to school. I don't even want to think about it.
>
> I'm so grateful that I went to school, and I'm happy, even though I didn't go onto
>
> medical school, I work in a job that it's helpful for me to have that science
>
> background, and it's exciting still to learn about what other people are doing in the
>
> medical field.

> Similar to Sofia's experiences, Maggie, as well, saw no other Latinx students in

her biology college classes. She recalled asking herself "Where are my people?" when

she first stepped into a biology class. Maggie immediately joined organizations to create

the support she needed as a Latinx STEM major.

> I was already aware that I was the only one of my skin within these classes, but
>
> having that support group and telling me, "Yeah, we're not enough, therefore you
>
> need to ..." kind of change your attitude from feeling sorry for yourself to being
>
> proud of who you are"

Then one day, during her second semester of college, Maggie recounted that her

professor told her:

> "do you know how many people beg me for people like you?" She was like, "you
>
> have a really good GPA" she was just like, "you're Hispanic, you're a woman."

Essentially she said, "you're a double minority" she said they want you, people

want different perspectives, different experiences to help their companies grow.

The idea of a need for different perspectives and diversity motivated Maggie to continue.

She shared that she has become involved with organizations on her campus to mentor

new Latinx students pursuing STEM. Maggie described her commitment to finishing her

STEM degree as paving the way for others and commented: "I just had that idea of

there's not enough of me out there, there's not enough of us. And so I had to be the one or

me and my group, we had to be the ones that had to be on the front line."

During the interview, Elizabeth shared how she struggled to keep up with college

level STEM coursework, and although her sisters also completed bachelor's degrees, they

didn't have the science background to support or advise her. Instead, her mother did

everything she could to help her. Elizabeth studied and attended tutoring sessions as well

as sought help from her professors. In spite of hearing her White, middle class peers

comment that they were familiar with the coursework, Elizabeth persisted.

Rick recounted an experience in which he was often hesitant to ask for help

during his first few years in college.

I remember being questioned what my ACT score was before someone offered to

help me, or I asked somebody to help and that was their response. They're like,

"What was your ACT? Should I even help you?" I was like, damn, okay, I'll ask

somebody else. So it's like you had a lot of people that ... just didn't understand

why you were there. They didn't care to understand, they just saw you as taking a

spot from somebody else. And then you had people that meant well but didn't see

you as ... a priority to help, and then you had a very select few that genuinely

cared about your success, and would assist you in whatever ways they could. But

overall, the experience was pretty rough, filled with many ignorant comments, but

you just keep on chugging.

This kind of experience can be extremely difficult to deal with, yet Rick continued to

pursue his degree despite these negative comments from peers.

Beatriz often sought help from the tutoring center at her university, however she

recounted how discouraging the tutors could be. Beatriz recounted that the tutor, a

Caucasian female, asked her:

What are you trying to get into?" I'm like, "What do you mean?" She was like,

"Yeah, career-wise." I'm like, "Oh, I want to go to medical school." She started

laughing and then she was like, "That's a very hard area." Then I think I sat there

just to show her that I wasn't going to give up, but when I left I felt like shit. I'm

like, "Well, there you go. I'm in a place where I'm not wanted."

Even this discouraging experience did not stop Beatriz. She found support in an African

American teaching assistant in her most difficult course and completed the class with a B.

Various Forms of Capital, Including CCW that Impact Latinx
Undergraduates in their Pursuit of a STEM Degree

The findings from this study addressed the question of: What are the various

forms of capital, specifically of Yosso's Community Cultural Wealth (CCW), that impact

Latinx STEM undergraduates in their pursuit of a STEM degree? The interview

questions were semi-structured and designed to address Yossos' six capitals of CCW:

aspirational, familial, navigational, social, resistant, and linguistic. The questions were also open-ended in that they allowed for other themes to emerge, as discussed in the above section of this chapter. I will discuss a summary of the capitals that participants drew from as college STEM majors. The presence and utilization of the capitals overlapped and I chose not to separate them in the following descriptions, and instead present them together to illustrate that Latinx drew on several forms of capital for individual experiences.

The data from this study showed that Latinx utilized non-dominant capital to navigate college, however, not all capitals were equally relevant to participants' attainment of STEM based on their responses and stories. This study found that aspirational, familial, navigational, and resistant capital strongly applied to participants experiences. However, social was moderately applied, while linguistic capital was not utilized often by participants to navigate college.

Familial and Aspirational Capital

First, the interviews showed that family and culture are by far the most dominant facets of participants' experiences. Eight out of 10 participants interviewed brought up Latinx culture as a central part of their experience in college. Question 1 of the interview asked for participants to answer: "Tell me about your family?" prompted by, "For example, how did you grow up?" This question was tied to familial capital, however, it was open enough to let participants discuss their interpretation of the question. Participants' responses to familial capital questions were often associated to aspirational

capital, such as family values, including as parents' education level, views of college and education, careers goals, and advice.

Edgar's experience growing up is a strong example of several capitals that Latinx drew from during an individual incident to attain higher education. Edgar mentioned that his parents immigrated to the United States for a better life for themselves and their children. Due to limited educations in Mexico, they had to work long hours in which they were not able to attend Edgar's academic or athletic competitions and events he was involved in high school. Nonetheless, Edgar said about his parents:

> They wanted to provide a better opportunity and I think the difference between let's say my family, and some of the people that I went to college with, that even though we didn't have much time with them, for my parents, in the evening, on the weekends, we did. We definitely always went to church on Sunday and spent a lot of time on Sunday with the rest of our family. Saturday we all did chores around the house and cleaned up, so we did have that emotional religious support from our parents.

Maintaining a healthy connection to family and the community, such as attending church, was instilled in Edgar. His parents' aspirations were also carried out by his older siblings that completed college. In addition, Edgar drew on his familial capital by seeking the guidance of his older siblings regarding attending his high school events or ensuring he was on the right track toward college.

Edgar shared that in his neighborhood, there was not a high expectation of going to college in Latinx families. Many of his friends who had no home supervision became

involved in bad activities that even involved illegal ones. Edgar observed and reflected on the situations his friends were in, and he drew on familial and aspirational capital, including reaching out to his siblings for support to navigate the educational system. The combination of these two capitals were evident in his experience. Edgar credited his parents and siblings for encouraging him to continue and aspire to attend college and finish: "I think the family support that I had and the expectations that my brothers and sisters set up for me just kind of like … I gotta finish."

In answering the question about family expectations, Maggie said that her parents were supportive and school was the end goal in sight. She said: "My parents came from Mexico and just having their immigrant background and them inspiring me, pushing me to go to school, knowing all throughout high school, college was an option for me." Although her parents could not provide Maggie with academic support in her college work, they were able to assist her financially. Maggie applied more pressure on herself to make sure she stayed focused and enrolled in the classes she needed for her degree. Maggie's parents' aspirations for college along with their financial support are an example of the influence of aspirational and familial forms of capital.

Fernando's parents are also immigrants from Mexico, with limited exposure to a K-12 education, however, a focus on academics was stressed in his home. He aspired to go to school for himself, but also for his family. He said that his parents:

always preach hard work, never give up. Really it's just more of the role model

that they set for us…...hard work and their sacrifice for us was the reason why we

had the opportunity and the privilege to actually go to school and continue our

education.

Fernando acknowledged that he is from a very poor family and that when he first started

his career, it thrilled him to be able to take his family out for nice dinners. His family's

emotional support along with high aspirations helped Fernando triumph.

The value of education, along with aspirations and emotional support intertwined.

Participants' dreams and goals aligned to parents' expectations. Beatriz shared her desire

to create an organization that would support Latinx immigrant families. She has

witnessed her parents struggle to care for her ill brother because he is not entitled to

medical services. Beatriz translated for her parents during hospital visits and she saw that

other immigrant families did not always have a child or someone in the family that could

attend meetings or doctor visits. She hopes to develop or help plan an organization that

will provide not only support translating, but also medical assistance for immigrants in

her brother's situation. This is an example of how Beatriz transformed aspirational and

familial capital into motivation to earn her biology degree.

Navigational and Resistant Capital

Many of the instances in which participants described in response to a

discouraging event or what their experience was like as a Latinx STEM major, involved

the feeling of being underprepared for STEM college courses and the culture shock of

attending a predominantly White university. Most participants struggled with the

coursework or adjusting to campus life. They commented that many of their classmates

were coming from schools that had more available AP courses, as well as financial

resources. However, participants drew on navigational and resistant capital to overcome and persist in STEM.

Self-advocacy. Participants were asked to address the question: What strategies did you learn in high school or from your community that was helpful in college? This question was designed to see what navigational capital students drew from to navigate college. Most participants said they did not learn any strategies. Even when I probed, they still said "No, I didn't learn any helpful strategies in high school." They credited family and friends for support, but they realized that once they were in class, their family's support and advice could only go so far. Participants had to rely on their navigational skills to succeed in class. Fernando mentioned that at the start of his first year, he was reluctant to approach his White, male classmates when he had questions because he was afraid they would judge him. He even avoided his professors for the same reason. When his GPA suffered, Fernando visited his advisor for help and found very little encouragement. He said of that experience:

> I had a general advisor and I remember this, she told me, "You might want to consider a different major." I was struggling with a couple of classes and I was wondering is there something else I can do? Do you think I should drop them? Drop the class? Maybe take some summer classes, this and that? I remember her telling me, "You might want to consider doing a different major." That just was really disheartening. It just kind of confirms, do I belong here? Do I need to finish this degree out? Will I have the support? Desiree was just a huge, huge, huge motivator.

Following this experience, Fernando began to seek the help he needed, such as attending tutoring and reaching out to his professors. Desiree was an African American woman that was a part of a student organization that provided support to SOC and Fernando visited her when he felt discouraged. He applied resistant capital as he sought emotional support from non-family members that were available on campus. Fernando even joined a Latinx fraternity because he became aware that he needed a sense of *familia* to succeed, as he described it. In reference to what he meant by *familia,* Fernando said it refered to community and support by people he could relate to on a cultural level.

A strong example of the use of navigational and resistant capital was in Natalia's experience as a Latinx engineering student. She was a top student in her International Baccalaureate (IB) high school and thought she was prepared for college STEM courses. However, upon taking her first engineering exam, she realized she needed a lot more support that her university did not immediately offer students, particularly, Latinx students. Eventually the STEM courses caused her anxiety, so she sought mental health counseling and accommodations for testing. These are examples of Natalia's resilience. She also was aware of her anxiety with exams and advocated for herself by requesting accommodations in exam settings.

When Michael had to leave a semester of school to help support his family after his mother lost her job, he drew on several forms of capital to return to school and finish his degree in four years as he had initially planned. Michael applied navigational capital and sought the guidance of his advisor to determine his workload when he returned to school. In addition, he wanted to attend a study abroad program for the following year

and looked for classes he could take abroad that met his degree requirements. He advocated for himself to convince his advisor that he could take on the semester. Michael said of his experience:

> That same year, I decided to go back to school, and did what most people could not do. I actually took 23 credit hours in one semester and actually it was my highest GPA ever. I worked really hard to recover, because I was determined to graduate.

Math classes were not difficult for Michael, but he mentioned that he struggled with writing. Nonetheless, he stayed on the course to completion of college and said:

> Writing a long page paper so that was a struggle, but I mean, in no time did I feel like "oh I can't do this. I need to drop out of college". That was not in me. I mean, if anything it just made me want to pursue it even further because I knew I could work hard and just make sure that I could do what I had set out to do.

Michael was determined to graduate from college to become a role model in his neighborhood.

Social Capital

Participants accessed resources at their universities, however the application of this capital was moderate. Resources came through family and the communities they joined as Latinx. Elizabeth turned to her mother for advice when she chose to attend a university two hours away from home in Wisconsin. Her mother's school principal was a resource and offered guidance and information about the university, including experiencing overnight stays at the campus to familiarize Elizabeth with college life. In

addition, a family friend also recommended the university Elizabeth selected. This influenced Elizabeth's decision to attend a private university because she preferred smaller class sizes. She was determined to succeed in her classes and looked for support when needed. She expressed,

> My undergraduate experience was stressful. At times, I wanted to drop out, because I felt like I didn't belong, but I had the perseverance………Yeah, and honestly I was not going to set myself up for failure. I seeked help through, I reached out to my professor who I received a lot of tutoring.

Maggie had a very similar experience, as she drew on the social bonds she formed with professors to access academic support and internship opportunities. Maggie said about her relationships with professors:

> I also became really good friends with my professors because I know a lot of people tend to be intimidated to ask questions and stuff but it's like if you don't ask questions then you're not going to get your answers and you're going to do things wrong and you're not going to do good. I'm that one student that where I make my name known in the classroom setting as well, where it's just like I love to be teacher's pet all the time.

This is an example of how she utilized her social capital by interacting with her professors and making her name known in class.

Beatriz's mother worked for a pair of doctors that also offered advice about college and extended their support during her pursuit of STEM. She said of her undergraduate experience, that when she was confused about what career to choose, her

family friend, Dr. Quartina offered her information about various careers, as well as jobs on campus. In addition, when she found herself struggling in a science course, in which Beatriz was not sure if she would have to discontinue, Dr. Quartina, and another doctor friend advised her about how to approach her advisor about the situation.

Linguistic Capital

All participants were bilingual. However, less than half found themselves applying their bilingual skills to their academic setting or college. Those that did use their language skills were male and majored in engineering, accept one that majored in math. Michael, Hector, and Fernando used their bilingual skills for their internships. In response to the question: Are you bilingual? If you are, did your bilingual skills help you in college? Michael said:

> Growing up in the south side of Chicago, my first language is Spanish, so it made
> me feel a little bit inferior but I actually embraced it……..I am bilingual. I
> actually am fluent in Spanish. I can write it, speak it and read it. I also worked in
> Mexico for a couple months with a Volkswagen company and I translated
> documents from Spanish to English, English to Spanish.

He added:

> I think it's another level or another dimension to someone's level of education and
> intelligence I would say. To acquire different languages and be able to be fluent in
> both is not only an asset but I would say definitely something that should be
> valued.

Michael described his study abroad experience in Mexico and how he felt like a leader when he was able to translate and guide his peers there.

Fernando studied engineering and also found that his language skills helped him interact more respectfully with the construction workers during his engineering internship. He said of this experience:

> I had an internship. Again, like I said, a lot of the workers are Hispanic and they do speak Spanish so being able to speak Spanish has helped me even now build a sort of respect and mutual communication with some of the workers and that just allows us to communicate more easily.

Another participant that had a similar experience was Hector who took full advantage of his bilingual skills and recognized it. He said in regard to immediately finding an engineering position after college:

> I mean, it's cost savvy just being bilingual with any company. I know before I started working for Caterpillar they have a Caterpillar plant in Mexico, for example. They hired me, before me the engineer that was in my spot used to travel and then they had interpreters down there for him once he got there. So that right there is cost savings for any company.
>
> I couldn't believe that they weren't utilizing the tools as they should be, so when I went to Mexico I started explaining to them in Spanish without using a third party interpreter and now them realizing, oh, well he's actually speaking and answering our questions, and getting the point across.

While linguistic capital was advantageous for a few participants, it was not a strength or capital that was often utilized by the majority of participants to maneuver college as Latinx STEM majors.

Overall, participants employed a combination of capitals, including familial, aspirational, navigational, and resistant that overlapped in various experiences. Social and linguistic capital were utilized as well as students became more familiar with the campus environment.

Table 4

Findings by Theme

Research Question		Theme (or CCW assets employed)
What are the undergraduate educational experiences of Latinx students who major in STEM?	→	• Family Schooling Presence • Financial Hardships • A sense of belonging
What factors impact Latinx students' decisions to pursue STEM degrees? What factors drive Latinx students' persistence in STEM?	→	• Resilience
How do various forms of capital, specifically those identified in Yosso's (2005) theory of Community Cultural Wealth, impact Latinx STEM undergraduates in their pursuit of a STEM degree?	→	• Aspirational and Inspirational overlap • Navigational and resistant overlap • Social • Linguistic were not utilized

Summary

Understanding the experiences of Latinx undergraduates majoring in STEM was the primary purpose of this study. Nine participants that graduated with a STEM degree, along with one participant completing her double major, agreed to participate in two in-depth interviews. Participants were interviewed using Seidman's method, in which they participated in one interview focused on life history, and the second interview about making meaning from their experience. Participants described the degree to which their families influenced their decision to pursue higher education and STEM, and also what kept them motivated to complete a degree.

Several themes emerged from participants' in-depth interviews. Familial schooling presence was the strongest theme in relation to how participants navigated the school system as Latinx STEM majors. Regarding their experience on campus, all participants, to some degree, did not feel welcomed on campus and expressed a lack of belonging. They expressed a need to feel connected to a community and having support from people on campus that they could relate to on a cultural level. Participants acknowledged that they, themselves, had to seek out help and support, as it was not directly offered in classes or by professors. To overcome obstacles and negative campus climates, several forms of Yosso's CCW capitals were utilized by participants to navigate barriers unique to Latinx, driving their focus and determination to finish STEM. The capitals overlapped with each other in various instances, and so they were presented together.

The following chapter presents a discussion about how findings contributed to the existing literature, theoretical framework, conclusions, implications for practice, and recommendations for further research, concluding remarks, and my reflections.

CHAPTER V

DISCUSSION

The purpose of this dissertation was to understand the experiences of Latinx and the forms of capital they employ to attain a STEM bachelor's degree. This final chapter will discuss how this study contributed to existing literature. Then, I discuss how the findings relate to my theoretical framework of LatCrit theory and Yosso's Community Cultural Wealth assets. In addition, this chapter provides conclusions that have implications for practice and recommendations for future research on the educational attainment of Latinx majoring in STEM. This chapter ends with reflections of what I learned as a Latinx researcher.

Findings' Contributions to Existing Literature

This study contributed to the extant literature by addressing the following areas: (1) the undergraduate educational experiences of Latinx students who major in STEM, (2) factors that impact Latinx students' decision to pursue STEM degrees, (3) factors impacting students' persistence in STEM, and (4) identification of various forms of capital, specifically those identified in Yosso's (2005) theory of Community Cultural Wealth that Latinx apply as STEM undergraduates. Most studies that look at increasing SOC in STEM focus on highlighting disparities in STEM completion between Latinx, Black, and Native American students and their White and Asian peers, with a focus on persistence, with little recognition of the unique aspects of the Latinx population, such as

culture, language, immigration, and ethnicity (Hernandez-Truyol, 1997; Villalpando, 2004). More so, literature on persistence has highlighted one size fits all strategies for SOC, grounded on deficit-based research. Research should focus on the completion of STEM among Latinx to understand what they have to say about how they attain STEM.

While extant literature (Corra et al., 2011; Darder & Torres, 2014; Gandara, 2006; Yosso, 2005) has expounded on the ongoing inequalities and obstacles in higher education for Latinx, my study indicated that the literature has not yet addressed Latinx' completion of STEM. LatCrit theory and Yosso's CCW framework provided insight into how Latinx navigate the educational system in predominantly White campuses, and my study showed that literature has not fully addressed the undergraduate experiences of Latinx in STEM. The Literature Review presented in this dissertation explored the various studies that look at disparities in STEM, often highlighting what capital and social resources SOC should use to navigate educational institutions. Coincidentally, all participants began and completed their STEM bachelor's degree at four-year universities. However, previous studies have not studied Latinx' perspectives and the meaning they make of their experiences in attaining STEM at four-year universities. The findings in this qualitative study help fill the gaps about the Latinx STEM experience at four-year universities, and what we can do to improve the direction of research to understand and support this burgeoning and young Latinx population.

The findings of this study answered the research question of what are the educational experiences of Latinx that major in STEM and how we can better understand the capital they employ to finish school. In this study, I recognized the unique

perspectives that Latinx STEM baccalaureates had of their experience and how they navigated the system. In the following subsections, I discuss the significance of my findings and contributions to existing literature.

The Undergraduate Educational Experiences of Latinx Students who Major in STEM

In this study, three major themes emerged from the encounters Latinx described: (1) familial schooling presence (2) financial hardships (3) a sense of belonging. These findings from the interviews align to the existing literature about the barriers Latinx experience, while at the same time challenging notions of poor family involvement in Latinx culture. Financial hardships were expressed in every interview, whether or not participants had financial aid or loans. The concern to finance an education was at times extremely influential in participants' decisions to continue or take a leave from school. However, despite the challenge of paying for school, participants committed to completing a STEM degree at a four-year university. In addition, a sense of belonging was crucial to Latinx as they found it difficult to cultivate relationships with peers in college. Latinx attended universities with predominantly White student bodies, in which they did not find welcoming and at times even hostile. Finally, findings related to the cultural and social capital Latinx apply in navigating college align well with Yosso's CCW. Participants drew from various capitals, including familial, aspirational, resistant, and social capitals to overcome challenges in the STEM classroom, which overlapped in many occurrences.

The finding of familial schooling presence in this study advanced existing literature about the high aspirations Latinx families have for their children (Langenkamp, 2017; Stanton-Salazar, 2001; Valencia et al., 2002) and how education is an extreme priority for them because in this study I specifically explored Latinx family views of education. Findings demonstrated the different forms of encouragement and support for higher education in Latinx families. Upon asking participants, during the study, "How did you grow up?" and before I could even follow-up with "What were the values taught at home?" participants immediately responded with sharing their parents' aspirations, which included higher education. According to Langenkamp (2017), aspirations are key predictors of higher educational attainment, helping families advance across generations. My findings reaffirm the influence of family on the education of Latinx. Most participants' parents immigrated from Mexico with limited K-12 educations, yet their hopes and dreams for their children were extremely important. Even when parents were not able to assist academically with school, siblings came together to provide academic support. Older siblings were also able to give guidance in the process of applying for college and selecting schools based on chosen major. Nearly half of the participants had older brothers or sisters that mentored them through the college application process. The experiences described by participants indicate the strong presence of Latinx families in education. Parents drew on their own capital/resources to be engaged in their children's education and to help them complete a STEM degree. These findings also challenge the idea that "familismo"; putting the needs of the family first by an individual (Losada et al., 2010; Sy & Romero, 2008) is as prevalent as previous research says. Latinx families

inspired and encouraged higher education and did not obstruct their children's path to STEM. My study also shows how parent involvement in Latinx families goes beyond the K-12 experience, in which most literature has focused on.

These findings show how Latinx STEM experiences deviate from deficit-based theories that Latinx families are not involved or do not have knowledge or experience to navigate and prepare their children for higher education (Solorzano & Yosso, 2002; Sy & Romero, 2008; Yosso, 2005;. Family schooling presence looked different for the participants. At times, participants' parents set an implicit expectation for their children to do well in school because they wanted better opportunities for them. But even when there was a lack of encouragement to attend college, even then, parents offered support in some form, such as a living space. There was no standard way that Latinx families participated in the education of their children, but nonetheless, parents and siblings supported participants.

My study uncovered that Latinx STEM baccalaureates commit to 4-year institutions in spite of the financial burden. Over the years, the burden of college cost has fallen on students and their families (Paulsen & John, 2002), making higher education difficult for Latinx, many whom are first-generation college students and low-income. Adelman (2005) reported that Latinx students are more likely to take the community college route than a four-year institution than students from other racial backgrounds, a reason being Latinx family's socioeconomic status (Malcolm, 2010). However, my participants described how they persisted because they knew how hard their parents had to work to support them, while others expressed how motivated they were to complete

school because of the potential they saw in their future with STEM. Latinx parents

conveyed the message that school is the key to better opportunities. While research

suggests other distractions such as financial needs can force Latinx youth to become

distracted from school (Pizarro, 2005), the findings show that participants were highly

motivated to continue to completion of STEM. Financing college was challenging for

every participant in my study, and they even had to work full-time jobs to manage the

costs of school. Two participants mentioned that having a full-time job interrupted their

ability to complete school within four years and/or to maintain the required GPA.

Understanding the financial struggles experienced by Latinx advanced the research on the

extent to which financing an education can impact students (Nunez, 2013; St. John, Hu,

& Fisher, 2010) and their ability to fully commit to the rigor of a STEM program. There

was not one participant that said they did not have to worry about paying for school. This

is an added responsibility for Latinx, on top of other obligations in their lives. Even

when participants had to step away from college to take a break because of reasons

related to financially supporting family back at home, they returned to finish their STEM

degrees. These findings demonstrate how Latinx rise above it all with persistence and

familial support. Financial circumstances were difficult, but participants stayed

committed to completing STEM at four-year universities.

        While students reached out to their family for financial and emotional support,

they also sought a sense of belonging and community on campus. In particular,

participants mentioned feeling "out of place" because they were not as prepared as their

White peers in STEM classes. These findings reaffirm and provide more evidence of

barriers preventing equity in access to higher education (Ohrt et al., 2009) for Latinx

students, which include poor school preparation and lack of rigorous curriculum prior to

college. My study supports the research about how Latinx students are more likely to be

assigned to experience less rigorous curriculum than their White counterparts (Arellano

& Padilla, 1996; Hill & Torres, 2010). In addition, participants' experiences detailed in

my findings reinforced stratification theory (Rogers-Chapman, 2014) that suggests that

access to opportunity may be limited to 'the haves' such as schools defined by high

socioeconomic status (SES), with low-minority enrollment that tend to have better access

to resources. All my participants are first-generation college students, the majority

coming from low-income homes, thus impacting their access to AP and college

preparatory classes. Even participants that had attended IB programs expressed that they

were frustrated in their STEM classes because they felt they had not been exposed to

rigorous content. They communicated that they were underprepared in STEM classes

and had to seek tutoring and support. In addition, findings showed that participants

frequently mentioned they attended high schools in predominantly Mexican and Latinx

communities, reinforcing how Latinx continue to attend schools separated from their

Black and White counterparts (Gandara & Contreras, 2010). Even more so, my study

reaffirmed that access to opportunities, such as AP courses, are limited by SES (Flores,

2010; Klugman; 2013; Rogers-Chapman, 2014) and by racial group, in turn, leaving

Latinx to struggle to catch up. Every single participant mentioned that they had to seek

tutoring, and help from professors, however, these were not always positive or inviting

experiences for them. Many expressed that they either felt embarrassed or uncomfortable asking for help, especially since they were in classes with predominantly White peers.

All participants expressed how important it was for others to understand them and to be able to connect to peers with a similar cultural background. Latinx participants in my study attended predominantly White institutions (PWI) and were not able to have supporting relationships in class. One participant mentioned that by his third and fourth year he fostered connections with peers and his professors. However, this same participant noted that his White classmates did not interact with him socially outside of class. Nine of the ten participants mentioned they were the first STEM majors in their family, and so at times family could not relate to their frustrations. When participants asked for help, they sought organizations that they could identify with on a cultural level. These findings indicated that Latinx STEM majors seek cultural congruity; an alignment between the student's home culture and university culture (Castellanos & Jones, 2003; Gloria et al., 2005; Gloria & Robinson Kurpius, 1996, 2001). Cultural congruity has been linked to the persistence of Latina/o students as well as other underrepresented groups in higher education. This study demonstrated that Latinx persevered with support from their families and with the resources they managed to find on campus. Self-advocacy played a huge role when participants found themselves questioning the support on campus.

Participants said they felt 'out of place' and often looked for other Latinx in their classes to bond with because their White, middle class peers were unapproachable. These findings added to the literature on campus climate that suggest associations

between students' perceptions of a positive or negative environment influence feelings of belonging, integration, and retention (Hurtado, 2002; Hurtado et al., 1999; Nunez; 2013). In addition, according to Yosso et al. (2009), Latinx students construct counter-spaces, which are 'spaces' or 'areas' on PWI campuses in order to preserve their culture and create a sense of belonging. Participants attended student centers, joined engineering fraternities, developed relationships with faculty, and sought help at student organizations. In doing so, Latinx developed a feeling of belonging to help minimize alienation experienced on PWI's. For many participants, majoring in STEM was a difficult task all four years because they did not have the support they needed, but aspirations and family kept them motivated.

Most studies, mainly quantitative, have looked at Latinx persistence by focusing on deficits of students that exit STEM (Andersen & Ward, 2014) to increase enrollment (Hurtado et al., 1999), while ignoring retention and completion. In my study, when Latinx could not look to family for support in academics, they searched for mentors and role models, and found them when they joined a Latinx social organization, but this was limited. While my study demonstrated the resilience and resourcefulness of Latinx, this also highlighted how universities have not improved resources for SOC, therefore Latinx students have been left on their own to seek help.

Factors that Impact Latinx Students' Decisions to Pursue and Persist in STEM

Another factor that impacted persistence was participants' motivations to help family and 'give back' to their community. They expressed how much support they received from their families and how they wanted to help them out financially after

graduation. In addition, participants described dreams of even running their own businesses and traveling. Participants also desired to help other Latinx make it in STEM. The act of helping or becoming a role model, as was expressed by participants, support Yosso's (2005) notion of how SOC 'lift' others as they want to help them advance.

My research underscored the unique aspects that motivate Latinx to persist despite unwelcoming college climates. The notion of starting "behind the line" was often stated by participants, as they felt their high school science classes had not prepared them sufficiently for college level STEM. They often questioned their place in STEM and expressed being hesitant to ask for help as they felt their classmates would judge them. These findings support previous research that Latinx are more likely to have anxiety and perceive themselves as less competent academically than their peers (Alva & de Los Reyes, 1999) when they are the minority in STEM classes. Stereotype threat is an influential factor in the experiences of SOC (Beasley & Fischer, 2012) and this study demonstrated how it caused Latinx to feel alone in class. There were participants that were discouraged by advisors from continuing in their field when they earned a grade less than a B. In particular, one participant explained how when she asked for help at a tutoring center, the tutor communicated negative advice and told Beatriz to switch to a major more suitable for her, "like Spanish." Eventually Beatriz formed a circle of support and graduated.

Despite these hardships, participants' resilience helped them to persist and complete STEM at four-year universities as they overcame feelings of being inadequate and sought help from tutoring centers, and even fraternities. Harper and Newman (2010)

recommended that researchers should look at how SOC overcome lack of preparation through cultivating relationships with STEM faculty and other professionals; and how they use strategies to conquer internalization of discouraging misconceptions about their racial group.

Findings Related to Latino Critical Theory

A major component of LatCrit is that it challenges the dominant discourse about Latinx educational attainment. Utilizing LatCrit theory as an analytical lens, the findings in my study demonstrated that Latinx experienced instances in which they became conscious of the social and educational inequalities (Yosso, 2002) surrounding them on PWI campuses. Latinx participants held some level of awareness and critique of their oppressive conditions and structures of domination and were somewhat motivated by a sense of social justice (Solorzano & Delgado Bernal, 2001). These oppressive conditions experienced by participants included: common experiences of feeling underprepared, (such as extensive tutoring and overhearing their White peers mention how they had performed the same labs in high school); the lack of support for Latinx that shows the preservation of self-interest, power, and privilege of dominant groups in American institutions (Calmore, 1992); recognizing being one of a few Latinx on campus; and noticing the economic differences in class. In addition, negative experiences included covert forms of microaggressions from peers or staff on campus and alienation/isolation. These findings also showed how Latinx overcame these obstacles.

LatCrit illuminates the role of race and culture in education settings, "particularly as it pertains to the pervasiveness of institutions to privilege one set of racial experiences

over another" (Gonzalez & Morrison, 2016, p. 89). While participants did not mention instances in which race or ethnicity were publicly called out in class or on campus, they shared that many times they felt alone, or as if they did not belong. At times, participants felt like their presence in STEM was being scrutinized by their peers. Some were even discouraged by their advisors to switch majors. Research on educational outcomes has found that campus racial climates that foster alienation and hostility toward SOC, also affect Latinx students' educational success. When universities neglect to support Latinx, an underrepresented group in STEM, this demonstrates a form of microinvalidation. Microinvalidations, a form of racial microaggression, are "characterized by communications that exclude, negate, or nullify the psychological thoughts, feelings, or experiential reality of a person of color" (Sue et al., 2007, p. 274). Participants also had mentioned how they felt excluded in the sense that they were one of possibly two Latinx in their classes and described how they usually felt out of place in Caucasian majority environments. Participants all expressed how they wished for a cultural connection, or even just someone that could understand they were coming from families with immigrant parents that didn't have a college education to guide them. However, while participants could've internalized the negative stereotypes or even switched to another major, instead they resisted. Delgado Bernal (2002) urges researchers to highlight the experiences of POC as validated holders and creators of knowledge and that is why it is important to share the experiences of Latinx as they can inform research of what the journey to STEM is like for them.

One major example of how LaCrit was an appropriate tool to analyze this data included one participant's experience as a light-complexioned Mexican at a White majority campus in Central Indiana. This participant described his college experience as 'normal' and that race was never an issue. However, he was often mistaken for an 'international' student because of his slight accent. The school he attended was predominantly White and throughout his four years in college he associated with the international students because he said he didn't want to surround himself with people that made him feel 'inferior'. I probed into the concept of feeling inferior because I was interested in gathering more information about Michael's experience that seemed to indicate a form of "otherness". Michael responded that he avoided students from more affluent backgrounds that would make him feel like less because they drove expensive cars and things. A LatCrit critical lens looks beyond race and highlights other aspects in which Latinx experience forms of oppression. LatCrit has an explicit focus "on the intersections of oppression that come from multiple parts of identity, including ethnicity, culture, nationality, and language issues experienced by people of color" (Anguiano, Milstein, De Larkin, Chen, & Sandoval, 2012, p. 128). Ethnicity, accent, and surname are aspects that LatCrit examine. Michael possibly stood out from his peers because of his accent and this appeared to have influenced his decision to separate himself from them. In a way, he may have been forced to, due to feeling like the "other".

I employed LatCrit as a critical lens in examining the Latinx experience in STEM. The questions designed for the interview were semi-structured and did not call out race or racism directly, so that if there were phrases or situations described than they would

emerge in participants responses. Participants described situations where they questioned

if the advisor or suggestions from advisors or professors were racially motivated.

Participants were aware that they were underrepresented in their biology, engineering and

other STEM courses and realized that the advice they received may have been biased.

This study confirms the effect of stereotype threat that has been applied in research to

explain academic performance of Latinx and other underrepresented groups in STEM.

Negative assumptions about Latino students' academic abilities can powerfully and

adversely shape their experiences. Latinx students who are more self-conscious about

stereotypes tend to have lower levels of academic "self-concept" and "academic

performance in college" (Massey et al., 2003; Smedley et al., 1993). There were several

instances in which participants questioned whether they belonged in STEM. Some

participants had nearly internalized stereotypes, such as Fernando who questioned

whether he should stay in his major after his advisor encouraged him to look at another

major, or Rick whose family said "education was not for poor Latinx."

LatCrit scholars assert that educational institutions' structures and practices are

contradictory because, while offering an open-door policy, the same educational system

oppresses and marginalizes students of color and in particular Latino students (Solorzano

& Delgado Bernal, 2001). All, but one of my participants talked about struggling in

STEM because they felt underprepared. These findings challenge the idea of meritocracy

and equal opportunity as it supports Rogers-Chapman's (2014) notion that a lack of

preparation, such as limited exposure to AP STEM courses can negatively impact Latinx

in attaining STEM. Most participants came from low-income families in which AP

classes were limited. Findings showed that many Latinx experience K-12 educations that underprepare them. The lack of support for Latinx shows the preservation of self-interest, power, and privilege of dominant groups (Calmore, 1992; Delgado, 1989) in American institutions.

Findings Related to Community Cultural Wealth

Chapter IV examined the findings of the study, including, themes that emerged and identification of the various forms of capital as identified in Yosso's (2005) theory of Community Cultural Wealth, that impact Latinx STEM undergraduates in their pursuit of a STEM degree. Participants articulated the various forms of community cultural wealth they utilized in STEM and higher education institutions. They also shared the aspirations and values they developed from their families and certain family dynamics provided them with direction, resilience and motivation. The findings showed that familial and aspirational capital were explanatory factors for academic achievement, such as students seeking emotional support so that they could stay on the path toward STEM. These two capitals overlapped as parents' hopes influenced participants' aspirations. As stated by Martinez, Chang, and Welton (2014), the capitals "are not always clearly delineated because they cannot be separated from the contexts they are cultivated in or from the individuals with whom they are shared" (p. 699). Familial capital is "cultural knowledge nurtured among familia (kin) that carry a sense of community history, memory and cultural intuition" (Yosso, 2006, p. 48) and aspirations can be developed through familial and social contexts (Luna & Martinez, 2013). Mothers, sisters, brothers, and even neighbors were mentioned by all participants as strong transmitters of educational and

moral values, as well as emotional support in school. Familial and aspirational capital were essential elements described by Latinx college students in their decision to pursue higher education. Aspirational capital was evident when future hopes were maintained despite the presence obstacles or discouraging remarks Latinx experienced from peers or faculty.

Navigational and resistant capital were applied to instances when participants needed the fuel to persist when there was a lack of campus support. Navigating college required skills, however, participants said they hadn't acquired any prior to college. They credited their social networks, which were made up of mainly of family in helping them navigate and understand higher education, including the process of college enrollment, applying for financial aid and support on campus. Participants usually had to seek help and advocate for themselves as they seldom found a supporting environment in their STEM classes. In addition, participants joined Latinx organizations to find support where others could understand their culture.

Social capital consisted of the individuals and/or networks of people (Martinez et al., 2017) participants relied on to support them in facing challenging situations. Garcia and Bayer (2005) highlighted the importance of relationships and how Latinx seek out support through other students they can connect with. Relationships are a form of social capital that enable Latinx to reach their goals. Social capital was evidenced by students when they accessed resources, such as fraternity and Latinx organizations for support. Some Latinx participants even bonded or reached out to professors or tutoring. However, the strongest source of social capital consisted of familial support. Participants

consistently turned to family for support during difficult situations. This was the first source of support participants reached out to, then after they turned to their campus for help. However, this was the extent of the use of social capital, thus, indicating that this capital needs to be strengthened. In doing so, Latinx can create more opportunities and access to higher education.

Linguistic capital was identified as valuable or as an asset by a few participants, especially males in engineering or math. All participants are bilingual, yet, only four out of 10 said it was a valuable skill, however, it was most useful for engineering majors that took on internships. This finding indicates how educational institutions devalue the language skills or Latinx students. LatCrit theory helps to analyze issues like language, immigration, ethnicity, culture, identity, and phenotype (Hernandez-Truyol, 1997; Martinez, 1994; Montoya, 1994). My findings show that Latinx language skills are invalidated on college campuses and that educational institutions are not finding ways to recognize Latinx (Rivera, Forquer, & Rangerl, 2010).

Despite campus climate, CCW framework provided insight into the experiences of Latinx STEM baccalaureates at four-year institutions. More importantly, this study presented the overlap of CCW in various instances, rather than in isolation. Participants clearly employed various capitals at one time to navigate educational institutions.

Conclusions

Implications for Practice

Latinx younger than 18 years of age are expected to represent 35 percent of the overall student population by 2050 (Passel & Cohn 2008). According to Dondero and

Muller (2012) "education represents one realm in which the implications of this population change are likely to be particularly acute" (p. 478). The changing demographics and diversification of the school-age Latino population suggest that schools will need to meet the needs of education for these students. Although the majority of Latinx students in public schools are native-born, approximately two thirds of them have at least one foreign-born parent (Fry & Gonzales 2008). Many of whom come from families with limited resources or experience in higher education. Through this study I had the opportunity to examine the experience of Latinx STEM baccalaureates. The primary purpose of this dissertation was to learn about the perspectives that Latinx have about their experience in college and attaining a degree in STEM. Using LatCrit and CCW theory as a framework, I gathered from their interviews data to identify and address their unique needs to better inform literature about the Latinx experience. Implications for improving the ways educational systems support Latinx are organized in the following subsections: (1) recommendations for universities (2) recommendations for policy makers and (3) recommendation for further research.

Recommendations for Universities

The most significant recommendations for universities is to improve building relationships and awareness at universities within student bodies. My findings show that Latinx students felt unwelcome in many of their STEM classes and on campus, and this caused them stress (Beasley & Fischer, 2012; Smedley et al., 1993) as they questioned whether or not they belonged in STEM. When classmates appeared unapproachable, Latinx feared asking for help.

In building relationships with Latinx college students, universities can create more awareness on campus about students working together and appreciating each other's culture. This can start with professors, in which they can provide activities/ opportunities in STEM courses for students to build relationships in class or simply opportunities for them to get to know each other. Participants ranged from ages 21-40, yet their experiences were very similar in which they were all impacted by the campus climate and heard discouraging words from advisors and classroom peers. One participant graduated high school, college in 2000 and another in 2017, and still, their stories of seeing next to zero Latinx in STEM is very concerning as it caused them some stress. In addition, findings indicated that students may need more mental health services geared toward Latinx, as two participants recommended it. Latinx may come from families where immigration, financial or other concerns impact their educational pursuits, in which mental counseling could be helpful. Participants expressed that having mental health counselors with a similar background that understand their experiences would be necessary for future generations.

In addition, findings showed that Latinx pursue four-year university degrees and that they can complete it, with the right support. According to the Integrated Postsecondary Educational Data System (IPEDS) 2014 survey, community colleges enrolled proportionally more Latinx students than four-year institutions with only 15% of students in four-year public institutions being Latinx. However, all ten participants in my study graduated from four-year universities in STEM, and this randomly occurred as my recruitment process did not require a certain type of bachelor's experience. A few

participants shared that at the beginning of their decision to pursue higher education they were tempted to choose community college because of peers that recommended taking this path because it would be easier to achieve. Even one participant shared she had chosen the path to community college due to her concerns over her ACT scores, however, Beatriz listened to family friends that advised her to pursue a four-year university. Despite challenges on campus and in classes, including subtle messages that biology or medical school was not meant for her, Beatriz was resilient and completed her STEM degree. Some participants had older siblings that also attended four-year universities, indicating that Latinx recognize the potential of four-year universities. It is extremely important to acknowledge and consider the implications from this study about the postsecondary decisions Latinx make and their goals. Universities should not assume that Latinx will not commit to completing a four-year degree. Latinx can succeed when given the right resources. The participants in this study showed resilience, however, the onus cannot simply be placed on students. Universities must take responsibility as well to support Latinx attain STEM.

Research has cited resources, including higher-level courses in secondary school, and college preparatory curriculum lead to greater academic achievement, college enrollment, and attainment (Cabrera & LaNasa 2000a, 2000b; Choy et al., 2000; Roderick et al. 2009; Schneider 2007; Welton & Martinez, 2014). However, my findings indicate that Latinx continue to attend schools with less rigorous STEM curricula than their White peers, placing them at a disadvantage when they get to college. A few participants even mentioned even being in IB programs, yet they struggled in college

level STEM. We must provide better support when Latinx major in STEM, as they may not have the same exposure as more affluent students that have more AP courses available to them. The K-12 experience in STEM for Latinx must also be addressed.

Recommendations for Policy Makers

The findings from this study give insight to policy makers about the challenges that Latinx experience as undergraduates in STEM programs where they are the minority. The Latinx student age population will continue to grow, as numbers show increasing college enrollments. However, graduation rates are not commiserate with enrollment of Latinx college populations. Findings demonstrated that participants felt that they lacked support on campus, such as counselors or mental health experts that could understand their culture and experiences on campus. Part of this issue was financial assistance. Several participants expressed having to work a part-time or full-time job as full-time students in STEM. This is a challenging task and it is important to increase financial aid to Latinx.

As recommended by Estrada et al. (2016) institutional-level tracking by program of student ethnicity and performance outcomes should be implemented at the college level. This data would allow educators and researchers to identify the characteristics of institutions with programs successful at recruiting and retaining Latinx in STEM. Publication of the data could be provided to federal and private funding agencies that provide financial support to institutions in the effort to address disparity and equity in STEM for Latinx and other underrepresented groups.

Recommendations for Further Research

This study holds implications for educational researchers as it emphasizes the experiences of Latinx and what they had to say about their journey through higher education as STEM majors. Participants were all situated in the Midwest, and attended White majority schools. I propose further qualitative research into the experiences of Latinx' from different regions that major in STEM. Depending on where Latinx are from, such as California has Mexican Americans and immigrant populations with different experiences compared to the Midwest or East Coast.

My research used a qualitative approach in which I used only a small group of participants that were located in the Midwest. Two of the participants under 25 offered to recruit other participants and they did. Overall, it was difficult to recruit Latinx participants that met the criteria, partly because of time constraints, but also that I could not find enough Latinx to volunteer. Through snowball sampling, I was able to interview participants that were members of the Society of Hispanic Professional Engineers (SHPE) and they passed on my recruitment flyer to other members. This is problematic because the Latinx student population under 18 will continue to grow and they will need to be prepared to represent our country. Policy makers need to provide more skilled teachers in K-12 that will prepare Latinx with rigorous coursework, as well as cultivate environments that will nurture a strong interest in STEM, as well as the skills to succeed in it.

Another recommendation for future research is gender differences in STEM amongst Latinx. In other words, the exploration of how Latinas experience STEM

compared to Latinos at four-year universities. For instance, I decided to use Latinx as an inclusive and gender-neutral term to describe my participants who mainly identified as Mexican-American or Puerto-Rican, however, it would be of great value to the field of education to explore the perspectives that Latinas have about their experiences versus Latinos and why they chose the field of STEM they studied. My participants consisted of many engineers and biology majors. However, most of the engineers were male and most of the biology majors were female. It would be interesting to gain a better perspective about why they chose their major.

Finally, findings showed that family and close family friends were critical to the completion of STEM for Latinx. Family involvement has been studied in K-12 experiences, but my findings showed that family support occurred in college as well. The integrationist model assumes that in order for students to be successful in college, they must assimilate to campus and its academic and social domains (Tinto, 1987, 1993). Tinto focuses on the students' background and individual attributes that influence her/his commitment to college completion. Level of institution, such as community college or 4-year university, quality and class size are recognized by Tinto, however, the onus is put on the individual students to integrate into campus life, academic and social systems, while ignoring structural barriers. One of the specific issues with Tinto's model is that it assumes that SOC must reject their own cultures to be successful in college (Rendón et al., 2000). The findings in this study showed that Latinx strongly held on to their culture and stayed connected with their families. Parents, even when they had a second or third grade education, supported participants to completion of STEM. They found ways to

help, whether it was emotional or reaching out to others for academic advice. The power of familial schooling presence was powerful in the experiences of Latinx and it contradicts Tinto's model that students need to give up their culture. I recommend future research in Latinx familial support in college and how Latinx persist through 4-year universities. This study demonstrated that Latinx committed to completing school and did not look for an easy path out. Overall, we need different models to study the completion of college and STEM for Latinx.

Concluding Remarks

This study gave me insight into the experiences of Latinx STEM baccalaureates as they described their perspectives, understandings and meaning they made of their time in college. Participants delved into detail about experiences that were meaningful to them. They also expressed that their families were there biggest support system as they gave them emotional and even financial support, when possible. More importantly, participants expressed that they need for educational institutions to have a better understanding of their experience as Latinx, to realize that it was difficult for them to find cultural connections they could make on campus and that they are coming from families that don't have the financial means to pay for school. In addition, participants mentioned the need for mental health counseling by professionals that understand the Latinx experience. These participants faced difficult experiences as students as well as family members, such as helping a sick brother, or working full-time to help support family due to a parent losing a job. Participants felt like no one at home could understand them

because either they were the first to go to college or the first to major in STEM. So counseling is essential in supporting Latinx.

The participants ranged in ages from 21 to 40 and yet their stories were similar, particularly that the schools they attended were still White majority in the Midwest, with unwelcoming campus climates. Participants expressed how they felt like the only support they received were from organizations that were Latinx-based. Latinx have the fastest growing student population in the United States and we must learn from the stories of Latinx and how to support them and ensure the completion of higher education for future generations. Latinx STEM baccalaureates have valuable knowledge about the systems of support that sustained their efforts to complete a degree. Furthermore, we have to create more welcoming atmospheres in schools for Latinx.

This study emphasized the forms of capital that can support marginalized students in confronting and navigating potentially exclusionary institutional practices and structures, including college (Nunez, 2013). Using a framework of LatCrit and CCW to understand the resources Latinx draw from was necessary to inform programs and policies to promote educational advancement.

Reflections

My research study was fueled by my personal experience watching friends exit STEM while I was a freshmen in college; and then learning 18 years later that many of my former science students did the same when they went on to study STEM. This prompted my interest in learning about the experiences of Latinx that attained a STEM degree. In addition, this experience motivated my commitment to social injustice,

including the underrepresentation of Latinx in STEM. A part of LatCrit theory is to

produce knowledge and "articulate a vision of social justice that responds to and attempts

to ameliorate the subordinated status of Latinas/os" (Iglesias & Valdes, 1998). Through

this study, I had the opportunity to listen to and collect the experiences participants

shared about their journey through STEM so that they can be heard and recognized in

literature.

      At the beginning of my study, I thought I was going to recruit participants

between the ages of 21-24, and the reason being that I was looking for recent Latinx

STEM baccalaureates. My thoughts were that I would collect data from recent graduates

because times have changed from when I was a student, and I thought it would be better

to illustrate the experiences of recent Latinx baccalaureates because it would resonant

better today. I assumed that during the interviews recent graduates would discuss skills

and tools they used in college to navigate the education system. I was assuming that

schools have improved their efforts to support Latinx because of the fact that it is the year

2018. I also assumed that my qualitative study would challenge the quantitative studies I

examined that tend to paint a bleak picture of Latinx educational attainment in STEM.

However, it didn't work out that way. First, I had difficulties recruiting recent graduates

of a STEM bachelor's degree. Surprisingly, it was people in my age range, 35-40 that

volunteered to participate. Acquaintances that knew of my study topic, even recruited for

me because they expressed how important it was to them to hear more about Latinx in

STEM. These friends were not even STEM majors themselves, yet, they reached out to

people they knew. Even after I was given permission from the IRB to post my flyer for

recruitment, the contact at my university did so for me, but not one student responded. I

took my flyer to coffeehouses in Latinx neighborhoods. And still, there was no response.

When I finally did recruit a recent graduate, and after interviewing her, she offered to

pass on my recruitment flyer. However, she commented that she knew only a few other

STEM baccalaureates because "there's not really many of us out there with STEM." As I

began to worry about falling short of the 8-10 participants I had agreed upon with my

dissertation team, I began to receive emails from interested, recent Latinx baccalaureates.

This occurred through 'word of mouth', in which participants recruited others that met

the criteria. The participants that did the recruiting expressed how they wanted their

stories to be shared because universities need to recognize the experiences of Latinx, and

to provide support for future generations. Each participant wished me well after my time

with them. I was so touched by how interested participants were in my study and that

they thanked me. It was truly a community effort to get to this point of completion. In

addition, my experience in recruiting participants demonstrated the forms of capital I

drew from, including social capital. For example, I drew on social contacts and

community resources, such as posting my recruitment flyer at coffee houses. When

friends asked what I was studying in graduate school, I shared my topic and study and my

contacts offered to help recruit from me. My experience supports Yosso's CCW assets. I

drew on my social capital to complete this dissertation.

At times, during the interviews, I had to hold back tears when listening to some of

the stories my participants described about their struggles. I was surprised that one of my

participants, in his early 20's, shared that his family viewed education as 'obtainable for

others', but not for him because they were Latinx and poor. I couldn't believe that in such a rich country, children are still raised in homes with the family message that education and opportunities are meant for others, and not for everyone.

Overall, my participants had very similar experiences. If it were not for some details, such as comments about technology that did not exist in the 90's, the reader would not be able to tell apart the experiences of recent graduates to older graduates in my study. Unwelcoming environments continue to permeate the experiences of Latinx at White majority schools, and a lack of preparation for college coursework has not improved as much over the span of 20 years, as participants described how underprepared they felt in college. Latinx students continue to be underserved. However, participants' resilience and optimism about their future is commendable. They drew on various forms of capital to get to the finish line. I was so impressed by every single participant and the endeavors they have taken on after college. They are giving back to their communities and want to uplift other Latinx in college and STEM. Their stories must be shared.

This study is a commitment to the advancement of Latinx educational attainment in college and beyond. I want to end with a quote by Lopez (1998) who questioned and examined Latinx' visibility in the United States. He suggested in using LatCrit as a critical tool and that:

> We seem to want knowledge of Latinos to be more expansive, more detailed, more subtle. At the same time, we want this knowledge to be more accessible, more integrated into social policy, more a part of everyday consciousness. Maybe we can have it both ways.

With this dissertation I hope that we can have it both ways: the well-being and future of

Latinx students should be a part of everyday consciousness.

APPENDIX A

RESEARCH RECRUITMENT SCRIPT

My name is Marlene Chavez and I am asking individuals to participate in a research study. This research study will be supervised by Dr. Aurora Chang in the Department of Curriculum and Instruction at Loyola University of Chicago.

As the investigator, I am trying to understand the experiences of Latinx STEM baccalaureates. Participants are being asked to participate in a 2-part interview with topic areas that include your background, educational experiences, and your perspective about being a STEM major. With your consent, each interview will be audio recorded. If you choose not to be audio recorded I will take notes during the interview. Each interview will last no more than 90 minutes and will be conducted at a location Capitol One Café in Lincoln Park or a café of your choosing.

There are no foreseeable risks involved in participating in this research beyond those experienced in everyday life. There are no direct benefits to you from participation, but your participation can help inform universities and educational policies about how we can improve the representation of Latinx in STEM.

Information gathered will be confidential through the use of a pseudonym. The audio recordings will be accessible by only the researcher and will be deleted at the conclusion of the research.

Compensation will be provided after the second interview, as this will indicate completion of participation, in the form of a $25 Visa Gift Card, in person. If you choose to withdraw from the interview, there will be no penalty or compensation.

Participation in this study is voluntary. You may withdraw at any time without penalty. If you do not want to be in this study, you do not have to participate. Even if you decide to participate, you are free not to answer any question or to withdraw from participation at any time without penalty. Your decision to participate or not will have no effect on our current relationship.

Consent:
Will you consent to participate in this research study?

Interview:
The first interview will focus on your life history. Questions will be asked that elicit information related to your family, community, and your experiences in education. These experiences will be put into context by asking you to describe these experiences and the meaning you've given them.

Interview One: Focused Life History
Interview Two: The Details of Experience/Reflection on the Meaning-Reflect on the Meaning of Your Experiences

APPENDIX B

CONSENT TO PARTICIPATE IN RESEARCH

Project Title: Examining the Experiences of Latinx STEM Baccalaureates
Researcher(s): Marlene Chavez
Faculty Sponsor: Dr. Aurora Chang

Introduction:
You are being asked to take part in a research study being conducted by Marlene Chavez for a dissertation under the supervision of Dr. Aurora Chang in the Department of Curriculum and Instruction at Loyola University of Chicago.

You are being invited to participate because I am interested in learning about your experience as a Latinx with a bachelor's degree in Science, Technology, Engineering, and Math (STEM). Your perspective can provide me with a lot of information about improving the retention of Latinx majoring in STEM and to increase their representation in STEM-related professions.

Please read this form carefully and ask any questions you may have before deciding whether to participate in the study.

Purpose:
The purpose of this study is to understand the experiences of Latinx that have graduated with a bachelor's degree in STEM. The overarching research question guiding this study is: What are the undergraduate educational experiences of Latinx students who major in STEM? To answer this broader question, I explore the following sub-questions: What factors contribute to students' persistence in STEM? How do various forms of capital, specifically those identified in Yosso's (2005) theory of Community Cultural Wealth, impact Latinx STEM undergraduates in their pursuit of a STEM degree?

Procedures:
If you agree to be in the study, you will be asked to participate in two 60-90 minute interviews with topic areas that include your educational background and experiences as a STEM major, and your perspectives about your college education. With your consent, each interview will be audio recorded. If you choose not to be audio recorded I will take notes during the interview.

Please indicate whether you give permission to be audio-recorded during the interviews by initialing next to the statement below.

_____ I agree to be audio-recorded for this study.

The interviews will last no more than 90 minutes and will be conducted at the Capitol One Café located at 1538 N. Clybourne Ave, Chicago, Il 60610 or a café/public place of your choosing.

Risks/Benefits:
There are no foreseeable risks involved in participating in this research beyond those experienced in everyday life. If you do not feel comfortable in participating, you are not required to answer anything that you do not want to. There will be no penalty if you decide to withdraw from the interview. If you are having some discomfort, I will address any questions or concerns.

Participants will not benefit directly from participation, but the information gathered will help with my dissertation and may help develop more literature, knowledge and understanding of Latinx students that major in STEM and their educational experiences. In doing so, I can inform universities and educational policies about understanding the Latinx STEM experience and in addressing retention and increasing representation in STEM.

Compensation:
You will receive compensation from participating in this study. You will be provided with a $25 gift card at the end of the second interview. If you decide to withdraw, there will be no penalty or compensation.

Confidentiality:
I will protect your right to privacy.
- Data generated in this study will only be used for the purpose of the study and not for any other purposes.
- In order to alleviate privacy concerns, your identity will be kept confidential by the use of pseudonyms, such as Participant 1, Participant 2, etc., when reporting this information.
- Your name or identifying information will not be included on any form.
- Any notes that I take will be stored electronically on a password protected network drive and destroyed after the study is completed. In addition, consent forms will be stored in a locked file cabinet.

Voluntary Participation:
Participation in this study is voluntary. If you do not want to be in this study, you do not have to participate. Even if you decide to participate, you are free not to answer any question or to withdraw from participation at any time without penalty.

Contacts and Questions:
If you have questions about this research study, please feel free to contact the researcher, Marlene Chavez at mchavez4@luc.edu. Or you may also contact the researcher's faculty sponsor, Dr. Aurora Chang at achang2@luc.edu.

If you have questions about your rights as a research participant, you may contact the Loyola University Office of Research Services at (773) 508-2689.

Statement of Consent:
Your signature below indicates that you have read the information provided above, have had an opportunity to ask questions, and agree to participate in this research study. You will be given a copy of this form to keep for your records.

_____   _____

Participant's Signature   **Date**

_____   _____

Researcher's Signature   **Date**

APPENDIX C

RESEARCH INTERVIEW PROTOCOL

INTERVIEW II: Life History	I will open the interview with sharing background about my personal experience in STEM, including friends that did not attain and those who did. I will explain that this personal story motivated to examine Latinx in STEM.
Type of CCW Capital	60-90 minutes
	Prompts **What do you mean by?** **Would you explain . . . ?** **What did you say when...?** **Give me an example of...** **Tell me about the time...** **Take me through the experience when . . .** **Opening questions:** 1. I'm interested in learning how you came to be a STEM major. First, tell me about your family.
Familial/Aspirational	Probe: How did you grow up? How did your family support you during college? Probe: What were their expectations of you regarding school/college? Or values they stressed about education.
Familial/Navigational/resistant	2. What influenced your interest in (field they are working in) _____? Probe: What do you think was the most influential factor in your decision to major in _____? Probe: Give me an example of the moment when you knew STEM was your calling.
Social	3. Would you say your community, such as school, neighbors, and friends were supportive or involved in your decision to attend college? Please explain.
Social/Aspirational/ navigational	4. What are some things you learned from your family and community that benefited your education? Pursuit of STEM? Probe: Were there any strategies you learned in K-12 years that were useful in college?
Social/Aspirational/ navigational	5. Was it important for you to stay connected to your community during college? If yes, tell me why this was important?
Aspirational/navigational	6. Why did you choose to attend _____college/university?
Aspirational	7. Think back to your undergraduate experience, how would you describe yourself as a student? Probe: What are your feelings about your ability to complete the coursework you took In high school in preparation for college.
	8. What kind of career/life plans did you make when you decided to major in _____?

Aspirational **Resistant**	9. Tell me about an experience that stands out as discouraging you toward majoring in {your major} prior to attending college, if any.
INTERVIEW II **Aspirational/Navigational/ resistant** **Linguistic** **Social/Resistant** **Aspirational/navigational/ resistant** **Social/navigational** **Navigational/resistant** **Navigational/resistant** **Navigational/resistant**	10. Take me through your experience as a Latinx STEM major. Probe: What it was like being a Latinx student on campus/in classes at your university? How did you view your abilities? Do you think high school prepared you for college level STEM? Explain. Are you bilingual? Do you think being bilingual is valuable as a STEM major? Explain. 11. How would you describe your college climate and setting? Give me some examples. How do you think your peers and instructors/professors viewed your abilities to complete the coursework? Describe a typical STEM major at your college. Did you socialize with other STEM majors? If yes, how so? Roughly, what percent of students in your major are like you In regard to race? Did this impact your comfort level in class? 12. Tell me about a challenging time in college. Probe: What experiences stand out as discouraging you toward majoring in…? 13. What support did you have on campus, if any, as a Student of Color/Latinx student? Latinx STEM major? Probe: Who did you reach out to you when you had questions or concerns about school/college? How did they help? 14. Describe what life has been like since graduation. Probe: how was the job interviewing process, did you feel prepared to pursue STEM jobs? 15. What advice would you give to new Latinx students in a STEM program to help them persist in the program? 16. What recommendations do you have for universities who want to help improve Students of Color student's/Latinx retention in STEM programs?

APPENDIX D

CODING SCHEME WITH QUOTES

What are the undergraduate educational experiences of Latinx students who major in STEM?		
Category	Themes	Direct Quote

Collective experiences	• Family Schooling Presence
	  o Family emphasis on education
	  o Emotional support
		Elizabeth: The biggest way they did support me was financially, and emotionally, but they didn't really understand

	• Financial hardships	Fernando: They didn't necessarily ask me, but it was kind of almost implied like, you might want to start working now, because I was 18 at the time now. That was discouraging in a sense where now I had to really work and help out the family.
	• A sense of belonging	Hector: For me, immediately I felt out of place. I attended school about maybe an hour and a half away from home, so I could go home in the weekends if possible with homework and projects and other stuff. It wasn't always possible. Immediately, I felt out of place and it didn't feel like I belonged.
What factors impact Latinx students' decisions to pursue STEM degrees? Factors impacting Latinx students' decisions to pursue STEM degree?		
Category	Theme	Direct Quote
Importance of cultural values or assets Latinx possess	• Persistence	Beatriz: I'm interested in, hopefully, finding a way of developing some type

	o Hopes and dreams	of group or organization to support people with disabilities, specifically people who are undocumented, so that they'll have benefits. You know how people that have benefits, they could apply to have someone to help them at their house.
	• Resilience	Maggie: I just had that idea of there's not enough of me out there, there's not enough of us. And so I had to be the one or me and my group, we had to be the ones that had to be on the front line.

How do various forms of capital, specifically those identified in Yosso's (2005) theory of Community Cultural Wealth, impact Latinx STEM undergraduates in their pursuit of a STEM degree?		
Category	Theme	Direct Quote
	Strategies	
CCW	• Familial and Aspirational Capital	Edgar: I think the family support that I had and the expectations that my brothers and sisters set up for me just kind of like … I gotta finish.
	• Navigational and Resistant	Fernando: You might want to consider doing a different major." That just was really disheartening. It just kind of confirms, do I belong here? Do I need to finish this degree out? Will I have the support? Desiree was just a huge, huge, huge motivator.

	• Social	Elizabeth: My mom was talking to her friends to get more information and be more knowledgeable about how the experience is going and how to comfort me, or what came next, or both, as a guide
	• Linguistic	Michael: I think it's another level or another dimension to someone's level of education and intelligence I would say. To acquire different languages and be able to be fluent in both is not only an asset but I would say definitely something that should be valued.

REFERENCE LIST

Ackerman, P., Kanfer, R., Beier, M., & Graesser, A. C. (2013). Trait complex, cognitive ability, and domain knowledge predictors of baccalaureate success, STEM persistence, and gender differences. *Journal of Educational Psychology, 105*(3), 911-927.

Adelman, C. (2005). The toolbox revisited: Paths to degree completion from high school through college. Washington, DC: U.S. Department of Education. Retrieved from www.aacc.nche.edu/AboutCC/Documents/FactSheet2012.pdf

Alon, S., Domina, T., & Tienda, M. (2010). Stymied mobility or temporary lull? The puzzle of lagging Latina/o college degree attainment. *Social Forces, 88*, 1807-1832.

Alva, S. A., & de Los Reyes, R. (1999). Psychosocial stress, internalized symptoms, and the academic achievement of Hispanic adolescents. *Journal of Adolescent Research, 14*(3), 343-358.

American Council on Education. (2007). *Increasing the success of minority students in science and technology*. Washington, DC: Author.

Anguiano, C., Milstein, T., De Larkin, I., Chen, Y., & Sandoval, J. (2012). Connecting community voices: Using a Latino/a critical race theory lens on environmental justice advocacy. *Journal of International and Intercultural Communication, 5*(2), 124-143.

Anzaldúa, G. (1987). *Borderlands: The new mestiza = La frontera* (1st ed.). San Francisco, CA: Spinsters/Aunt Lute.

Apple, M. (2014). *Official knowledge: Democratic education in a conservative age* (3rd ed.). New York, NY: Routledge.

Arellanes, J., Viramontez Anguiano, A., & Lohman, R. (2017). The desire to thrive: Families overcoming economic hardships through educational aspirations. *Journal of Family and Economic Issues, 38*(3), 338-353.

Arellano, A. R., & Padilla, A. M. (1996). Academic invulnerability among a select group of Latino university students. *Hispanic Journal of Behavioral Sciences, 18*(4), 485-507.

183

Arredondo, P., & Castillo, L. G. (2011). Latina/o student achievement: A collaborative mission of professional associations of higher education. *Journal of Hispanic Higher Education, 10*, 6-17.

Arthur, J., Waring, M., Coe, R., & Hodges, L., (2012). *Research methods and methodologies in education*. London: Sage Publications.

Astin, A. W. (1993). *What matters in college?: Four critical years revisited*. San Francisco, CA: Jossey-Bass.

Auerbach, S. (2004). Engaging Latino parents in supporting college pathways: Lessons from a college access program. *Journal of Hispanic Higher Education, 3*(2), 125-145.

Ayala, M. (2012). The state of research in Latino academic attainment. *Sociological Forum, 27*(4), 1037-1045.

Azmitia, M., & Brown, J. R. (2002). Latino immigrant parents' beliefs about the 'path of life' of their adolescent children. In J. M. Contreras, K. A. Kerns, & A. M. Neal-Barnett (Eds), *Latino children and families in the Unites States: Current research and future directions* (pp. 77-105). Westport, CT: Praeger Publishers.

Battey, D. (2013, January 01). "Good" mathematics teaching for students of color and those in poverty: The importance of relational interactions within instruction. *Educational Studies in Mathematics*: *An International Journal, 82*(1), 125-144.

Baumbusch, J. (2010). Semi-structured interviewing in practice-close research. *Journal for Specialists in Pediatric Nursing, 15*(3), 255-258.

Beasley, M., & Fischer, A. (2012). Why they leave: The impact of stereotype threat on the attrition of women and minorities from science, math and engineering majors. *Social Psychology of Education, 15*(4), 427-448.

Behnke, A., Piercy, K., & Diversi, M. (2004). Educational and occupational aspirations of Latino youth and their parents. *Hispanic Journal of Behavioral Sciences, 26*(1), 16-35.

Bell, D. A. (1980). Brown v. Board of Education and the interest-convergence dilemma. *Harvard Law Review, 93*(3), 518-533.

Berger, E. H. (1995). *Parents as partners in education: Families and schools working together.* Englewood Cliffs, NJ: Prentice Hall.

Berta-Ávila, M. (2003). The process of conscientization: Xicanas/Xicanos experiences in claiming authentic voice. *Journal of Hispanic Higher Education, 2*(2), 117-128.

Bonilla-Silva, E. (2001). *White supremacy and racism in the post-civil rights era*. Boulder, CO: L. Rienner.

Bonous-Hammarth, M. (2000). Pathways to success: Affirming opportunities for science, mathematics, and engineering majors. *The Journal of Negro Education, 69*(1), 92-111.

Bordes-Edgar, V., Arredondo, P., Kurpius, S., & Rund, J. (2011). A longitudinal analysis of Latina/o students' academic persistence. *Journal of Hispanic Higher Education, 10*(4), 358-368.

Borus, M. E., Crowley, J. E., Rumberger, R. W., Santos, R., & Shapiro, D. (1980). Findings of the national longitudinal survey of young Americans, 1979. *Youth Knowledge Development Report, 2.7*. Washington DC: Government Printing Office.

Bourdieu, P. (1977). *Outline of a theory of practice* (Cambridge studies in social anthropology; 16). Cambridge; New York, NY: Cambridge University Press.

Braun, D., Gormally, C., & Clark, M. (2017). The deaf mentoring survey: A Community Cultural Wealth Framework for measuring mentoring effectiveness with underrepresented students. *CBE Life Sciences Education, 16*(1).

Brown, L. A., & Strega, S. (2005). *Research as resistance: Critical, indigenous and anti-oppressive approaches*. Toronto: Canadian Scholars' Press.

Brown, R., & Campbell, D. M. (2009). Recent trends in preparing ethnic minorities for careers in mathematics and science. *Journal of Hispanic Higher Education, 8*(2), 225-241.

Buriel, R., & Cardoza, D. (1988). Sociocultural correlates of achievement among three generations of Mexican American high school seniors. *American Educational Research Journal, 25*(2), 177-192.

Burnsed, B. (2011, August 5). How higher education affects lifetime salary: College degrees significantly boost earning, but women and minorities benefit less. *U.S. News and World Report*. Retrieved from http://www.usnews.com/education/best-colleges/articles/2011/08/05/how-higher-education-affects-lifetime-salary

Burtless, G. (Ed.). (1990). *A future of lousy jobs: The changing structure of U.S. wages*. Washington, DC: The Brookings Institution.

Cabrera, A. F., Castañeda, M. B., Nora, A., & Hengstler, D. (1992). The role of finances in the persistence process: A structural model. *Research in Higher Education, 33*(5), 571-593.

Cabrera, A. F., & LaNasa, S. M. (2000a). Three critical task America's disadvantage face on their path to college. In A. F. Cabrera & S. M. LaNasa (Eds.), *Understanding the colleges choice of disadvantaged* (p. 107). San Francisco, CA: Jossey-Bass Inc.

Cabrera, A. F., & LaNasa, S. M. (2000b). Overcoming the task on the path to college for America's disadvantaged. *New Directions for Institutional Research, 2000*(107), 31-43.

Calmore, J. O. (1992). Critical race theory, Archie Shepp, and fire music: Securing an authentic intellectual life in a multicultural world. *Southern California Law Review, 65*(5), 2129-2230.

Cammarota, J. (2007). A social justice approach to achievement: Guiding Latina/o students toward educational attainment with a challenging, socially relevant curriculum. *Equity and Excellence in Education, 40*(1), 87-96.

Cammarota, J., & Romero, A. (2006). A critically compassionate pedagogy for Latino youth. *Latino Studies, 4*(3), 305-312.

Carastathis, A. (2014). The concept of intersectionality in feminist theory. *Philosophy Compass, 9*(5), 304-314.

Carneiro, P., Heckman, J. J., & Masterov, D. V. (2005). Labour market discrimination and racial differences in premarket factors, IZA Discussion Paper No. 1453.

Carreón, G., Drake, C., & Barton, A. (2005). The importance of presence: Immigrant parents' school engagement experiences. *American Educational Research Journal, 42*(3), 465-498.

Casanova, U. (1996). Parent involvement: A call for prudence. *Educational Researcher, 25*(8), 30-32, 46.

Castellanos, J., & Jones, L. (2004). Latino/a undergraduate experiences in American higher education. In J. Castellanos & L. Jones (Eds.), *The majority in the minority*. Sterling, VA: Stylus.

Cavazos, J., Jr., Johnson, M. B., & Sparrow, G. S. (2010). Overcoming personal and academic challenges: Perspectives from Latino college students. *Journal of Hispanic Higher Education, 9*, 304-316.

Ceja, M. (2004). Chicana college aspirations and the role of parents: Developing educational resiliency. *Journal of Hispanic Higher Education, 3*(4), 338-362.

Cerezo, A., & Chang, T. (2013). Latina/o achievement at predominantly White universities. *Journal of Hispanic Higher Education, 12*(1), 72-85.

Cerna, O., Pérez, P., & Sáenz, V. (2009). Examining the precollege attributes and values of Latina/o bachelor's degree attainers. *Journal of Hispanic Higher Education, 8*(2), 130-157.

Chajewski, M., Mattern, K. D., & Shaw, E. J. (2011). Examining the role of Advanced Placement® exam participation in 4-year college enrollment. *Educational Measurement: Issues and Practice*, *30*(4), 16-27. doi:10.1111/j.1745-3992.2011.00219.x

Chang, A. (2017). Un-American: Latina high school students' testimonios of American and white conflation in the middle of nowhere. *Race Ethnicity and Education, 20*(2), 240-251.

Choy, S. P., Horn, L. J., Nunez, A., & Chen, X. (2000). Transition to college: What helps at-risk students and students whose parents did not attend college? In A. F. Cabrera, R. Zemsky, S. M. LaNasa, & M. Steven (Eds.), *Understanding the college choice of disadvantaged students*. New Directions for Institutional Research (107). San Francisco, CA: Jossey-Bass.

Christenson, S. L., & Hurley, C. M. (1997). Parents' and school psychologists' perspectives on parent involvement activities. *School Psychology Review, 26*, 111-120.

Clark, E. S. (2017). *Religion and race in America.* New York, NY: Oxford University Press.

Clayton, K. K. (1993, December). *Family influence over the occupational and educational choices of Mexican American students*. Paper presented at the annual meeting of the American Vocational Association, Nashville, TN.

Cole, S., & Barber, E. G. (2003). *Increasing faculty diversity: The occupational choices of high-achieving minority students*. Cambridge, MA: Harvard University Press.

Cole, D., & Espinoza, A. (2008). Examining the academic success of Latino students in science technology engineering and mathematics (STEM) majors. J*ournal of College Student Development, 49*(4), 285-300.

Conchas, G. Q. (2006). *The color of success: Race and high-achieving urban youth*. New York, NY: Teachers College Press.

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher, 19*(5), 2-14.

Cooper, C. (1996). *Bridging multiple worlds: Cultures, identities, and pathways to college*. Oxford; New York, NY: Oxford University Press.

Corra, M., Carter, J. S., & Carter, S. K. (2011). The interactive impact of race and gender on high school advanced course enrollment. *The Journal of Negro Education, 80*(1), 33-46.

Correa, E., & Girón, A. (2013). Credit and capital formation: Lessons of Mexican migrant entrepreneurs in the U.S. financial crisis. *Journal of Economic Issues, 47*(2), 555-560.

Covarrubias, A. (2011). Quantitative intersectionality: A critical race analysis of the Chicana/o educational pipeline. *Journal of Latinos and Education, 10*(2), 86-105.

Creswell, J. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Crisp, G., Nora, A., & Taggart, A. (2009). Student characteristics, pre-college, college, and environmental factors as predictors of majoring in and earning a STEM degree: An analysis of students attending a Hispanic serving institution. *American Educational Research Journal, 46*(4), 924-942.

D'Amico, M., Rios-Aguilar, C., Salas, S., & González Canché, M. (2012). Career capital and the community college. *Community College Journal of Research and Practice, 36*(4), 251-261.

Darder, A. (2011). Embodiments of public pedagogy: The art of soulful resistance. *Policy Futures in Education, 9*(6), 780-801.

Darder, A., & Torres, R. (2014). *Latinos and education: A critical reader* (2nd ed.). New York, NY: Routledge.

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future* (Multicultural education series). New York, NY: Teachers College Press

Dasgupta, N. (2011). Ingroup experts and peers as social vaccines who inoculate the self-concept: The stereotype inoculation model. *Psychological Inquiry, 22,* 231-246. doi:10.1080/1047840X.2011.607313

Delgado, R., & Stefancic, J. (2013). *Critical race theory: The cutting edge* (3rd ed.). New York and London: New York University Press.

Delgado Bernal, D. (1998). Using a Chicana feminist epistemology in educational research. *Harvard Educational Review, 68*, 555-579.

Delgado Bernal, D. (2002). Critical race theory, Latino critical theory, and critical raced-gendered epistemologies: Recognizing students of color as holders and creators of knowledge. *Qualitative Inquiry, 8*(1), 105-126.

Delgado Bernal, D. (2018). A testimonio of critical race feminista parenting: Snapshots from my childhood and my parenting. *International Journal of Qualitative Studies in Education, 31*(1), 25-35.

Delpit, L. (2012). *"Multiplication is for white people": Raising expectations for other people's children*. New York, NY: New Press.

Denicolo, C. P., González, M., Morales, S., & Romaní, L. (2015). Teaching through testimonio: Accessing community cultural wealth in school. *Journal of Latinos and Education,* 1-16.

Dennis, J., Phinney, J., & Chuateco, L. (2005). The role of motivation, parental support, and peer support in the academic success of ethnic minority first-generation college students. *Journal of College Student Development, 46*(3), 223-236.

Denzin, N., & Lincoln, Y. (2017). *Handbook of qualitative research* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Dolan, E. (2016). Uneven recoveries from the Great Recession. *Journal of Family and Economic Issues, 37*(3), 331-332. doi:10.1007/s10834-016-9504-5.

Dondero, M., & Muller, C. (2012). School stratification in new and established Latino destinations (Report). *Social Forces, 91*(2), 477-502.

Duncan, B., & Otis, D. (1968). Minorities and the process of stratification. *American Sociological Review, 33*, 356-364.

Duque, L. (2013). A framework for analysing higher education performance: Students' satisfaction, perceived learning outcomes, and dropout intentions. *Total Quality Management and Business Excellence, 25*(1-2), 1-21.

Elliott, R., Strenta, C., Adair, R., Matier, M., & Scott, J. (1996). The role of ethnicity in choosing and leaving science in highly selective institutions. *Research in Higher Education, 37*(6), 681-709.

Emerson, R., Fretz, R., & Shaw, L. (2011). *Writing ethnographic fieldnotes* (2nd ed.). Chicago Guides to Writing, Editing, and Publishing. Chicago, IL: The University of Chicago Press.

Epstein, J. L. (1995). School/family/community partnerships: Caring for the children we share. *Phi Delta Kappan, 76,* 701-712.

Estrada, M., Burnett, M., Campbell, A. G., Campbell, P. B., Denetclaw, W. F., Gutiérrez, C. G., et al. (2016). Improving underrepresented minority student persistence in STEM. *CBE Life Sciences Education, 15*(3).

Fernandez-Kelly, M. P., & Schauffler, R. (1996). Divided fates: immigrant children and the new assimilation. In A. Portes (Ed.), *The new second generation* (pp. 30-53). New York, NY: Russell Sage Foundation.

Fiske, E. B. (1988). The undergraduate Hispanic experience: A case of juggling two cultures. *Change, 20,* 29-33.

Fix, M., & Clewell, B. C. (2000). *Overlooked and underserved: Immigrant students in U.S. secondary schools*. Washington, DC: The Urban Institute.

Flores, G. (2011). Latino/as in the hard sciences: Increasing Latina/o participation in science, technology, engineering and math (STEM) related fields. *Latino Studies, 9*(2-3), 327-335.

Freire, P. (1970). *Pedagogy of the oppressed*. New York, NY: Continuum.

Fries-Britt, S., Younger, T., & Hall, W. (2010). Lessons from high-achieving students of color in physics. *New Directions for Institutional Research, 2010*(148), 75-83.

Fry, R. (2002). *Latinos in higher education: Many enroll, too few graduate*. Washington, DC: Pew Hispanic Center.

Fry, R., & Gonzales, F. (2008). *One-in-five and growing fast: A profile of Hispanic public school students*. Washington, DC: Pew Hispanic Center.

Fry, R., & Taylor, P. (2012). *The rise of residential segregation by income*. Washington, DC: Pew Research Center.

Fry, R., & Taylor, P. (2013, May). *High school dropout rate at record low: Hispanic high school graduates pass Whites in rate of college enrollment*. Washington, DC: Pew Hispanic Center.

Fuller, B., Eggers-Piérola, C., Liang, X., & Holloway, S. (1996). Rich culture, poor markets: Why do Latino parents forgo preschooling? *Teachers College Record, 97*, 400-418.

Gaddis, S. M. (2013). *The influence of habitus in the relationship between cultural capital and academic achievement.* doi: http://dx.doi.org.flagship.luc.edu/10.1016/j.ssresearch.2012.08.002

Gamoran, A., & Hannigan, E. C. (2000). Algebra for everyone? Benefits of college-preparatory mathematics for students with diverse abilities in early secondary school. *Educational Evaluation and Policy Analysis, 22*(3), 241-254.

Gandara, P. (Eds.). (2006). *Expanding opportunity in higher education: Leveraging promise*. Retrieved from https://ebookcentral.proquest.com

Gándara, P. C., & Contreras, F. (2009). *The Latino educational crisis.* New York, NY: Teachers College Press.

Gandara, P., & Contreras, F. (2010). *The Latino education crisis: The consequences of failed social policies* (1st Harvard University Press paperback ed.). Cambridge, MA: Harvard University Press. Shernaz B., García, Patricia L. (2016, July 26). *Guerra Education and Urban Society, 36*(2), 150-168. First published date: doi: 10.1177/0013124503261322

Gándara, P. (2015). With the future on the line: Why studying Latino education is so urgent. *American Journal of Education, 121*(3), 451-463.

García, D. G., Yosso T. J., & Barajas, F. P. (2012). "A few of the brightest, cleanest Mexican Children": School segregation as a form of mundane racism in Oxnard, California, 1900-1940. *Harvard Educational Review, 82*(1), 1-25.

Garcia, L., & Bayer, A. (2005). Variations between Latino groups in U.S. post-secondary educational attainment. *Research in Higher Education, 46*(5), 511-533.

Garcia, S. B., & Guerra, P L. (2004). Deconstructing deficit thinking: Working with educators to create more equitable learning environments. *Education and Urban Society, 36,* 150-151.

Gaytán, F. X. (2014). Creating a college culture for Latino students: Successful programs, practices, and strategies by Concha Delgado Gaitan. *Journal of Latinos and Education*, *13*(4), 317-319. doi:10.1080/15348431.2014.887471

Ginorio, A., & Huston, M. (2001). *Si se puede! Yes, we can. Latinas in school.* Washington, DC: American Association of University Women Educational Foundation. (ERIC Document Reproduction Service No. ED452330)

Gipson, J. (2016). Predicting academic success for students of color within STEM majors. *Journal for Multicultural Education, 10*(2), 124-134.

Giroux, H. (1983). *Theory and resistance in education: A pedagogy for the opposition* (Critical perspectives in social theory). South Hadley, MA: Bergin & Garvey.

Gloria, A. M., & Castellanos, J. (2012). Desafíos y bendiciones: A multiperspective examination of the educational experiences and coping responses of first-generation college Latina students. *Journal of Hispanic Higher Education*, *11*, 82-99.

Gloria, A., Castellanos, J., & Orozco, V. (2005). Perceived Educational barriers, cultural fit, coping responses, and psychological well-being of Latina undergraduates. *Hispanic Journal of Behavioral Sciences, 27*(2), 161-183.

Gloria, A. M., & Robinson Kurpius, S. E. (1996). The validation of the Cultural Congruity Scale and the University Environment Scale with Chicano/a students. *Hispanic Journal of Behavioral Sciences, 18,* 533-549.

Gloria, A. M., & Robinson Kurpius, S. E. (2002). Influences of self-beliefs, social support, and comfort in the university environment on the academic persistence issues for American Indian undergraduates. *Cultural Diversity and Ethnic Minority Psychology*, *7*, 88-102.

Goldenberg, C., Gallimore, R., Reese, L., & Garnier, H. (2001). Cause or effect? A longitudinal study of immigrant Latino parents' aspirations and expectations, and their children's school performance. *American Educational Research Journal, 38*(3), 547-582.

Goldsmith, P. (2009). Schools or neighborhoods or Both?: Race and Ethnic Segregation and educational attainment. *Social Forces, 87*(4), 1913-1941.

Gonzales, N. A., Germán, M., Kim, S. Y., George, P., Fabrett, F. C., Millsap, R., & Dumka, L. E. (2008). Mexican American adolescents' cultural orientation, externalizing behavior, and academic engagement: The role of traditional cultural values. *American Journal of Community Psychology, 41,* 151-164. doi:10.1007/s10464-007-9152-x

González, K. (2002). Campus culture and the experiences of Chicano students in a predominantly White university. *Urban Education, 37*(2), 193-218.

Gonzalez, R., & Morrison, J. (2016). Culture or no culture? A Latino critical research analysis of Latino persistence research. *Journal of Hispanic Higher Education, 15*(1), 87-108.

Gradín, C. (2012) Conditional occupational segregation of minorities in the U.S. J*ournal of Economic Inequality.* doi:10.1007/s10888-012-9229–0.

Grandy, J. (1998). Persistence in science of high-ability minority students: Results of a longitudinal study. *Journal of Higher Education, 69*(6), 589-620.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78*(6), 1360-1380.

Griffith, A. L. (2010). *Persistence of women and minorities in STEM field majors: Is it the school that matters?* doi:http://dx.doi.org.flagship.luc.edu/10.1016/j.econedurev.2010.06.010

Hansen, S. L. (2013). STEM degrees and occupations among Latinos: An examination of race/ethnic and gender variation. *Race, Gender and Class, 20*(1), 214-231.

Harper, S. R., & Newman, C. B. (2010). An anti-deficit achievement framework for research on students of color in STEM. *New Directions for Institutional Research, 2010*(148), 63-74.

Harper, S. R., & Davis III, C. F. (2012). They (don't) care about education: A counternarrative on Black male students' responses to inequitable Schooling. *Educational Foundations*, *26*(1/2), 103-120.

Hauser P. C. (2013). Deaf scientists need deaf mentors. In Proceedings of the 6th International Deaf Academics and Researchers Conference, held July in Lisbon, Portugal.

Hauser, R. M., & Featherman, D. L. (1974). White-nonwhite differentials in occupational mobility among Blacks the United States, 1962-1972. *Demography, 11*, 247-265.

Hemphill, F. C., & Vanneman, A. (2011). *Achievement gaps: How Hispanic and White students in public schools perform in mathematics and reading on the National Assessment of Educational Progress* (Statistical Analysis Report. NCES 2011-459). Washington, DC: National Center for Education Statistics.

Hernandez, A., & Vargas-Lew, L. (1994). Intergenerational academic aspirations of Mexican-American females: An examination of mother, daughter, and grandmother triads. *Hispanic Journal of Behavioral Sciences, 16*(2), 195-204.

Herrmann, F., & Maly, K. (2013). Hermeneutics and reflection: Heidegger and Husserl on the concept of phenomenology (New studies in phenomenology and hermeneutics (Toronto, Ontario).

Hernandez, D., Rana, S., Alemdar, M., Rao, A., & Usselman, M. (2016). Latino parents' educational values and STEM beliefs. *Journal for Multicultural Education, 10*(3), 354-367.

Hernandez-Truyol, B. E. (1997). Borders (en)gendered: Normatives, Latinas, and a LatCrit paradigm. *New York University Law Review, 72*, 882-927.

Hill, A. J. (2017). State affirmative action bans and STEM degree completions. *Economics of Education Review, 57*, 31-40.

Hill, N., & Torres, K. (2010). Negotiating the American dream: The paradox of aspirations and achievement among Latino students and engagement between their families and schools. *Journal of Social Issues, 66*(1), 95-112.

Hoover-Dempsey, K., & Sandler, H. (1995). Parental involvement in children's education: Why does it make a difference? *Teachers College Record, 97,* 310-332.

Horwitz, E. K. (1987). Surveying student beliefs about language learning. In A. Wenden & J. Rubin (Eds.), *Learning strategies in language learning.* Englewood Cliffs, NJ: Prentice Hall.

Hout, M. (2015). A summary of what we know about social mobility. *The Annals of the American Academy of Political and Social Science, 657*(1), 27-36.

Hungerford-Kresser, H., & Vetter, A. (2012). Positioning and the discourses of urban education: A Latino student's university experience. *The Urban Review, 44*(2), 219-238.

Hurtado, S. (1994). The institutional climate for talented Latino students. *Research in Higher Education, 35*(1), 21-41.

Hurtado, S. (2002). Creating a climate of inclusion: Understanding Latina/o college students. In W. A. Smith, P. G. Altbach, & K. Lomotey (Eds.), *The racial crisis in American higher education: Continuing challenges for the twenty-first century* (pp. 121-135). Albany: State University of New York Press.

Hurtado, S., Milem, J. F., Clayton-Pedersen, A. R., & Allen, W. R. (1999). Enacting diverse learning environments: Improving the climate for racial/ethnic diversity in higher education. *ASHE/ERIC Higher Education Report, 26*(8). Washington, DC: George Washington University. Latinos in Higher Education and Hispanic-Serving Institutions, 105.

Hurtado, S., & Ponjuán, L. (2005). Latino educational outcomes and the campus climate. *Journal of Hispanic Higher Education*, *4*(3), 1-18.

Iglesias, E. M., & Valdes, F. (1998). Religion, gender, sexuality, race and class in coalitional theory: A critical and self-critical analysis of LatCrit social justice agendas. (Difference, Solidarity and Law: Building Latina/o Communities through LatCrit Theory). *Chicano Latino Law Review, 19*, 503-588.

Irizarry, J. (2009). Reinvigorating multicultural education through youth participatory action research. *Multicultural Perspectives, 11*(4), 194-199.

Johnson, K. R. (1997). "Melting pot" or "ring of fire"?: Assimilation and the Mexican American experience. *California Law Review, 85*(5), 1259-1313.

Kao, G., & Thompson, J. (2003). Racial and ethnic stratification in educational achievement and attainment. *Annual Review of Sociology, 29*, 417-442.

Keels, M. (2013). Getting them enrolled is only half the battle: College success as a function of race or ethnicity, gender, and class. *American Journal of Orthopsychiatry, 83*(2-3), 310-322.

Kevane, B., & Schmalzbauer, L. (2016). "Education is everything. It determines your future": Latino youth and college access in Montana. *Latino Studies, 14*(2), 272-280.

Kingston, P., Hubbard, R., Lapp, B., Schroeder, P., & Wilson, J. (2003). Why education matters. *Sociology of Education, 76*(1), 53-70.

Kiyama, J. M., Museus, S. D., & Vega, B. E. (2015). Cultivating campus environments to maximize success among Latino and Latina college students. *New Directions for Higher Education, 2015*(172), 29-38.

Klugman, J. (2013). The advanced placement arms race and the reproduction of educational inequality. *Teachers College Record, 115*(5), 1-34.

Knapp, L. G., Kelly-Reid, J. E., Whitmore, R. W., & Miller, E. (2007). Enrollment in postsecondary institutions, Fall 2005; graduation rates, 1999 and 2002 cohorts; and financial statistics, fiscal year 2005 (NCES 2007-154). Retrieved from www.nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2007154

Koch, B., Slate, J. R., & Moore, G. W. (2013). Hispanic student performance on advanced placement exams: A multiyear, multistate comparison. *Journal of Education Research, 7*(2), 135-155.

Kouyoumdjian, C., Guzmán, B. L., Garcia, N. M., & Talavera-Bustillos, V. (2017). A community cultural wealth examination of sources of support and challenges among Latino first- and second-generation college students at a Hispanic serving institution. *Journal of Hispanic Higher Education, 16*(1), 61-76.

Ladson-Billings, G. (2001). *Crossing over to Canaan: The journey of new teachers in diverse classrooms* (1st ed., The Jossey-Bass education series). San Francisco, CA: Jossey-Bass.

Ladson-Billings, G., & Tate, W. F. (19965, Fall). *Teachers College Record, 97*(1), 47-68.

Landale, N. S., Oropesa, R. S., & Noah, A. J. (2017). Experiencing discrimination in Los Angeles: Latinos at the intersection of legal status and socioeconomic status. *Social Science Research.*

Langenkamp, A. (2017). Latino/a immigrant parents' educational aspirations for their children. *Race Ethnicity and Education,* 1-19.

Lapayese, Y. (2009). (Re)imagining new narratives of racial, labor, and environmental power: Towards a liberatory education for Latina/o students. In J. Andrzejewski, M. Baltodano, & L. Symcox (Eds.), *Social justice, peace, and environmental education*. New York, NY: Routledge.

Lareau, A. (2011). *Unequal childhoods class, race, and family life* (2nd ed.). Berkeley: University of California Press.

Lareau, A. (2015). Cultural knowledge and social inequality. *American Sociological Review, 80*(1), 1-27.

Lee, J., & Klugman, J. (2013). Latino school concentration and academic performance among Latino children. *Social Science Quarterly, 94*(4), 977.

Lent, R. W., Brown, S. D., Fouad, N. A., & Santana, M. C. (2017). SCCT and underrepresented populations in STEM fields. *Journal of Career Assessment, 25*(1), 24-39.

Leonardo, Z., & Grubb, N. (2014). *Education and racism: A primer on issues and dilemmas*. New York, NY: Routledge.

Levy, F. S. (1995). Incomes and income inequality. In R. Farley (Ed.), *State of the union: America in the 1990s* (Vol. 1, pp. 1-57). New York, NY: Russell Sage.

Lichter, D. T., Ziliak, J. P., García, A. S., & Schmalzbauer, L. (2017). Placing assimilation theory: Mexican immigrants in urban and rural America. *The Annals of the American Academy of Political and Social Science, 672*(1), 64-82.

Liebman, J. S., & Sabel, C. F. (2003). The Federal No Child Left Behind Act and the post-desegregation civil rights agenda. (Symposium: The resegregation of southern schools? A crucial moment in the history (and the future) of public schooling in America). *North Carolina Law Review, 81*(4), 1703-1749.

Lin, N. (2001). *Social capital: A theory of social structure and action* (Structural analysis in the social sciences; 19). Cambridge, UK; New York, NY: Cambridge University Press.

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.

Longerbeam, S. D., Sedlacek, W. E., & Alatorre, H. M. (2004). In their own voices: Latino student retention. *NASPA Journal, 41*(3), 538-550.

Lopez, E., Gallimore, R., Garnier, H., & Reese, L. (2007). Preschool antecedents of mathematics achievement of Latinos. *Hispanic Journal of Behavioral Sciences, 29*(4), 456-471.

Lopez, G. P. (1998). Learning about Latinos. (Latino National Political Survey) (Difference, Solidarity and Law: Building Latina/o Communities through LatCrit Theory). *Chicano Latino Law Review, 19*, 363-416.

López, M. H. (2009). *Between two worlds: How young Latinos come of age in America*. Pew Hispanic Center. Retrieved July 11, 2011, from http://pewhispanic.org/files/reports/117.pdf

Losada, A., Márquez-González, M., Knight, B. G., Yanguas, J., Sayegh, P., & Romero-Moreno, R. (2010). Psychosocial factors and caregivers' distress: Effects of familism and dysfunctional thoughts. *Aging and Mental Health, 14,* 193-202. doi:10.1080/13607860903167838

Lubrano, A. (2003). Bricklayer's boy. In J. Moser, & A. Walters (Eds.), *Creating America: Reading and writing arguments* (pp. 350-355). Englewood Cliffs, NJ: Prentice Hall.

Luna, N. A., & Martinez, M., (2013). A qualitative study using community cultural wealth to understand the educational experiences of Latino college students. *Journal of Praxis in Multicultural Education, 7*(1), Article 2. doi: 10.9741/2161-2978.1045

Lutrell, W. (2010). Introduction. In W. Lutrell (Ed.), *Qualitative educational research: Readings in reflexive methodology and transformative practice*. New York, NY: Routledge.

Lutz, A. (2007). Barriers to high-school completion among immigrant and later-generation Latinos in the USA. *Ethnicities, 7*(3), 323-342.

Lynn, M., & Dixson, A. (2013). *Handbook of critical race theory in education*. New York, NY: Routledge.

Malcolm, L. E. (2010). Charting the pathways to STEM for Latina/o students: The role of community colleges. *New Directions for Institutional Research, 2010*(148), 29-40. doi:10.1002/ir.359

Maltese, A. V., & Tai, R. H. (2011). Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among US students. *Science Education*, *95*, 877-907.

Martinez, G. A. (1994). Legal indeterminacy, judicial discretion and the Mexican American litigation experience: 1930-1980. *University of California at Davis Law Review, 27,* 557-618.

Martinez, L. M., & Woods, D. A. (2007). Chapter three: Closing the racial/ethnic gaps. In *Still not equal* (pp. 29-37). New York, NY: Peter Lang Publishing, Inc.

Martinez, M., Chang, A., & Welton, A. (2017). Assistant professors of color confront the inequitable terrain of academia: A community cultural wealth perspective. *Race Ethnicity and Education, 20*(5), 696-710.

Massey, D. (1993). *American apartheid: Segregation and the making of the underclass.* Cambridge, MA: Harvard University Press.

Massey, D. S. (2010). Social sciences: Immigration statistics for the twenty-first century. *The Annals of the American Academy of Political and Social Science, 631,* 124-140.

Massey, D. S., Charles, C. Z., Lundy, G., & Fischer, M. J. (2003). *The source of the river: The social origins of freshmen at America's selective colleges and universities.* Princeton, NJ: Princeton University Press.

Massey, D. S., & Denton, N. (1988). The dimensions of residential segregation. *Social Forces, 67,* 281-315.

Maxwell. S.P. (2013). Parental and familial factors among Latino/a youths' successful matriculation into postsecondary education. *Advances in Social Work, 14*(1), 125-145.

McDonough, P. M. (1997). *Choosing colleges: How schools and social class structure opportunity.* Albany: State University of New York Press.

McDonough, P. M. (2005). Counseling matters. In W. G. Tierney, Z. B. Corwin, & J. Colyar (Eds.), *Preparing for college: Nine elements of effective outreach* (pp. 69-88). Albany: State University of New York Press.

McDonough, P., & Núñez, A.-M. (2007). Bourdieu's sociology of education: Identifying persistent inequality, unmasking domination, and fighting social reproduction. In C. A. Torres, & A. Teodoro (Eds.), *Critique and utopia: New developments in the sociology of education.* New York, NY: Rowman and Littlefield.

Mcintosh, P. (2015). Extending the knapsack: Using the white privilege analysis to examine conferred advantage and disadvantage. *Women and Therapy, 38*(3-4), 232-245.

Merriam, S. (2009). *Qualitative research: A guide to design and implementation* (Jossey-Bass higher and adult education series). San Francisco, CA: Jossey-Bass.

Metcalf, H. E. (2014). Disrupting the pipeline: Critical analyses of student pathways through postsecondary STEM education. *New Directions for Institutional Research, 2013*(158), 77-93.

Michelson, M. R. (2003). The corrosive effect of acculturation: How Mexican Americans lose political trust. *Social Science Quarterly, 84*(4), 918-933.

Milner, H. (2010). *Start where you are, but don't stay there: Understanding diversity, opportunity gaps, and teaching in today's classrooms*. Cambridge, MA: Harvard Education Press.

Minikel-Lacocque, M. (2013). Racism, college, and the power of words: Microaggressions reconsidered. *American Educational Research Journal, 50*(3), 432-465. doi: 10.3102/0002831212468048

Moller, S., Banerjee, N., Bottia, M., Stearns, E., Mickelson, R., Dancy, M., ... Valentino, L. (2015). Moving Latino/a students into STEM majors in college. *Journal of Hispanic Higher Education, 14*(1), 3-33.

Montoya, M. (1994). Mascaras, Trenzas, y Grenas: Unmasking the self while unbraiding Latina stories and legal discourse. *Chicano Latino Law Review, 15*, 1-37.

Morales, E. E. (2005). In Trotman F. K. (Ed.), *Promoting academic resilience in multicultural America: Factors affecting student success*. New York, NY: Peter Lang.

Morgan, P., Farkas, G., Hillemeier, M., & Maczuga, S. (2016). Science achievement gaps begin very early, persist, and are largely explained by modifiable factors. *Educational Researcher, 45*(1), 18-35.

Morgan Consoli, M., & Llamas, J. (2013). The relationship between Mexican American cultural values and resilience among Mexican American college students: A mixed methods study. *Journal of Counseling Psychology, 60*(4), 617-624.

Mossa-Mitha. (2005). Situating anti-oppressive theories within critical and difference-centered perspectives. In *Research as resistance: Critical, indigenous and anti-oppressive approaches* (pp. 37-72). Toronto: Canadian Scholars' Press.

Mueller, C., Riegle-Crumb, C., Schiller, K. S., Wilkinson, L., & Frank, K. (2010). Race and academic achievement in racially diverse high schools: Opportunity and stratification. *Teachers College Record, 112*(4), 1038-1063.

Murillo, E. (2010). *Handbook of Latinos and education: Theory, research and practice*. New York, NY: Routledge.

Noguera, P. (2006). Latino youth: Immigration, education, and the future. *Latino Studies, 4*(3), 313-320.

Nora, A., Cabrera, A., Serra-Hagedorn, L., & Pascarella, E. (1996). Differential impacts of academic and social experiences on college-related behavioral outcomes across different ethnic and gender groups at four-year institutions. *Research in Higher Education, 37*(4), 427-451.

Nunez, A. M. (2013). Employing multilevel intersectionality in educational research: Latino identities, contexts, and college access. *Educational Researcher*, *43*, 85-92.

Núñez, A. M. (2009a). Latino students' transitions to college: Social and intercultural capital perspective. *Harvard Educational Review, 79*(1), 22-48.

Núñez, A. M. (2009b). Modeling the effects of diversity experiences and multiple capitals on Latina/o college students' academic self-confidence. *Journal of Hispanic Higher Education, 8*(2), 179-196.

Oakes, J. (1985). *Keeping track: How schools structure inequality.* New Haven, CT: Yale University Press.

Oboler, S. (1995). *Ethnic labels, Latino lives: Identity and the politics of (re) presentation in the United States*. Minneapolis: University of Minnesota Press.

Ochoa, G. L. (2016). *Mapping the causes of unequal schooling and the transformative possibilities of sociology.*

Ohrt, J. H., Lambie, G. W., & Ieva, K. P. (2009). Supporting Latino and African American students in advanced placement courses: A school counseling program's approach. *Professional School Counseling, 13*(1), 59-63.

Olmedo, P. (1997). Voices of our past: Using oral history to explore funds of knowledge within a Puerto Rican family. *Anthropology & Education Quarterly*, *28*, 550-573.

Olson, J. S. (2011). In H. Olson Beal (Ed.), *The ethnic dimension in American history* (4th ed.). Hoboken, NJ: Wiley.

Olszewski-Kubilius, P., Steenbergen-Hu, S., Thomson, D., & Rosen, R. (2017). Minority achievement gaps in STEM. *Gifted Child Quarterly, 61*(1), 20-39.

Ong, A. D., Phinney, J. S., & Dennis, J. (2006). Competence under challenge: Exploring the protective influence of parental support and ethnic identity in Latino college students. *Journal of Adolescence, 29,* 961-979. doi:10.1016/j.adolescence.2006.04.010

Orfield, G., & Eaton, S. (1996). *Dismantling desegregation: The quiet reversal of Brown v. Board of Education.* New York, NY: New Press.

Oropesa, R., & Jensen, L. (2010). Dominican immigrants and discrimination in a new destination: The case of Reading, Pennsylvania. *City and Community, 9*(3), 274-298.

Otto, L., & Haller, A. O. (1979). Evidence for a social psychological view of the status attainment process: Four studies compared. *Social Forces,* 57(3), 887-9l4.

Pacheco, M., & Gutiérrez, K. (2009). Cultural-historical approaches to literacy teaching and learning. In C. Compton-Lily (Ed.), *Breaking the silence: Recognizing the social and cultural resources students bring to the classroom* (pp. 60-77). Newark, DE: International Reading Association.

Parker, L., Ledesma, M. C., & Calderón, D. (2015). Critical race theory in education. *Qualitative Inquiry, 21*(3), 206-222.

Parra-Cardona, J. R., Bulock, L., Imig, D. R., Villaruel, F., & Gold, S. (2006). "Trabajando duro todos los días": Learning from the life experiences of Mexican-origin migrant families. *Family Relations: An Interdisciplinary Journal of Applied Family Studies, 55,* 361-375.

Pascarella, E., Pierson, C., Wolniak, G., & Terenzini, P. (2004). First-generation college students. *The Journal of Higher Education, 75*(3), 249-284.

Passel, J. S., & Cohn, D. (2008). U.S. population projections: 2005-2050. Washington, DC: Pew Research Center.

Paul, F. (2005). Grouping within algebra 1: A structural sieve with powerful effects for low-income, minority, and immigrant students. *Educational Policy*, *19*, 262-282.

Paulsen, M., & John, E. (2002). Social class and college costs. *The Journal of Higher Education, 73*(2), 189-236.

PCAST. (2012). Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics. Retrieved from http://www.whitehouse.gov/sites/default/les/microsites/ostp/pcast-engage-to-excel-nal2-25-12.pdf

Peralta, C., Caspary, M., & & Boothe, D. (2013). Success factors impacting Latina/o persistence in higher education leading to STEM opportunities. *Cultural Studies of Science Education, 8*(4), 905-918.

Perez, E. O. (2015). Xenophobic rhetoric and its political effects on immigrants and their co-ethnics. *American Journal of Political Science, 59*(3), 549-564.

Perna, L.W. (2006). Studying college access and choice: a proposed conceptual model. In J. Smart (Ed.), *Higher Education: Handbook of Theory and Research* (Vol. XXI, pp. 99-157). Cambridge, MA: Springer.

Perna, L. W., & Thomas, S. L. (2008). Theoretical perspectives on student success: Understanding the contributions of the disciplines. *ASHE/ERIC Higher Education Report*, *34*(1). San Francisco, CA: Jossey-Bass.

Perry, B., Martinez, E., Morris, E., Link, T., & Leukefeld, C. (2016, September). Misalignment of career and educational aspirations in middle school: Differences across race, ethnicity, and socioeconomic status. *Social Sciences (Basel, Switzerland), 5*(3).

Pew Hispanic Center. (2009). *Between two worlds: How young Latinos come of age in America*. Washington, DC: Retrieved from http://pewhispanic.org/files/reports/117.6.pdf

Pierce, C. (1989). Unity in diversity: Thirty-three years of stress. In G. Berry, & J. Asamen (Eds.), Black students: Psychological issues and academic achievement (pp. 296-312). Newbury Park, CA: Sage.

Pizarro, M. (2005). *Chicanas and Chicanos in school: Racial profiling, identity battles, and empowerment* (1st ed., Louann Atkins Temple Women & Culture Series; bk. 11). Austin: University of Texas Press.

Portes, A., & Fernández-Kelly, P. (2008). No margin for error: Educational and occupational achievement among disadvantaged children of immigrants. *The Annals of the American Academy of Political and Social Science, 620*, 12-36.

Portes, A., & Rumbaut, R. G. (2006). *Immigrant America: A portrait*. Berkeley and Los Angeles: University of California Press.

Portes, A., & Zhou, M. (1993). The new second generation: Segmented assimilation and its variants. *The Annals of the American Academy of Political and Social Science, 530*, 74-96.

Pstross, M., Rodríguez, A., Knopf, R. C., & Paris, C. M. (2016). Empowering Latino parents to transform the education of their children. *Education and Urban Society, 48*(7), 650-671.

Puma, M., Karweit, N., Price, C., Ricciuti, A., Thompson, W., & Vaden Kiernan, M. (1997). *Prospects: Final report on student outcomes*. Washington DC: U.S. Department of Education, Office of the Undersecretary.

Quintana, S. M., Vogel, M. C., & Ybarra, V. C. (1991). Meta-analysis of Latino students' adjustment in higher education. *Hispanic Journal of Behavioral Sciences, 13,* 155-168.

Rampey, B. D., Dion, G. S., & Donahue, P. L. (2009). *NAEP 2008 trends in academic progress* (NCES 2009-479). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Ravitch, D. (2010). *The death and life of the great American school system: How testing and choice are undermining education*. New York, NY: Basic Books.

Reese, L. (2002). Parental strategies in contrasting cultural settings: Families in Mexican and "El Norte". *Anthropology and Education Quarterly, 33*, 30-59.

Reiners G. M. (2012). Understanding the differences between Husserl's (descriptive) and Heidegger's (interpretive) phenomenological research. *Journal of Nursing Care, 1*(119). doi:10.4172/2167-1168.1000119

Rendón, L. I., Jalomo, R. E., & Nora, A. (2000). Theoretical considerations in the study of minority student retention in higher education. In J. M. Braxton (Ed.), *Reworking the student departure puzzle* (pp. 127-156). Nashville, TN: Vanderbilt University Press.

Renzulli, L., & Evans, L. (2005). School choice, charter schools, and white flight. *Social Problems, 52*(3), 398-418.

Rice, K. G., Lopez, F. G., Richardson, C. E., & Stinson, J. M. (2013). Perfectionism moderates stereotype threat effects on STEM majors' academic performance. *Journal of Counseling Psychology*, *60*(2), 287-293. doi:10.1037/a0032052

Rios-Aguilar, C., & Kiyama, J. (2012). Funds of knowledge: An approach to studying Latina(o) students' transition to college. *Journal of Latinos and Education, 11*(1), 2-16.

Rios-Ellis, B., Rascón, M., Galvez, G., Inzunza-Franco, G., Bellamy, L., & Torres, A. (2015). Creating a model of Latino peer education. *Education and Urban Society, 47*(1), 33-55.

Rivas-Drake, D. (2008). Perceived opportunity, ethnic identity, and achievement motivation among Latinos at a selective public university. *Journal of Latinos and Education, 7*(2), 113-128.

Ro, H. K., Knight, D., & Loya, K. (2016). Exploring the moderating effects of race and ethnicity on the relationships between curricular and classroom experiences and learning outcomes in engineering. *Journal of Women and Minorities in Science and Engineering, 22*. doi:10.1615/JWomenMinorScienEng.2016013601

Rivera, D. P., Forquer, E. E., & Rangel, R. (2010). Microaggressions and the life experience of Latina/o Americans. In D. W. Sue (Ed.), *Microaggressions and marginality: Manifestations, dynamics, and impact* (pp. 59-83). New York, NY: Wiley.

Rochin, R., & Mello, S. (2007). Latinos in science. *Journal of Hispanic Higher Education, 6*(4), 305-355.

Roderick, M., Nagaoka, J., & Coca, V. (2009). College readiness for all: The challenge for urban high schools. *The Future of Children, 19*(1), 185-210.

Rodriguez, D. (2010). Storytelling in the field: Race, method, and the empowerment of Latina college students. *Cultural Studies ↔ Critical Methodologies*, *10*, 491-507.

Rogers-Chapman, M. (2014). Accessing STEM-focused education. *Education and Urban Society, 46*(6), 716-737.

Rojas, L., & Liou, D. (2017). Social justice teaching through the sympathetic touch caring and high expectations for students of color. *Journal of Teacher Education, 68*(1), 28-40.

Rueschenberg, E., & Buriel, R. (1989). Mexican American family functioning and acculturation: A family systems perspective. *Hispanic Journal of Behavioral Sciences, 11,* 232-242. doi:10.1177/ 07399863890113002

Rumberger, R. W. (1983). Dropping out of high school: The influence of race, sex, and family background. *American Educational Research Journal*, *20*, 199-220.

Ryan, C., Casas, J., Kelly-Vance, L., Ryalls, B., & Nero, C. (2010). Parent involvement and views of school success: The role of parents' Latino and White American cultural orientations. *Psychology in the Schools, 47*(4), 391-405.

Samuelson, C. C., & Litzler, E. (2016). Community cultural wealth: An assets-based approach to persistence of engineering students of color. *Journal of Engineering Education, 105*(1), 93-117.

San Miguel, A. M., & Kim, M. M. (2015). Successful Latina scientists and engineers. *Journal of Career Development, 42*(2), 133-148.

Sanchez, G. (1997). Face the nation: Race, immigration, and the rise of nativism in late twentieth century America. *The International Migration Review, 31*(4), 1009-1030.

Sanchez, J. E., Usinger, J., & Thornton, B. W. (2015). Predictive variables of success for Latino enrollment in higher education. *Journal of Latinos and Education, 14*(3), 188-201.

Sandoval, C. (1991). U.S. third world feminism: the theory and method of oppositional consciousness in the postmodern world. *Genders, 10,* 1-24.

Santiago, S. A., & Soliz, M. (2012). Finding your workforce: The top 25 institutions graduating Latinos in science, technology, engineering, and math (STEM) by academic level—2009-10. Washington, DC: Excelencia in Education.

Schneider, B., Broda, J. M., & Burkander, K. (2013). Pathways to college and STEM careers: Enhancing the high school experience. *New Directions for Youth Development, 2013*(140), 9-29.

Schneider, S. (2007). Nominal comparability is not enough: (In-)equivalence of construct validity of cross-national measures of educational attainment in the European Social Survey. *Research in Social Stratification and Mobility, 28*(3), 343-357.

Schueths, A., & Carranza, M. (2012). Navigating around educational road blocks: Mentoring for pre-K to 20+ Latino/a students. *Latino Studies, 10*(4), 566-586.

Sciarra, D. T., & Whitson, M. L. (2007). Predictive factors in postsecondary educational attainment among Latinos. *Professional School Counseling, 10,* 307-316

Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3rd ed.). New York, NY: Teachers College Press.

Seymour, E., & Hewitt, N. M. (1997). *Talking about leaving: Why undergraduates leave the sciences*. Boulder, CO: Westview Press.

Sheets, R. H. (2005). *Diversity pedagogy: Examining the role of culture in the teaching-learning process.* Boston, MA: Allyn & Bacon.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22*(2), 63-75. Retrieved from http://content.iospress.com/journals/education- for-information/22/2

Shiu, A., Kettler, T., & Johnsen, S. K. (2009). Social effects of Hispanic students enrolled in an AP class in middle school. *Journal of Advanced Academics, 21*(1), 58-82.

Slaney, R. B., Rice, K. G., & Ashby, J. S. (2002). A programmatic approach to measuring perfectionism: The almost perfect scales. In G. L. Flett, & P. L. Hewitt (Eds.), Perfectionism: Theory, research, and treatment (pp. 63-88). Washington, DC: American Psychological Association. doi:10.1037/10458-003

Sleeter, C. E. (2017). Critical race theory and the whiteness of teacher education. *Urban Education, 52*(2), 155-169.

Smedley, B. D., Myers, H. F., & Harrell, S. P. (1993). Minority-status stresses and the college adjustment of ethnic minority freshmen. *Journal of Higher Education, 64*(4), 434-452.

Smith, J., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method and research*. Los Angeles, CA: SAGE.

Smith, S. S. (2000). Mobilizing social resources: Race, ethnic, and gender differences in social capital and persisting wage inequalities. *Sociological Quarterly, 41*(4), 509-537.

Solorzano, D., & Bernal Delgado, D. (2001). Examining transformational resistance through a critical race and Latcrit Theory Framework. *Urban Education, 36*(3), 308-342.

Solorzano, D., Ceja, M., & Yosso, T. (2000). Critical race theory, racial microaggressions, and campus racial climate: The experiences of African American college students. *The Journal of Negro Education, 69*(1), 60-73.

Solorzano, D., & Ornelas, A. (2004). A critical race analysis of Latina/o and African American advanced placement enrollment in public high schools. *The High School Journal, 87*(3), 15-26.

Solórzano, D., & Villalpando, O. (1998). Critical Race Theory, marginality, and the experience of students of color in higher education. In C. A. Torres, & T. R. Mitchell (Eds.), *Sociology of education: Emerging perspectives* (pp. 211-224). Albany: State University of New York Press.

Sólorzano, D. G., Villalpando, O., & Oseguera, L. (2005). Educational inequities and Latina/o undergraduate students in the United States: A critical race analysis of their educational progress. *Journal of Hispanic Higher Education, 4*(3), 272-294.

Solórzano, D., & Yosso, T. (2002). Critical race methodology: Counter-storytelling as an analytical framework for education research. *Qualitative Inquiry, 8*(1), 23-44.

Spanierman, L. B., & Heppner, M. J. (2004). Psychosocial Costs of racism to Whites Scale (PCRW): Construction and initial validation. *Journal of Counseling Psychology, 51*, 249-262.

Stanton-Salazar, R. D. (2001). Manufacturing hope and despair: The school and kin support networks of U.S. Mexican youth. New York, NY: Teachers College Press.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist, 52*(6), 613-629.

St. John, E. P., Hu, S., & Fisher, A. S. (2010). Breaking through the access barrier: How academic capital can improve policy in higher education. New York, NY: Routledge.

Strum, P. (2014). "We always tell our children they are Americans": Mendez v. Westminster and the beginning of the end of school segregation. *Journal of Supreme Court History, 39*(3), 307-328.

Sue, D. W., Capodilupo, C. M., Torino, G. C., Bucceri, J. M., Holder, A. M. B., Nadal, K. L., & Esquilin, M. (2007). Racial microaggressions in everyday life: Implications for clinical practice (Report). *The American Psychologist, 62*(4), 271-286.

Sugrue, T. (1996). *The origins of the urban crisis: Race and inequality in postwar Detroit*. Princeton, NJ and Oxford: Princeton University Press.

Sullivan, L. G. (2007). Preparing Latinos/as for a flat world. *Journal of Hispanic Higher Education, 6*(4), 397-422.

Swail, S. W., Cabrera, F. A., Lee, C., & Williams, A. (2005). *Latino students and the educational pipeline: Pathways to the bachelor's degree for Latino students.* Educational Policy Institute.

Sy, S., & Romero, J. (2008). Family responsibilities among Latina college students from immigrant families. *Journal of Hispanic Higher Education, 7*(3), 212-227.

Takacs, D. (2002). Positionality, epistemology, and social justice in the classroom. *Social Justice, 29*(4), 168-181.

Thompson, C. E., & Neville, H. A. (1999). Racism, mental health, and mental health practice. *Counseling Psychologist, 27,* 155-223.

Thompson, R. C., Monroe-White, T., Xavier, J., Howell, C., Moore, M. R., Haynes, J. K., et al. (2016). Preparation of underrepresented males for scientific careers: A study of the Dr. John H. Hopps, Jr. defense research scholars program at Morehouse College. *CBE Life Sciences Education, 15*(3).

Tienda, M. (1995). Latinos and the American pie: Can Latinos achieve economic parity? *Hispanic Journal of Behavioral Sciences, 17*(4), 403-429.

Tierney, W. G. (1997). The parameters or affirmative action: Equity and excellence in the academy. *Review of Educational Research, 67*(2), 165-196.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago, IL; London: University of Chicago Press.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago, IL: University of Chicago Press.

Trucios-Haynes, E. (2000). Why "race matters": LatCrit theory and Latino racial identity. *La Raza Law Journal*, *12*, 1-455.

Trumbull, E., Rothstein-Fisch, C., & Hernandez, E. (2003). Parent involvement in schooling: According to whose values? *The School Community Journal, 13*(2), 45-72.

Valdes, F. (1999). Forward: Latina/o ethnicities, critical race theory and post-identity politics in postmodern legal culture: From practices to possibilities. *La Raza Law Journal*, *9*, 1-31.

Valencia, R. (2001). Inequalities and the schooling of minority students in Texas: Historical and contemporary conditions. *Hispanic Journal of Behavioral Sciences, 22*(4), 445-459.

Valencia, R. R., Menchaca, M., & Donato, R. (2002). Segregation, desegregation, and integration of Chicano students: Old and new realities. In R. R. Valencia (Ed.), *Chicano school failure and success: Past, present, and future* (2nd ed., pp. 70-113). London: Routledge.

Valenzuela, A. (1999). *Subtractive schooling: U.S.-Mexican youth and the politics of caring* (SUNY series, social context of education). Albany: State University of New York Press.

Vélez, W., & Saenz, R. (2001). Toward a comprehensive model of the school leaving process among Latinos. *School Psychology Quarterly, 16*(4), 445-467.

Vélez-Ibáñez C. G., & Greenberg J. B. (1992). Formation and transformation of funds of knowledge. *Anthropology and Education Quarterly, 23*, 313-335.

Vesely, C. K., Goodman, R. D., Ewaida, M., & Kearney, K. B. (2015). A better life? Immigrant mothers' experiences building economic security. *Journal of Family and Economic Issues, 36*(4), 514-530. doi:10.1007/s10834-014-9422-3

Villalpando, O. (2004). Practical considerations of critical race theory and Latino critical theory for Latino college students. *New Directions for Student Services, 2004*(105), 41-50.

Weidman, J. C. (1989). Undergraduate socialization: A conceptual approach. In J. C. Smart (Ed.), Higher education: Handbook of theory and research (Vol. 5; pp. 296-322). New York, NY: Agathon.

Welton, A., & Martinez, M. (2014). Coloring the college pathway: A more culturally responsive approach to college readiness and access for students of color in secondary schools. *The Urban Review; Issues and Ideas in Public Education, 46*(2), 197-223.

Wideen, M., Mayer-Smith, J., & Moon, B. (1998). A critical analysis of the research on learning to teach: Making the case for an ecological perspective on inquiry. *Review of Educational Research, 68*(2), 130-178.

Williams, B. A., & Lemons-Smith, S. (2009). Perspectives on equity and access in mathematics and science for a 21st-century democracy. *Democracy and Education*, *18*(3), 23-28.

Wright, B. (1990). Tribally controlled community colleges: An assessment of student satisfaction. *Community/Junior College Quarterly, 13,* 119-128.

Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education, 8*(1), 69-91.

Yosso, T. J. (2006). *Critical race counterstories along the Chicana/Chicano educational pipeline* (Teaching/learning social justice). New York, NY: Routledge.

Yosso, T. J., Smith, W. A., Ceja, M., & Solorzano, D. G. (2009). Critical race theory, racial microaggressions, and campus racial climate for Latina/o undergraduates. (Report). *Harvard Educational Review, 79*(4), 659-690,781,785-786.

Zuckerman, H. (1977). *Scientific elite.* New York, NY: The Free Press

VITA

Marlene Chavez is the daughter of C.L. Chavez and A. Chavez. Born in Chicago, Illinois, Marlene was raised with her three brothers and three sisters. She attended Chicago Public Schools, grades K-12. Upon graduation, Marlene attended University of Illinois at Urbana-Champaign, where she majored in elementary education, with a concentration in language arts. After graduating with a bachelor's degree, Marlene completed a master's degrees in Special Education (2003), Science Education (2007), and another degree in Administration (2010). Her professional teaching tenure began in a predominantly Mexican, immigrant neighborhood in Chicago. After 13 years of teaching, Marlene decided to pursue a Doctorate at Loyola University at Chicago as a part-time student.

Marlene currently works for a publishing/education company. She has also worked as adjunct faculty at Dominican University and National Louis University in Chicago training first-year teachers. Marlene has a passion for social justice and helping underrepresented groups in STEM. She is dedicated in sharing the voices and success of Latinx students.

DISSERTATION COMMITTEE

The dissertation submitted by Marlene Chavez has been read and approved by the following committee:

Aurora Chang, Ph.D., Director
Assistant Professor, School of Education
Loyola University Chicago

Blanca Torres-Olave, Ph.D.
Assistant Professor, School of Education
Loyola University Chicago

Yvonne El-Ashmawi, Ph.D.
Clinical Assistant Professor, School of Education
Loyola University Chicago