UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE PERCEPTIONS OF LATINA PRE-ENGINEERING STUDENTS IN RURAL OKLAHOMA CAREERTECH

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

By

AMANDA S. CUMMINGS

Norman, Oklahoma

2024

THE PERCEPTIONS OF LATINA PRE-ENGINEERING STUDENTS IN RURAL OKLAHOMA CAREERTECH

A DISSERTATION APPROVED FOR THE

DEPARTMENT OF INSTRUCTIONAL LEADERSHIP AND ACADEMIC CURRICULUM

BY THE COMMITTEE CONSISTING OF

Dr. Stacy Reeder, Chair

Dr. Kyong Ah Kwon

Dr. Kate Raymond

Dr. Jenny Sperling

Dr. Mirelsie Velázquez

Acknowledgments: The Appreciation

As I reflect on this journey and the amazing women who shared their stories, I also recognize the intricacies in the weaving of my own life's basket. The patterns have changed throughout my life, with each row expanding the side walls from their base, yet the basket still remains unfinished, without a rim. With forty-five years of varying patterns and rows, I would like to extend my gratitude to the several people who have made this most recent row possible:

Firstly, I must thank my outstanding professors, who believed in my abilities, provided a space for me to discover my passions, and gave me the autonomy to do so. Each of you encouraged me to bravely question and inquire, which changed the lens through which I view the world of education. For that, I will be forever grateful.

To my committee, Dr. Velázquez, Dr. Kwon, Dr. Kate, and Dr. Sperling, who gave generously of their time and provided me the space to share my productive struggle and discourse, including relentless texts, calls, and emails: you shaped whom I have become as a researcher. Thank you for sharing your knowledge and imparting your wisdom throughout this journey.

To Dr. Stacy Reeder, who was there from my first program interview to my final revisions, your friendship, mentorship, and love are truly immeasurable. You always believed that I could do this–so I did.

Without my influential PK-12 educators, Freda, Mrs. Jones, Mrs. Mosley, Mr. and Mrs. Dills, and Mrs. Zeigler, who empowered me to believe in myself and challenged me never to settle for the status quo, this small-town girl would have never realized this milestone.

To my past, current, and future students with whom I have been fortunate enough to share a classroom, thank you for being the day-to-day sources of my passion for education and the true inspiration for my educational research.

And to all my fellow PK-12 and CTE educators, especially Sharon, Sheila, Martha, Kacy, Jackie, Karen, Bob, Christina, and Eubank, who have been steadily by my side in the trenches, please know that I would not be the educator I am today without your mentorship and collaboration.

In addition, this journey would not have come to fruition without my Circle of Women: Amy, April, Jaime, Donna, Melissa, Mylee, Shari, Simon, and Tonya, and my village of fellow graduate students: Amber, Ja'Corie, Kristen, Mariah, and Tonya; all of whom have given me encouragement, strength, support, laughter, and, most of all, their friendship. With a special thanks to T for being my ride or die in the program, to Kit for keeping me grounded in the final legs of this journey, and to TT for reading and proofing every last word that was written and rewritten to ensure the essence of work reigned true.

To our extended family, Simona, Cary, Elizabeth, Andy, and Fr. Jim: thank you for sharing life with me, for being no more than a phone call away, and for supporting my family, now and forever.

Next, I must thank my first students: my brothers, Parker and Ethan, who suffered early in their formative years from my lack of pedagogy and classroom management but were nevertheless my test subjects. You were resilient, and I am grateful for our common love of STEM. Meghan and Kara, I cannot sufficiently thank my brothers without also thanking the women who have loved them and completed our tribe. I am cognizant that, because of our life

courses, our precious, Maizy and Henry, will grow up to use STEM to change our world for the better.

To my first teachers, Nanny, Granddaddy, Papa, Granny, and my Mom and Dad, you taught me to question authority, the value of human rights, to utilize my voice for advocacy, and the power of education; I hope I have made you proud.

However, the most significant people in this journey have been the base of my basket: Robert, Hannah, Wyatt, and Amy. They believed in me even when I did not, offered the best hugs and smiles on the longest days, and never wavered in their unending support. I love you all more than you will ever be able to comprehend.

While this feels like the first step at the end of a long and inspiring journey, I recognize it is just the beginning of my research expedition, adding a fabulous row to the basket of my life as a critical scholar and career educator.

All my gratitude to each of you for being the best parts of my basket.

Table of Contents: The Layout

List of Tables

Abstract

This qualitative study, Perceptions of Latina Pre-Engineering Students in Rural Oklahoma CareerTech, examined the Latina perspectives of STEM education, educational decisions, oppressive systems, and alternate pathways. The purpose of this study was to understand two specific perceptions of rural Oklahoma Latina students: what guided their educational program choice and what relationships they perceived between oppressive systems, their identity, and STEM. The study aimed to develop an understanding of Latina students' educational experiences and their influence on the complex intersectionality of the underrepresentation of Latinas in engineering career fields. This narrative case study utilized the theoretical framework of Critical Race Theory (CRT) and Latino Critical Race Theory (LatCrit) to center Latina voices through the counter-narratives of the participants. Employing thematic narrative analysis, common themes revealed critical findings, including a creative childhood that dismantled gender barriers, inspirational educators, influential mothers, and oppressive experiences. The implications of these findings within the context of education include the need to continue sharing these powerful counter-stories and systemic change, the importance for students to build using tools in primary grades, and the promotion of CareerTech education as an alternate pathway for STEM education and careers. Additional potential research areas include urban settings, expanding the participants to include other Women of Color, and exploring other CareerTech systems across the United States. This research aimed to contribute to the broader conversation regarding the lack of representation of women in STEM education and career fields and to aid in the resolution by sharing the historically marginalized voices.

Chapter 1: The Persuasion

"You do not have to be me in order for us to fight alongside each other. I do not have to be you to recognize that our wars are the same." ~Audre Lorde (2007)

The history of education is steeped in white supremacy and Eurocentric male values and privilege, a history in which all others fought for, and were often denied, equal opportunity and access (hooks, 2014). Oppressive practices and policies have riddled governmental, societal, and specifically educational spaces since their inception. However, the systems of oppression are quite complex, and the stories of those impacted are not monolithic (Stroh, 2015). Minoritized groups face challenges unique to their cultural and lived experiences (Crenshaw, 2010). Situated in the intersectionality of gendered subjugation and Latino oppression are the narratives of Latina women.

Systems of Oppression

Institutional and cultural systems of oppression have produced a multiplicity of impacts for Latinas concerning race and gender that have influenced their identities (Delgado & Stefancic, 2011). These intersectional experiences of invisibility have resulted in increased scrutiny, isolation, and marginalization by the dominant hierarchy, intensifying the oppressive Latina climate (Crenshaw, 1991). Latino marginalization has also been deepened by the perpetuation of stereotypical narratives and biases, including Machismo, an exaggerated masculine bravado, and Marianismo, a submissive and virtuous feminine suffering (Castillo et al., 2010; Piña-Watson et al., 2014; K. M. Rodriguez et al., 2013; Stevens, 1973). Additionally, systemic barriers such as limited access to educational opportunities, economic disparities, and discriminatory immigration policies contribute to the complex web of challenges faced by Latinas (Civil, 2014; Contreras Aguirre et al., 2020; Corona et al., 2016; Davila & de Bradley,

2010; R. Gutiérrez, 2002). The intersectionality of race and gender compounds these obstacles, creating a layered experience of marginalization that requires a comprehensive and intersectional approach to understanding the lives of Latina students. These systems of oppression and subsequent obstacles are woven into all areas of the Latina lived experience, including education and the field of Science, Technology, Engineering, and Mathematics (STEM) (Civil, 2014; Contreras Aguirre et al., 2020; Delgado & Stefancic, 2011; Flores, 2011; R. Gutiérrez, 2002; Yosso et al., 2009; Zavala, 2014).

The United States' educational system has historically been reflected as a Eurocentric, monolingual, and patriarchal learning space with culturally insensitive policies and practices (Delgado & Stefancic, 2017; Gillborn & Ladson-Billings, 2009, 2016; Taylor et al., 2009). Foundationally, the system was designed for white, privileged, and English-speaking men who could deter tyranny, subdue society, and ensure assimilation among the white commoners (Rippa, 1984). As minoritized groups were slowly permitted entry into the world of academics, the core of this institutional system of inequality was never modified (Delgado & Stefancic, 2017; Gillborn & Ladson-Billings, 2009, 2016; Taylor et al., 2009). Changes were made on the surface, but they have never permeated the structure of the education system. As schools are social institutions that mirror the larger society, the field of STEM education does not differ from this narrative (Davila & de Bradley, 2010).

The absence of Women of Color in STEM fields was initially acknowledged in the publication, *The Double Bind: The Problem of Being a Minority Woman in Science* (S. M. Malcom et al., 1976). This research was the first to address the intersectionality of minoritized women in STEM, referring to it as the "double bind." The concept of the double bind formed as a result of both People of Color and women being underrepresented in STEM, and both of these

marginalizations bound Women of Color. This research identified the root of the double bind as a lack of belonging for Women of Color , where women in STEM organizations were predominately white, and movements to increase the presence of minorities in STEM were focused on Men of Color. This work has continued in other research to examine this intersectionality in education and acknowledges some transition from oppressive policy to neglectful practices (Huber, 2010; L. Malcom & Malcom, 2011; Nuñez, 2011; Ong et al., 2012). Subtle barriers for have disguised the more overt oppressive practices of the past, yet these institutional systems are still reducing access and opportunity for education, careers, and advancement in STEM.

The Attempts at Diversifying the STEM Workforce

Despite an increasingly diverse population and the urging for inclusionary practices, the United States continues to experience a misrepresentation in the STEM workforce (Benavent et al., 2020; Casad et al., 2020; Fry et al., 2021; General Accounting Office, 2014; IPUMS, 2020; Kennedy et al., 2021). Women and racially minoritized groups are underrepresented in most math and science research careers, with significant underrepresentation found in specific STEM disciplines, including biomedical and chemistry research, university faculty, computer science, and engineering professionals (United States Bureau of Labor Statistics, 2020). Various explanations have been offered for this underrepresentation in the STEM workforce and among those majoring in STEM fields. The educational explanations have included varying levels of student interest in science and mathematics (Byrd et al., 2013), the lack of availability of advanced STEM courses in middle and high schools (Hill et al., 2010), being unprepared for postsecondary STEM courses (Dika & D'Amico, 2016), and the lack of academic support systems (Rice et al., 2013). Additional social explanations have included discriminatory barriers

(Grossman & Porche, 2014) and the absence of role models, mentors, and a critical mass of women and minoritized groups in specific STEM fields (McGee, 2020). More individualized yet related explanations for the underrepresentation have included differences between family and career paths (Nugent et al., 2015), perceptions of inferiority and STEM self-efficacy (Rice et al., 2013), and negative professional spaces (Grossman & Porche, 2014).

In the last two decades, these explanations have resulted in contributions and donations of millions of dollars from individuals, corporations, and government agencies for many interventions and initiatives (Granovskiy, 2018). These programs and grants have sought to remedy the skills deficits, increase the presence of diverse role models, and provide career and research exposure in high schools (Cole & Espinoza, 2008; Collins, 2018; Granovskiy, 2018; Grossman & Porche, 2014; Nugent et al., 2015). These interventions and initiatives have developed from the assumption that the lack of representation results from a pipeline issue. Unfortunately, the STEM pipeline primarily focuses on a deficit model aiming to fix underrepresented students through tutoring, increasing self-efficacy, and socializing them into STEM. This approach has failed to seek complete social and cultural reform at the classroom, departmental, and institutional levels (Fox et al., 2009; L. Malcom & Malcom, 2011; Ong et al., 2018). With the lack of structural reform to the educational and STEM system, the focus remains on the individual. These conditions have led to this research regarding how Latinas individually adapt and aspire within these oppressive systems versus adopting the institutional narratives.

Much of the prior STEM initiatives and interventions have focused on and been funded to examine urban areas and PK-12 educational settings (Grossman & Porche, 2014; M. V. Gutiérrez et al., 2011; Harris & Hodges, 2018). However, the limited research in rural communities has shown an increase in academic achievements and career retention when

students form connections to potential STEM career paths (Gutierrez et al., 2022). In rural Oklahoma, CareerTech Centers help foster these connections by connecting academics, skills, and the workforce. As an alternate pathway to STEM careers, CTE Pre-Engineering programs could influence students' development by increasing knowledge and skills, positively impacting self-efficacy and motivation in STEM (CareerTech Education (CTE), 2016; Mutambara & Bayaga, 2021). With CTE programs providing students in rural communities with comprehensive engineering skills, these programs could also build Latina students' confidence and provide connections to the engineering workforce through college and career readiness.

The Challenge in Representation

As of 2019, women constitute 50.1% of the population in the United States, with 21.38% being Women of Color) (Census Bureau 2019 as cited in National Science Foundation, 2021). Within this population of Women of Color, Latinas constitute the most significant percentage, totaling 9.06%, with 8% represented in the workforce (Bureau of Labor and Statistics 2019 as cited in National Science Foundation, 2021). Despite specific categories for Latinas in population and workforce data, educational STEM data is often less definitive as it separates Latinos into groups categorized as either women or racially minoritized, making it difficult to precisely determine Latina participation in STEM. Engineering fields are also challenging to assess, with many statistics combining engineering with science fields or referencing either women or Latinos as single, individualized groups.

Analysis of the areas of intersectionality in the data reveals that the majority of the information reported was combined as science and engineering (S&E) degrees. Recent statistics indicate that women belonging to underrepresented and minoritized groups, including the classifications of Blacks, African Americans, Hispanics, Latinas, American Indians, and Alaska

Natives, received 31% of the S&E degrees awarded to their respective racial and ethnic communities at the associate's, bachelor's, master's, and doctorate levels. (Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey 2020 as cited in National Science Foundation, 2021). While minoritized women have increased representation for degrees in psychology, social sciences, and biological sciences, these women represent only 3% of all degrees earned in the field of engineering. These annual NSF reports have continued to expand the degree fields of S&E to include healthcare occupations that have always been predominately female. These additional fields have aided in the misconception that growth and representation among women in S&E are increasing. While the number of women in this expanded definition of STEM is growing, the prevalence and growth in engineering are minimal, especially for Women of Color. Minoritized men far exceed minoritized women's attainment of all types of degrees in the field of engineering. Despite this expansion and some progress, minoritized populations continue to be underrepresented in S&E degree recipients relative to their representation in the overall population, with the field of engineering being the most significant discrepancy.

Rationale and Significance of the Study

Research reveals the disproportionate presence of Latinas in engineering (S. L. Rodriguez et al., 2022). Studies have examined ways to increase Latina presence in STEM by "fixing" students through various initiatives (Bottia et al., 2021; Dika & D'Amico, 2016; Ong et al., 2018). While these avenues may have increased educational attainment for some Latina students, the remedies have failed to produce significant gains in STEM representation (S. L. Rodriguez et al., 2022). Perhaps the resolution is not in the students' deficiencies but rather in their strengths. This research aims to understand the experiences of Latinas in navigating institutions of

oppression in which they are educated, spaces in which they have historically been unsupported and unwelcomed (Donato, 1997; S. M. Gonzales, 2019; Schmid, 2021). This study also seeks to understand the supports, experiences, and educational decisions of Latina students who have chosen to enter a field where they are underrepresented. Reflecting on the experiences that framed their identities, perhaps the students' counter-narratives can shed light and serve as a resource for other Latina women (R. Miller et al., 2020). This critical inquiry specifically aimed to develop an understanding of the perspectives of young Latina women from rural communities who have chosen the alternate pathway of CareerTech Pre-Engineering programs. By understanding the processes by which Latina students select and pursue their future careers and educational plans, educators could possibly begin to build a more supportive and culturally responsive educational framework for cultivating attainment and reducing oppressive practices in STEM education. However, the power of sharing these young women's stories fostered a more inclusive and representative narrative that acknowledged the diverse experiences of Latina individuals.

Purpose of the Study

This study aims to examine the Latina perspective of STEM education, educational decisions, and alternate pathways by answering the following research questions:

- *What influences and experiences do Latina students who choose to enter a CareerTech Pre-Engineering program perceive to have guided their program decision?*
- *What relationships and experiences do Latina students who choose to enter a CareerTech Pre-Engineering program perceive between oppressive systems, their identity, and STEM in rural Oklahoma?*

To answer these questions, this qualitative narrative case study will examine the perceptions of rural Latina students who choose to enter a CareerTech Pre-Engineering program, the potential influence of their families, educational histories, and experiences, and their decision to pursue a STEM pathway at a rural CareerTech. This approach is situated in constructivism, a theory which states that people develop knowledge through personal experiences (P. Miller, 2016), with each student's narrative providing an understanding and insight into their educational experiences, influences, and decisions. These counter-narratives, derived from Critical Race Theory (CRT) and aligned with LatCrit, specifically focus on the experiences unique to the Latina community, including oppressive practices, immigration, language, culture, identity, and ethnicity (Delgado & Stefancic, 2011, 2017; Gonzalez et al., 2021; Huber, 2010; R. Miller et al., 2020). Counter-narratives which emerge through these complementary theoretical lenses involve challenging and subverting dominant narratives that often downplay the role of race, ethnicity, and intersectionality in shaping legal and societal structures (R. Miller et al., 2020; Solorzano & Yosso, 2001). In addition, this narrative case study also inquires about the existence and influence of Latino conceptual norms of Familismo, Machismo, and Marianismo in Latinas' identity, family, and educational decisions (Azpeitia & Bacio, 2022; Estrada & Jimenez, 2018).

The Researcher

As an educator specializing in STEM careers in rural Oklahoma, my professional commitment revolves passionately around increasing engagement and fostering interest in STEM career domains. Having served as a secondary K-12 mathematics educator for twelve years, I observed a palpable aversion to and inadequate comprehension of mathematical problem-solving and application among my students. My career trajectory in education underwent a pivotal shift

in 2020 with my transition to CareerTech education, which brought into focus the intersectionality of student interests, performance, and representation in these alternate educational settings. Unfortunately, my observations and experience uncovered the replication of the prevalent underrepresentation within STEM career fields, with a noticeable absence of female and racially diverse students. Motivated by this recognition, I began a thorough inquiry to critically examine these educational spaces and alternative avenues to understand the evident deficiency of diversity within STEM disciplines. As a critical scholar, I recognized the importance of the individual experience and narrowed my focus to those who comprise the largest population of historically excluded women in the United States: Latina.

As a critical scholar, my role is multifaceted and guided by a commitment to interrogating power dynamics, challenging dominant narratives, and advocating for social justice. Central to my role as a critical scholar is the recognition of the intersectionality between knowledge, power, and privilege. I strive to examine how dominant discourses shape our understanding of reality and perpetuate systems of oppression, particularly those based on race, gender, and class. I seek to listen to marginalized voices and challenge the status quo by deconstructing these discourses and exposing their inherent biases. This work involves actively engaging in conversation and amplifying the voices of those who have been historically silenced or marginalized by dominant power structures. Through collaborative and participatory approaches, I aim to co-create knowledge grounded in the lived realities of those harmed by social injustices.

Critical scholarship also entails a reflexivity that extends to my own positionality and privileges as a researcher. As a white woman engaging in discussions surrounding Communities of Color, it is imperative to articulate my positionality, acknowledging the inherent biases and

privileges that shape my perspective. My identity as a white woman situates me within a historical and contemporary context of systemic advantages conferred by whiteness. This recognition serves as a foundation for understanding the limitations of my lens and the complexities inherent in engaging with issues of race, inequality, and social justice. Central to my positionality is an acknowledgment of the pervasive influence of white supremacy and privilege in shaping societal structures and power dynamics. These privileges provide me with a level of comfort and security that is often not afforded to individuals from marginalized communities and have shielded me from many of the systemic injustices and oppressions they face. Therefore, I approach conversations surrounding Communities of Color, recognizing that my understanding of these issues may be incomplete or distorted. I strive to serve as a co-conspirator in the struggle for racial justice and equality, which entails actively leveraging my privilege to dismantle oppressive systems and amplify marginalized communities' voices. I am committed to listening, learning, and centering the experiences and perspectives of People of Color in my academic work and advocacy efforts.

The Dissertation Layout

As this dissertation research aims to understand Latina perspectives and experiences in STEM, the layout of this dissertation will consist of five chapters. This chapter provided the rationale and purpose for the study, including the research questions to be addressed. Chapter two extends to share the historical background, knowledge, and prior research, including the theoretical framework in which the research is situated. Next, chapter three presents the study's design and methodology, including the theoretical framework's application. Chapter four shares the complete narratives of each of the study's five participants organized by the identified

themes. The dissertation closes with Chapter Five, which presents the culmination of the research findings, analysis, summary, and implications of this research.

Definitions of Key Terms

When embarking upon this critical research, an awareness to establish a shared meaning and understanding of vocabulary became evident. The dynamics of societal and research discourse contain ever-emerging and evolving language that characterizes how funds of knowledge and cultural wealth influence individual interpretation and meaning (Moll, 2019). In recognition of this linguistic fluidity, this section is dedicated to defining some key terms central to this inquiry while acknowledging that these terms are not static nor universal definitions and were interpreted at the time of this research.

CareerTech Education (CTE): A term used to describe an educational track previously known as vocational education. This branch of public education, which has roots in Oklahoma, prepares students for the careers of the world through training, skills, and college and career readiness.

Critical whiteness Studies (CwS): The study of the structures and systems that produce white privilege. This analysis is through a lens of whiteness as a race, a culture, and a source of systemic racism (Applebaum, 2016).

Hispanic: An ethnicity referring to individuals who speak Spanish and/or are descended from Spanish-speaking populations. This term is often used in census and statistical research to represent Latino populations in the United States.

Identity: Encompasses the personal and social aspects crucial in shaping how individuals perceive themselves and relate to the world around them. Identity is intersectional and dynamic and can evolve as individuals navigate life experiences and engage with different social contexts. Additionally, identity is a social construct influenced by cultural, historical, and societal factors.

With the complexity and intersectionality of identity formation, this study will view formation as individualistic and self-defined by the participants.

Latino: A racial description referring to only male or male & female individuals born in or with ancestors from Latin America, the Caribbean, or Spain.

Latina: A racial description referring to any female born in or with ancestors from Latin America, the Caribbean, or Spain.

Latinx: A non-binary term to describe individuals born in or with ancestors from Latin America, the Caribbean, or Spain. The origin of this term is believed to be from the United States and is not always recognized nor respected by the Latino community.

Men of Color (MOC): A term used to unite the lived experiences of men historically and institutionally marginalized because of their race, ethnicity, and/or skin color (Delgado & Stefancic, 2017).

Mexican-American: A term used to describe individuals in the United States who immigrated from Mexico after the Mexican-American War.

Minoritized Populations: A group that has been minoritized and historically excluded by the dominant group. They have distinct experiences with marginalization based on how race, gender, class, sexual orientation, and other identities intersect (Delgado & Stefancic, 2017). This research views this oppression as something done to these individuals rather than a characteristic of them.

People of Color (POC): A collective term referring to Black and Brown bodies who have experienced systemic and institutional oppression by the dominant group (Also termed BIPOC: Black, Indigenous, and People of Color).

Resilient: A term used in literature to describe a trait identified as necessary for women, especially Women of Color, when successfully navigating systems of oppression. An intentional decision was made to not use this term because the systems should reform rather than the individual.

Rural: Remote areas with restricted access to funding, non-adjacent to urban areas, and often with reduced population densities of 500 or fewer people per square mile. Also referred to as new growth and emerging communities.

Strong: A trait identified as necessary for women, specifically Women of Color, when successfully navigating systems of oppression. The exclusion of this term in this research was intentional as it places the burden on individuals to endure and adapt to oppressive systems rather than addressing the need for systemic reform.

Women of Color (WOC): A term used to unite, transcend, and embrace women and their lived experiences of historical and systemic marginalization and exclusion because of their race, ethnicity, and/or the color of their skin (Crenshaw, 1991).

Chapter 2: The Knowledge

Paulo Freire dismantled the hierarchal idea that, *"Knowledge is a gift bestowed by those who consider themselves knowledgeable upon those whom they consider to know nothing…"* when he stated, *"Projecting an absolute ignorance onto others, a characteristic of the ideology of oppression, negates education and knowledge as processes of inquiry" ~ (2000)*

Introduction

According to the U.S. Census Bureau (2012), Hispanics in 2011 reached 16.77% of the U.S. population, thereby becoming the largest minority ethnic group in the country. It has been estimated that the Hispanic population in the United States will reach 30% by 2060, which would make them a significant part of the anticipated minority-majority (Preuss et al., 2019). With the increase in their population, their representation in different fields has been a significant interest in the literature, including in the area of education. In public schools in the United States, the number of Hispanic students enrolled has increased steadily, reaching 13.8 million in 2020 out of 49.4 million total students (National Assessment Educational Progress, 2022). At the same time, their educational performance has lagged behind their white peers as well as the national average. The average graduation rate in public high schools for Hispanic students was 83% compared to 90% for white students, with an overall average of 87% in 2019-2020 (National Center Education Statistics, 2023b). Similar underperformance has been observed in areas relevant to STEM, such as science and mathematics.

In math and science, the Hispanic students' scores evaluated by the National Assessment of Educational Progress were below proficiency levels and also below those of white peers in grades 4, 8, and 12 (National Assessment Educational Progress, 2022). Hispanic students' underperformance in STEM areas at high school levels has led to their underrepresentation in

degrees in the STEM field in post-secondary education. For example, the percentage of students of Hispanic ethnicity in 2017-2019 who earned a bachelor's degree in a STEM field was 12% when looking at all degrees awarded in STEM (Kennedy et al., 2021; National Center Education Statistics, 2023a). Overall, the total share of degrees obtained by Hispanic students across all areas was 15% when compared to all ethnic groups. For master's degrees, Hispanic students' total share in all areas was 11%, with only 9% of those in STEM fields in 2017-2019 (Kennedy et al., 2021; National Center Education Statistics, 2023a). Hispanic students represented only 7% of the obtained professional doctorates in fields related to STEM. When looking at all of these STEM statistics and Hispanic student representation, Latina women represented only 3% of all degrees earned in the field of engineering (National Science Foundation, 2021).

Researchers have identified several factors that may explain the limited representation of Hispanics in STEM fields, noting such factors as limited inclusivity, lack of role models, low expectations from teachers, and poverty of resources (Dou & Cian, 2020). However, there has been a lack of focus on Latina women's experiences in relation to their educational decisions and alternative paths related to STEM education. The purpose of this qualitative narrative case study is to examine the Latina perspective of STEM education, educational decisions, and alternate pathways. In the current chapter, literature relevant to the research problem is reviewed along with literature related to the theoretical framework of the study. In order to identify relevant literature, a number of databases were used, including PubMed, ERIC, Scopus, JSTOR, and Google Scholar. Studies that met the themes found relevant to the research problem and that were published in peer-reviewed journals or by reputable publishers were included.

The current chapter is organized as follows: First, a discussion is presented on the study's theoretical framework, which is based on Critical Race Theory (CRT) and Latina/o/x Critical

Race Theory (LatCrit). Next, a historical overview of Latina education is provided, followed by literature on representation in STEM in relation to ethnicity and gender. Latina identity is discussed next. This discussion is followed by a discussion on Latinas in relation to STEM education and intersectionality. Finally, literature related to CareerTech and rural STEM education is discussed as relevant to the research problem. The chapter ends with a summary and a discussion of research gaps.

Theoretical Framework

The theoretical framework of the current study is based on Critical Race Theory (CRT) and Latina/o/x Critical Race Theory (LatCrit), as this study is situated in theoretical extensions of critical social science. This social science entails critically analyzing oppressive social practices and structures to generate societal and individual transformation (Fay, 1987). These extending practices are inherent elements of CRT (Delgado & Stefancic, 2017) and LatCrit (Solorzano & Yosso, 2001).

When attempting to understand a problem, researchers often examine the problem from a mechanistic view (Capra & Luisi, 2014). In Descartes' mechanistic worldview, the entire natural order operates based on mechanical principles, with every aspect of the material world explicable through its components' arrangement and motions. This perspective, termed Cartesian reductionism, suggests that understanding complex structures such as plants, animals, or the human body involves breaking them down into their smallest parts (Capra & Luisi, 2014). However, the flaw in this reductionist viewpoint lies in assuming that while acknowledging the composition of living organisms from smaller elements, particularly molecules, their properties can solely be explained by focusing on these molecular components. This viewpoint also overlooks the nuanced interactions and emergent properties that go beyond the mere sum of

individual parts. While this way of thinking has led to significant scientific discoveries and theories, it has fostered a narrow worldview. This tapered view has historically overlooked many outside factors in problem-solving approaches (Stroh, 2015). The consequences of a mechanistic view have resulted in failed solutions or the creation of additional problems resulting from the resolutions. Some researchers began recognizing this error, and a shift in worldviews and research unfolded (Capra & Luisi, 2014; Stroh, 2015). This evolution in problem-solving approaches, known as systems theory, has transformed research and altered how humans view, impact, and advocate for social change (Capra & Luisi, 2014). Systems perspectives recognize the interconnectedness and complexity of the challenges faced by the human race. CRT and LatCrit utilize a systems approach when examining the oppressive foundational policies and practices in the United States institutions, including education. The development of this qualitative study focused on a systematic examination of the influences on Latina education.

Critical Race Theory

CRT was introduced in the context of education in the 1990s by Ladson-Billings and Tate (1995). A fundamental assertion of CRT is the rejection of the view that the history of the United States with respect to racial relations has been characterized by linear progress and improvement (Donnor et al., 2018). CRT is presented against the view that the current arrangements of society represented natural outcomes borne out of agency and merit. Instead, it presents the opportunities made available to individuals in terms of racial accumulation (Ladson-Billings, 2021). CRT in education provides researchers with a critical lens not offered by many other theoretical frameworks (Huber, 2010; Tate, 1997). This race and gender-conscious framework can be used to examine the intersectionality of oppression and experiences that have mediated the education of non-white people.

The intersectionality of oppression in CRT is examined through five tenets initially applied to legal theory, which include the social construction of race, the concept that racism is ordinary and not aberrational, the idea of interest convergence, the belief that whites are the benefactors of civil rights legislation, and the idea of storytelling and counter-storytelling (Delgado & Stefancic, 2017). The tenets were extended as they were applied to other social disciplines, including education (Crenshaw, 2010; DeCuir & Dixson, 2004; Ladson-Billings & Tate, 1995; Tate, 1997). These expanded tenets include the assertion that race is socially constructed and has been deemed socially significant despite not being connected to biological reality (Delgado & Stefancic, 2017). Further, the centrality and intersectionality of racism acknowledge that racism is a regular social feature embedded within structural and systemic ideals that replicate racial inequality. The expanded tenets of CRT also include the view that the power of interest convergence recognizes that racism is codified in law, embedded in structures, and woven into public policy, which benefits the dominant culture that is uninterested in its eradication due to self-interests.

Additionally, the consequences of differential racialization reject popular misconceptions and stereotypes about minoritized groups and accept that individuals do not have monolithic identities (Donnor et al., 2018). The challenge to dominant ideology rejects claims of meritocracy and "colorblindness" and recognizes that the systemic nature of racism bears the primary responsibility for reproducing racial inequities (Ladson-Billings, 2021). The importance of experiential knowledge values and embraces individual scholarship and the lived experiences of People of Color through counter-narratives, through storytelling, and by rejecting research that excludes or neglects to acknowledge these stories (Donnor et al., 2018). The commitment to social justice focuses on eradicating racism and other forms of oppression by centering People of

Color, taking a stance on social justice issues, and acknowledging how all oppression interrelates within this theoretical framework (Delgado & Stefancic, 2017).

History. Critical race theory started in the 1970s within the legal academy in the United States. It began from the awareness among legal scholars, activists, and lawyers that the multiple achievements of the civil rights period had come to a halt and, in some areas, were undergoing reversal (Crenshaw, 2010; DeCuir & Dixson, 2004; Delgado & Stefancic, 2017). Early CRT scholars, such as Bell, Freemen, and Delgado, began work to provide alternatives to the mainstream frameworks and theories in law to challenge and fight racial inequality (Delgado & Stefancic, 2017). The methods of these different scholars utilized multiple theoretical approaches, such as cultural studies, postmodernism, feminist theory, critical theory, and critical legal studies, to develop the fundamental tenets of CRT (Donnor et al., 2018).

Critical Legal Studies (CLS) contended that the law was neither objective nor unpolitical (Matsuda, 1987). Critical Race Theory, the term coined by Kimberlé Williams Crenshaw, developed from CLS, recognized that the law was complicit in maintaining an unjust society (Crenshaw, 2010; Delgado & Stefancic, 2017). CRT scholars realized that the law had been used to support and sustain racial inequality, but the law also had the potential to emancipate and liberate People of Color (Delgado & Stefancic, 2017). The theory acknowledges the creation of race as a social construction and assesses how institutional oppression has continued to preserve a caste system in the United States (Crenshaw, 2010; Delgado & Stefancic, 2017). CRT activists and scholars recognize the intersectionality of race, sexuality, and gender and understand the increased challenges the junctures create (Delgado & Stefancic, 2017).

Work on CRT continued throughout the 1970s and 1980s. In the latter decade, it transformed into a movement when the first workshop on CRT was held. In addition to Bell,

Freemen, and Delgado, work on CRT was also advanced by scholars such as Williams, Matsuda, Lawrence, Harris, and Crenshaw (Delgado & Stefancic, 2017). Over the years, CRT grew from its initial roots in the legal academy into multiple other fields, such as ethnic studies, American studies, political science, and education (Donnor et al., 2018). Further, the CRT movement fueled the development of several other critical studies, such as Critical whiteness Studies, Asian American Critical Race Studies, Critical Queer Studies, American Indian Critical Race Studies, and Latino Critical Race Studies (Ladson-Billings, 2021). These studies and scholars acknowledge that racism was and will always be woven into the legal, institutional, and social fabric of the nation (Delgado & Stefancic, 2017).

This weaving recognition led to the application of CRT in education by Gloria Ladson-Billings and William Tate as an analytic tool to understand educational inequities (1995). The seminal work posed three central propositions (Ladson-Billings & Tate, 1995):

- Race continues to be a significant factor in determining inequity in the United States.
- U.S. society is based on property rights.
- The intersection of race and property creates an analytic tool to understand social and, consequently, school inequity.

The connections between property, school funding, and unjust districting have continued to perpetuate race and class inequalities in education (Ladson-Billings, 2005). The theory has also provided a critical lens for other areas of education, including curricula, policies, and practices (Donnor et al., 2018). Its principles center on the view that racism is an essential aspect of American society rather than an exception that legal achievement could help undo (Ladson-Billings, 2021). Further, the early researchers argued that a culture develops its social fabric to pursue its own interests (Donnor et al., 2018). In the context of the United States, this was

viewed in terms of the subservience of the interests of the minority for enhancing the systematic interests of the white majority (Delgado & Stefancic, 2017). Consequently, the present social systems developed by the white majority do not encourage racial progress for individuals from non-white groups unless it helps advance their own interests (Ladson-Billings, 2021).

Application in Previous Research and Current Study. In the context of education, researchers have utilized CRT in a number of ways. One application discussed by Delgado and Stefancic is that of counter-narratives, which are both a method for telling unheard stories from the margins of society and a tool for analyzing and challenging those in power whose stories are part of the dominant discourse in majoritarian society (2017). These stories can provide self-preservation, a resistance to subordination, and an enrichment of their truth. Educational counter-narratives can seek equity by empowering marginalized voices, which, in turn, works to educate the dominant group (Ladson-Billings, 2005; Ladson-Billings & Tate, 1995; R. Miller et al., 2020; Solorzano & Yosso, 2001). These narratives reveal the actuality that society is deeply structured by racism (Delgado & Stefancic, 2017). This revelation provides an avenue for individual reflection and examination of practices, experiences, and biases.

Through these experiences, members of society can then begin to expose and contextualize institutional oppression (R. Miller et al., 2020). This awareness also forms a critical consciousness to identify unfair practices and transformative possibilities in educational spaces (Gillborn & Ladson-Billings, 2016; Ladson-Billings, 2005; Ladson-Billings & Tate, 1995). These efforts motivate academic research and practice through the voices and experiences of the oppressed (Freire, 2000). Failure to listen to these narratives will result in an incomplete analysis of the system and perpetuate systemic racism in education (Donnor et al., 2018).

Counter-narratives can provide the knowledge necessary to bring about actions and solutions for a more equitable educational structure (Ladson-Billings, 2005).

CRT has also been utilized by researchers who argued that differences in outcomes based on ethnicity in educational attainment can be interpreted as logical outcomes in systems designed on competition (Amiot et al., 2019). Researchers have also used CRT to highlight the role of educational policies and practices in advancing racial inequality while rejecting the view that white individuals are inherently superior or that non-white individuals are intrinsically inferior (Mensah, 2019). Researchers have also used CRT to examine historical factors in interpreting present disproportionalities in education and highlighted the ways ethnicity aligns with other characteristics of identity, such as linguistic background and citizenship status (Aronson & Meyers, 2020). Further, researchers have noted the need to move beyond documenting inequalities in their research to advocating for practical solutions aimed at decreasing inequality (Ladson-Billings, 2021). In the context of the current study, these interests are further advanced, with considerations of how ethnic background and gender may affect the educational decisions of Latinas in the context of STEM education. As previous researchers have considered similar studies in the context of Black women, the use of CRT in the current study was found appropriate (Ashford et al., 2017; Burnett et al., 2022; Ong et al., 2018).

Latina/o/x Critical Race Theory (LatCrit)

CRT has expanded beyond the Black and white racial binary, recognizing that racism impacts the experiences of all People of Color. As a result, LatCrit emerged to examine the specific oppressive experiences of Latinos (Huber, 2010). LatCrit is a complementary, theoretical branch extending from CRT, focusing specifically on the experiences unique to the Latina/o/x community, including immigration, language, culture, identity, ethnicity, and

sexuality (Solorzano & Yosso, 2001). LatCrit, as applied to education, challenges the dominant discourse with regard to race and racism by examining how educational theories, institutions, curricula, and instructional practices continue to oppress marginalized Latino students (Solorzano & Bernal, 2001). The theory also provides a framework for examining the historical racialization of both documented and undocumented immigrants (Huber, 2010). LatCrit theory in educational research has also been used to illuminate how theory and pedagogy subordinate and marginalize Latino students (Crenshaw, 2010; Delgado & Stefancic, 2017).

As the social construction of race recognizes the origin of oppression for minoritized groups in CRT, LatCrit extends this acknowledgment that racism is endemic and a permanent fixture in American education (Solorzano & Bernal, 2001). As the centrality and intersectionality of racism acknowledge that race and class cannot be disjointed under CRT, LatCrit extends to argue that class and racial oppression cannot account for subjugation based on gender, language, or immigration status and only within this intersection can researchers find some to theoretical, conceptual, and methodological questions related to Latino students (Solorzano & Yosso, 2001).

Since the power of interest convergence in CRT acknowledges the dominant culture's failure to intercede and advocate for change in policy and law, LatCrit theorists acknowledge that educational structures and processes are contradictory with the decision to oppress and marginalize parallel to the potential to emancipate and empower Latino students (Solorzano & Bernal, 2001). Further, as the consequences of differential racialization rebuff misconstructions and stereotypes about minoritized groups under CRT, LatCrit extends this to redefine human rights, regardless of immigration status (Alemán, 2009).

The challenge to dominant ideology rejects claims of equal opportunity and race neutrality under CRT. Consequently, LatCrit theorists argue that these traditional paradigms

conceal power and privilege for the self-interest of the dominant groups and question this concealment within the educational system to seriously address the education of Latinos (Solorzano & Bernal, 2001). Additionally, given the importance of experiential knowledge, which is crucial to CRT for understanding, analyzing, and teaching about racial subordination, LatCrit draws strength from students' lived experiences through oral histories and counter-narratives (Alemán, 2009). Because the commitment to social justice seeks to transform racial, gender, and class oppression under CRT, LatCrit envisions this as a social justice research agenda for eliminating racism, sexism, and poverty to empower minoritized Latino students (Solorzano & Yosso, 2001). LatCrit provides a framework not only for examining the lives and unique lived experiences of Latina students but also for observing the effects on Latina students' lives brought on by the challenges and complexities intrinsic to institutional oppression (Solorzano & Yosso, 2001).

History. It was noted in the previous section on CRT that the critical jurisprudence underwent an expansion from the 1980s onwards (Hernández-Truyol et al., 2006). However, despite this expansion, Latinos still lacked representation in the discourses and activities related to CRT (Gonzalez et al., 2021). Latinos were also underrepresented in the legal profession in that period. Despite this underrepresentation, it was realized that in a few decades, the Latino population in the United States would grow significantly (Solorzano & Yosso, 2001). It was in this period that LatCrit emerged as a theory, in part through the awareness of the marginalization of Latinos as well as their underrepresentation in society, policy, theory, and law (Alemán, 2009). The developments that followed eventually led to Representing Latina/o Communities: Critical Race Theory and Practice, a colloquium held in 1995 in Puerto Rico (Gonzalez et al., 2021). The aim of this gathering was to consider the lack of representation of Latinos in general

and in critical race theory (Hernández-Truyol et al., 2006). The term LatCrit was forged from this gathering and was very intentionally designed. Latina/o was chosen, as it defined People of Color, whereas Hispanic was an Anglo-created term that implied having an origin from Spain (Gonzalez et al., 2021). This terminology supported the rejection of white supremacy and privilege by Latinas/os and other People of Color (Solorzano & Yosso, 2001).

In order to develop their movement, LatCrit scholars obtained inspiration from previous experiences and knowledge in the domain of jurisprudence as well as in Critical Legal Studies (Solorzano & Yosso, 2001). Consequently, the new movement benefited from the insights of previous experiments in the legal academy (Gonzalez et al., 2021). It was decided that the movement would hold multi-year conversations that would place Latinos at the center of legal and social analysis (Hernández-Truyol et al., 2006). It was determined, however, that the conversations would be held between activists and scholars representing diverse groups and communities (Solorzano & Bernal, 2001). The conversations officially began in 1996, during the Cinco de Mayo Weekend, with the organization of the First Annual LatCrit Conference, which was held in San Diego, California (Hernández-Truyol et al., 2006). This conference aimed to examine the relationship between ethnicity and race across Latino communities and other Communities of Color, such as African Americans and Asian Americans (Gonzalez et al., 2021). Through Annual Conferences and other projects, the conversations that began in the early years have continued, with resulting papers published in scholarly journals (Gonzalez et al., 2021; Hernández-Truyol et al., 2006). This continued scholarship has also led to the dismantling of myths in Latino culture, including religion, skin color, and sexuality.

Earlier research observations and assumptions attribute the influence of Marianismo and Machismo to Latino communities (Castillo et al., 2010; Piña-Watson et al., 2014; Stevens,

1973). Marianismo was defined as the idealized beliefs and norms that describe the gender role expectations of Latina women within the culture (Castillo et al., 2010; Piña-Watson et al., 2014; Stevens, 1973). This conceptual framework originated from the political scientist Evelyn Stevens, whose research focused on Latina's subordinate position and idealized beliefs about women in Latin American countries (1973). Latina roles were traditionally characterized through the idyllic lens of the Virgin Mary, as Latinas were perceived inside their culture as pure, virtuous, humble, and spiritually superior to men. However, they were also expected to suffer and sacrifice for the family and be submissive to the men within it. These men in early research were claimed to be Machismo. Machismo represented Latino men's expected normative behavior and masculine force within their Latino culture (Arciniega et al., 2008). While the definitions in the literature were somewhat vague, the consensus was one of negative context (Arciniega et al., 2008; Basham, 1976; Stevens, 1973). The hypermasculine characteristics of sexism and chauvinism have been connected to the negative experiences of Latina women and children. However, this negative context was seen as too restrictive and considered an inadequate image of Latino men (Arciniega et al., 2008; Mirandé, 2018). An improved representation was found in the intersectionality of Machismo and Caballerismo, a more positive context, including chivalry and family (Arciniega et al., 2008; Estrada & Jimenez, 2018). Some researchers continue to claim that the expectations and associated behaviors of Marianismo and Machismo are clearly defined throughout Latino families in both Latin America and the United States (Arciniega et al., 2008; Castillo et al., 2010). As such, some research shows that Marianismo and Machismo have substantially influenced Latina students' decisions concerning themselves and the balance between their education and obligations to their families (Castillo et al., 2010; Piña-Watson et al., 2014; Stevens, 1973). However, through LatCrit and counter-narratives, a dedication to

family has been better identified outside of the construct of Marianismo and Machismo (Azpeitia & Bacio, 2022; Corona et al., 2016; S. M. Gonzales, 2019; Kiyama et al., 2015). This dismantlement has provided a lens to examine the complex intersectionality of those who identify as Latina/o without applying stereotypes, assumptions, and myths.

This intersectionality of LatCrit in education specifically looks at the oppressive and marginalizing institutions of American education for Latino students. LatCrit theory in education was conceived as a social justice project that attempts to connect theory to practice, scholarship to teaching, and the academy to the community (Solorzano & Yosso, 2001). The application of LatCrit in education is transdisciplinary and links to many other areas of scholarship. This work is crucial to educators and policymakers in understanding how Latino students engage in resistance strategies due to inadequate educational conditions and ineffective instructional practices (Solorzano & Bernal, 2001). In the words of Gloria Anzaldua, "If we have been gagged and disempowered by theories, then we can also be loosened and empowered by theories" (1990).

Application in Previous Research and Current Study. Some researchers have applied LatCrit in the context of STEM education and representation. For example, Hortencia Lara utilized the LatCrit framework to examine whether research awards by the National Science Foundation continued racism and related oppressive systems in STEM research or whether there was resistance against the disproportionalities against Latinos in STEM (2017). The researchers found that, by not acknowledging sexism and racism in their research, negative consequences for Latinos were perpetuated in educational research. The researchers also found that research, in which dominant ideologies like meritocracy were maintained, placed Latino students in STEM at a disadvantage. In another study, Hernandez Negrete et al. explored the ways in which STEM

educators can utilize the LatCrit framework to encourage learning by allowing Latino students to draw from their culture as sources of strengths rather than weaknesses (2023). The researchers introduced the LatCrit framework in the realm of STEM education. They synthesized the two to argue for a pedagogical approach in the teaching and designing of STEM-based curricula utilizing the LatCrit approach.

Researchers Contreras Aguirre et al. also utilized the LatCrit framework in the context of STEM (2020). Specifically, they focused on obtaining insights regarding the role of family, faculty, and peers in their persistence in the STEM fields. The study was conducted in two Hispanic-Serving Institutions using LatCrit as the theoretical framework and focused on the experiences of Latinas in the STEM disciplines. Another study by Salinas et al. focused on narratives in which the researchers examined Latina teachers' experiences in social studies courses (2016). As these demonstrate, previous researchers have used the LatCrit framework in the context of Latinas, education, and also STEM, showing the relevance and effectiveness of using this framework in the context of the current study focused on the Latina perspective of STEM education, educational decisions, and alternate pathways.

Historical Overview of Latino Education

The oppressive history of Latino education in the United States is riddled with exclusionary practices concerning language, immigration, religion, and race. Beginning in the territory of Texas with the Mexican-American War of 1848, the English-speaking colonizers and established American Anglos rejected the concept of sharing space with immigrants as the country expanded westward (M. G. Gonzales, 2019). Despite the suggested protection of language, land, and citizenship under the Treaty of Guadalupe Hidalgo in 1848, assimilationist practices were woven into public school establishments. Antebellum nativism surged throughout

the country, leading to harsh and exclusionary practices toward foreigners, Catholics, and People of Color before and after the Civil War (Ricento & Burnaby, 1998). Anti-Catholic leaders developed Protestant schools throughout the western territories and promoted the desired segregation and Americanization of public education through adopted English-only policies (Schmid, 2021). Even though many Latinos spoke English, the children were still subjected to hateful rhetoric and were often not permitted to attend public schools (Schmid, 2021). As a result, many Latino parents established their own independent bilingual schools or enrolled their children in Catholic schools. As the federal government stole and appropriated Indigenous lands for colleges under the Morrill Land Grant Act of 1862, even most elite Mexican-Americans experienced denied entry into these educational spaces (37th Congress of the United States, 1862). This oppression and segregation later became supported legal practices by the "separate but equal" policy established by *Plessy v. Ferguson* in 1896 (*Plessy v. Ferguson*, 1896). While this policy was aimed at Black bodies, the complex interaction of legal and social construction of race would challenge the future of Latino-American education.

Immigrant persecution and Latino segregation continued as the country finalized the formation of the forty-eight contiguous states. Following World War I, the United States sought to isolate the country from communistic influences and the influx of what was considered by society as unskilled and uneducated immigrants (Schmid, 2021). The Emergency Quota Act of 1921 and the National Origins Act of 1924 reflected these racist ideals and led to the barring of any additional immigrants from Mexico (Ngai, 2007). The acts also drastically restricted immigration from all other countries except those of Northern Europe. This push for white Americans only resulted in a multitude of English-only statutes in schools across the nation (Schmid, 2021).

The first challenge to this mindset occurred in *Romo v. Laird* in 1925 (Muñoz, 2001). Adolpho Romo Sr., an American rancher and father in Maricopa County, Arizona, sued the Tempe Elementary School District. Mr. Romo felt the school district had violated the "separate but equal" doctrine when the district denied his four children access to the Tenth Street School. The Tempe School district has designated the Eighth Street School for "Mexican American" or "Spanish American" students, while the Tenth Street School was for white children. Even though most of the students who attended the Eighth Street School were American citizens, the district was permitted by Arizona state law to separate them under the guise of pedagogical differences as long as the educational opportunities were equal. Mr. Romo objected to this segregation because the educators at the Eighth Street School were not state-certified teachers. The Tenth Street School teaching staff members were either certified educators or critic teachers overseen by college faculty from the then Tempe Normal School, now known as Arizona State University. The Maricopa Superior Court ruled in Mr. Romo's favor and found that the district had violated the law. The Tenth Street District was forced to permit the Romo children. However, the school district quickly ended this limited integration by hiring certified staff at the Eighth Street School.

This institutional segregation for Latinos continued to be challenged in the *Del Rio (TX) Independent School District v. Salvatierra* case in 1930 (Donato & Hanson, 2012). The district sought to expand the already segregated facilities for Mexican-American students. Jesus Salvatierra challenged this expansion under "separate but equal," stating that this doctrine only applied to Black students. Fearing forced separation and inadequate educational opportunities, many organizations, including the League of United Latin American Citizens (LULAC), joined the fight. Unfortunately, Salvatierra and his supporters lost, and the case managed to legalize the segregation of Mexican-American students in Texas under the claim of linguistic segregation.

The repercussions of this case would continue in Texas with the case of Delgado v. Bastrop Independent School District in 1948 (*Delgado v. Bastrop Independent School District*, 1948). Unfortunately, schools in Texas would not desegregate until *Brown v. Board of Education of Topeka* (1954), and Latino students continue to face linguistic and immigrant oppression today (Cobas & Feagin, 2008; Padilla, 2001).

Despite the increased anti-immigrant sentiment during the Great Depression, Latino parents also fought for the education of their children in California, and they achieved more swift success than those in Texas. In the winter of 1931, seventy-five Mexican-American children were physically denied entry into Lemon Grove Grammar School and ordered to attend the school across the tracks in a predominately Mexican section of town (Donato & Hanson, 2012). This decision came from Lemon Grove's all-white school board, which claimed that children of Mexican descent should attend their own school due to overcrowding, sanitary, and moral conditions. Latino children returned home ashamed, and their outraged parents petitioned the courts for readmission in the name of twelve-year-old Roberto Alvarez. The Roberto Alvarez v. the Board of Trustees of the Lemon Grove School District was successful. In March of 1931, the court ordered the reinstatement of students to their regular school (*Roberto Alvarez v. Board of Trustees of the Lemon Grove School District.*, 1931).

The fight continued in California after a 9-year-old girl named Sylvia Mendez was turned away from a public school in Orange County, California, in 1946 (Donato & Hanson, 2012). Her father, frustrated by the remedial education options, filed a lawsuit against the four remedial school districts in Orange County(*Mendez v. Westminster School Dist.*, 1946). His attorney took an unconventional approach and argued that segregation resulted in feelings of inferiority among Latino children that could limit their ability to be productive Americans. The courts agreed and

ordered that the discriminatory practices against students with Mexican ancestry in California public schools cease immediately. In the court's decision, Judge McCormick wrote that "the paramount requisite in the American system of public education is social equality. It must be open to all children by unified school association regardless of lineage" (*Mendez v. Westminster School Dist.*, 1946).

This legal victory set the stage to end the segregation of public education. Thurgood Marshall used similar arguments from Mendez et al. v. Westminster School District et al. in his reasoning for *Brown v. Board of Education* in 1954 (*Brown v. Board of Education of Topeka*, 1954; Donato, 1997; Donato & Hanson, 2012). On May 17, 1954, Chief Justice Earl Warren delivered the unanimous court decision. The court ruled that separate but equal educational facilities for racial minorities were inherently unequal and infringed upon the Equal Protection Clause of the Fourteenth Amendment (*Brown v. Board of Education of Topeka*, 1954). Unfortunately, despite the ruling, many schools refused to desegregate, as the court's decision provided no timeline for completion. In response to this inaction, the Supreme Court again ruled and then ordered all public schools to be integrated with deliberate speed on May 31, 1955 (*Brown v. Board of Education II*, 1955). During this same period, another court case, *Hernandez v. Texas,* was heard in the U.S. Supreme Court (*Hernandez v. Texas*, 1954). While the case itself did not involve education, the decision extended the application of the Fourteenth Amendment to Latino Americans. *Brown v. Board of Education*, coupled with this decision, expanded the educational ruling to include Latino students, who were referred to as "other white" in the verdict. During that period, lawyers commonly asserted that Mexicans should be considered as white to claim rights accorded to Caucasians, yet they also argued for additional legal protection due to evident racial discrimination (Lopez, 2005). This strategy, referred to as the "other white"

approach, had been employed for years in advocating for Mexican-American rights and was applied in the case of Hernandez. In the legal brief, the focus was seldom on race; instead, they aimed to establish discrimination based on national origin (*Hernandez v. Texas*, 1954). This racial absence allowed them to make a case for minority protection and, consistent with the essence of the "other white" strategy, maintain their classification as whites.

Gradually, legal segregation was eradicated across the country; nevertheless, educational equality was far from being realized in the U.S. education system (Donato, 1997). Latinos struggled with being classified as white in desegregation, while simultaneously being classified as Brown, socially. This intersectionality presented different challenges in desegregation for Latino communities (Contreras & Valverde, 1994). As American youth began to find their voices, Latino students in Los Angeles began to speak out against their own injustice. When their voices went unheard, the students took to the streets. In one of the largest student walkouts in history, thousands of East L.A. Latino students walked out of class in March of 1968 (Solorzano & Bernal, 2001). They sought to improve the unacceptable conditions and presented a list of grievances to the Los Angeles Board of Education. While the protests did not result in immediate improvement, they contributed to the broader Chicano movement that sought civil rights for Latinos (Donato, 1997). This pursuit for civil rights finally led to the recognition of Mexican-Americans as a separate minoritized group in Cisneros v. Corpus Christi Independent School District in 1971 (*Cisneros v. Corpus Christi Independent School District*, 1971; Contreras & Valverde, 1994).

While also claiming to focus on the inequality of Latino education, the federal government sought to remedy the "linguistic handicap" of Latino students in 1968 (Ricento & Burnaby, 1998; Sung, 2017). Concerned about the economic downturn and crime that was

inaccurately attributed to the Latino community, legislators met to remedy the situation. Policymakers believed inadequate language development fueled a culture of poverty within Latino communities (Sung, 2017). The Senate Special Subcommittee hearings on bilingual education stated that this perceived connection between language and poverty, coupled with poor home environments, led to a distorted sense of values for Latino youth. Latino activists also endorsed bilingual legislation with the hope of promoting cultural and economic gains through increased educational opportunities. This conjoined support led to the Bilingual Education Act (BEA), also known as Title VII of the Elementary and Secondary Education Act, which was the first piece of U.S. legislation that recognized the diverse needs of English language learners (ELL) (Ricento & Burnaby, 1998). Support for ELL education continued with *Lau v. Nichols*, when the Supreme Court ruled that school districts receiving federal funds must provide supplemental English language instruction for students whose first language is not English (1974). While the case did not directly involve Latino students, the ruling extended support for ELL students in an attempt to provide a more equitable education (Ricento & Burnaby, 1998).

While courts continued to rule against oppressive educational practices for American students, questionable policies, codes, and propositions were persistent in targeting undocumented students. In Texas, the education codes permitted school districts to deny admission or charge tuition to undocumented students (Donato & Hanson, 2012). The regulations were created based on the concept that undocumented students were not in the jurisdiction of the state and, therefore, excluded from public education. In 1982, *Plyler v. Doe* found the codes unconstitutional and ruled that all children, regardless of citizenship, were entitled to free public education under the 14th Amendment (*Plyler v. Doe*, 1982). Unfortunately, the plight of undocumented students continued with multiple propositions in

California concerning policy, reporting, and restrictive practices, all of which were eventually deemed unconstitutional (Lee et al., 2001). However, undocumented Latino students still struggle with a pathway to citizenship (Benuto et al., 2018).

In 2001, The Development, Relief, and Education of Alien Minors (DREAM) Act proposed a conditional path to citizenship, through which undocumented students who completed high school in the U.S. could attend a post-secondary institution or join the military (Benuto et al., 2018). Unfortunately, the act fell eight votes short of passing, and Congress has since failed to address the issue. In 2011, after several attempts to resolve the citizenship issue, President Obama issued an executive memorandum called the Deferred Action for Childhood Arrivals (DACA) (Benuto et al., 2018). DACA was designed to be a temporary fix for protecting undocumented youth from deportation. The program costs $495 for each two-year renewal and does not lead to citizenship. Despite the governmental economic gains from the program and unclaimed taxes of the recipients, DACA has continued to be under attack by policymakers. As of September 2023, while the program still exists for those already admitted, first-time DACA applications remain blocked and have not been processed (*DACA*, 2023). Living in constant fear of policy changes, Latino families have also been traumatized by recent deportation practices and policies, including separating documented children from their undocumented parents, with no promising solutions on the horizon.

Critical scholars understand that these patterns of progress and regress are standard and function as a permanent fixture of racial history in the United States (Donnor et al., 2018). The history of Latino education, including Americanization, testing, tracking, and industrial and migrant education, supported a singular system designed to produce Latino children as a source of cheap labor (M. G. Gonzales, 2019). This system has perpetuated the oppressive status of the

Latino community within the larger dominant economy. Despite the systemic oppression toward brown bodies in the education system, Latino students continue to pursue, persist, and, for some, find success in educational spaces (Jang, 2019; Yosso et al., 2009).

Representation in STEM

In the context of education, a degree in STEM field has been defined in the literature as degrees in such disciplines as mathematics and statistics, computer and information sciences, health-related fields, engineering and architecture, physical and earth sciences, life sciences, and agriculture and environmental sciences (Benavent et al., 2020). In the United States, the National Center for Education Statistics uses a Classification of Instructional Programs scheme in which 44 professional doctorate programs, 336 research doctorate programs, 427 master's programs, and 424 bachelor's programs across these disciplines were classified as STEM (Fry et al., 2021). It can be noted, however, that there is no universally agreed-upon definition of STEM fields in education (Miriti, 2020).

In the context of employment, STEM fields may extend across occupations such as mathematics, computer, architecture, engineering, Earth sciences, physical sciences, life sciences, and health-related employments such as healthcare providers (Fry et al., 2021). With respect to representation, findings generally show that Hispanic and Black workers are underrepresented in the STEM workforce in relation to their overall share of the workforce. In terms of gender, female representation has been found to vary depending on particular STEM occupations (Fry et al., 2021). While female workers are a majority in health-related occupations, they remain underrepresented in such occupations as engineering, computing, and physical sciences (Benavent et al., 2020; Fry et al., 2021).

Ethnicity and Representation in STEM

Reports on STEM representation in the United States have shown the underrepresentation of Hispanics, as well as African Americans, in the workforce, while Asian Americans and white individuals have been found to be overrepresented (Miriti, 2020). For example, although they make up 17% of the overall workforce in the United States across all occupations, Hispanic workers only constitute 8% of the workforce in STEM (Fry et al., 2021; IPUMS, 2020). Hispanic workers constitute 9% of occupations related to health and 8% of occupations related to computers. African American workers, who comprise 11% of the overall workforce across all professions in the United States, constitute 9% of the workforce in STEM fields (Fry et al., 2021; IPUMS, 2020). African Americans constitute 7% of the workforce in computer-related jobs and 5% in engineering jobs.

In contrast, white workers occupy 67% of the occupations in STEM fields, which is higher than their share in the total workforce across all professions, at 63% (Fry et al., 2021; IPUMS, 2020). Further, white employees have been found to be especially overrepresented in architecture and engineering (Miles et al., 2020). White workers, comprising 62% of the workforce, are slightly underrepresented in computers. Asian American workers, who constitute 6% of the total workers across all professions, comprise 13% of the workers in STEM, demonstrating significant overrepresentation (Fry et al., 2021; IPUMS, 2020). More significant overrepresentation has been found in computer-related jobs, where Asian workers comprise 20% of the workforce. Asian American workers are also overrepresented in engineering at 13% and health-related jobs at 10%. Other ethnic groups, including Pacific Islanders, Native Hawaiians, Native Americans, and individuals with multiple ethnic identities, comprise 3% of the STEM employee population (Fry et al., 2021; IPUMS, 2020).

With regards to STEM education, findings show that the percentage of Hispanics who earned a bachelor's degree in a STEM field was 12% in 2018, although they made up 15% of all the bachelor's degrees (National Center Education Statistics (NCES), 2023a). It has also been found that, compared to African American, Asian, and white individuals, Hispanics have a lower likelihood of earning a college degree (Miles et al., 2020). Compared to their share in the total master's degree recipients, which is 11%, Hispanic adults obtained 9% of master's degrees in STEM in 2018 (NCES, 2023a). Hispanics were found to have received 8% of math master's degrees, 9% of life science and physical science master's degrees, and 10% of engineering and architecture master's degrees. Among Ph.D. graduates in the field of artificial intelligence, Hispanics were only 3.2% of the total share (NCES, 2023a).

In comparison, African American students obtained 9% of STEM degrees in 2018 (NCES, 2023b). They are underrepresented in engineering, physical science, and math. Among Ph.D. graduates in the field of artificial intelligence, African Americans were only 2.4% of the total share (NCES, 2023a). Asian students were found to have obtained 10% of the bachelor's as well as master's degrees in STEM fields (NCES, 2023a). White students were found to have obtained 67% of the STEM degrees in 2018 (NCES, 2023a). Individuals from other ethnicities received 4% of bachelor's degrees in STEM (NCES, 2023a).

Gender and Representation in STEM

With respect to gender, it has been found that women constitute half of the individuals employed in the STEM workforce (Benavent et al., 2020). However, the representation of women varies across particular STEM jobs (Casad et al., 2020). Women have been found to be overrepresented in jobs related to health, while underrepresented in multiple other jobs. Among healthcare technicians and practitioners, women comprised 74% of the employees in 2018 (Fry

et al., 2021; IPUMS, 2020). However, they made up only 25% of the employees in computer jobs, and a significant underrepresentation of women exists in engineering and architecture with 15%. Among, women constitute 40% of the physical scientists, 48% of life scientists, and 47% of the mathematics workforce (Fry et al., 2021; IPUMS, 2020).

With respect to education, it has been found that women are more likely than men to be enrolled in college and obtain a bachelor's degree (Casad et al., 2020). A majority of the degrees obtained by citizens in the United States in 2018 across bachelor's, master's, and doctorate degrees were women (Benavent et al., 2020). However, in the STEM fields, their share was 53% among bachelor's degree awardees, 60% among master's degree awardees, and 48% among research doctoral awardees in STEM fields (National Center Education Statistics, 2023a; National Science Foundation, 2021). Further, women have been found to have obtained 58% of the professional degrees, a majority, in health sciences (National Center Education Statistics, 2023a; National Science Foundation, 2021). Women generally constitute a majority of the recipients of degrees in health-related disciplines. However, there is an underrepresentation of women in some STEM fields with respect to education (Benavent et al., 2020). For instance, in physical sciences and math research doctorates, men are represented at higher levels than women. A more significant underrepresentation of women in education exists in computer science and engineering (National Center Education Statistics, 2023a; National Science Foundation, 2021). Among bachelor's degree awardees in engineering, women made up 22%, and in computer science, 19%.

Latina Identity

In considering Latina identity relevant to educational decisions, researchers have identified several components (S. Rodriguez et al., 2019). Of these components, the most significant influence is family. Specifically, researchers have observed the role of familismo, or familism, which refers to a cultural value of an individual valuing the family-based collective form of making decisions (Corona et al., 2016). It also involves a sense of responsibility and obligation to ensure their family members' well-being (Azpeitia & Bacio, 2022). In relation to educational choices, researchers have found family members to be an essential source for Latina students' ability to obtain tangible guidance and information (S. M. Gonzales, 2019). Researchers have found that the college aspirations of high-achieving students are often developed with a key contribution from family (Kiyama et al., 2015). Mothers' struggles and words of encouragement also positively impact the aspirations of Latina students (Corona et al., 2016). Among immigrant Latinas, mothers, in particular, have been found to play an important role through advice and support (Azpeitia & Bacio, 2022). For Latina students, the family provides a resource of knowledge, where their ideologies significantly influence the decisions of students as well as their career ambitions (S. M. Gonzales, 2019).

Researchers have found that, for Latina students, the deep values associated with family make the family an important resource for success (S. M. Gonzales, 2019). Latino families are traditionally much larger and interwoven than other cultural families, with many children not leaving home until marriage (Azpeitia & Bacio, 2022). Even then, the family is considered extended rather than separated. Familismo is an essential cultural concept that includes solidarity, dedication, and reciprocity within the immediate and extended family (Marín & Marín, 1991; Smith-Morris et al., 2012). This cultural connection places value on

interdependence and includes seeking the family's advice on important decisions, including marriage, career choice, and education (Cross, 2020; Marín & Marín, 1991; Niemeyer et al., 2009). These familial expectations and advice differ based on gender roles within Latino families and culture. In the presence of family support, high expectations are observed among Latinas regarding their academic performance. Further, identity and ancestry via family and community have been found to foster support systems for Latinas, which may encourage their persistence in education (Azpeitia & Bacio, 2022). Family support, background, and culture have been found to be influential in the motivation of Latinas (S. Rodriguez et al., 2019). Resilience obtained through these sources may help Latinas manage their challenges in educational attainment.

Researchers have noted other ways through which identity affects education for Latinas (Martinez, 2013). For example, it has been found that there are often tensions in the experiences of Latinas in their identity as they navigate the challenges that result from the collectivistic values of their families and the individualistic values of the educational system in the United States (S. Rodriguez et al., 2019). Latinas have been found to understand the importance of independence and individualism while also maintaining loyalty to the values of their family (Corona et al., 2016). A part of a successful educational experience for Latina students is negotiating and navigating the division between the family's collectivism and the broader culture's individualism (Kiyama et al., 2015). Often, Latina students are able to navigate this challenge by recognizing education as a means through which they can provide for and enhance their families, as well as their communities (S. Rodriguez et al., 2019).

In addition, interaction with teachers has also been found to be an important element in Latina student's educational attainment and decisions (Gallard Martínez et al., 2019). Specifically, interactions with teachers may enhance the educational experiences of Latinas (S.

L. Rodriguez & Blaney, 2021). Such engagements may occur in multiple forms, such as decisions regarding educational fields, information related to courses, performance, and collaboration with teachers on projects (Sparks et al., 2023). Meaningful relationships with teachers can influence Latina students as teachers may enhance their identity and impact their persistence in STEM (Gallard Martínez et al., 2019). Specifically, such relationships can validate their cultural identity and resources, encouraging a feeling of community (S. L. Rodriguez & Blaney, 2021). However, the limited familiarity of Latinas with higher education environments may make it challenging to form meaningful relations with teachers (Sparks et al., 2023).

Latinas, STEM education, and Intersectionality

Intersectionality in the context of Latinas is the recognition of the many dimensions through which oppression may be experienced by these women from minority groups, marginalized simultaneously due to their gender as well as ethnicity (Sparks et al., 2023). For Latinas pursuing STEM, a key barrier is gender, as Latino culture has been traditionally viewed as male-dominated (Banda, 2020). Latino culture is regarded as having expectations regarding women concerning motherhood and marriage, which can result in challenges when there are conflicts between these roles and those related to careers in STEM. Latinas' identity as women, including women in STEM, and being of Latino origin, can add multiple dimensions of challenges in pursuing a career in STEM (Sparks et al., 2023).

CRT scholars have theorized that the intersecting oppressions of gender and race impact Women of Color more significantly than the sum of racism and sexism. Educational history demonstrates the lengthy Latino battle to rectify and achieve equity in educational spaces (Donato, 1997; Donato & Hanson, 2012; S. M. Gonzales, 2019; Ricento & Burnaby, 1998; Schmid, 2021). When examining the intersectionality of women, Women of Color, and STEM,

Latinas' lack of representation and experiences of oppression have created a tragic combination of subjugation (Ong et al., 2012). Research has examined different areas and combinations of this intersectionality, including STEM, gender, and race, with only some exploring the intersection of all three (Cole & Espinoza, 2008; Crisp et al., 2009; Erete et al., 2021; Flores, 2011; S. L. Rodriguez et al., 2022; Valenzuela, 2020; Zavala, 2014). These intersectional studies have primarily focused on college students or women in the STEM profession, with only a few looking at adolescent students prior to entering post-secondary studies. The intersectionality of this study includes secondary Latina students, STEM, engineering, and rural education. This research aims to understand how young Latinas successfully navigate these unwelcoming spaces, their perspectives on underrepresentation, and their desire and decision to pursue a STEM career in engineering.

There have been efforts to implement practices that could help address the disparities experienced by Latina students in the context of education. In CRT, the concept of counterspace refers to sites where deficit perceptions of non-white individuals can be challenged (Vaccaro & Camba-Kelsay, 2016). Counterspaces can be academic and socially safe spaces for underrepresented students (Ong et al., 2018). The spaces can be used to promote their understanding and make connections in academic work. Counterspaces can also be places of validation, critical analysis, and to vent frustrations (Nuñez, 2011). By sharing stories of attainment, microaggressions, and experiences, Latinas have found ways to establish and maintain a positive academic climate for themselves (Ong et al., 2018). While many counterspaces are physical spaces, they can also be specific student organizations or a smaller section of a larger working group. Unfortunately, these counterspaces are primarily present in post-secondary settings but could quickly and easily be developed for a multitude of groups in

many other educational settings (Nuñez, 2011; Ong et al., 2012; Vaccaro & Camba-Kelsay, 2016).

Researchers have also noted the important role of Hispanic Serving Institutions, which are higher education institutions with a minimum of 25% enrollment of Hispanic undergraduates. These institutions provide important contributions to advancing Latinos at various levels of higher education (Sparks et al., 2023). Such institutions are typically found in areas with a greater concentration of Latinos, such as Texas and Florida (Banda, 2020). Their impact in encouraging STEM among Latinos has been notable (Sparks et al., 2023). For low-income Latino students pursuing STEM, these institutions can be agents of change that help them integrate with higher education and obtain persistence (Rawhiya Jacob et al., 2022). Researchers have also noted the role of expectations in encouraging academic aspirations, with higher expectations for Latinas at these institutions playing a pivotal role (Sparks et al., 2023).

CareerTech

CareerTech refers to an educational track with roots in Oklahoma. As a branch of public education, it provides vocational education and prepares students for the workplace through training, skills, and college and career readiness (Oklahoma Department of Career and Technology Education, 2023a). The history of vocational education in Oklahoma is a testament to the state's unwavering commitment to equipping its residents with technical and career-oriented training (Goble, 2004). The division of Oklahoma education has existed for more than a hundred years, during which it has served the role of connecting businesses with students through opportunities for training (Goble, 2004). In the early 20th century, Oklahoma recognized the need for specialized training, paving the way for vocational education. During this period, funding primarily stemmed from state appropriations and local contributions. These initial steps

laid the foundation for a robust vocational education system that would evolve significantly over the years.

The 1940s to the 1960s marked a crucial turning point with the enactment of the federal Smith-Hughes Act in 1917, later renamed the Vocational Education Act (Goble, 2004). This landmark legislation provided federal funding, supplementing state and local contributions and facilitating the widespread expansion of vocational education opportunities throughout Oklahoma and the United States. In the subsequent decades, from the 1970s to the 1980s, the educational system witnessed a heightened focus on vocational education as a means to prepare students for the workforce (Goble, 2004). This current model of vocational education supports industries, increases the skilled workforce, and provides career pathways for residents of the area. It has served a diverse group of individuals, including students seeking GEDs, employed adults, unemployed adults, prison inmates, senior citizens, business and industry, and high school and junior high school students (Goble, 2004). With the aim of providing a high-quality workforce to employers and skilled preparation to workers for success in education and the workplace, CareerTech education (CTE) currently has 77 skills center campuses, serves 391 school districts, and 29 technology centers serving both rural and urbanesque areas of Oklahoma (Oklahoma Department of Career and Technology Education, 2023a). In 2011, the Oklahoma CareerTech Skills Centers School System celebrated 40 years, and in 2022, the CTE programs had 446,940 enrollments and served 6,671 companies.

Federal initiatives, such as the Carl D. Perkins Vocational and Technical Education Act, have injected additional funding into vocational education programs (Goble, 2004). Oklahoma, in line with national efforts, continued its investment in vocational education through a combination of state funding and federal grants, ensuring students had access to quality training.

The 1990s to the present day saw multiple reauthorizations of the Carl D. Perkins Act, underscoring the pivotal role of vocational education and workforce development (Threeton, 2007). Oklahoma, in alignment with other states, received funding through these reauthorizations. During this period, the state prioritized aligning vocational education programs with industry needs, ensuring students were equipped with skills tailored to high-demand jobs. As the 21st century unfolded, a paradigm shift occurred, broadening the scope of vocational education into the encompassing concept of career and technical education (CTE) (Goble, 2004; Oklahoma Department of Career and Technology Education, 2023b, 2023a). This evolution expanded beyond traditional vocational trades, embracing high-tech and specialized fields, including engineering and computer science pathways. Funding for CTE programs continued to flow from a blend of federal, state, and local sources, reflecting the collaborative efforts of various stakeholders in shaping a dynamic and responsive education system (Threeton, 2007).

Throughout this transformative journey, vocational education in Oklahoma adapted to the evolving demands of the workforce and the economy (Goble, 2004). Federal legislation, state policies, and local initiatives played pivotal roles in shaping this evolution. The overarching goal has remained steadfast: to provide students with relevant skills, preparing them for successful and fulfilling careers, and also including college readiness (Oklahoma Department of Career and Technology Education, 2023b). Oklahoma Department of Career and Technology Education (ODCTE) oversees and ensures the educational objectives and standards are met in each program across the state (Oklahoma Department of Career and Technology Education, 2023a). As the state continues to invest in the future of its workforce, the legacy of vocational education serves as an optional pathway, guiding students toward a prepared and prosperous future.

Rural Education, STEM, and Alternative Pathways

In the literature, researchers have noted that schools in rural areas face unique challenges with respect to preparing students for higher education and careers in STEM that urban schools do not face (Mutambara & Bayaga, 2021). Specifically, students in rural areas experience challenges related to geographic isolation (Stramel & Legleiter, 2020). These students also experience difficulty with internet bandwidth, which may create challenges in the adoption of technology as well as online support (Chen & Lin, 2019). These students may also have limited access to advanced science and math coursework and experience financial difficulty that may prevent them from exploring some educational and employment opportunities (Dixon, 2023).

For rural students with exceptional academic performance, economic, technological, and geographic challenges may be crucial factors preventing them from advancing toward higher levels in STEM education and in pursuing STEM careers (Gutierrez et al., 2022). One reason is that rural schools are more likely to have teacher attrition related to STEM fields (Nelson-Barber et al., 2023). Furthermore, rural schools are often unable to attract teachers in STEM fields with adequate specialty and education levels (Margot & Kettler, 2019). Teachers in rural areas often have limited preservice education to manage gifted students and may find it difficult to access services for professional development in this regard (Dixon, 2023). As a result, teachers may experience difficulty in nurturing STEM talent in rural areas with opportunities (Stramel & Legleiter, 2020).

It has been observed that there is a need to encourage the motivation, attitude, knowledge, interest, and persistence of students in STEM education in rural areas to meet the labor force requirements (Nelson-Barber et al., 2023). Through the development of alternative learning opportunities in STEM, it is possible to meet the local requirements of students through

the availability of multiple pathways for STEM careers and education (Dixon, 2023). Alternative pathways, developed to provide effective engagement to underrepresented students, in relation to STEM learning opportunities, provide a path to meet the current workforce requirements (Stramel & Legleiter, 2020). Researchers have noted that alternative programs could potentially positively influence students' cognitive development, related to their knowledge and skills, and their psychosocial development, related to their self-efficacy and motivation (Mutambara & Bayaga, 2021). Because of this, alternate programs may be able to provide students in rural areas with a robust learning environment for STEM. For high-achieving students with limited opportunities, alternative STEM programs are more likely to produce STEM career opportunities than those without access to such programs (Stramel & Legleiter, 2020). In rural areas, connections with career paths have been found to produce greater student engagement in school and more time spent on academic activities, yielding greater academic success (Gutierrez et al., 2022).

STEM courses and programs have been integrated into curricula throughout the United States. However, these courses and programs are inaccessible for many students who reside in rural areas (Harris & Hodges, 2018; Lavalley, 2018; Marksbury, 2017). Some primary barriers identified in current research include access to resources and qualified educators due to funding, community, and cultural values, and outreach program disparities, which can provide aid and funding from research (Harris & Hodges, 2018; Ihrig et al., 2018; Lavalley, 2018; Marksbury, 2017). Rural school district funding is less per pupil due to a smaller tax base, which reduces additional resources. Aware of the inadequacies of funding in rural education, the federal government enacted The Rural Education Achievement Program (REAP) (Schmidt et al., 2016). The program was established to provide financial support for rural schools, but the program

requirements have not aligned with many schools' needs, and for some districts, meeting the requirements exceeds the provided funding. Other supplemental funding for public education comes from state and federal initiatives to improve student performance and increase student attainment (Harris & Hodges, 2018). Unfortunately, most initiatives focus on urban school reform, with rural districts being marginalized or completely ignored. These STEM initiatives often include educational research, which comes with additional educational dollars. As a result, the research is disjointed, with many current studies focusing on either STEM or rural education but not both (Ihrig et al., 2018). This lack of initiatives, research, and funding has left rural students at a disadvantage in the field of STEM (Harmon & Smith, 2012).

Pursuing STEM careers usually requires post-secondary education, which adds additional stress for rural students as they have to leave their communities (Margot & Kettler, 2019). Many families in rural areas also struggle to see the value of this extended education, especially in the southern region of the United States, where the lowest percentage of adults in the U.S. have graduated high school (Showalter et al., 2019). These generational experiences have influenced educational values, and without relevance to rural life, STEM curriculums have lacked family support (Harris & Hodges, 2018). These indifferent or negative parental attitudes toward STEM courses have also deterred students' interest and performance in these areas. Studies have also shown that parental expectations for educational attainment are lower in rural communities (Ihrig et al., 2018). Without the support for STEM education in their schools and homes, rural students are unlikely to pursue a career in the field (Harmon & Smith, 2012).

In this regard, CareerTech centers can connect STEM and the classroom through community and industry partnerships (CareerTech Education (CTE), 2016). CTE programs can bring relevance to STEM fields through research and the engaging application of academics.

Students who participate in research opportunities through developing vocational interests and STEM identities before entering college have shown significant STEM persistence and increased confidence in their studies (Marksbury, 2017). Adults in STEM careers have also reported being strongly impacted by STEM projects and the application of math and science in their primary and secondary educations (Deming & Noray, 2018). CTE STEM programs provide these daily, and along with additional training and work-based education (WBE), these programs can increase student success in STEM careers (CareerTech Education (CTE), 2016). This underutilized alternate pathway could provide local opportunities for rural Latina students.

Summary and Research Gaps

In the present chapter, a literature review was presented, with themes identified in the literature based on the research problem. The focus of the current study is on the Latina perspective of STEM education, educational decisions, and alternate pathways. The literature review reflected themes related to this purpose, such as representation in STEM and Latina identity. The review began with a discussion of the theoretical framework based on CRT (Delgado & Stefancic, 2017) and LatCrit (Solorzano & Yosso, 2001). Regarding the former, it was found that the theory rejected the view that the history of the United States with respect to racial relations has been characterized by linear progress and improvement (Dixson & Rousseau Anderson, 2017). Considerations of how ethnic background and gender may affect the educational decisions of Latinas in the context of STEM education made these theories an appropriate framework for the current study. Another framework component is LatCrit, a complementary theoretical branch extending from CRT, focusing specifically on the experiences unique to the Latina/o/x community (Solorzano & Yosso, 2001). It was found that previous researchers have used the LatCrit framework in the context of Latinas, education, and also

STEM, showing the relevance and effectiveness of using this framework in the context of the current study. Both theories also validate the lived experiences through counter-narratives, which led to the study's methodology.

The review then focused on a historical overview, showing how the oppressive history of Latino education in the United States is riddled with exclusionary practices concerning language, immigration, religion, and race. Latino representation in STEM was also discussed, where it was noted that although Latinos make up 17% of the overall workforce in the United States across all occupations, Hispanic employees only constitute 8% of the workforce in STEM (Fry et al., 2021; IPUMS, 2020). It was also found that the percentage of Hispanics who earned a bachelor's degree in a STEM field was 12% in 2018, although they made up 15% of all the bachelor's degrees (National Center Education Statistics, 2023a; National Science Foundation, 2021).

Latina identity was another central theme in the literature, as it was found relevant to educational decisions. Researchers have identified several influences on identity (S. Rodriguez et al., 2019), with a special mention of the role of familismo, a cultural value of family influence in decision-making (Corona et al., 2016). Intersectionality in the context of Latinas naturally occurred, recognizing the many dimensions through which oppression may be experienced by these women (Sparks et al., 2023). An important concept in this regard was counterspace, referring to sites in which deficit perceptions can be challenged and dismantled. Alternative spaces and options in education also highlighted CareerTech Education, the program that is the focus of this study (Goble, 2004). The literature also examined schools in rural areas, noting their unique challenges concerning preparing students for higher education and careers in STEM (Mutambara & Bayaga, 2021) and geographic isolation (Stramel & Legleiter, 2020).

As the engineering field has been historically vital in the advancement and prosperity of society, the workforce has lacked diversity (Schreuders & Mannon, 2007). Research has demonstrated the value of these diverse contributions to development and innovation (Bonous-Hammarth, 2000; Cantor et al., 2014; Hill et al., 2010; McDermott & Mack, 2014; S. L. Rodriguez et al., 2022). Society cannot expect an increase in this diversity and representation to continue and broaden without valuing, engaging, and enhancing outcomes for minoritized students (S. L. Rodriguez et al., 2022). To foster and support this growth, secondary educational spaces need to examine, create, and sustain pathways for minoritized students in STEM. Supporting students rather than "fixing" them is key to helping them persevere in spaces where they are underrepresented (Ong et al., 2018). Educational systems should not only focus on the negative influences and factors that impact students; instead, policymakers and those with power should examine the academic spaces in which minoritized students are forced to navigate and then change the system.

Considering the specific challenges of rural area students, CareerTech centers can connect STEM and the classroom through community and industry partnerships. (CareerTech Education (CTE), 2016) CTE programs can bring relevance to STEM fields through research and the engaging application of academics while providing an alternative route into the traditional system. The literature has looked extensively at STEM, underrepresentation, and different avenues for increasing Latinas' participation and attainment in STEM fields. While STEM has been studied in a multitude of ways, the narrowing of research to specifically examine engineering, rural, or CTE education has occurred less frequently or as in-depth. This study provides a glimpse into this research by sharing the experiences and narratives of five Latina

adolescents and the influences on their academic plans, including the decision to enter Pre-Engineering CTE programs before post-secondary instruction.

With underrepresentation in STEM having been significantly studied and narrowed by gender and race, the research has been examined less often concerning both gender and race. The long and oppressive history of Latinas/os has also influenced many scholars to research areas of Latino education. The intersection of these studies has looked at all stages of education, from elementary to post-secondary, and at all levels in between. The gaps are found in these intersectional spaces of the research. Therefore, to more fully understand their perceptions and decisions, we need to hear their stories from their voices: The stories of CTE Pre-Engineering Latina students from rural Oklahoma.

Chapter 3: The Research Recipe

"Our ability to reach unity in diversity will be the beauty and the test of our civilization."

~ Mahatma Gandhi (2002)

This research study explored rural Latina students' perceptions of their K-12 educational experiences and the influence of their identities, including cultural and familial introspections, as potential contributing factors to their decision to enter a Pre-Engineering program at an Oklahoma CareerTech. This holistic exploration included individual student perceptions of their familial and educational history, systems of oppression, and cultural identities. The students' mothers and CareerTech educators also shared their perceptions about the student, their program decisions, and their familial and educational histories. These explorations aimed to understand the students' perceptions and experiences as influencing their decision to enter the field of engineering and STEM. This study serves as a starting point for research that will inform educational systems and direct improvements in educational experiences, influence systemic policies, and eventually support and shape an increase in STEM professions among underrepresented Latina populations. This research shares these experiences from the students' voices rather than statistical data alone because the STEM field needs to be rehumanized if it intends to diversify its population (R. Gutiérrez, 2018). It is only through hearing the stories of Latinas who have experienced the journey that others will be able to understand the pursuit of STEM education for Latina students and increase Latinas' presence in the engineering field.

Research Questions

This qualitative study used the following primary research questions to direct the inquiry:

- *What influences and experiences do Latina students who choose to enter a CareerTech Pre-Engineering program perceive to have guided their program decision?*

- *What relationships and experiences do Latina students who choose to enter a CareerTech Pre-Engineering program perceive between oppressive systems, their identity, and STEM in rural Oklahoma?*

Methodology

Qualitative research begins with assumptions and the use of ontological, epistemological, theoretical, and interpretive frameworks that guide the inquiry (Cresswell & Poth, 2017). This inquiry utilizes individuals' understandings and perceptions of social or human problems. To study a specific problem, researchers must identify a methodological approach to data collection that is sensitive to the participants and the spaces in which they inquire. They must also design a process of inductive and deductive analysis to recognize patterns and emerging themes. The findings are often presented using the participants' voices and researcher reflexivity to provide an interpretive response to the problem. Given the need for individual perspectives to address the essence of this inquiry, a qualitative methodology is best aligned with this study.

Ontological and Epistemological Framework

An ontological framework describes the researcher's perspectives and beliefs about what exists in the world about which individuals can acquire knowledge. Ontology is essentially the study of being (Crotty, 1998). Ontological and epistemological stances often emerge together, and many researchers struggle to keep the two conceptually separate. This study was no different. My ontological position is one of relativism, where each individual constructs their own unique reality. These realities are fluid, as they can change due to historically and culturally affected interpretations, rather than absolute truths (Crotty, 1998; Moon & Blackman, 2014). This stance should not be intertwined with bounded relativism, which also views knowledge as subjective. However, it states that shared realities exist within a bounded group (i.e. cultural,

societal, and generational), but across various groups, different realities exist (Guba & Lincoln, 1994). This distinct position of relativism leads to and supports the epistemological stance of this study, as knowledge is individual.

A researcher's epistemological framework describes beliefs about the nature and creation of knowledge and what it means to know (Hamlyn, 1995). My epistemological position is one of Constructivism. This epistemology rejects objective truth as knowledge, and that meaning is not discovered but is instead constructed through experience (Crotty, 1998). Constructivism is often described as individuals engaging in their world to make sense of it. While this is done on an individual level, people are born into a social system in which their familial systems, including culture, provide the lens of people's first impressions. Familial and cultural experiences inform an individual's reality and how they perceive those realities. However, in some cases, these experiences can also blind individuals from others' perspectives. Because of these influences, this study examined the cultural, familial, and individual perspectives of the participants.

Theoretical Framework

As discussed in chapter two, this inquiry is situated within the theoretical extensions of critical social science. These extended theories constitute integral components of Critical Race Theory (CRT) (Delgado & Stefancic, 2017)and Latino Critical Race Theory (LatCrit) (Solorzano & Yosso, 2001). This framework, attuned to considerations of race and gender, facilitates an exploration of the intersectionality of oppression and the experiences influencing the education of People of Color. In the context of Latina education, the application of the five tenets derived from Critical Race Theory (CRT) signifies a complex examination of the dynamics shaping the experiences of Latina students within educational frameworks. These tenets, conceived initially within the realm of legal theory, when applied to Latina education, still encompass the social

construction of race, the centrality and intersectionality of racism, the power of interest convergence, the consequences of differential racialization, and the challenge to dominant ideology (Crenshaw, 2010; Delgado & Stefancic, 2017; Huber, 2010; Ladson-Billings & Tate, 1995; Solorzano & Bernal, 2001; Solorzano & Yosso, 2001; Tate, 1997):

- *The Social Construction of Race:* In the domain of Latina education, the recognition of the social construction of race becomes pivotal. Despite lacking biological underpinnings, race is acknowledged as socially constructed and assigned societal significance. This recognition informs an understanding of how race operates within educational structures and influences the experiences of Latina students.
- *Centrality and Intersectionality of Racism*: Acknowledging the centrality and intersectionality of racism in Latina education involves recognizing that racism is not an isolated phenomenon but rather a pervasive social feature embedded within structural and systemic ideals. This acknowledgment underscores the complex ways in which race intersects with other dimensions of identity, such as gender, class, language, and immigration status, influencing the educational experiences of Latina students.
- *Power of Interest Convergence*: Within the Latina educational context, the power of interest convergence underscores the systematization of racism in educational structures and policies. This recognition extends to the understanding that these structures may simultaneously contribute to the oppression and marginalization of Latina students while holding the potential for their emancipation and empowerment. The convergence of interests in maintaining the status quo becomes a focal point for analysis.
- *Consequences of Differential Racialization*: In Latina education, the consequences of differential racialization reject misconceptions and stereotypes about Latina individuals.

These consequences extend to a redefinition of human rights within the educational sphere, emphasizing the need to ensure equal rights and opportunities for Latina students, regardless of their immigration status.

- *Challenge to Dominant Ideology*: The challenge to dominant ideology within Latina education involves a rejection of claims of equal opportunity and race neutrality. This theoretical stance posits that traditional paradigms conceal power and privilege, particularly for the self-interest of dominant groups. Within the educational system, this necessitates a critical examination of how these ideologies perpetuate racial inequities and impact the education of Latina students.

In essence, the application of these CRT-informed tenets in the context of Latina education provides a robust analytical framework for understanding and addressing the intricate dynamics of racialized experiences within educational settings. This approach encourages a complex examination of policies, practices, and structures that either perpetuate or challenge the systemic inequities faced by Latina students.

This study conducted this examination through the use of narrative analysis, which CRT and LatCrit support, as these theories value the experiential knowledge that was documented through storytelling (Delgado & Stefancic, 2017; R. Miller et al., 2020; Solorzano & Yosso, 2001). These stories, often referred to as counter-narratives within the theories, can be used to document how race, racism, and oppressive practices have influenced Latina students' perceptions (R. Miller et al., 2020). In the realm of this Latina education research, counter-narratives served as essential tools for understanding the experiences of these Latina students. The narratives play a multifaceted role, including challenging misconceptions and stereotypes, validating diverse experiences, and empowering students to share their voices within educational

contexts. By amplifying these student perspectives, these counter-narratives contributed to a more inclusive understanding of the challenges and successes experienced by these young women in educational settings.

Study Design

Case studies are in-depth explorations from multiple perspectives, designed to provide a deep understanding of a bounded case or cases (Bloomberg & Volpe, 2019; Cresswell & Poth, 2017). They are distinguished based on the focus of analysis and the intent of the study. As a narrative case study, this research explored and aimed to develop an understanding of rural Latina students and families, their educational histories and experiences, and their decision to pursue a STEM pathway at rural CareerTech centers. By listening to these stories, this research project strove to shed light on others' experiences and decisions. A narrative case study centers on a thorough exploration of a specific case, aiming to unravel the intricacies through the collection and analysis of detailed narratives (Merriam, 2009). The thematic narrative analysis involves a systematic examination of these narratives to identify patterns, themes, and relationships, providing a comprehensive and complex interpretation of the case (Merriam, 2009; R. Miller et al., 2020). The primary intent is to gain an in-depth understanding of the case within its broader social, cultural, and historical context, generating insights, contributing to theory development, and potentially informing policy and practice (R. Miller et al., 2020). This study design also serves to present human stories that enhance empathy and understanding, making the findings more relatable and impactful. This qualitative research approach combines storytelling with thematic narrative analysis to illuminate the complexities of social phenomena and contribute valuable insights to academic knowledge and real-world applications.

This narrative case study approach aligned with the theoretical framework, as counter-narratives are foundational to CRT and LatCrit. This foundation recognizes that the world is not static and is instead constructed through words, stories, and silences (Ladson-Billings & Tate, 1995). By rudimentary definition, counter-narratives convey how race influences the educational experiences of People of Color, which counters the normative stories of the privileged (R. Miller et al., 2020). Counter-narratives also seek to achieve educational equity by using the voices of the silenced and subjugated by altering the dominant narrative and bringing awareness to the oppressive structures of educational institutions, including pedagogy and biases (Delgado & Stefancic, 2017; Solorzano & Bernal, 2001). Through this counter-narrative exploration, this study aimed to understand the experiences and perceptions of Latina students in rural Oklahoma and their pursuit of a STEM career.

As narrative case studies focus on understanding, the bounding of these studies is often through location, time, and, occasionally, culture (Josselson & Hammack, 2021; Merriam, 2009). This narrative case study was bound by location through the constructs of Oklahoma CareerTech Pre-Engineering programs and rural educational spaces and by Latina culture. This study used this bounded system to illustrate and gain an understanding of rural Oklahoma Latina students' decision to enter a STEM career field. This design was chosen because it best aligned with the epistemological and ontological stances that knowledge is constructed through lived experiences, as individuals have unique lived experiences. When coupled with cultural and educational influences, the participants' identities have a multitude of layers (Josselson & Hammack, 2021). This methodology can provide a holistic view of the participants, and only through examination of their experiences can a researcher begin to understand their realities.

Participants

Participants in this study must have identified as Latina and been enrolled in a rural Oklahoma CareerTech Pre-Engineering program. In addition, they must have met the following requirements:

- attended a rural school system for both their primary and secondary education
- resided in a rural community during their primary and secondary education

The goal for this study was to have five to seven participants, which provided nearly complete saturation, based on enrollment reported by Oklahoma CareerTech Districts. The participants were recruited from the qualifying thirteen CareerTech districts with Pre-Engineering programs serving rural communities in Oklahoma.

Qualifying a community as rural should be based on defining characteristics. Unfortunately, however, a singular standard definition could not be found. The United States Census Bureau uses a vague description that classifies rural areas as those left after defining urban areas (Ratcliffe et al., 2016). Urban areas are often deemed as communities with more than fifty thousand residents. Some legal and financial policies use greater than ten thousand as the population quota for delineation between the two. The United States Department of Agriculture also defines rural in the context of what it is not, as rural areas are defined as nonmetropolitan counties with varying meanings (Cromartie, 2020). Under some of these classifications, nearly all of Oklahoma would be deemed rural. When looking at education systems, the Oklahoma State Department of Education (OSDE) defines local education agencies (LEAs) as areas with a resident population of less than 2,500 or having a population center of less than 1,000 persons and characterized by sparse, widespread populations (2021). These areas deemed rural continue

to be delineated as rural fringe, rural distant, and rural remote. However, this delineation appears to be inconsistent.

With so many varying definitions, and given the absence of clarity around what is considered rural in Oklahoma, this research used the annual school district list compiled by the Organization of Rural Oklahoma Schools (OROS) (2022) and the list of districts qualifying for Small, Rural School Achievement (SRSA) complied by OSDE (Oklahoma State Department of Education, 2021). To be eligible for membership to OROS, a school must have served rural communities, which OROS determines based on student population and land area within the district (Organization of Rural Oklahoma Schools, 2022). In comparison, rural districts qualifying for SRSA are defined as having a total average daily attendance (ADA) of fewer than 600 students or located in a county with a population density of fewer than ten persons per square mile (Oklahoma State Department of Education, 2021). They can also qualify for SRSA if they have been assigned a school locale code of 41, 42, or 43 by the Department's National Center for Educational Statistics (NCES) or are located in an area of the state defined as rural by a governmental agency of the state.

For this study, the PK-12 home school district attended by the student participant must have been listed as both a member of OROS and as a qualifying LEA for SRSA. In addition, the CareerTech center attended by the participant must serve the school site listed as both an SRSA and OROS school district. The table below identifies Oklahoma CareerTech sites and their qualification or disqualification as used for the purpose of this study (Table 1). Of these thirteen qualifying CTE sites, ten districts responded with student enrollment data and two did not provide a response. Additionally, one was eliminated due to a conflict of interest with the researcher as it was their place of employment. Therefore, this study reached 77% site

participation. Among all the participating sites, all but one qualifying participant chose to participate in this study.

Table 1

The Qualifications of CareerTech Centers for the Study

CareerTech District	Oklahoma CareerTech Site	Pre-Engineering Program	Serves SRSA Schools	Serves OROS Schools	Qualifies for the Study *
Caddo-Kiowa TC *****	Ft. Cobb	Yes	Yes	Yes	Yes
Canadian Valley TC *****	Chickasha	Yes	Yes	Yes	Yes
Canadian Valley TC *****	El Reno	Yes	Yes	Yes	Yes
Chisholm Trail TC *****	Omega	Yes	Yes	Yes	Yes
Eastern Oklahoma TC *****	Choctaw	Yes	Yes	Yes	Yes
Francis Tuttle TC	Danforth	Yes	No	Yes	No
Francis Tuttle TC	Portland	Yes	No	Yes	No
Gordon Cooper TC *****	Shawnee	Yes	Yes	Yes	Yes
Great Plains TC *****	Lawton	Yes	Yes	Yes	Yes
Kiamichi TC *****	Hugo	Yes	Yes	Yes	Yes
Kiamichi TC *****	Idabel	Yes	Yes	Yes	Yes
Meridian TC *****	Stillwater	Yes	Yes	Yes	Yes
Metro TC	Springlake	Yes	No	No	No
Mid-America TC *****	Wayne	Yes	Yes	Yes	Yes
Mid-Del TC	Midwest City	Yes	No	No	No
Moore-Norman TC	Norman	Yes	No	No	No
Northeast TC	Afton	Yes	Yes	No	No
Red River TC *****	Duncan	Yes	Yes	Yes	Yes

Tri-County TC	Bartlesville	Yes	Yes	No	No
Tulsa TC	Lemley	Yes	No	No	No
Western TC *	Burns Flat	Yes	Yes	Yes	Yes

Data Collection

Before the data collection began, authorization was obtained from the University of Oklahoma's Internal Review Board (IRB)(see Appendix A). Once this authorization was granted, the data collection process commenced with the recruitment of participants by disseminating a flyer via email to all qualifying CTE Pre-Engineering programs in Oklahoma (see Appendix B). Subsequently, instructors responded, confirming the flyer was given to eligible students or indicating the absence of Latina students in their programs. Confirming their interest via email, call, or text, Latina students and their parents expressed their willingness to participate in the study. Initial meetings were conducted at the CareerTech Center sites attended by the participant, with her mother and instructor also present. To confirm their voluntary participation, assent was obtained from child participants, and consent was obtained from adult participants utilizing the approved IRB forms (see Appendices C-G). After obtaining consent, scheduled interviews and observations took place.

Prior to the interviews, the researcher also acquired student transcripts and ACT scores and conducted an observation of each participant in her educational setting. The student records provided an institutional history of each participant's education. In contrast, the observation allowed for a more informal picture of each participant's learning style and natural behaviors, both interpersonal and academic, and established a rapport with the researcher and participant. This observation also allowed the researcher to witness participant interactions between her, her

instructor, and her peers and served as an expansion and triangulation of the interview data. These observations were documented using the observation protocol (see Appendix H), and the instructor was subsequently interviewed using a specific educator interview protocol (see Appendix I). These semi-structured interviews were both audio and video recorded. Upon completion of these program-related observations and instructor interviews, interviews with student participants and their mothers were conducted. These interviews were also recorded in both audio and video formats, with the student interviewed first, following the student protocol (See Appendix J). This sequential order was deliberately chosen to prevent potential influence on the participants' perspectives and experiences from their mothers' narratives. The mothers observed the student interviews and were subsequently interviewed using the parent protocol (See Appendix K). This comprehensive and structured approach ensured the systematic collection of data while respecting the ethical considerations of participant involvement and consent.

The primary source of data collection was the semi-structured participant interviews utilizing fifteen questions (Appendix J). The purpose of the open-ended questions was to elicit the participants' perceptions without inferring any expectations of responses (Cresswell & Poth, 2017; Merriam, 2009). These questions were revised to be less leading and more open-ended, following a pilot study conducted in the Spring of 2022. The interview of each participant was conducted in person at a location of the student's choosing, whether it be at her CareerTech center, high-school location, or in her home setting. This location aligned with the research recommendation to discuss educational experiences in educational spaces that provide a space of comfort and safety for the participant at the first meeting (Cresswell & Poth, 2017). Given the minor ages of the participants, a group setting with their mothers was also deemed the most

appropriate for transparency. Any clarifying subsequent interviews and follow-up questions were completed either in-person at the CareerTech, via Zoom, or via email, depending on the participants' availability and preference. These additional interviews and inquiries utilized audio, video, and written documentation. The method of recording all meetings involved two devices to provide a backup in the event of failure (Bloomberg & Volpe, 2019; Cresswell & Poth, 2017). All data gathered throughout the study was stored securely through encrypted digital files, and pseudonyms were utilized to protect the participants' identities (Cresswell & Poth, 2017). A study key was also created to organize and ensure the accuracy and alignment of the information obtained and was stored separately to ensure participant anonymity.

This qualitative data collection method was chosen to collect the participants' rich stories and lived experiences. The various data sources were designed to enhance the comprehensive understanding of the participants' identities, families, education, and perceptions of influence. The thorough and multifaceted data collected also provided triangulation of the interview data through the additional data sources. This triangulation practice provided an increased understanding of the study's inquiry by illuminating different facets of experiences, thereby providing a more authentic and complex view of the participants' lives (Bloomberg & Volpe, 2019; Cresswell & Poth, 2017; Ezzy, 2002; Merriam, 2009).

Data Analysis

The data for this study was analyzed through narrative analysis. Narrative analysis in qualitative research using the theoretical framework of Critical Race Theory (CRT) and LatCrit involved a comprehensive exploration of stories to uncover the intricate intersections of race with other social categories and institutional systems (Delgado & Stefancic, 2017; Ezzy, 2002; Solorzano & Yosso, 2001). Utilizing the voices of marginalized individuals, specifically Latina

voices in this study, this LatCrit narrative analysis sought to understand and amplify their counter-narratives, stories that challenge prevailing stereotypes and mainstream perspectives of Latina students (Huber, 2010; R. Miller et al., 2020; Solorzano & Bernal, 2001; Solorzano & Yosso, 2001). Counter-narratives capture the counter-reality as it is experienced by subordinate groups rather than the experiences of those in power (Delgado & Stefancic, 2017). This form of analysis critically reflects on power dynamics inherent in storytelling, examining whose stories are privileged and how storytelling contributes to or challenges the reproduction of racial hierarchies (R. Miller et al., 2020; Solorzano & Yosso, 2001). This approach acknowledged the intersectionality of race with gender, class, education, and location and aimed to provide a complex understanding of the layered impact of multiple forms of oppression within each Latina's narrative. CRT and LatCrit narrative analysis also delve into how narratives reflect and interact with structural and institutional racism, considering the historical context that shapes contemporary racial experiences, including educational spaces (Delgado & Stefancic, 2017; Ezzy, 2002; Solorzano & Yosso, 2001). Grounded in understanding, this narrative analysis explored these narratives in broader social, cultural, and educational contexts while also seeking expressions of empowerment and resistance within the stories.

The processing and analyses of the data were ongoing throughout the study. This continued analysis allowed for modest changes to the questions, extensions, or other forms of data to be collected from future participants (Merriam, 2009). This practice throughout the study also reduced the number of subsequent follow-ups required for the participants, helped keep the research focused, and allowed the researcher to remain immersed in the process between interviews (Cresswell & Poth, 2017). Examples of these changes and additions included discussions about Covid experiences, the demands of rural education, and examples of in STEM

in their educational history. This continual analysis also allowed the researcher to share transcripts with the participants for the purpose of trustworthiness, clarification, and discrepancies in transcription and interpretation before further analysis (Cresswell & Poth, 2017). Procedurally, the transcripts were transcribed from the interview audio recording utilizing OTTER.AI software (Liang & Fu, 2016). This software differentiated the audio between voices, with the researcher labeling each voice with the participants' pseudonym. This process also identified repeated and commonly used vocabulary. As final transcripts were created for review by all participants, the repeated or unnecessary words, such as um and like, were removed to provide clarity throughout the written documentation.

Once the participants validated the interview transcripts, including follow-up questions, the semi-structured interviews were inductively coded to produce a thematic narrative analysis rooted in CRT and LatCrit. Inductive coding is a ground-up approach by which codes emerge from the data, rather than a predetermined list (Ezzy, 2002). This method prevented unanticipated issues or problems from being overlooked due to researcher bias and expectations. To begin the coding process, the interview transcripts were uploaded to MAXQDA (VERBI Software, 2021). The software interface allowed for the manual assignment of codes for the purpose of separating segments of data. Within MAXQDA, the implementation of coding stripes, color-coded visual cues, served as a mechanism for the visual representation of coded segments within textual data, enabling the application of specific codes. Additionally, a text search function was utilized to ensure the identification of all pertinent segments. Using a non-hierarchical code system, the data was organized, which provided a systematic approach to data organization that aided in identifying patterns, themes, and meaningful units within the narratives.

Once codes were identified, a thematic analysis of the codes began. This practice of thematic analysis complements the coding process, as it includes emergent categories rather than preconceived ones (Ezzy, 2002). In the context of education and theory, this thematic narrative analysis rooted in CRT and LatCrit sought to uncover the intricate ways in which individuals' stories within educational settings reflect and contest broader societal challenges related to issues of race, power, gender, and class (Delgado & Stefancic, 2017; Solorzano & Yosso, 2001). In this analysis, the narratives were explored for elements that highlighted the intersection of these dynamics and shaped individuals' stories while answering the research questions, including understanding the structural and institutional forces that contribute to inequities and disparities within the narratives. The analytical process included identifying recurring patterns and similarities, followed by exploring connections among the codes through examining relationships and identifying commonalities across coded segments (Ezzy, 2002; Merriam, 2009). Some initial relationships and commonalities emerged as the codes were clustered, including identity, breaking gender barriers, immigration, family and educational experiences, inspiring individuals, and oppressional experiences. These clusters laid the foundation to conceptualize and articulate broader themes. These themes were overarching concepts that encapsulated the essence of related codes and provided a more generalized representation of the data found in the stories. The common themes that emerged from these Latina stories were the following:

- a creative childhood that dismantled gender barriers
- inspirational educators
- influential mothers
- defying oppressional experiences

In narrative analysis, themes are used to construct coherent narratives that communicate the qualitative findings (Ezzy, 2002; Josselson & Hammack, 2021). These narratives were compiled to reflect the richness and complexity of the stories while highlighting the themes that emerged. Once these themes were identified, deciding how to present them with the data defaulted to the theories in which this research is situated. The power of a counter-narrative comes from the stories being told by the voices of those who experienced it (R. Miller et al., 2020; Solorzano & Yosso, 2001). To respect and honor the participants' experiences and perceptions, all narrative text presented outside of the transitions is written in the words of the student participants, mothers, and educators. In addition, each young woman's story was kept intact to provide a holistic and individualistic view of the experiences of each Latina student. The construction of each narrative included clustering excerpts from the interviews under the guiding themes, ensuring that the meaning, feelings, and perceptions conveyed during the interviews remained (Cresswell & Poth, 2017; Merriam, 2009). This process was challenging, as the intent was to use most of the transcripts with minimal omissions. Omissions only occurred when the coded data did not meet the overarching themes. The transcripts of data from the mothers and teachers were added to support and triangulate the stories of the young women within the organization of the themes (Cresswell & Poth, 2017; Merriam, 2009). These additional stories told, from the mothers' and educators' voices, were added to the narratives, providing a rich and holistic view of the lives of these Latina students.

Issues of Trustworthiness

Trustworthiness in qualitative research refers to the standard by which researchers confirm the validity and reliability of the study (Bloomberg & Volpe, 2019). The method of trustworthiness for this study was naturalistic, including credibility, confirmability,

transferability, and dependability (Guba, 1981; Guba & Lincoln, 1982, 1986, 1994). A naturalistic approach to trustworthiness aligns with the researcher's constructionist approach to knowledge. Each of these methods has been addressed differently, yet together, they provide validity for the study's findings. Credibility refers to the truth of the research study findings. Researchers should use at least one of the four primary triangulation methods to show that the findings are credible (Guba & Lincoln, 1994). The method used in this study was data triangulation. This method was achieved by utilizing multiple data sources, including interviews, field observations, and educational records. In addition, peer debriefing was also used to ensure that the emerging analyses were accurate, reflected in the data, and not influenced by researcher bias. This process was achieved by sharing excerpts of data with fellow researchers to verify coding similarities and identify any possible discrepancies.

Confirmability continues with the validity of the data through the verification and the methods in which it was obtained (Guba, 1981; Guba & Lincoln, 1982, 1986, 1994). The validation for this study was achieved from a review conducted by a fellow researcher, who examined the data acquisition methods and the collective counter-narratives. More importantly, this study also used member checking of the transcript, including the coding and analysis (Cresswell & Poth, 2017; Ezzy, 2002; Josselson & Hammack, 2021). This process included additional meetings with participants to discuss their coded interviews and confirm, modify, and verify the researcher's interpretation. This step was vital in ensuring that the participants' voices and experiences are their own and were not misconstrued through analysis. In addition, confirmability refers to the process of analysis and the resulting findings (Cresswell & Poth, 2017; Ezzy, 2002; Josselson & Hammack, 2021). This confirmation led to the most important method used in the study's validity: the participant and her mother reviewed the entire compiled

narrative to ensure that both the essence and interpretation of the lived experience were accurate. This method also checked for researcher bias and ensures the findings are based on participants' responses. In addition, an audit trail was used throughout this process to document every step of data analysis with a rationale ensuring and verifying the interpretation and translation of responses to findings (Cresswell & Poth, 2017; Ezzy, 2002).

Transferability and dependability are distinctly connected to additional applications, including fellow researchers, different settings, and readers of the study. Transferability is the applicability of the findings to similar situations, populations, and phenomena (Guba, 1981; Guba & Lincoln, 1982, 1986, 1994). This method can only be achieved through detailed and comprehensive descriptions of the research, methods, participants, and the assumptions central to the inquiry. Only through intricate and descriptive data, context, and analysis processes can a reader determine the transferability of the study to other settings and situations. Dependability refers to the extent that the study could be replicated by other researchers, resulting in consistent findings. While the researcher cannot confirm transferability or replication, this study aimed to be overly transparent throughout to verify the dependability of the methods, analysis, and findings.

Ethical Considerations

Throughout the inquiry process, a researcher must also ensure ethical practices to minimize potential harm to the participants (Bloomberg & Volpe, 2019; Cresswell & Poth, 2017). While IRB reviewed the methods and approved the study's design, other ethical issues were considered, given qualitative research's emergent and flexible design. The three primary concerns revolved around informed consent, preventing participant harm, and ensuring confidentiality. The ethical principle of informed consent requires that all participants retain their

autonomy, analyze the risks, and decide if the research risks were worth the findings (Bloomberg & Volpe, 2019; Cresswell & Poth, 2017). Because the participants were a mix of minors and adults reading either English, Spanish, or both, this study addressed this principle at the initial meeting, with each participant agreeing to the research process through an informed consent form in the language of their choice for adults, and an informed assent with parental consent for minors (Appendices C-G).

This study also explored the participants' familial and educational histories, oppressive spaces, and immigration experiences. Recognizing the trauma and intense feelings that can surface when individuals share and reflect on these topics, the researcher prepared to discontinue the discussion, pause when needed, and redirect when necessary to prevent additional harm. The participants were also aware that they could skip questions at any time, choose to stop the interview or discontinue their participation in the research. These practices provided emotional protection and autonomy for the participants.

Other areas of participant harm include privacy, confidentiality, and anonymity (Bloomberg & Volpe, 2019; Cresswell & Poth, 2017). Privacy is concerned with other individuals' access to participant information. This privacy extends to what, when, and under what circumstances information may be shared or withheld. It also includes the participant's right to decline any information they do not want to receive. Confidentiality and anonymity continue this participant protection through the prevention of identifiable information and secure storage of data. Pseudonyms replaced participants' names and other identifiable information, including the names of schools and communities, to prevent identification by outside members. The codes and keys to this data were stored away from the original transcripts, recordings, and other

artifacts. All data collected in this study has been stored and protected from unauthorized access, loss, or theft, and, upon completion, will be destroyed.

Another ethical consideration is the researcher's positionality within the context of this research (Cresswell & Poth, 2017). As researchers study a population, it is essential to think critically about their personal history and the intent of the inquiry (Crotty, 1998). For researchers outside of minoritized populations, the embeddedness in whiteness must also be acknowledged, as it is critical to how they consider race and privilege (Applebaum, 2016; Corces-Zimmerman & Guida, 2019; Nayak, 2007). This aspect of the researcher's identity is critical to how they position themselves in the research and its influence on their conceptualization of the study. This self-examination is also vital to identify any biases and assumptions by the researcher that might have influenced the study's design.

Researcher Positionality and Subjectivity Statement

Critical whiteness scholarship is another developed extension of CRT research through Critical whiteness Studies (CwS) (Applebaum, 2016; Corces-Zimmerman & Guida, 2019; Nayak, 2007). The underpinnings of this scholarship are three beliefs:

- Whiteness is a modern invention and has changed over time and place.
- Whiteness is a social norm and comes with an index of unspoken privileges.
- The bonds of whiteness can be deconstructed for the betterment of humanity.

Similar to other critical theories, CwS includes additional tenets central to the theory (Applebaum, 2016; Corces-Zimmerman & Guida, 2019; Nayak, 2007):

- Whiteness is a socially constructed identity shaped by historical, political, and cultural and is associated with privilege and power, contributing to social inequalities.

- Whiteness is often normalized as the default, while other racial identities are marginalized.
- Criticism of colorblindness and the belief that ignoring racial differences leads to a more just society when it perpetuates inequalities.
- Acknowledgment that experiences of whiteness intersect with other social categories, such as gender and class.
- Responsibility and advocacy among white individuals to challenge and dismantle systems of privilege for social justice.

As a Critical whiteness Scholar (CwS), I hold the belief that racism and whiteness are ubiquitous and invincible in the United States and are foundational in how I see, understand, and think about myself as a raced and privileged individual. These unearned privileges bring with them a responsibility to be relentless in my challenge to whiteness and be vigilant in my pursuit, as an end to these issues will likely never be achieved. This study was designed to challenge the male-dominated whiteness present in STEM education. As a white female student who also navigated oppressive practices within STEM education, I desire to be a co-conspirator and aid in the establishment of safe spaces in STEM for Women of Color. This awareness and aspiration to expand the representation and diversity of women in STEM education was a driving force in this research.

When considering my positionality, I connected with participants through the shared spaces of education, gender, and religious identities. I am a CTE Pre-Engineering instructor, serving Oklahoma rural communities similar to the programs in which the participants are enrolled, and I also taught STEM in rural Garvin County for a decade before teaching in CTE. I also identify as female and was educated in rural Oklahoma for my entire K-12 education. When

considering the mothers in the study, I am also a parent of two adult children who attended rural schools in Oklahoma. Within religious spaces, I am of Christian faith as a member of the Catholic faith. My parish is predominately Latino, and my family has been immersed in this beautiful and diverse culture among our neighbors, friends, and fellow parishioners for most of my life. However, these areas were not my only connections to this research.

I am an inside-outside member of this community, which allows for contributions and limitations to this study. As an inside-outside member, I share the identity of being a female in STEM; however, I am not a Woman of Color. My subjectivities bring a better understanding of the STEM curriculum, and I have witnessed beneficial outcomes for minoritized students in the classroom. I also share a religious doctrine with all of the participants in this study. These areas helped establish trust and rapport with the participants and families. Through my religious upbringing I also acquired some linguistic understanding, which was helpful in communication, and I have advanced knowledge of translation tools that were available if needed. However, language was also considered to be a limitation, as I am not fluent in Spanish, and despite these shared spaces, I am not a member of the cultural community. Because of these limitations, I was cautious when telling the stories of the participants, ensuring the use of their voices and not my own interpretations.

I had some assumptions from my lived experiences that required acknowledgment and awareness to prevent their influence on this study. One assumption was that the majority of Latino students from rural communities have had a limited productive mathematics education. I also assumed most families have gendered their expectations for their children, and that this difference between genders has affected their education. Another assumption was that linguistic challenges have negatively impacted Latina students' course placement and teacher perceptions

of their abilities. Finally, I have witnessed the deep family connections and cultural ties in my role as a community member and educator, which I believed shaped these students' identities. These personal assumptions were developed through readings and experiences, but as a researcher, they must be acknowledged, considered, and questioned when disseminating the data. This study design intended to represent true and accurate reflections of these students' identities and experiences, utilizing their voices and sharing these narratives' power and influences with others.

Limitations and Delimitations

Limitations of the study refer to the characteristics of design and methodology that influenced the interpretation of findings (Bloomberg & Volpe, 2019). The identified limitations of this study included a small sample size and generalization. The study only included five Latina participants from rural Oklahoma. When qualitative studies often involve a small number of participants, the generalization of findings is limited to a larger population (Cresswell & Poth, 2017; Merriam, 2009). As a critical research study focused on the in-depth exploration and understanding of specific Latina students, the findings of the study were not designed to be broadly applicable. Along with size, the theories of CRT and LatCrit, used in the development of this study, value the individual and their experiences and do not support generalizations made across historically marginalized groups (Delgado & Stefancic, 2017; Solorzano & Yosso, 2001).

However, delimitations of the study are broader and arise from the specific and intentional choices made by the researcher (Bloomberg & Volpe, 2019). These choices include exclusionary and inclusionary decisions in the research design. This study aimed to understand Latina students' perceptions of their decision to enroll in Pre-Engineering programs at rural Oklahoma CareerTech Centers. The delimitations of this study included decisions about the

population and location. The research focused on Latina women. This decision was based upon the lack of both minoritized individuals, women in STEM fields and classrooms, and the increasing population of Latinas in the United States. Also, the STEM tracks available in the Oklahoma CareerTech system include various health programs, computer science, and pre-engineering. Pre-Engineering was chosen because it was an individual career path and is the only CareerTech pathway that is strictly a college-preparatory program. The Oklahoma CareerTech system serves both urban and rural settings. However, most CareerTech Centers in Oklahoma serve rural communities, and rural settings often are missing from the research. Classifying rural communities was an additional challenge, with the solution found in OROS and SRSA. However, OROS is still a self-classifying organization with a paid membership, and SRSA has many varying criteria for qualifying schools.

Despite the limitations and delimitations, this qualitative study was designed to highlight and understand the experiences of rural Latina students who were attending CareerTech Pre-Engineering programs. These young women and their mothers graciously volunteered to share their experiences, which included family histories, educational decisions, and oppressive experiences. These emotionally charged narratives revealed their perceptions, expressed their opinions, and disclosed harm inflicted by institutional and societal practices. The next chapter includes these powerful and influential narratives.

Chapter 4: The Data

"Tell the story of the mountain you climbed. Your words could become a page in someone else's survival guide." ~Morgan Harper Nichols

Borrowing from one of the participant's narratives, finding meaning in life is much like appreciating where warp and weft meet in a culmination born from basket weaving. The art of basket weaving, as Yareli, one of the participants, explains, is referred to as *Cesteria,* which is the practice of weaving together organic materials into a desired shape. This weaving technique interlaces two or more series of active elements that come together to form a shared pattern throughout the creation until it is made whole. The narrative of the five participants in this study culminates in much the same way–into five baskets–each with its own organic elements. Each element is woven together throughout the participants' lives to become whole and unique but with patterns of commonality.

The organic elements of these narratives are the voices each contain. Each story embodies at least three elements: the Latina student, her mother, and her pre-engineering instructor. Other voices are highlighted through their personal accounts and perspectives. The organic nature of the participant's voices is left intact, maintaining each participant's distinctive voice. The only breaks in the narratives come from arranging them into the patterns that naturally occur as emerging themes.

These patterns are the shared identified themes throughout all of the participants' stories. To communicate these themes, each narrative was analyzed thoroughly, and the common themes that emerged through narrative analysis are supported by the stories of the young Latina women who experienced the following: Creative childhoods comprised of experiences that helped to dismantle gender barriers, inspirational educators, influential mothers, and defying oppressional

experiences. What follows are the first-person narratives woven by the individual lives of five young Latina women who have chosen to share their stories after entering into Pre-Engineering programs in rural Oklahoma CareerTech centers.

Yareli's Narrative: "We Have to Rise Up, Give Ourselves a Chance, and Learn It."

On a cool spring evening, a young woman and her mother arrived at a rural community school in Melville, Oklahoma. The space was familiar and safe to both of them, as the mother, Maria, worked there as a teaching assistant, and for Yareli, this school had been the only school she has known until this year. When Yareli began attending this school year, she decided to challenge herself and enroll in a Pre-Engineering program at her local CareerTech center. Capital Technology Center (CTC) is a few towns removed from her community of Melville. This new school experience brought her back to Melville schools this evening. Yareli met a CareerTech educator at CTC interested in sharing her story of determination and need for systemic change by pursuing STEM education. Back in the space where her education began, Yareli shared her motivation and decision to pursue pre-engineering, and together, with the help of her mother, they tell their story of struggles and hardships along with the power of family and influential women.

Introduction

As the interview began, Yareli described herself and responded openly to the request to tell her story of who she is and the life circumstances that have helped shape her and influenced her life decisions:

> I am a seventeen-year-old girl from a small town where everyone knows everybody, and I am the youngest of five sisters, one of them being my twin. My sisters and I were raised by my mom and grandpa throughout my childhood, and we are very family-oriented. I

like doing stuff with my family and hanging out with my sisters. I look up to my oldest sisters a lot and appreciate all of their advice. The expectations are not necessarily to be better than them but to know right from wrong and try not to make the same mistakes that have hurt your family in the past. While we all speak English, Spanish was a language that we spoke whenever my grandpa was still alive, but it has faded out over the last two years since his death. I miss talking to him in Spanish because he wouldn't judge me whenever I got a word wrong or something. He was always so supportive. We were also Catholic for a little bit, about half my life, but now we go to a Pentecostal church. My family has always been close to God and loves attending church when we can. Outside of my family, I have three solid close friends who are always fun to hang out with. We all met in cheer and grew really close in June. We have just been pretty unstoppable since we are always hanging out together, at football games on the sidelines, and stuff like that. I also like going to school to interact with other people, too. I really just enjoy being with people.

A Creative Childhood That Dismantled Gender Barriers

As we continued to explore her life, Yareli's narrative traveled back to her younger years. She explained how her childhood experiences allowed her to explore, create, and build things through and with the support of her family members, the most influential of whom were often male:

> My cousin is a year younger than me, and we have always been really close. He and my uncle lived right across the alley from us for many years. My twin sister, him, and I would always hang out during the long summers. We would always invent stuff for our adventures, make slime and potions, and build stuff out of sticks. We would ride our

bikes here to the school and then slowly try to get home like it was our mission. We were always creating new and different ways to play.

I have always been really creative and quickly learned things, from song lyrics to patterns. I'm just always doing or learning something. I remember spending a whole day making bracelets from threads after discovering the patterns from braiding my dolls' hair. My grandpa really liked how I did the braids, so he sat down and began teaching me how to weave baskets. From there, my grandpa taught me how to do other less girly things, too. My grandpa was a really big influence on that. He always encouraged me to build and find solutions for myself rather than just do it the way it had always been done.

Yareli's mother added to this by sharing, "My dad was the best teacher. He often said, 'We are not born knowing. We have to learn. None of us know what to do, boys or girls. When we are first faced with something, we have to rise up, give ourselves a chance, and learn it. Otherwise, you will most certainly never know it.'"

Inspirational Educators

As the interview progressed, Yareli explained that throughout her education, she received guidance and instruction from passionate educators who not only recognized Yareli's capabilities and taught her math and science, but who also directed her toward schools and courses that would augment her learning:

In elementary, I loved the competitive timed tests. If you knew something and knew it well, then the teachers just pushed you to get better by continuing to improve and learn more. My teachers were like family even before my mom worked here. They have always gone out of their way to help other students, and I have so much respect for them as teachers and as people. However, I do not really enjoy English and reading because they

are always choosing the books and materials to read. If I got to choose, I would read mysterious things, uncover new facts, or explore unknown family relationships. The questions are always about what this tells you, what it is about, and what you think it means. I just do not enjoy those activities. I like the grammar stuff, though, because you get to break down the sentence into parts and decide where each needs to go.

I continued to enjoy math during middle school. I was in a class with a few other kids that were at my level in math. We'd always get done with our tests early and hang out after because our teacher would make us do the test with everyone. When we finished early, she'd have us go into the room next door and talk about the test, kind of like a debrief. She recognized that the group of us was getting really good at math, so she just let us start moving ahead. She was also frustrating to me because, at the time, she really didn't help much. She always pushed us to get the work done, but whenever we'd ask her if an answer was right, she would tell us to look it up and verify it for ourselves. I had mixed emotions about her at the time, but I am grateful because she got me in the spot I am in today. The next year, in seventh grade, she had all of us move to a different class, so instead of doing eighth-grade math, we did algebra with the people in the grade above us. It was weird at first, but it was nice to know that you were a step ahead. And it's been like that ever since, just the eight of us. Our high school math teacher has always been really helpful. She walks us through each piece, explains why it is this way, and connects it back to the world. She is just an overall really good teacher.

Science was different. I didn't really enjoy it in middle school. It was all in the book and not very interesting. Once I got to Biology, though, I loved it. We had genetics labs and hands-on activities. Genetics are so fascinating. My biology teacher also led the Ozobots

> Club after school. It was a STEM club where we learned computer programming, coding, and worked with robots. We also designed 3-D pens and worked with 3-D printing. So much of what I learned with him was about how things worked from the inside out, which is what I really enjoy. I like learning how things work. My science courses have also included life skills like sewing and creating resources that can be useful in life. Capital Tech does that for me, too. I got to choose what program to attend based on what interested me the most. I share so many interests with the other students, and we all have so much in common. One of my initial interests in the Pre-Engineering program was the math courses because Melville only goes up to Algebra II. I was excited to have the option to take trigonometry and college algebra and get ahead, even if it would be hard. I also have more science courses offered there. My two teachers are so incredibly helpful and go out of their way to build connections with us. My classmates are mostly boys, with a few girls sprinkled here and there. I also found connections in SkillsUSA, my student organization at CTC. I like being helpful. If I can find a way to go out of my way to help someone, I will. SkillsUSA allows me to help others and humanizes the engineering work we do. I definitely want to connect engineering to social science and help others. I plan to pursue something like that in college. CTC makes me realize I can be an independent woman and support myself while also having a family one day.

Influential Mothers

Yareli has grown to understand the struggles her mother faced as a young immigrant woman who displayed fierce determination to build a comfortable life for herself and her family in the United States—even in the face of immense challenges—and Yareli says her mother passed that courage and determination down to Yareli and her sisters:

> My decision to pursue bigger dreams has been influenced mainly by my mom and sisters. My mom did not have an easy life, but she has always done the best she could. She has always said we could do anything we set our minds to do, and she has been there every step of the way, encouraging us to dream big. I know she wants something different for us, something easier and independent from anyone else. She always says we have to make our own way and cannot depend on someone to do it for us. My sisters have also helped push me to believe in myself. They are always commenting on how I work to build things and find simpler and easier ways to do things instead of doing it the traditional or hard way. If something is broken, I am the girl in the house who will try to fix it, often with my mom's help and advice.

Yareli's mother, Maria, was born in 1971 in Juarez, Mexico, across from El Paso, Texas. The fourth of five children in the family, she immigrated to the United States in 1978 before the youngest of her siblings had yet been born. Maria shared the story of their family's immigration and her personal struggle for citizenship, a story Yareli knows very well:

> I had my seventh birthday a month after we arrived in the United States. My dad always liked doing farm work, so we came immediately to a farm. He began working there, and as a child, it seemed like we were there forever. In reality, we were only a little bit over a year. Then, we moved to another small town in New Mexico. We lived in the outskirts, of course, because we always lived on the farm. I was pushed to learn the language quickly because my parents did not speak any English. All of my life, speaking the language was left up to myself and my siblings. I had a really good teacher in second grade who was patient enough to teach me English. For me, my story of citizenship really began when I started translating for my parents at seven years old. We went back and forth between

New Mexico and Oklahoma a few times before staying in Oklahoma for good in 1986. I had my 15th birthday here and stayed ever since.

Oklahoma definitely brought challenges. I struggled here after coming from a 75% Hispanic community in New Mexico to a 1% Hispanic community in Oklahoma, with me being the 1%. The second day that I was enrolled at Townson High School, I got into a fistfight with another girl because of my skin color. I barely remember what happened. It was such a blur, and I was so upset. My principal called my dad's boss and told him I was walking home. I had told the principal I was never coming back. Once I got home, my parents convinced me that I could go back and that would be okay. After the fight, everybody left me alone. I managed to make two really good friends, one of whom is still my friend today.

The Townson school community was so emotionally tough for me that I sought an escape from it all. I did want to graduate, and I did eventually get my GED, but I knew that I would never finish nor survive at that high school in Townson. I found a solution in the form of a man. We married very young, and I had my first child at the age of sixteen and then three more girls by the time I was twenty. When I reflect back, I struggle with the choices I made. While my children are the best parts of me, I could have waited, been patient, and found a better way to survive the community we were living in. Instead, I chose to escape, and that road was more difficult than it had to be.

My marriage was not what I had envisioned. It was rough and challenging, and before long, I had to get a job to take care of my young children. I found a job at a local poultry factory despite not having documentation. Quickly, my translation skills became incredibly valuable as many workers were not bilingual. The company encouraged many

of us to establish residency through amnesty laws. I helped with these appointments by translating and eventually saved enough to get my entire family legalized through residency. The opportunity to be documented was truly an amazing feeling of success and opened so many doors for all of us.

I was able to take a real job, but I desired to be more than a resident. I wanted all the rights afforded to natural-born citizens, including attending college. I studied, filled out all of the citizenship papers, and finally, in 1992, I became eligible to take the exam and became a citizen. I have never felt so proud, frustrated, and scared at the same time. I was proud and shared it with others I worked with and served. I remember coworkers and regular customers saying things like, "Well, now you get to pay real taxes instead of spending mine." It infuriated me as they were so wrong. I had paid into DACA, paid taxes that I could never file on as a resident, and worked all of my time here in America, even as a young girl. However, my husband did not support all of my dreams. I think he felt threatened by my independence, but I decided to try college in spite of his opinions. After my unsuccessful college attempt, I filed for divorce. I then had to work two jobs, and thankfully, my dad and mom helped me with the girls. I was going to prove I could be a good citizen and earn my place here. Eventually, we moved to a better community here in Melville, and while it is not perfect, it is certainly better than Townson in the 1980's. My journey was a tough one, certainly something I never want my girls to experience, which is why I have always shared with them my mistakes and prayed they would never follow in my footsteps. I have always encouraged them to give themselves a chance and to never let anyone tell them what they can or cannot become in their life.

Defying Oppressional Experiences

Despite her mother's hopes for her, Yareli's influences have not always been encouraging. She has had to rise above the low expectations held for her by her peers and, furthermore, by adults in authoritative positions and educational spaces:

> My counselor, Mrs. Culpepper, thought I should not go to CTC because she did not think I could be successful, and it would look bad on my transcript. She just told me to steer away from it and try to do something easier. She used the example of a really smart white boy who went over there a few years ago and was on the verge of failing at the end of the year. He did not end up failing, but she did not want that or something worse to happen to me. I would not necessarily say that I was upset about it, but I believed I could do it and wanted to try. You will never know if you do not try, and I just went with something that could possibly benefit me in the future.

As Yareli's mother heard this retelling of this story, tears began to fall. I stopped to ask her if she would like to share her thoughts and feelings, and she had this to say:

> I expect a lot from the girls, which means I push them, probably a little too much at times, but I am outnumbered. However, I have always encouraged them to be exceptional and to do things for themselves on their own terms. When she shared her conversation with Mrs. Culpepper, I was angry and sad as it stung a little because you do not want your children or any child to be compared to someone else. It reminds me of when she and her twin got separated in third grade. It was like a wake-up call for me. They had always been in the same class, but the twins were still different people with their own personalities and strengths. Before the split, it felt like Yareli was always waiting for her twin to catch up. She has thrived in her advanced STEM courses where her sister would

have failed. Who was I to force them to stay on the same path or compare them to one another? They are both smart and witty but in different ways, as are all students.

As Yareli shared a loving and understanding look with her mother, she turned back to our conversation and continued to share her struggles and the choices she has made to overcome these challenges:

> I live in a pretty rural community, which has its benefits and challenges. While it is easier to get recognition like gifted and talented and National Honor Society, we do not have a lot of other opportunities. We do not have extra courses like other bigger schools because of funding. There are only three science courses: physical science, biology, and anatomy, and I need way more if I am going to be able to attend college. I have also not experienced a lot of variety in my teachers since many of them teach the same subject for several grade levels. We also do not have a lot of ways to get community service hours. Those are required for NHS, and despite helping at my church, I have never received the award. I eventually got NTHS at CTC, which made me very proud. Going to a smaller school also meant we did not have our own computers for a long time. We had computers in the library, but they were slow. After Covid, we got Chromebooks, and everything changed at Melville. The laptops made our classwork so much easier because we could do it in our classrooms and expanded what we could do. We use Excel, Word, and Google all the time now. Learning how to use all of this before CTC made a big difference in my success there.
>
> At CTC, most of my classes are full of boys, with only three other girls besides me. Many of the boys feel like they are better than most of us, mainly because they are just boys. At first, I was really nervous because I did not know any of the girls, and two of them were

> already good friends, with the other having a boyfriend in that class. So, they just stayed away despite me trying to talk to them during the first few months of school. I did not really try to talk to anyone else because I felt they did not like me and that I did not belong here. As we started projects, we would be put into groups with different people, and they mainly did the job because they thought I could not do it. I just tried my best, but if they had an idea, I just went with it so they would not know if I knew or not. Eventually, I believed in myself more because of the group experiences and recognized I had similar ideas, too. I began to put myself out there by joining in their conversations, and the teachers put us in different groups with different people every time, which helped build my confidence. The boys began to see that I was smart and had good ideas. It is hard to overcome the advantages of men. They are physically stronger, which gives them an advantage, and people just think they are better than women in STEM.

Her CTC educator, Mr. Bradford, shared in a separate interview that he, too, had heard these inaccuracies from educators and students throughout his eighteen-year teaching career:

> I have often been told by male students and fellow colleagues that girls do not like math or the problem-solving side of STEM. They claim that the concept of having to solve a problem does not appeal to them. I think there is kind of a sheep effect once they enter the engineering program, especially for the guys. With so many in the program, they seem to follow each other. With so few girls in the program, fewer girls follow them into the field. I really think if we could just increase the female presence, we would see an increase simply from the image that they can succeed here, just like the boys. What I am unsure of is how to get some of them started so others can follow. We share the few previous stories of success when recruiting, hoping to inspire and empower other young

women. Yareli is another excellent example of overcoming adversity and what we hope to continue in this program.

Yareli continued to narrate her story and expounded on the challenges she faced growing up Latina in her small, rural community:

> Being Latina is definitely a gift and has advantages like speaking a different language and English and having a culture unique to your family. My town is mostly Caucasian, and despite not being raised much differently from them, whenever a brown or Mexican girl is mentioned in books or something, everyone always stares at me. It makes me feel so uncomfortable. I guess maybe they just don't know any different. These past few years have been incredibly tough in different ways. Other students have begun to call my sisters and me bad names because they thought it was funny or maybe they wanted to be mean. We just want to still fit in, but things have changed so much with politics. I even told my principal at Melville what was happening. He just said to grow thicker skin and to try not to let those words affect you. He acknowledged that they should not be saying it either, but he just said not to let it bother you for a long time. He did nothing to the first two boys besides telling them to not say it again. After more and more mean words were being said to us and the black family that lives here, he had some other kids stay in ISD for like three days. I think the punishment was only different because they said to our faces specifically and not just about us. It just all makes me sad because I know their parents. I feel like a lot of their parents teach them those words, which means their families are racist. I never knew it until we got older, and I wonder if their parents always thought that about my family.

Maria validated her daughter's experiences and narrated further accounts of the racial oppression she and her family had experienced. She went on to detail how those experiences have affected and continue to shape and affect her personally, especially as the parent of young Latina girls:

> Every single one of the girls has been forced to deal with some sort of discrimination. Unfortunately, that is just the price of being brown in America; I mean, it is what it is. However, 2020 got very ugly. I was even approached by students wanting to know who I was going to vote for, asking if I even had the right to vote, and that really offended me as I do not have to discuss any of my decisions or documentation with anyone. The community got pretty tense, and it even trickled down to the girls. Yareli's sister's grades were perfect as she had straight A's, including English. So, at the end of the year assembly, when she got her award for English, the teacher pointed out that she was the only student in the class who kept an A all year and emphasized to everyone that she was a Hispanic girl. It was very unnecessary and unprofessional, and the comment made her feel like she did not deserve it. People do not realize what words others will carry with them for a lifetime. Sometimes, they last forever. I am not sure I stand up for them enough, but even I am stunned by the things people will say. The comments are less aggressive these days, more slight than blatant, but they still impact our lives. It makes us question what we are capable of and if we should always be peacemakers. Sometimes, when the shock is gone, you find yourself aggravated because you lost the opportunity to stand up for yourself. I do not know if America will ever really change because 2020 surfaced a lot of feelings that I thought were fading. Unfortunately, this is not something we can teach at school; it comes from homes and families and dark places of hate.

Camila's Narrative: "Doing the Most with What You've Got"

On a rainy, cool spring morning, Camila and her mother, Diana, await the arrival of a guest to their home. They have chosen to share Camila's story with the hope of inspiring other young women to determine and pursue their own ambitions. So much has changed since Camila began her journey in STEM education, as she has added two new schools to her resume and made a commitment to serve her country, enlisting in the United States National Guard. While she has made many sacrifices to get to this place, she is hopeful that, in the near future, women like herself will have a different story to tell. Camila's story presents her journey as she sought to find her place in the world of engineering.

Introduction

The interview began with Camila providing a brief overview of how her family is structured, and how that family dynamic—along with the people involved in it—has contributed to shaping the young woman Camila has become:

> It has been me and my mom forever here in Oklahoma. I am the baby and only girl. My brothers are significantly older than me, like twelve years. They have kids and grown-up lives while I am still waiting to graduate. Our lives are in very different places, so I often feel like it is just the two of us. I never hesitate to tell her everything: the good, the bad, the ugly. She is my person who I share all the joy, tears, and anger with. She has always been there for all three of us. As a single mom, she made sure we all had support for academics and pushed us to do better. I have always felt very smart, so academics have been my thing, and I work hard to ensure success.

At this point, Camila's mother Diana interjected, suggesting the possibility that Camila's paternal genealogy contributes to Camila's intelligence and aptitude in STEM studies:

> I am not the best at math or with money; however, Camila has always been great at both. The skills just seemed to come naturally for her. Her dad was also incredibly smart and very good at math. He worked hard and had a good education despite being quite poor. She also has his eyes and sense of humor, so she definitely got the best parts of him.

Camila continues to describe her absent father with kindness and empathy, despite his decision to return to Mexico when Camila was quite young, leaving her and her mother behind in America:

> My dad was an immigrant from Mexico who did not have the best character. He drank a lot and struggled with work because he did not have documentation. I think it was very difficult for him to be here. He was not with my mom for long before returning to Mexico. However, I am grateful for the time he was here; otherwise, I would not exist. I am proud of the life my mom and I have together. Ever since I was little, she worked, and there was never a time I was hungry. We might have to turn the lights off early or take a shorter shower, but you just have to do the most with what you've got. I think she has always done that.

A Creative Childhood That Dismantled Gender Barriers

Camila then shared how, during her childhood, her grandmother recognized Camila's intellectual talent and encouraged her to learn math and science skills. In addition, both her mother and grandmother modeled the benefits of gaining knowledge in technical and mechanical skills stereotypically performed by males:

> My focus on my academics comes from my mom and my grandma, who was like a second mom that I called "Bessie Mama." My mom would wake up early every day and take me to Bessie Mama's house before work. My grandma and I would sit together at

the kitchen table every day. She bought me math and reading workbooks, and we worked on them daily. I thought it was fun because she would make me believe it was. I learned early that academics are important, and I was good at them. Bessie Mama had worked at the state school with kids who had intellectual disabilities, and I think that helped her recognize how smart I was and how she could help me grow through hands-on tasks. She used her kitchen to teach me how to use math and reading through cooking and measuring.

My mom also encouraged me to see how far it would take me, and it became a priority in our house. She has always expected me to do quite a bit with chores and tasks, but always after my schoolwork. Both of them made a point to tell me regularly that girls could do anything boys could do. Without men around, they fixed things in the house by themselves, and I learned how by helping them. I can work on my car, fix plumbing, and use most tools and Google to fix anything.

Inspirational Educators

Camila explained how, with the recognition and encouragement of two math teachers, she overcame the challenges of Covid and a seemingly apathetic educator:

> Math was always super easy. Once we started timed tests in second grade, I flew through all of them. Mrs. Hearse moved me from addition and subtraction to multiplication before everyone else. After that, she kept ensuring I was being challenged, even past her class. She was so sweet and kind, and she always told me how proud of me she was. She set the pace for me to be in advanced math courses in junior high. Junior high was the first time I remember asking my teachers how to study, specifically Mrs. Collings, who taught me Algebra and Geometry. The classes were more challenging, so I had to work harder at

home and improve my skills. She helped me learn how to study math and reminded me it was more than just memorizing. I needed to understand the "why" and the real-life applications of mathematics. I think that's why I find English and History boring. It was always memorizing the rules just because and knowing the facts about what happened before you. We never explored the "why" in those courses.

After Mrs. Collings at the junior high, I found myself being taught by a coach at the high school. I recognize this happens a lot in small schools, and I know we need a coach, but we need a math teacher, too. He did not cover the things we needed. Coach Wallace skipped the "hard stuff," as he called it, and his pace was so slow. Covid also made it so much worse. We would have videos of him working a couple of problems on our off days, but what was I supposed to do with that? I knew if I was going to excel, I needed to do something different.

Despite not having much science in school, I have always been good at math and science, and even my ACT score was almost perfect in science. I do both well, but I just did not know how to put that into a career. I feel most advise accounting, medical, or teaching. No one really talks about engineering a lot, and when they do, they do not even know what they actually do. They just know that they are intelligent people. Mrs. Collings was the first to talk to me about pre-engineering, so I decided to try it at Major Technology Center (MTC) because my high school was never going to challenge me.

Diana agreed that Camila needed to be challenged and find an educational and career path that she would enjoy as she reflected on Camila's decision to go to MTC:

Camila has always been different. We influenced her to overcome female stereotypes, which is why I think she never considered something else in STEM, like nursing.

> Entering a field like engineering means she will need to stand her ground, but I love her decision. Women need to know all kinds of things, but the most important thing in your career is that you enjoy doing it.

Camila continued talking about her time at MTC and the challenges it has presented her:

> Before CareerTech, I had always chosen to challenge myself by staying busy in school activities like StuCo, cheer, and band. Because of my involvement, my first year was tough. I would wake up early and stay up late and was not able to put enough quality time into it. However, looking back at it, I am so glad I did it all that year. I proved to myself that I could, and I learned so much and really enjoyed the work. My instructor, Mr. Pearson, was relentless and never lowered the bar. Instead, he made me work harder because he knew I could. It felt like going to college every day.

Mr. Pearson also shared his thoughts about Camila entering the program and why he thinks she has been so successful:

> I think what influenced Camila to join pre-engineering was her skills in math. She felt like she could use those math skills to pursue a career in engineering. With so few girls in our program, I make a point to share that many of the best engineers are female because they are more detail-oriented than males. The young women I have taught are always strong in math and physics, especially the calculations. The difference in the young ladies who are successful in engineering is often the early hands-on experience. The gender roles for young girls do not support getting dirty, building, and using tools. Camila was not afraid to jump in and do the physical work involved in engineering. She had built those skills at a young age. As a society, we have to stop gender-specific toys and assigning roles if we hope to see more women like Camila in engineering.

Influential Mothers

Camila's mother, Diana, experienced many struggles throughout her life, and she was determined for Camila's story to be different from her own. Because of this, she endeavored to empower Camila. She taught Camila never to settle, to make her own way, and to rise above society's expectations for women:

> My struggles began before I was born. My mother was at the top of her class and was dating the Pleasantville High School football star. Mistakes were made, and she became pregnant with me in high school. They married, and she became the first woman to attend high school here in Pleasantville while pregnant. It was a huge scandal, one that made my grandparents so ashamed. So, she and my dad moved into my great-grandparent's home for a while until they finished high school. After they graduated, my dad began a career with AT&T, and we moved out of Pleasantville. They had my brother shortly after moving, but their marriage was rough. When it was rough, my brother and I were sent back to Pleasantville. They divorced several times, and eventually, they dropped us off and never came back.
>
> I think my grandpa was to blame for most of it. He always told my mom that she did not need to be good at school because a good man would make her a living. When she would talk about going to college and having a career, he would laugh at her and tell her she was not smart enough. Once she got pregnant, he threw it in her face how right he was and that she would never amount to anything. My grandma told me that my mom resented us, leading her to leave us all behind.
>
> Despite my grandpa's chauvinistic beliefs, my grandma, the one who Camila calls Bessie Mama, worked to support all of us. She told me never to be intimidated by males, and I

had to want to succeed. Unfortunately, she let him treat her something awful, and I left home before graduating high school. I ended up in Kansas with an older man and planned to finish school there. I was brown like Camila, and when I applied to the high school, the principal referred to me as a dirty Indian. I had certainly never been dirty nor treated like that, and I was appalled and cried all the way home. I never returned to that school, though I eventually got my GED. I had to work several horrible jobs, and my marriages were not good. When I had Camila, I decided to do it differently, and I returned to Pleasantville with her and her two brothers.

When we returned, it was just Bessie Momma, me, and the kids. She helped take care of the kids, and I worked. She and I were both determined to make sure Camila's story was different from ours, so we pushed Camila's academics. The boys graduated, and Bessie Momma died, leaving Camila and me to do it all. She is so intelligent and cares so deeply. When I got sick with tuberculous two years ago, her world got a lot harder, yet Camila was resilient through all of it. I can no longer work, which affects my mental health, but she is the light that keeps us going every day.

Defying Oppressional Experiences

Camila expressed that people regularly make assumptions about her based solely on her appearance being that of a young Latina, especially with regard to language:

> I have always spoken English. In fact, the only Spanish I know is from my high school courses. However, when people look at me, they assume I speak Spanish. When I started working at Chicken Express, they tried to teach me how to make the gravy in Spanish. I am now employed at Sonic, and just last week, a group of men on the patio just started speaking Spanish to me. I had to tell them that I could not take their order in Spanish

> because I did not understand what they were saying. I present Hispanic, so everyone assumes incorrectly. These assumptions are so frustrating, and I wonder what else they assume about me based on how I look.

Diana shared that she had had a similar experience when Camila was in the first grade; it occurred during the elementary school's open house event:

> As Camila and I walked into her first-grade classroom, I do not think the teacher even connected that Camila was my daughter. I am much paler, being only Indian and not Hispanic, and my hair has always been more red than brown. The teacher says, "Oh no, I do not speak Spanish." She continues to mumble some derogatory terms and then hands Camila some papers in Spanish. I quickly step in and explain that I am her mother and that neither of us speaks Spanish. The teacher is relieved and then continues to tell me how terrible it is to have Mexicans in class. I explained that Camila was both Indian and Mexican. Without apologizing, she says, "Well, she is not really since she speaks English." From that day forward, I told Camila not to share her lineage with anyone and just to say she was Native or Indian. The negative feelings around being Mexican were so strong, and I did not want her to deal with all the hate and discrimination. It still happened despite my attempts, and I am sorry I told her that now. I want her to be proud of who she is despite all the prejudice in this community.

Camila continued to share negative experiences she endured as a result of educators making assumptions about not only her but also her Latino classmates with regard to race and language. Her peers at school also made misinformed assumptions about Camila, based on her appearance alone:

My name also triggers the same response. I remember when I started school, they called and asked my mom if I would need to be in ESL before they even saw me. Even after meeting and speaking with me, they still continued to send home papers with me in Spanish. Every year through elementary, a counselor would ask in front of me if I needed to be in the language testing group. The teacher would say, "No, she's really smart." My friends in that group were smart, too; They were just learning English. I mean, how hard was it to get to know me? It was a small school, and they should know the kids they teach. It is not that uncommon to have blended families with brown kids and a white mom. People even choose their families and should be able to do that without people assuming anything.

Recently, this year even, Mrs. Allen needed someone to take the French test at a scholastic meet. She called me in and asked if I would take it. I was like, "I do not know French, Mrs. Allen." She said, "I know you do not, but it is close to Spanish." I rolled my eyes and explained again that I did not know Spanish. I feel like I need a t-shirt or something to announce it to the world.

I am also Native American. We are Chickasaw, and the Indians send school supplies each year to all of the tribal students. While I appreciate it, it has also been a point of frustration and embarrassment. First, people will question when I come to the office to get my box, like "You are Mexican Camila, not Indian," which is ridiculous because why can I not be both? Other students would also tease me about being poor and make jokes about me being a "beaner with a feather." It bothered me so much that I eventually made my mom get them because I did not want the ridicule of it all. I mean, I needed it, and I am grateful for it, but the embarrassment of being in need was brutal.

In her pursuit to take on challenges, especially inside a rural educational system that lacked funding and was in dire need of technological updating, Camila's emotional well-being suffered. She questioned her ability to find success as a woman on her own, without the aid of a man—a doubt she eventually overcame:

> Because I have always strived to rise above and excel, I overworked myself a lot, especially last year, and I took on too much. The problem is when I do this, I just cannot give my all to any of it. My personal health also suffers because I do not have time to take care of myself. After the pressures of last year, I recognized I needed to narrow my focus. I now just do band and just focus on my academics. I have been so much happier, and as a result, I earned Academic All-State this year and maintained my 4.0 in both high school and college classes.
>
> While I have loved growing up here in Pleasantville, most people are super kind, but education resources here are definitely lacking. Because we are in the country, we do not get as much funding as big city schools. The school cannot give everyone a computer. We just got Chrome carts for the classrooms after Covid, which is good because the computer labs are old. One of my ACT tests got invalidated because the computers crashed when we were taking the test in one of the labs. I ended up working an entire summer to buy a laptop for home so I could do my schoolwork outside of school. I had tried to use the public library computers before that, but there are not many of those available, and the hours are not great. The buildings are old, and teachers do not have everything they need to teach. This lack of resources is another reason I chose to go to MTC. Everything there is updated, we have fantastic tools, and so much money is funding the education there.

> My mom struggled financially as a single mom, and despite what she said, I thought I might need a man to be successful. I fell into a relationship with a classmate two years ago. Because I did not have a relationship model to follow, I found myself in some unhealthy practices. I began to isolate myself and give him all of my attention. I stopped spending time with friends and let him control much of my social life. This lack of connection with other girls made me sad, and I missed out on so much. Eventually, I recognized the need and began to make changes. Quickly, my boyfriend attempted to step in, but I chose connection over him, and I have never been happier. I have this group of girls; we all go to church together and hang out. I realize how important it is to have them and to have my own identity. This desire for personal and financial independence also led me to join the National Guard. I scored really high on my ASVAB, so they offered me a lot of money and will pay for my college. I am anxious about being away from my mom but excited about the adventure.

Camila expressed that even though she is confident in her ability to live and find success independently, she nevertheless recognizes and braces herself for the challenges she expects to face as a brown woman studying and working in a field dominated by males:

> Being a brown woman in so many spaces where everyone is white is something I have grown to expect. However, being a woman in spaces dominated by men has been harder to overcome. At MTC, I am one of two girls in my program. The boys in class joke about us, and while they are trying to be funny, I think in their minds, they believe women are not as smart as men. I do not get intimidated just because I am in a space with guys, but many women do. I see that in the military, too. Physical comparisons occur often, yet women are as strong as some men, and we have other skills, too. Men can be just so

misogynistic, and it is not like women and men have those roles anymore. We just need to be more confident in those moments and get through the uncomfortable awkwardness of it. My gender and race should not be at the center when I am measured for my abilities; I am so much more than what the world sees me as.

Evita's Narrative: "One Moment that Changed Everything"

On a spring evening during her senior year, Evita and her mother, Katherine, traveled to Goodwin Technology Center to meet with a researcher interested in telling their story. All three of the women initially expected this first gathering to take just two hours. However, the two hours doubled into four, and the group members spent this time discovering, sharing, and laughing about the experiences of a determined young woman who is passionate about who she is and who she hopes to become. Evita hopes to change the future for other young women like herself.

Introduction

Evita began by outlining the story of her upbringing as a third-generation Spanish-American on her mother's side of the family and a second-generation Mexican-American on her father's side:

> I am Evita, a Mexican-American. My grandmother's family emigrated from Mexico to El Paso before she was born. They moved around a lot because her parents were migrant workers, but she still had to go to school because she was an American citizen. They eventually moved around, primarily in California, but she still had to change schools often. I remember her telling me how she wished she could have stayed in one spot and had a group of lifelong friends, but that was not her story. However, my grandfather's story is much more tragic. He does not know much about his father because he never met him. He lived with his mom and older brother in Mexico. His mom fell ill and needed a

medical procedure done, but they could not afford good doctors. So, she just found someone who claimed they were a doctor to do it. They ended up taking their money, left her open, and killed her. She was barely breathing when they found her, and then he and his brother were left as orphans. They were forced to quit school and go to work at nine and twelve. They worked in the fields and just really anywhere they could find work in order to survive. They lived on the streets for several years, worked where they could, and asked for help from the church and others struggling to make ends meet. As the number of workers suffering grew, they began to fight and protest for higher wages and fair treatment of workers.

Eventually, the government tried to control the workers and put a price on Evita's grandfather's and his brother's heads. So, at that point, the Catholic Church intervened and flew the two of them with some other young boys out to California and Arizona. My grandfather was flown out to California and finished being raised by the Catholic Church, [while] his brother was flown to Arizona, and the church cared for [my grandfather's brother] there. They sent both of them to school, helped them get green cards, and established jobs for them in America. Once he met my grandma and they got married, he was able to apply for citizenship with her as his sponsor.

They raised my dad in California. Sadly, the area made him ashamed of who he was because then, in California, they had a whole thing about "if you're not born in Mexico, then you're not really Mexican." He was segregated from the "real Mexicans" because he was born in America but separated from the whites because he was brown. He felt very isolated and ashamed and tried to hide his history. So, when he was raising me, he never taught me the language and never shared his experiences when I was young because he

believed I should not want to be Mexican. I wish he *had* raised me with those [cultural values] because it feels like I missed out. It feels like I do not get to be Latina because I was raised like a white girl. It is not his fault because that was how he was raised, but for me, I am proud to be a Mexican-American.

I was born in California, close to three months early. When I was first born, I had major health issues. Because I was so fragile, we just stayed in the house alone and only had immediate family over. It just got to the point where my mom needed to return to work, and I still could not be put in daycare because I had a really bad immune system at that point. My mom's parents had recently retired and moved back to Oklahoma, where they had been born. My mom and dad decided that, if they also moved here, then my grandparents could take care of me. So that is what we did. We moved here when I was four months old, and my grandparents took care of me every day while my mom was at work. Then, my brother was born here a few years later.

Evita continued by describing who she is as a young woman and her pathway to transformation, awareness, and growth:

I am extremely motivated. I have to keep going and doing what I am doing and being what I want to be because I know that other girls do not have that opportunity. I am determined, outspoken, and just an all-around girl. I grew up in the South, extremely white America. I feel like other people have a completely different way of seeing it than I did. At the school that I went to, I was one of only two people who were not white, with thirty of us in our class. It was just me and her, and all my friends were white. I never looked at myself and my friend group and realized I was different. I lived like they did and experienced all the same things. I never consciously realized that I was any different

> until I got to high school, which was located in another school district. At Riverdale High School, there were many more people like me. It was the first time I became aware of the differences between Latinas, Native Americans, and Black girls. I witnessed how they separated themselves into their own little cliques that did not include a lot of white people. I realized that I was the only one who was comfortable in the groups with lots of white girls, and then I started thinking about it. I am the only Person of Color on my robotics team, my dance team, my pom team, my volleyball team, my homeschool AP classes, and here at Goodwin Technology Center. Recognizing my lack of awareness and how it was not affecting me was difficult because I saw how it affected other girls. I never really experienced it the way that most other brown girls do, but I can see where they are coming from. I think my mixed heritage and wealth changed my access to many things, except I never had access to other Latinas to even consider separating myself, because then, I would just be alone.

Ms. Caldwell, Evita's engineering instructor at Goodwin Technology Center, corroborated Evita's description of herself as young woman who embodies significant independent traits:

> Evita is very driven and an excellent student. She knows what she wants and goes after it. She is very borderline perfectionist, but I do not think that it stresses her as much as maybe other perfectionists might be stressed about it. She is very meticulous about what she turns in and is thorough in all of her work. Sometimes, I think she can be perceived as headstrong and bossy a little bit because she is assertive, but she works well in a team. She has college goals in place and works hard toward those goals. Evita is self-motivated, and I know her mother is really involved in her education. However, I do not feel like that is the driving force behind what Evita does or the decisions that she makes. I think

> Evita's decisions are hers alone, and she decides things for herself because she knows it is what she wants and what is best for her. Her mother is just standing by and supportive of all of it. I know Evita will go far and will be successful in whatever she decides to do.

A Creative Childhood That Dismantled Gender Barriers

Evita recalls that her father's own, albeit squashed, desire to work with his hands, led him to teach Evita not only to follow her heart in what she wanted to do, but also to pursue any dream that may or may not be inside the cultural expectations of her gender:

> My earliest memory is from preschool when I was three. I was obsessed with trains. I played with the trains every day. The teacher and boys in my class would always ask if I wanted to play with the dolls. My dad was not happy about that and explained to my teacher that trains were my thing, even if I was a girl. I still love trains. I remember that was the first thing I ever built: a train track. We really just assembled it, but eventually, my dad and I would make mountains, trees, and tunnels. We would say the train could take us back to California to see his parents. My grandpa, my dad's dad, has a construction company. My grandpa refused to let my dad be a laboring Mexican and forced him to go to college. My dad actually loved building things. In fact, he said his favorite job was working at an automotive warehouse with his hands. He wishes that he would have stayed in that job and moved up in the ranks. Instead, he let his dad make the decisions for him, and now he does not get to have that job that he loves. Because of that, he has always told me I can do whatever I want in life. That it is my decision. He has never said things like that it is a boy's job or that girl's do not build things. Even with his conservative Mexican values, my grandpa seems excited to see me go to college and have a career where I build and create things that improve the world.

Katherine interjects, emphasizing Evita's drive to overcome gender and racial barriers, while also underscoring Evita's father's determination to achieve the same goals:

> Given the lack of representation of being Latina in a very male-dominated field, Evita will need to be very strong at putting men in their place. I would just say she is good at sticking up for herself. That is a trait she gets from her dad because I am non-confrontational. Her dad has continued to lift her beyond the stereotypes and worked very hard to break down barriers she might think exist because of her race and gender.

Inspirational Educators

Evita recalls the inspirational teachers who recognized, directed, and fostered the talent and drive Evita had displayed since her childhood:

> I think for me, the most influential moments have been other women encouraging me. It began in elementary with my gifted teacher, Ms. Hanover. We would go to gifted and talented with her, which included math, science, and engineering; that was our favorite thing to do. In middle school, I ended up joining the robotics team, and the only reason I started was because of my teacher, Ms. Zeigler. She approached me and said, "You talk a lot and explain yourself well. We really need young women like you on our robotics team." That one moment changed the rest of my life. It has been her encouragement throughout the years that kept me believing that I could do what I wanted to do. I wanted to get the best grades that I could, and I wanted to be involved in everything. I love doing all these things, but I also want to prove that I can do it and excel at it. I am not certain where the drive comes from, but I feel like I want to because my grandparents and my dad could not. I refuse to waste an opportunity.

> Ms. Zeigler and the middle school robotics team are really where my journey begins. I started making friends that I would not have made. We went to world-level competitions every year. She led us to a new project every year that solved a problem in the world. The first year, we focused on birds flying into airplane engines. Our solution included a Kevlar balloon, and after testing at our local airport, it was found to be 80% effective. In seventh grade, we focused on discarding medications safely. Our solution included adding sodium bicarbonate to break down the active chemicals in drugs, which can then be thrown away or poured down the drain. Then, in eighth grade, the theme was space. We focused on the importance of sleep and developed an astronaut sleep station. It helped regulate their circadian rhythm since they were not experiencing the sun rising and setting. She taught us to research, interview people, be independent explorers, and present our findings. She introduced me to my first female engineer, who I was able to interview in seventh grade.

Ms. Caldwell agreed that this experience had, indeed, led Evita to enter the program:

> Evita was very involved in robotics at an early age, and we have found that robotics is a big recruiter. Students who are interested in robotics do not often have the ability to be involved in that at their high schools. We see that as a need we can fill through our engineering program. Evita was on a team at her middle school that was very successful in FIRST Robotics and wanted to continue that. I am not sure if it ever was really a decision for her. I think it was always just expected that she would continue here at Goodwin. Many of the students who do really well in Ms. Zeigler's robotics program sort of funnel into our program naturally.

Evita continued, sharing the stories of her transition into high-school robotics at Goodwin Technology Center and learning that she could become an inspiration to the young girls coming up behind her:

> As I transitioned to high school robotics, the team is scored in two areas: the robot part and the chairman's role. The Chairman position is focused on community service and your team's ability to give back. I mainly specialize in the chairman's role and have completed many community impact projects over the past four years. My work has been recognized at the World Games all three times as the Goodwin Technology Center team, and last year, we won. We were one of the top twelve teams in the world. More importantly, through community outreach, I get to change the lives of students in my community every day by giving them STEM activities and showing them that girls can do this. I feel like it has come full circle as I get to be Ms. Zeigler for elementary school students. That makes it sound like it is all me, but the guys who do the robot side are really supportive of the work I do, and I recognize that, without them, we would not have a team.

Her mother's eyes well up with tears as she interjects the following:

> I would add this is the first time I am hearing her give herself credit. Her team gives her credit often, though. I see it when they win; they all stop and tell Evita to go first, and when it is over, the team will always come up to her and say thank you. They recognize the work she does, but to finally hear her recognize herself brings tears to my eyes. Acknowledging her own power does not discredit someone else; it simply recognizes her impact. I am proud to hear her compliment herself because she is her fiercest critic.

Influential Mothers

Evita's mother, Katherine, outlined her own struggles in rising above the lowered expectations her parents held for her:

> I grew up in a really big city in California, but when it was time for me to start school, my grandmother was going to be my after-school childcare. However, she actually lived in a rural farming town, thirty minutes from our home, so my parents transferred me from a school district of ten thousand students to a K-8 school with 300 kids. I basically got a very rural education living in a very big city. The high school that my K-8 school funneled into was also not very large, as my graduating class had 119 kids. Everybody knew everybody except for my parents. They did not know everybody because they lived and worked in the big city. My parents never really talked to me about going to college, and neither did my friends. In our school community, either you were the farmers and landowners or the farm workers. Most of the farmworkers were migrants and did not speak the same language as me, so most of my friends were farmers and landowners. Being in that group of students meant they had the money and the resources. Eventually, as we grew older, we all wanted out of the small town, and college could be the way out. My dad did not finish the sixth grade but owned a business successfully for over forty years. So, in my parents' eyes, I did not need an education beyond high school. As my friends began going on college tours, I was afraid to ask my parents about it. I eventually brought up the conversation, and both of my parents said the smart thing to do would be to attend a junior college. A junior college would be cheaper, and I could take a few classes and see if that was what I wanted to do. So, I went to a junior college for one year, and during that year, I would go visit all my friends who had gone away to the big

universities. After that year, I was ready and wanted to go away, too. I did not even tell my parents that I had started applying to schools. My dad was an associate pastor, and I felt like they would be more apt to let me go away to college if I found a private Christian school that was the same denomination as us. So, I only applied to all the Christian schools and got accepted. There was only one that I really liked, and it was in Seattle. I remember showing my parents the brochure and telling them I got in and wanted to visit. I was so surprised when my dad made the hotel and flight arrangements and took me to visit. I attended there for three more years and finished with a bachelor's degree. After graduation, I planned to stay and live in Seattle because I loved it there. I also wanted to save money and pay off my student loans. I decided to return home and live with my parents for a couple years to build up the income and pay off some bills. I was home for maybe four months when I met Evita's dad, and I never went back.

Defying Oppressional Experiences

Evita reflected on the oppressions she experienced at the hands of her peers and educators, not only because she was Latina, but also because of her gender:

> When I decided to go to Goodwin Technology Center, everyone cautioned me about how difficult it would be. However, my school counselor warned me I could lose my class rank and future scholarships as a result. It was as if she did not think I could be successful here. I had already decided to enroll, but my pride and defiance made me never look back. I do not really understand why she said that to me or if she realized how I would internalize it, but I am almost glad she did. It was as if I pushed myself even harder because she did not believe that I could. Once I got here, I recognized some of the challenges would be to outdo the boys. The boys were never blatant about it, but they

definitely gave the vibe that I was less than them and did not belong there. One example is in the robot shop, we only have one bathroom down there. It used to be a men's restroom and still has a toilet and urinal. They just scraped off the men's sign, but the faded image still remains. It is also pretty obvious that they did not expect anyone to actually use the women's portion because there is a table sticking out over the toilet. So, when I do my business and go to stand up, I hit my head on the table every time. It is just a reminder that I am entering a man's world and will probably forever be hitting my head trying to push for my place in society and engineering.

So many of the girls from my small town also do not think they have to work as hard as the boys. They focus on their hair, nails, and which boys might be the wealthiest in adulthood. I am amazed how many are more focused on who they might marry and have a family with instead of college and their own careers. I mean, I thought we were past that stage for women, but it seems to be alive and well in rural Oklahoma. Even the male teachers seem to think that way. When I went to meet my teachers for this year, my history teacher asked about me being in the afternoon as a senior. I explained that I went to Goodwin Technology Center in the morning. He literally said, "Oh, are you in the Cosmetology program?" I was so furious, and to make it worse, he is also Mexican. I make a point to show him the advanced math and physics I am doing here in his class. I know he did not mean any harm by it; he is a very nice man, but I am just so tired of the sexiest assumptions about young women, especially in 2023.

Rural Oklahoma is also very conservative in other areas. I remember during middle school when Trump got elected, my classmates made jokes about President Trump sending me back to Mexico. The boys, especially, were so dumb. They acted like, despite

being American, that they could deport me for being brown. Other times, being brown has meant that I must be Native American. They would call people to the office to get their supplies from the tribe, and even teachers would ask if I had been up to the office yet to get mine. The assumption is infuriating, but I also wonder why not me. I understand that the Native Americans experienced a lot, but my family did, too. They worked from daylight to sunset in the fields for so little pay and were treated like slaves while big corporations profited. That should be a crime, and they should have to give back to my grandparents for the way they were treated, too.

Katherine added the details of a recent uncomfortable experience with her high school counselor:

> This fall, I reached out and sent an email to the high school counselor. I was contacting her because we were trying to get a jump on scholarships. Senior year was so moving fast. I asked if she could direct us toward different ones, including minority scholarships. When she replied to my email, she said that she did not know of anything off the top of her head, but suggested I reach out to the tribe as they would have someone that could assist with that. I was shocked by the response. Evita loves her, and she is a very kind person. However, there is nothing in her school records that says she is Native American, absolutely nothing. It hit me because I realized all these people think that we have gotten a free ride, and we have worked very hard to get her where she is going. I could not believe she just made this assumption. It just blew me away, so I had to take a day before I replied to that email. Part of me was like, I am going to write this really long email, and then the other part of me was kind and accepted the mislabeling. I just replied and told her I had no idea as I was not familiar with the tribe. Evita is Mexican, and they are not a tribe. I could tell from her response that she was embarrassed and felt horrible. I get that,

but she should not have made that jump, especially when you have access to a file that clearly says that she is not native.

Evita explained that her future plans will work to benefit her Hispanic culture and its people:

> My plan is to leave Oklahoma once I graduate. I have been accepted to a university on the east coast with predominately Latino students. I am going to soak up all the culture, language, and experiences I can. Once I graduate, I hope to have a career that will allow me to give back to communities in Mexico and Central America. I want to honor where my family's history began and bring pride to my heritage. I do not anticipate a perfect space, but I am looking for somewhere where I can learn, work, and be respected for being me, Evita, a Mexican-American engineer.

Yolanda's Narrative: "Work Hard and Expect Nothing to be Given"

Yolanda and her family live in an area outside of established GPS mapping. They occupy a space considered to be "off the grid," which is intentional, as her father is undocumented. The family lives in fear of losing him to deportation, as it has happened before. Her parents, Guadalupe and Niguel, were hesitant about this meeting, but they also recognized Yolanda's desire to share her experiences. Anxious, yet welcoming, on a spring evening, they agreed to direct a CareerTech educator to their beautiful ranch, where they opened their home and shared their story of education, and hopeful resolve to realize the American dream.

Introduction

Amidst the anticipation of a new addition–Yolanda's infant sister–to the family, and the simultaneous, yet unexpected, emergence of Yolanda's interest in the world of engineering, Yolanda began her story with a little about herself, her family, and her community:

> I am the oldest of almost five siblings. I have two brothers and one sister, and my mom is also pregnant with a baby girl. We are all so excited for the new sister. I am also a perfectionist, always striving to be the best and excel in things, but most of all, I hope to make my parents proud. I really do it for them because they have worked their whole lives to get me here, and I feel like it is the least I could do. They do not make me work, so I prioritize studying. The decision to go to Career Tech was because my school is really small. Bellview High School does not have the classes and education other big schools offer. I was unsure if engineering would be my thing, but I love Calvary Technology Center. The courses are tough. I struggle sometimes, but the satisfaction of working through it and creating a working prototype is the best. At first, I was quite shy and afraid to ask questions. My classmates at Calvary TC are so smart and serious about learning. I found it kind of intimidating at first, but now I talk quite a bit. At the end of the day, the engineering program is a fantastic opportunity for a girl like me.

Yolanda's STEM instructors do not always fully understand or have knowledge of the intricate complexities of Yolanda's family dynamics. They are, at times, however, observative and supportive figures along Yolanda's academic journey. Ms. Galloway, Yolanda's instructor at Calvary TC, offered this–somewhat limited and at times inaccurate–narrative regarding Yolanda:

> When we first started school, Yolanda was hesitant and unsure of herself. However, I feel that over these last two years, she has blossomed more than I would have expected in a typical high school setting. I see her working on projects, physics, and upper mathematics that I do not think Yolanda would have ever tried unless she had been here. As I have gotten to know her and her family situation–with a single mom and low socioeconomic

status–I feel like she wants to be that strong person and show all her siblings we can do this. She wants them to know they can do this engineering track and attend college.

Yolanda continued to share why this opportunity was so valuable to her and her family:

> As Catholics, we practice being humble and grateful for what life has given us. My family has also been so proud and supportive of my educational opportunities. My parents both came from Mexico, where these options did not exist. They made sure I learned English as I grew up, but we only speak Spanish at home. My parents are mostly bilingual, too, though my English is better. For them, it is so important that I have a career and financial independence when I am grown. We still help our family in Mexico, and I hope to be able to one day send money, too. We are proud to be Mexican-Americans, and my mom and dad often remind us how lucky we are to be here in America.

A Creative Childhood That Dismantled Gender Barriers

Yolanda's father played such an integral part in her seeking out a STEM-based education and career that she is reminded of him on a daily basis during her studies and practices:

> My dad is good at everything, especially building stuff. I grew up helping him on the ranch. I have always wanted to be like him, so engineering seemed like the logical choice. At Calvary TC, we do technical tasks that remind me of him every day. He has always encouraged me to fight for what I want. He grew up in the mountains of Mexico with a drunk for a father. His dad did not take care of the family, and because of that, his mother, older brothers, and baby sister suffered a lot. He and his sister left them when he was fourteen and came to America to make money to support them. They walked for

> three days and then rode in the trunk of a small car for ten hours with a single bottle of water to share.

Almost as a suggestion that bravery and steadfastness are inherent to Yolanda's genealogy, her father expressed that Yolanda's life was a reflection of the determination and resolve he had always recognized in his own sister:

> My sister is one of the strongest women I know. I do not think I would have made it in the car without her. She kept telling me to stay calm and picture a happy place instead of the dark, small trunk. Yolanda reminds me of her. She is strong and brave, so much more than a man. She can do anything in life if she wants. We were poor, and at school in Mexico, they would take my sister from class and make her clean. Many of the poor girls were made to think that was their worth. Yolanda and my sister have much more worth than a cleaner.

Inspirational Educators

As Yolanda matured, she encountered educators who not only directed her toward possibilities, but also reassured Yolanda that she was more than capable of realizing her dreams:

> My first memories of school begin in Mexico. I was born in America, and then we were forced to return to Mexico. I went to preschool there, and I remember being so hot in the uniform with the socks all the way to my knees. We went back and forth a lot when I was little. It was not until I was nine and my brother was born that we stayed here in the United States for good. Early elementary was tough until fourth grade when I had Miss Key. She was a great teacher. I was extremely shy and would sit behind a bookshelf so people would not talk to me. Miss Key encouraged me to use my voice and helped me believe I was enough. Then, in sixth grade, Mr. Wright was just amazing. He introduced

> us to STEM and the careers that go along with it, including engineering. I got top of my class that year. Seventh and eighth grades were lousy because of Covid, and school was mostly online.
>
> When we returned to ninth-grade year, Mr. Wright encouraged me to start making decisions for my future. He was the one who suggested Calvary TC. The classes at Bellview are so easy compared to the work I do at Calvary. Several students have already dropped out because it was too challenging. Mr. Wright had said it would be difficult, but my dad has always said you cannot expect something just to be given to you. You have to work hard for what you want in life.

Influential Mothers

Yolanda's mother embodies a nurturing personality who prioritizes her children and whose dedication has added to Yolanda's confidence. She has also modeled for Yolanda the benefits of making her own decisions and acting as the captain of her own life:

> My mom is an amazing person. She is so kind and takes care of all of us. She had to drop out of school in fourth grade, so she does not know all the school stuff. However, she knows how to do so many other things. She drives us to school, the tech center, and all of the activities my siblings and I do. Her life was so different from mine. Her family was wealthy, but the area they lived in was dangerous. The violence is why she left school at such a young age.

Guadalupe supplemented by explaining more clearly the nature of her life in Mexico and her bittersweet transition to life in the United States:

> Niguel and I are from the same area in Mexico. My parents were wealthy and provided work for much of our pueblo. As the violence increased, my parents decided to keep us at

home. We still worked on reading, spelling, and basic mathematics, but school here in America was not the same. Niguel did work for my family when he was a young man. He was so handsome, but my grandparents and parents did not approve. Niguel left for the Americas when I was eleven, and I thought I would never see him again.

As my family's farm grew, many people were coming to our village to recruit workers. They were offering residency to the families. Many people did not trust them, but my father did. I am so happy he did because I received papers when I was seventeen. My whole family eventually moved to America. When we arrived, many people from our area were working at the same farm. My father said he saw Niguel there. I immediately looked for him, and we have been together ever since.

Niguel has always worked. Even when he got deported, he made sure we were ok. I never finished school, so getting a job would be hard. I am very ashamed that I never went back. I can learn, but I was scared and embarrassed to try again since I was grown. These feelings are why I tell Yolanda to work hard. She has the opportunity we never did, and she cannot waste it. Life keeps going, and she has to keep going, too. I want her to be proud of who she is and not be ashamed or have regrets.

Defying Oppressional Experiences

Yolanda did have supportive educators who recognized and encouraged her talents, but she also endured discrimination from educators, peers, and fellow community members:

I remember my first American teacher was in kindergarten, and she had all the names written on the desks. She showed me to my desk, and the name said, Alejandra. I knew what my name looked like, and I told her that it was not my name. She said Alejandra was close enough to Yolanda, and both are Mexican names, so that it would be ok. I was

sad, but I was too afraid to say much more about it. That entire year, all of my things said Alejandra. Looking back, I do not know why she did not just change it. I even asked my mom later if my name was really Yolanda because I thought maybe it might have been Alejandra on my papers.

By second grade, the school knew my mom and that we spoke both English and Spanish. My teacher that year was really mean, and she thought I was stupid. She always talked very slow when she spoke to me, like I did not know the language. She had me take an assessment and claimed I failed part of it. I ended up repeating second grade because of it. The funny thing is that it might have been one of the best things. For some reason, that helped me, and after that, I was known as a smart kid. We moved to Bellview after that. This town is so different because no one in the community speaks Spanish, and I am the only brown girl in this small high school. When we first arrived, they treated me like I was on display, as if they had never seen someone like me before. They had me say phrases in Spanish, touched and poked my skin, and asked so many questions about my faith and culture. It was strange because I did not think of myself as that unique or different until I came here. Now, I am just Yolanda, the brown Mexican girl. I like that so much more than all the awkward attention.

The attention has happened other times, too. When I was in sixth grade, I was helping my friend with his work. I made a joke and said something about his work. He responded loudly and asked if I wanted to talk about my pronunciation of English. It was so embarrassing and made me really self-conscious. I just hate people putting the spotlight on me. The other students at Bellview have made jokes about Hispanics being dirty but not about me specifically. They actually joke right in front of me like I am not Hispanic. I

> sometimes wonder if they realize that Mexicans are Hispanic. I want to be like, "That is me you are joking about," but I do not because it makes me feel embarrassed. I cannot really say anything because it is not like they are trying to offend me, but it is like they do not even realize what they are doing.

Beyond the stereotypes, microaggressions, and profiling, the most significant obstacle from Yolanda's perspective is that of being a first-generation American–with all of its (often isolating) privileges, pressures, expectations, and unforeseeable challenges:

> One of the greatest challenges I have faced in my education is being the first in my family. Being the oldest of two immigrant parents, they have never gone to school like Americans do. They never went to college, so applying and considering the costs and scholarships are new ideas for them. All of it takes me so much longer than the other students at Calvary TC. They all know what to do, and I have to ask so many questions and research everything. The counselor at my high school is not much help either. Because we live in a rural farming community, most of the students stay in Bellview and continue their family's legacy of farming. I am figuring it out, though. I started concurrent courses online and hope to have my associate degree before I graduate high school.
>
> My dad not being documented has also been difficult. He has been caught at the border twice. One time, the border patrol kept him for about two months. The last time he came back to America, he had to travel with Coyotes. It was so expensive, and my mom was afraid he would die. When he got back to us, they decided to hide him here on the ranch. Because of being deported, he will never be a citizen. My mom has to do many things for us because he cannot leave the ranch. I am also so careful not to talk about him at school.

> Everyone thinks it is just us and my mom, and sometimes I almost mess up and talk about him. It is as if he only exists at home, where it is safe to be different.

Mariana's Narrative: "Recognizing Abilities that Never were Considered"

On a spring day after class, Mariana met her mother, Marisol, in front of Central Technology Center. Their plan for the evening was to meet with a researcher exploring Latina students and CareerTech Pre-Engineering programs. Mariana's presence in the program provides representation for three different underrepresented groups in engineering: women, Latinas, and differently-abled individuals. Mariana was born thirteen weeks premature and suffered a brain bleed early in her development outside the womb. This event damaged her brain and impacted her motor skills, specifically in her lower extremities. This condition is clinically referred to as cerebral palsy; however, Mariana simply looks at it as one of the many challenges she has overcome to achieve all that she has during her education.

Introduction

Mariana began by explaining that, while she identifies as Hispanic, her Hispanic parents have encouraged her to adopt a lifestyle that is decisively American:

> I am a Hispanic girl from Arizona who was raised in mostly uncultured spaces because we left Arizona and came to Oklahoma. My mother's family immigrated to Arizona from Mexico when my grandmother was young. My Abuela is also Yaqui, a tribe from Arizona and northern Mexico. My father is a Spaniard, as his parents came to America from Spain to Arizona. This is why I call myself Hispanic because I am a blend of many Spanish cultures. Despite having these stories, we have not really lived in the culture since coming to Oklahoma. My parents have been insistent that we become American. They both speak Spanish and I know some, but they always talk to us in English.

Mariana's mother, Marisol, explained further that the fears and challenges she and her husband had faced during Mariana's infancy had contributed to shaping their early protective parenting practices, practices that would become *less* protective as Mariana matured:

> With all of the challenges Mariana faced, we decided early that it would be better to not confuse her with multiple languages. She and her twin were born so prematurely there was not really much hope for their survival. After her twin died, we were so afraid she too would die, but she is a fighter. Her brain developed a brain bleed early after birth, so we thought it would be Mariana we lost. Instead, she defied the odds and has continued to do so in everything. The doctors said she would never talk, never walk, possibly be blind, and yet here she is doing all of those things. Luckily, her only challenges have been physical, mostly her legs, but she has found a way to walk without assistive equipment. From the beginning with Mariana, I never treated her any differently or made it easy for her. So, up until the time she started kindergarten, she did not even realize she was different–or disabled, as they would label her.
>
> Mariana has changed so much since then. She once whispered when she spoke and could be found in little corners, observing rather than engaging. It was as if she was avoiding bringing attention to herself. These last few years at Central Tech, she has just come out of her shell. I think she had a lot of self-doubt, but now she is realizing just how amazing she is and using that to her advantage. We have always been her safety net, knowing that no matter what, we were going to catch her. Now, she can catch herself.

A Creative Childhood That Dismantled Gender Barriers

Mariana credits her father for helping her to recognize that art and engineering go hand-in-hand and that Mariana was indeed capable of overcoming her physical challenges and entering into any field of study and career she wished to pursue:

> I have always loved art and creating things. When I was little, I had to use a walker to get around. It left me without any free hands. So early on, I found ways to carry things using my walker. I would tie baskets or create systems of links to drag things along. I never considered these activities to be engineering, but my dad recognized it in the beginning. He also introduced me to robotics, some programming he had learned in the military. Together, we built a robotic claw I could use to grab things when my legs got tired. When I would talk about a career in graphic arts, my dad would counter the idea with ways to use art to build. He was always showing me beautiful buildings and ways I could use both my art and building skills together.
>
> He saw something in me that I did not consider. I think the main reason was I looked at jobs that would put me behind a desk rather than on my feet. I always worry people will think less [of me] because of my legs, but now that I have shed the walker, I think he might be right. I also had never met a female engineer and assumed it would be equally hard as a girl. Though I have never been a girly girl, so I figured that might help. Then I got to Central Tech and was like, wow, this is really cool. During my sophomore year here, I got to develop the idea and realized this was something I was interested in. I was able to meet other women in the field and could see me doing this. With the more hands-on projects and the math, I realized engineering is art, the art of creating.

Inspirational Educators

Mariana comprehends academic lessons easily, and while she did not feel challenged at her home high school, a guidance counselor there recognized Mariana's capabilities and directed her toward an engineering program, where she has fallen under the guidance of educators who nurture Mariana's potential:

> School was always easy before Central Tech. At my home school in Williamsburg, nothing is very challenging. The teachers always seem to slow down for the kids who need more time. If you understand the lesson, you just have to wait for everyone to catch up. That is how I fell in love with reading. It was a thing I would do when other students were working. We did not do much STEM stuff in elementary because the teachers were just worried about the math and reading scores. Our math was just worksheets, which is another reason I never connected art and STEM. It was not until middle school that I began to see some different things in my elective classes.
>
> Ultimately, it was my counselor who showed me the options at Central Tech. Miss Molly spoke to all of us about the possibilities, and she specifically pulled me aside to talk about the engineering program. I was not sure at first, but she kept after me about how smart I was and that I should really apply to the program. She also said Central Tech had a lot more advantages than our low-income school, and it would be a really good opportunity to further my education and gain more skills. I looked at the application but did not think I was smart enough to do it. Despite my doubts, Miss Molly was relentless. She emailed my dad and then my mom. Turns out she was right. It has been the best thing I have ever done for myself and my education.

> Central Tech has helped me come out of my shell not only through courses but also through robotics. I joined one of the robotics teams and have gone to a lot of competitions. I have learned the aspects of design and how to use CAD. Chemistry has also been really fascinating with all the labs. My home school does not have anything like that. I have also learned how to use very large power tools, which I probably would have never tried because power tools intimidate me. I am very shaky, and my coordination is a challenge with my disability. However, my teachers have shown me how to adapt and use them safely and properly. So, while they still scare me some, I do know how to use them. Central Tech has taught me that I can modify things to work along with me rather than against me.

One of the engineering program's instructors, Mr. Murphy, added this about Mariana:

> When we recruit, we look for those who would be successful, whether they think they would be or not–the students who can do anything they set their mind to, basically because they have had to. They may not have the best grades, but we seek hard workers who may not be at the top of the class. Many of our rural kids have not been challenged at their high school but can still show an aptitude for math and science. We look for those students who have a creative spark in their eyes. Mariana is all of those things and is that student. She is determined, creative, and incredibly talented. On the surface, I think she has been passed over because, physically, she does not appear to be the student that she is. Given her background and challenges, Mariana brings a different perspective to the field, something so needed in engineering.

Influential Mothers

Mariana's mother, Marisol, has been an inspiration for Mariana, for Marisol has overcome her own physical challenges in order to study medicine and earn the opportunity to work as a nurse, if she so wished:

> Growing up, my life was pretty normal until junior high. One day in my freshman year, I was walking home from school, and a car backed up and hit me. The accident fractured my hip and forced me to stay home for the rest of that year from school. Then, almost a year after the date, we left campus at lunch and walked to the University of Arizona Cafe. At that time, they did not have a crosswalk, but a bunch of us would just kind of cross the street there. I was not paying attention, and this car hit me. It was a hit-and-run and much worse than the first. I had multiple fractures, and once again, I missed the rest of that year and some of my junior year as well. After that, I decided to just get my GED, but I did not stop seeking further education. I went to a community college for two years and then to a vocational medical school. I received my phlebotomy certification, CNA, and RN. After all my medical issues, I wanted to be a surgical tech. Instead, I got married and had kids, and then they became my priority. I now work at a prison as a nurse.

Defying Oppressional Experiences

Mariana explained that her peers and educators often make assumptions about her intelligence based, not on her race, but on her physical challenges:

> Growing up, I have been harassed more about my disability rather than being Hispanic. People always assume that because of my physical challenges, I am not very smart. In third grade, I went to the library to check out a book for the reading program. I remember choosing a really thick book called Jericho Walls. I made my way to the counter, and the

librarian said I should choose a more appropriate book. I asked if something was wrong with this one. I thought she meant the content was like PG13 or something. She then clearly stated loudly in front of everyone that there was no way this was on my reading level. My teacher quickly walked up and corrected the situation, but the librarian and my teacher never apologized. I did really well on the AR test, and several people were surprised that I could read that much. I remember being loud about it in front of the librarian. My dad was very proud of that, too!

Marisol explains that one way in which she and her husband support Mariana is by encouraging Mariana to always seek out methods for overcoming any challenge. Thereby, Mariana will serve as an inspiration to others and continue to increase her belief in herself:

> It has always been a man's world, and I think there is a kind of dominance for men as opposed to women in so many fields. With Mariana having the issues that she does with her cerebral palsy, everything has been and will be even more of a struggle. However, I do think that she can also use that to her advantage. Because she can show people how you can overcome so many different obstacles and prove she is capable of doing anything. I think that alone is an inspiration and should serve as the norm for all different types of people.
>
> So many families with children like Mariana make it easier and do things for their children. We have never done that with her. We have just been 100% supportive and walked alongside her all the way. When she researches different options or brainstorms ideas, we are right there with her. It happens a lot where she might have ideas and does not have the resources or cannot find them. That is where we step in, offer support, and share what we have found.

Summary

The expectation in qualitative dissertations and research is for the researcher to summarize the findings, and in the case of this study, this practice would involve summarizing the narratives of these five young women. While this study utilized their counter-narratives to answer the research questions and to support the need for systemic change, this research will deviate from the customary approach of summarizing findings. This departure is motivated by identity as a white critical scholar. I hold the conviction that it is inappropriate to employ my perspective, informed by my racial background, any more than I already have in the organization and narration in chapter four. Consequently, this dissertation will refrain from encapsulating the narratives of those who have been historically marginalized. Instead, the final chapter will concentrate on elucidating the insights garnered from the participants' narratives, delineating how these narratives contribute to addressing the research questions, and advocating for systemic change within the realms of education and broader society.

As the narratives of these five young women, intricately woven by their voices, form a collection of baskets that is the heart of this research study. These shared experiences represent the unique journey of a daughter, her mother, and their extended family as they navigated systems of oppression in education and within their communities. Together, they create a powerful mosaic that transcends individual stories, reflecting a shared spirit of courage and determination. The depths of these narratives reveal that the bond between mother and daughter and student and teacher are both sources of support and serve as catalysts for empowerment. Each warp and weft is a testament to the transformative influence of familial relationships, shaping not only the individual lives of these young women but also contributing to the broader narrative of shared experiences. This research study, inspired by the collective voices of these

remarkable women, aims to shed light on the complexities and decisions intrinsic to their journeys. The stories celebrate the empowerment derived from intergenerational connections and the influence embedded in the shared warp and weft of family and education, forming a unique and meaningful basket of stories. By acknowledging and honoring these narratives, the diverse and interconnected experiences that shaped the lives of these Latina women can be understood.

Chapter 5: The Integration

Ruth Bader Ginsburg credited fellow colleague and friend, Justice Sandra Day O'Connor when she shared, *"As women achieve power, the barriers will fall. As society sees what women can do, as women see what women can do, there will be more women out there doing things, and we'll all be better off for it."* (2006).

This study sought to understand the perceptions and experiences of Latina students who chose to enter a CareerTech Pre-Engineering program in rural Oklahoma. This area of study was selected because of the documented and observed absence of Latinas in the field of engineering. Despite an awareness of the absence of women in STEM, advocacy and outreach programs throughout the United States have not seen significant gains in the presence of Women of Color in engineering (Cole & Espinoza, 2008; Collins, 2018; Granovskiy, 2018; Grossman & Porche, 2014; Nugent et al., 2015). Other areas of STEM have experienced an increase in the representation of women, but the engineering field remains predominately male. Considering that the fundamental role of engineering is to address the challenges and improve the quality of life for individuals and society as a whole, the perspectives of engineers should represent all of society (Granovskiy, 2018). With this belief, this study set out to understand the perspectives and supports of Latina students who braved spaces where they have been historically excluded and to understand the decision to choose CareerTech programs as an alternate pathway into the field of engineering.

The Challenges in Representation

The literature explored the challenges Latinas face in STEM education and employment, emphasizing the intersectionality of race and gender. In the realm of education, STEM fields encompass various disciplines. While the statistics have varied programs and divisions under

STEM, they universally show that the representation of women majoring in engineering does not reflect the population (National Center Education Statistics, 2023a). In addition, the employment landscape in STEM reveals disparities in representation, particularly for Hispanic and Black workers, who are underrepresented compared to their overall share in the workforce. Gender disparities also persist, with women being underrepresented in certain STEM occupations, specifically engineering (United States Bureau of Labor Statistics, 2020). The intersectionality of race and gender further complicates the challenges faced by Latinas in STEM, necessitating a comprehensive approach to understanding their educational and career decisions.

This literature also acknowledged the historical battle for equity in educational spaces for Latinos, particularly Latina students' underrepresentation and experiences of oppression in education, including STEM. Efforts to address these disparities, such as counterspaces and Hispanic Serving Institutions, emphasize the need for inclusive practices in educational settings (Contreras Aguirre et al., 2020; Nuñez, 2011; Ong et al., 2018). STEM educational experiences in rural areas add another level of complexity resulting from economic, technological, and geographic challenges (Dixon, 2023). The prevalence of teacher attrition related to STEM fields in rural schools, along with difficulties in attracting adequately specialized and certified STEM teachers, contribute to a lack of effective STEM education in rural areas (Nelson-Barber et al., 2023). Post-secondary education requirements for STEM careers pose an additional challenge, as access to prerequisite courses, such as calculus, in rural settings is limited. These institutional and geographical issues, coupled with societal oppression experiences, exacerbate the challenges of nurturing STEM in Latina students.

Supporting Latina identities within the educational context was also documented in the literature. Previous research emphasized the significant role of family, cultural values, and

familial expectations (Azpeitia & Bacio, 2022; S. Rodriguez et al., 2019). Familismo was attributed as a cultural value influencing Latina students' decisions and aspirations. The impact of teachers in supporting Latina students was also highlighted (Gallard Martínez et al., 2019; S. L. Rodriguez & Blaney, 2021; Sparks et al., 2023). Interactions with teachers play a crucial role in Latina students' STEM educational journey, impacting their decisions and overall attainment. Research suggests that diverse forms of engagement, such as academic program decisions, course-related information, performance discussions, and collaborative projects, contribute to enhanced educational experiences for Latinas (Gallard Martínez et al., 2019; S. L. Rodriguez & Blaney, 2021; Sparks et al., 2023). Meaningful relationships with teachers have been identified as influential factors shaping the identity and persistence of Latina students in STEM fields. These relationships can validate cultural identity, providing a sense of community and support. This research highlighted the importance of addressing the unique challenges faced by Latina students in navigating educational spaces to foster more effective teacher-student relationships.

The Questions and Aims of the Study

With the knowledge and gaps within the literature, this qualitative study was designed to answer the following questions:

- *What influences and experiences do Latina students who choose to enter a CareerTech Pre-Engineering program perceive to have guided their program decision?*
- *What relationships and experiences do Latina students who choose to enter a CareerTech Pre-Engineering program perceive between oppressive systems, their identity, and STEM in rural Oklahoma?*

The answers to these questions were found through analyzing the narrative of five Latina students. This analysis aimed to do the following:

- to understand the students' perceptions and experiences as connections to their decision to enter the field of engineering and STEM
- to understand the experiences of Latinas navigating institutions of oppression in which they are educated
- to understand the supports, experiences, and educational decisions of Latina students who have chosen to enter a field where they are underrepresented
- to develop an understanding of the perspectives of young Latina women from rural communities who have chosen Pre-Engineering programs

Analyzing the Findings

The narratives of each participant, Yareli, Camila, Evita, Yolanda, and Mariana, encompassed shared commonalities. All five participants lived out childhoods marked by the dismantling of gender barriers and the fostering of creativity. Additionally, each Latina student encountered at least one motivating educator who inspired her educational journey. Furthermore, each of the young women faced and remained steadfast when challenged by negative and oppressive stereotypes and experiences. Finally, each of the young women represented in this study benefited from the presence of empowering maternal forces in their lives as they pursued their educational and career aspirations.

A Creative Childhood That Dismantled Gender Barriers

The narratives of Yareli, Camila, Evita, Yolanda, and Mariana together highlight the profound impact of supportive family environments in fostering a creative and gender-inclusive childhood. Yareli's early experiences, fueled by the encouragement of her male family members, particularly her grandpa, emphasized hands-on learning and problem-solving. Camila's mother and grandmother actively engaged her in academics, challenging stereotypical gender roles and

imparting practical skills. Evita's father, despite his family's conservative values, broke gender norms and instilled in her the belief that gender roles did not confine her career choices. Katherine, Evita's mother, emphasized Evita's confrontation of gender and racial stereotypes, a characteristic influenced by her father, in his determination to break down barriers. Yolanda's journey reflected her father's encouragement to pursue STEM despite their challenging background, drawing parallels between Yolanda and her resolute aunt. Yolanda's father highlighted the intrinsic worth of women beyond societal expectations. Finally, Mariana's father played a pivotal role in recognizing her engineering potential, bridging art and engineering, and challenging preconceived notions about her physical abilities. Mariana's story emphasized the interconnectedness of art and engineering and how breaking free from stereotypes can lead to a fulfilling career. These narratives demonstrate the significance of familial support, breaking gender barriers, and fostering an environment where young individuals can explore diverse interests and talents.

Inspirational Educators

The narratives of these young women stress the importance and influence of educators' roles in guiding and inspiring students on their journey toward STEM fields. Yareli's educational path was shaped by teachers who recognized her mathematical aptitude and provided opportunities for competitive challenges, fostering a learning environment that pushed her to continually improve. These educators went beyond conventional teaching, guiding Yareli towards experiences that enriched her understanding and passion for STEM. Camila's story also reflected the transformative influence of supportive teachers, such as Mrs. Hearse and Mrs. Collings, who recognized Camila's exceptional abilities in mathematics early on. These educators accelerated her learning and emphasized the importance of conceptual understanding

and real-world applications. However, Camila faced setbacks with an unhelpful high school teacher, emphasizing the less positive impact of educators on a student's academic journey. Her subsequent experience at Major Technology Center (MTC) proved pivotal, providing challenges and inspiration that fueled her passion for STEM.

Evita's trajectory was profoundly impacted by educators like Ms. Hanover and Ms. Zeigler, who introduced her to the world of robotics and instilled in her the belief that she could excel in STEM fields. Starting from middle school and continuing into her time at Goodwin Technology Center, Evita's engagement in robotics reflected the profound influence of educators on shaping a student's interest and skill set in STEM. Yolanda's narrative also highlighted her transformative experiences with educators, including Miss Key and Mr. Wright. They encouraged her to find her voice and directed her towards a challenging STEM education at Calvary TC, emphasizing the importance of hard work and determination.

Mariana's story adds another layer to these narratives by underscoring the role of dedicated counselors, such as Miss Molly, who recognized her potential and actively encouraged her to pursue engineering at Central Tech. Mr. Murphy, an instructor at Central Tech, acknowledged Mariana's creativity and talents, which challenged preconceived notions about her abilities and emphasized the significance of diverse perspectives in engineering. Collectively, these narratives illuminate the profound impact that passionate and supportive educators can have in fostering students' interest, confidence, and ultimate success in STEM fields.

Influential Mothers

The narratives of Yareli, Camila, Evita, Yolanda, and Mariana recognized the challenges their mothers faced. The stories illuminated the profound influence these women had on shaping their daughters' ambitions. Yareli's mother, Maria, navigated significant obstacles as a young

woman who immigrated to the United States. Yareli credited her mother for passing down courage and the belief that one can achieve anything through hard work and determination. Maria's journey, marked by challenges, immigration struggles, and eventual citizenship, serves as a powerful motivator for Yareli's pursuit of bigger dreams in STEM.

Camila's mother, Diana, faced adversity and societal expectations, yet she instilled in Camila the importance of rising above these challenges. Diana's determination to empower Camila by urging her not to settle and find her own path emphasizes a mother's significant role in shaping their daughter's ambitions. Despite her struggles, Diana prioritized Camila's education, recognizing its transformative potential. Katherine, Evita's mother, also realized the power and influence of education as she navigated rural education and parental expectations that limited her exposure to higher education. While navigating initial challenges, Katherine eventually pursued a college education despite her parents' reluctant beliefs about the necessity of it. Her decision to attend a Christian school in Seattle showcased her determination to break away from the expected path while still honoring her parents' values. This pursuit of education became a valuable lesson for Evita, who, in turn, inherited the necessity and willingness to rise above lowered expectations.

Guadalupe, Yolanda's mother, experienced a different set of challenges, leaving school early due to violence in her homeland. Despite her regrets about not completing her education, Guadalupe emphasized the importance of hard work to Yolanda. Guadalupe's journey from Mexico to the United States, finding love with Niguel, and working hard to provide opportunities for her daughter all serve as a testament to her life within an oppressive society. Mariana's mother, Marisol, also faced challenges in obtaining an education. Despite her physical challenges after two tragic accidents, she pursued an education in the medical field. Marisol's story of

overcoming adversity and continuously seeking education despite the obstacles she faced inspired Mariana. Marisol's journey reinforces the idea that setbacks should not deter one from pursuing education and achieving career goals. These narratives depict mothers who were forced to navigate oppressive and traumatic experiences and utilized their experiences to influence their daughters' lives. The participants' mothers provided support and served as living examples of defying societal expectations, pursuing education, and navigating challenges and oppression with unwavering determination. The influence of these mothers echoes through the generations, shaping the lives of Yareli, Camila, Evita, Yolanda, and Mariana, and is evident in their pursuits of STEM careers and higher education.

Defying Oppressional Experiences

In the weaving of personal narratives, a collection of determined defiance emerges from the experiences of these young women as they navigate the complex intersectionality of race, gender, and socioeconomic factors. Yareli, Camila, Evita, Yolanda, and Mariana, each with a unique journey, shared their stories of confronting stereotypes, overcoming discriminatory barriers, and prevailing over the challenges imposed by an educational system designed with inequities. Their narratives also acknowledged the broader societal issues prevalent in rural communities, where opportunities are often limited, and the biases ingrained in gender roles and racial prejudices continue. Through their collective voices, a powerful theme unfolds that demonstrates the need for inclusive and equitable environments that empower Latina students to defy the systems in which they are educated.

Yareli faced discouragement from her high school counselor, Mrs. Culpepper, who doubted her ability to succeed at CTC. Despite this, Yareli pursued her goals, highlighting the importance of trying and believing in yourself. Yareli's mother, Maria, echoed her daughter's

sentiments, emphasizing the uniqueness of each child's journey and the harmful impact of comparisons. In a rural community with limited opportunities, Yareli confronted additional challenges, including a lack of diverse courses and limited access to technology. However, her determination led her to thrive at CTC, where she overcame gender stereotypes and showcased her intelligence. Mr. Bradford, one of her educators, acknowledged the prevalence of gender biases in STEM fields and the need for increased female representation. Yareli also shared her experiences as a Latina in a predominantly Caucasian town, facing stereotypes and racial comments. Her mother, Maria, recounted instances of racial oppression, revealing the lasting impact of discriminatory remarks on her family.

Camila also discussed the frustration of being stereotyped based on appearance and confronting assumptions about language skills and ethnicity. Diana, Camila's mother, shared a painful incident during Camila's elementary school open house, revealing the biases and prejudices they encountered. Camila further discussed the challenges of being a minority in a predominantly white community, where assumptions about Camila's heritage were pervasive. Camila's journey began in an underfunded rural educational system. Her perseverance and lack of resources prompted her to seek opportunities at a more well-funded institution, emphasizing the disparities in education based on location.

Despite warnings of difficulty, Evita's defiance in pursuing education at Goodwin Technology Center challenged the stereotypes associated with women in technical fields. Her experience with gender bias in the robotics shop restroom underscored the subtle ways women are made to feel like outsiders in male-dominated spaces. The broader observation about girls in her town prioritizing marriage over education reinforced the need to break free from traditional gender roles. The conservative atmosphere in rural Oklahoma, as described by Evita,

demonstrated the persistence of discriminatory attitudes. The racially insensitive jokes during the 2016 election and the assumptions about her ethnicity showcased the prevalence of racial bias and the effects of microaggressions in educational spaces.

Yolanda, a first-generation American, highlighted the difficulties of navigating the education system without familial precedent. She shared the additional burden of her father's undocumented status, revealing the complexities faced by immigrant families in pursuing education. Yolanda's experience of being mislabeled as Alejandra in kindergarten also highlighted the insensitivity often born of cultural differences in educational spaces. Her challenges as a first-generation American, compounded by her father's undocumented status, underlined the unique difficulties faced by immigrant families navigating the education system.

Mariana, with her physical challenges, encountered discrimination centered around her disability more than her ethnicity, adding another area of intersectionality to her story. Mariana's struggle against assumptions about her intelligence due to her physical challenges provided a different perspective. Her determination to prove herself, as seen in the library incident, emphasized the need to challenge societal expectations surrounding disabilities. Her mother, Marisol, stressed the importance of challenging stereotypes and resisting the negative influence of these experiences. Marisol's insights into supporting Mariana's journey and leveraging her challenges as inspiration reflected the importance of fostering an inclusive environment. Despite the family's refusal to make things easier for Mariana, they nevertheless provided unwavering support, emphasizing the occasional need for a collective effort to overcome obstacles.

Each of these young women defied stereotypes, faced discrimination, and navigated challenges rooted in gender, ethnicity, and socioeconomic factors. Despite coming from diverse backgrounds, Yareli, Camila, Evita, Yolanda, and Mariana share a common thread of

determination in their pursuit of education and personal growth. Their stories underscore the importance of fostering inclusivity, dispelling biases, and providing equitable opportunities. As they navigate the intricate intersectionality of race, gender, and economic status, their experiences shed light on the systemic issues ingrained in the United States public educational system, particularly in rural communities where opportunities are often limited. Their experiences demonstrate the need for educational environments that empower and support young Latina women.

Interpretation of Findings

In this study, the resonating narratives of Yareli, Camila, Evita, Yolanda, and Mariana indicated the need for reflection on the implications in education. The power of storytelling surfaces as a formidable tool, as the experiences of these Latina women exposed systemic issues that hinder their educational journeys. The systems of oppression in which they are forced to navigate have caused significant harm and should be addressed and reformed for future generations of Latina women. The study also highlights the importance of cultivating relationships, countering gender norms, and engineering through play and building from a young age. As the research delves into the implications, it becomes evident that connections between educational settings and families, advocation for STEM programs and alternate pathways in underrepresented communities, and fostering inclusive environments are not mere suggestions but imperatives.

The Power of Telling and Sharing These Stories

Through the theoretical design of this study, the overarching aim has been to understand the experiences of these young women. These counter-stories provided an understanding of and amplified the voices and experiences of individuals who have defied societal expectations, faced

discrimination, and navigated complex challenges (Golombek et al., 2022). By sharing their experiences, Yareli, Camila, Evita, Yolanda, and Mariana provided a platform for marginalized stories, shedding light on the pervasive issues of racism, gender bias, and socioeconomic disparities embedded in educational systems in rural Oklahoma. Their experiences contributed to a broader conversation about equity, justice, and inclusivity in STEM education. Each of their experiences challenged existing stereotypes and biases, fostering a deeper understanding of the diverse struggles that young Women of Color face in their pursuit of education and success in engineering (Martin & Garza, 2020).

While individual systems impact others, these experiences shed light on specific areas in American education and society in need of reform. The ramifications of an inoperable United States immigration system on the educational trajectories of Latina students are multifaceted and profound. These young women have contended with heightened levels of uncertainty, anxiety, and stress as their families have grappled with undocumented and precarious immigration statuses. When considering the impact on their education, the attack on their emotional well-being has, at times, impeded their capacity to focus on their academic pursuits. Additionally, the financial strain their families have been forced to navigate with legal challenges, DACA, and potential deportation risks have limited their access to many resources necessary for academic success. The challenges are exacerbated when coupled with the financial burden imposed by restricted access to higher education funding due to bureaucratic policies. In addition, the socio-political climate shaped by harmful and absent immigration policies has fostered hateful rhetoric, discrimination, and stigmatization against Latino communities and, at times, created a hostile learning environment for these young women and their families. Thus, the ramifications of a malfunctioning US immigration system reverberate profoundly throughout the educational

journeys of Latino students making it imperative for comprehensive immigration reform to ensure equitable educational opportunities.

Sharing these counter-stories also shifts the focus from deficit-based to asset-based narratives that no longer blame the individual student nor presume innate deficiencies (Valencia & Solorzano, 1997). The narratives demonstrated the deficient institutional systems and how these young women have utilized their assets to rise above these deficiencies. These stories also form a resistance against systemic oppression. By recounting the stories through their perceptions and voices, Yareli, Camila, Evita, Yolanda, and Mariana reclaim their story, break free from the constraints of stereotypes, and inspire other young women who face similar challenges (Delgado & Stefancic, 2011). The stories can act as a catalyst for empowerment, showcasing that determination and defiance can lead to transformative personal outcomes for those who experience them. Through empathy and connection, these young women's narratives have the potential to evoke change by encouraging educators to critically examine institutional practices, governmental laws, and systemic policies that perpetuate inequity. These counter-stories provide an understanding that can further dismantle barriers and create educational environments where Latina students can thrive.

The Shared Decision of CareerTech

The participants' decisions to enroll in a Pre-Engineering program at their local CareerTech center provide answers to both research questions. All five participants shared the issue of not having access to advanced coursework needed to pursue a career in STEM at their high schools. Evita had shared that there were other students in the Pre-Engineering program who had enrolled for the same reason, though they did not intend to pursue a career in engineering. The other students were simply there because they desired to take the program's

advanced science and mathematics classes since their rural high schools lacked these courses. Based upon an evaluation of the participants' transcripts and observations, the following table was created to show the science, mathematics, and engineering courses offered at their high schools and CareerTech centers (Table 2). This compilation shows that their access to advanced courses would have been limited or nonexistent without attending CTE despite a high aptitude for those courses. Their enrollment in CTE demonstrates the perceived relationship between oppressive systems and rural Oklahoma and provides an acknowledged influence on their program decision.

Table 2

Participant Course Offerings & ACT STEM Aptitude

Courses	**Yareli**	**Camila**	**Evita**	**Yolanda**	**Mariana**
Algebra I	HS	HS	HS	HS	HS
Geometry	*Both*	*Both*	*Both*	*Both*	*Both*
Algebra II	*Both*	*Both*	*Both*	*Both*	*Both*
Algebra III	CTE	CTE	CTE	CTE	CTE
Trigonometry	CTE	*Both*	*Both*	CTE	CTE
Pre-Calculus	CTE	*Both*	*Both*	CTE	CTE
Calculus	CTE	*Both*	*Both*	CTE	CTE
Physical Science	HS	HS	HS	HS	HS
Biology	HS	HS	HS	HS	HS
Biology II	HS	*Both*	*Both*	*Both*	*Both*
Anatomy	CTE	*Both*	CTE	CTE	CTE
Chemistry	CTE	HS	*Both*	CTE	CTE
Physics	CTE	CTE	CTE	CTE	CTE
Environmental Science	CTE	CTE	CTE	CTE	CTE
Introduction to Engineering Design	CTE	CTE	CTE	CTE	CTE
Principles of Engineering	CTE	CTE	CTE	CTE	CTE
Engineering Robotics	CTE	CTE	CTE	CTE	CTE
Aerospace Engineering	CTE	CTE	CTE	CTE	CTE
Digital Electronics	CTE	CTE	CTE	CTE	CTE

Engineering Design & Development	CTE	CTE	CTE	CTE	CTE
Oklahoma Rank STEM ACT %	79	97	88	82	81

The Interpretation of a Creative Childhood That Dismantled Gender Barriers

This theme provides answers to both of the study's research questions. The Latina women participating in the CareerTech Pre-Engineering program were motivated by their creative childhood experiences and the dismantling of traditional gender norms. Yareli, Evita, Yolanda, and Mariana attribute this deconstruction of oppressive gender barriers to the influential males in their lives. Yareli's narrative is traced back to her early years, revealing how her close relationship with her cousin and uncle fostered a creative environment. Her grandpa encouraged her to challenge traditional gender roles and shaped Yareli's inclination toward building and finding innovative solutions that compelled her to consider an education in engineering. Yareli shared, "He always encouraged me to build and find solutions for myself rather than just do it the way it had always been done." Evita's childhood memories reflected her father's determination to break gender norms. Despite being raised with conservative Hispanic values, her dad encouraged her to pursue any dream. Her father and grandfather nurtured Evita's passion for building trains, which extended this breakdown of traditional gender roles facilitated through the selection of toys. Evita talked about this when she said, "My teacher and boys in my class would ask if I wanted to play with the dolls. My dad…explained to my teacher that trains were my thing, even if I was a girl. I remember that was the first thing I ever built: a train track." This experience supports girls building and constructing masculine-themed toys as opportunities to cultivate interest, proficiency, and self-efficacy in a skill set relevant to STEM fields (Fulcher & Hayes, 2018).

Yolanda's STEM-based education and career choice were also strongly influenced by her father's multifaceted support. She admired her father's diverse skills while working on the ranch with him, especially in building and problem-solving. Yolanda said, "I grew up helping him on the ranch. I have always wanted to be like him so engineering, seemed like the login choice. At Calvary TC, we do technical tasks that remind me of him every day. He has always encouraged me to fight for what I want." Yolanda's observation supports that informal routine experiences and science conversations can foster young STEM identities regardless of their capital (Dou & Cian, 2020). Mariana's childhood experiences, challenged by her physical limitations, fostered ingenuity between her and her father. She said, "I found ways to carry things using my walker. I never considered these activities to be engineering, but my dad recognized it in the beginning." Her father also recognized the intersection of art and engineering, encouraging Mariana to see the potential in combining her artistic talents with building skills, showing Mariana "beautiful buildings and ways [Mariana] could use both [her] art and building skills together." Mariana shared, "He [her dad] saw something in me that I did not consider." Through hands-on projects in CTE, Mariana discovered the creative essence of engineering, leading her to envision a career in the field. Each of these fathers committed to breaking down barriers and lifting the participants beyond stereotypes, which helped prepare them to navigate a male-dominated field like engineering.

However, the deconstruction of gender roles within the lives of these young women was not exclusively orchestrated by male individuals. Camila's childhood experiences were marked by the guidance of her mother and grandmother, who actively engaged her in academics and hands-on tasks. In her reflection, Camila said, "My grandma…bought me math and reading workbooks, and we worked on them daily. [Her Grandma] recognize[d] how smart I was and

how she could help me grow through hands-on tasks. She used her kitchen to teach me how to use math and reading through cooking and measuring." Both women challenged traditional gender roles by fixing things around the house and instilling in Camila the belief that women could excel in any field: "Both of them made a point to tell me regularly that girls could do anything boys could do. Without men around, they fixed things in the house themselves." Camila's exposure to technical and mechanical skills, stereotypically associated with males, set the foundation for her pursuit of STEM education. Yareli's mother also reinforced the importance of learning and self-improvement, emphasizing that individuals are not born knowing but must learn and rise to challenges regardless of gender.

The trajectory of these Latina students toward STEM and pre-engineering was influenced by guidance from family members who actively challenged and transcended prevailing gender norms. These young women experienced a childhood that deliberately dismantled stereotypes and cultivated spaces conducive to fostering creativity, continuous learning, and exploring diverse interests. The collective impact of unwavering support emerged as a pivotal force in shaping their educational aspirations and supporting them as they navigate the challenges inherent in male-dominated fields. The familial influence characterized by a commitment to breaking gender barriers motivated these young women and equipped them with the confidence and determination to pursue educational and career paths in engineering, a field traditionally underrepresented by Women of Color.

The narratives also demonstrated how the continued presence of systemic gendered norms have historically exerted a profound influence on women, perpetuating inequalities across a multitude of areas. These norms encompass a complex web of societal expectations, cultural beliefs, and institutional practices that dictate acceptable behaviors, roles, and opportunities

based on gender. For these young Latina women, the intersectionality of race and gender compounded the effects of these norms, resulting in unique challenges and forms of discrimination. While facing intersecting barriers stemming from both racial and gender biases, these women navigated their marginalization within educational and societal structures through determination, self-actualization, and the support of family. However, such efforts should not have been necessary, as societal evolution should inherently encompass recognition of gender equality across all facets of life, including education.

The Interpretation of Inspirational Educators

The narratives of Yareli, Camila, Evita, Yolanda, and Mariana collectively answer the first research question by highlighting the pivotal role of passionate educators in guiding these Latina women toward STEM and Pre-Engineering programs. Educators have been documented as influential in shaping Latina students, so this finding was not surprising. However, the findings did serve as a positive reminder of the effect of outstanding educators (Hughes et al., 2020). Beginning in elementary school, Yareli's teachers supported her through competitive math tests and evolved her relationship with science through hands-on experiences that broadened her perspective. Her middle-school math teacher recognized Yareli's and a few of her peers' talents early on, allowing those of them who understood clearly to test and then "go into the room next door and talk about the test, kind of like a debrief." Despite Yareli not taking to science initially, once she began high school and "had genetics labs and hands-on activities," she became interested in science and joined the STEM club.

Similarly, Camila's academic trajectory was influenced by dedicated educators, such as Mrs. Hearse and Mrs. Collings, who recognized her mathematical talents and emphasized understanding the practical applications of mathematics. Camila was also motivated by an

educator when she was introduced to engineering by Mrs. Collings, which influenced Camila to enroll in CTE, where she met Mr. Pearson, who "was relentless and never lowered the bar…he made me work harder because he knew I could." Evita's journey, shaped by inspirational teachers like Ms. Hanover and Ms. Zeigler, involved transformative experiences in gifted programs and middle school robotics. She said, "I think for me, the most inspirational moments have been other women encouraging me." She remembers a teacher telling her, "You talk a lot and explain yourself well. We really need young women like you on our robotics team." Evita shared, "That one moment changed the rest of my life."

Yolanda's transformative encounters with supportive teachers, Miss Key and Mr. Wright, were crucial in encouraging her to pursue STEM education. Mr. Wright's guidance led Yolanda to CTE for a challenging STEM-based education. Yolanda shared, "Miss Key encouraged me to use my voice…and Mr. Wright introduced [us] to STEM, including engineering…and encouraged me to start making decisions for my future." As Mariana's shift from an unstimulating environment to CTE was guided by her home high school counselor, Miss Molly. Miss Molly recognized Mariana's capabilities and encouraged her to apply to the engineering program. Mariana shared that, "Miss Molly spoke to all of us about the possibilities, and she specifically pulled me aside to talk about the engineering program. I wasn't sure at first, but she kept after me about how smart I was and that I should really apply to the program." Together, each of these narratives emphasize the transformative influence of educators in guiding Latina women toward STEM and pre-engineering, showcasing the importance of mentorship and challenging opportunities in empowering these young women to pursue their passions in spaces where they have been historically marginalized.

The Interpretation of Influential Mothers

The influence and dedication of the participants' mothers provide answers to both research questions. The educational journeys of Yareli, Camila, Evita, Yolanda, and Mariana were overwhelmingly shaped by their mothers who have been instrumental in guiding their paths. Their mothers, Maria, Diana, Katherine, Guadalupe, and Marisol, have also influenced their identities and aspirations by sharing their histories and their unrelenting love and support for them. Yareli's pursuit of bigger dreams has been profoundly influenced by her mother, Maria. Growing up, Maria faced numerous challenges as a young immigrant woman who strived to build a comfortable life for her family in the United States. Yareli acknowledged her mother's immense determination and courage in the face of adversity. Maria's commitment to creating a better future for her daughters left an indelible mark on Yareli. Maria's advice to her daughters, encouraging them to dream big and make their own way, has instilled in Yareli the belief that she can overcome any obstacle. Yareli's mother, who went through the arduous process of immigration and citizenship, served as a living testament to the possibilities that come with hard work, determination, and independence: "[My mother] always says we have to make our own way and cannot depend on someone else to do it for us. I am the girl in the house who will try to fix it [anything broken], often with my mom's help and advice." Yareli's mother, who went through the arduous process of immigration and citizenship, served as a living testament to the possibilities that come with hard work and determination.

Similarly, Camila's mother, Diana, has played a fundamental role in shaping Camila's ambitions and identity and empowering her to pursue engineering. Diana's own life experiences, marked by struggles and determination, have fueled her desire to ensure a different path for her daughter. Despite facing challenges, including a difficult marriage and societal expectations for

women, Diana emphasized the importance of not settling and making one's own way. She actively encouraged Camila to rise above societal norms and pursue her aspirations. Diana said, "Bessie Momma [Camila's grandmother] and I were both determined to make sure Camila's story was different from ours, so we pushed Camila's academics." Diana's efforts to create a different narrative for Camila, coupled with her unwavering support during challenging times, have profoundly impacted Camila's academic journey and the woman she has become. Evita's mother, Katherine, also faced obstacles and limited expectations growing up in a small town. Katherine, determined to break free from societal constraints, pursued higher education despite familial discouragement. She said that both of her parents encouraged her to attend a two-year junior college, that it would be "the smart thing to do," but she applied to a Christian college, got accepted, and finished with a bachelor's degree. In doing so, Katherine became the first in her family to attend college, challenging the chauvinistic and non-academic beliefs that surrounded her. Her commitment to education in the face of adversity served as a model for Evita. Despite facing additional health challenges, Katherine continued to prioritize education, highlighting the value of perseverance and self-determination.

Yolanda's mother, Guadalupe, embodied a forced tenacity as she navigated oppressive challenges in a foreign land. Guadalupe's decision to leave school at a young age did not deter her from supporting her children's education. She became a pillar of support for Yolanda, ensuring that Yolanda had the opportunities Guadalupe never had. Guadalupe's emphasis on hard work, independence, and seizing opportunities has instilled confidence in Yolanda, shaping her educational journey. Yolanda's mother said, "[Yolanda] has the opportunity [her father and I] never did, and she cannot waste it. Life is going, and she has to keep going, too." Mariana also draws inspiration from her mother, Marisol, who overcame physical challenges to pursue a

career in nursing, earning her GED and then later her phlebotomy certification, CNA, and RN, expressed, “I did not stop seeking further education.” Marisol’s determination and pursuit of education after facing a life-altering accident showcased her commitment to academics. Sharing physical challenges and career paths, Mariana, after witnessing her mother’s journey, has been motivated to embrace her own physical challenges and pursue her own path in STEM education.

The narratives of Yareli, Camila, Evita, Yolanda, and Mariana collectively illustrate how their mothers have profoundly influenced their identities and aspirations. In each narrative, the mothers served as powerful role models in the development of their daughters’ identities and demonstrated the importance of pursuing education despite the significant obstacles within the systems. These stories conveyed the life and love decisions that have influenced these young women and demonstrated the power of these relationships. Applying these relationships in educational spaces can positively impact Latina students (Velazquez, 2017), as these women have not only shaped their daughters’ perspectives but have also encouraged them to overcome obstacles and excel in STEM and engineering programs.

The Interpretation of Defying Oppressional Experiences

As Latina students in rural Oklahoma, Yareli, Camila, Evita, Yolanda, and Mariana, faced multiple challenges related to oppressive systems, identity, and STEM education. Yareli’s story reflected the pervasive low expectations placed on her by her peers and authoritative figures like her counselor, Mrs. Culpepper. Despite her mother’s encouragement to pursue excellence on her terms, Yareli encountered biased assumptions about her capabilities. She said, “Mrs. Culpepper thought I should not go to CTC because she did not think I could be successful, and it would look bad on my transcript.” Mrs. Culpepper’s discouragement is a representation of systemic biases and misconceptions that female students, particularly Latinas, face in STEM

fields (Robinson, 2022). Yareli's experience at CTC exposed gender disparities in STEM classes, where she is outnumbered by boys who initially dismiss her abilities. This disparity reflects a broader issue discussed by her CTC educator, Mr. Bradford, who acknowledged the prevailing misconception that females do not excel in math or STEM fields. Overcoming these biases requires challenging existing stereotypes and fostering an environment that promotes equitable opportunities.

The narrative also delves into the racial challenges faced by Yareli as a Latina in a predominantly Caucasian town. The discomfort she felt when singled out due to her ethnicity highlights the impact of racial insensitivity and the need for cultural understanding. The racial oppression extends beyond Yareli, as her family faced derogatory comments and discrimination. The school's response to racially charged incidents, exemplified by the principal's advice to "grow thicker skin," underscores the lack of a proactive approach to combat racism. Camila's story also reinforces the challenges of racial assumptions and biases. Educators incorrectly assumed that Camila was proficient in Spanish based on her appearance, which exemplifies how preconceived notions can affect educational experiences. Camila said, "I have always spoken English. In fact, the only Spanish I know is from my high school courses." These assumptions, combined with stereotyping Native American identity, adds additional layers to the challenges faced by Latina students in academic spaces.

Mariana's story introduced the perspective of physical challenges, illustrating how additional biases related to ability can compound Latina students' struggles. She told a story, stating that she remembers "choosing a really thick book called Jericho Walls, and the librarian said I should choose a more appropriate book. I thought she meant the content. She [the librarian] then clearly stated, loudly, in front of everyone, that there was no way this was on my

reading level." The librarian's assumption about Mariana's reading level based on her physical challenges underscores the need for more inclusive and informed attitudes toward students with disabilities.

Furthermore, the stories of Evita and Katherine bring attention to the intersectionality of race and gender. Despite discouragement from her counselor and societal expectations, Evita's determination to pursue her dreams in a male-dominated field speaks out against the tyrannical environment experienced by many women in STEM. Evita recalls that, at the Goodwin Technology Center, "The boys were never blatant about it, but they definitely gave the vibe that I was less than them and did not belong. …in the robot shop, we only have one bathroom…it used to be a men's restroom and still has a toilet and a urinal. They just scraped off the 'Men's' sign." Katherine also experienced an encounter with a counselor who assumed Evita was eligible for Native American scholarships. The incident highlights the need for educators to be sensitive to diverse backgrounds and avoid perpetuating stereotypes. Evita elaborated "Other times, being brown has meant that I must be Native American. I understand that the Native Americans experienced a lot, but my family did, too. The assumption is infuriating."

Yolanda's experience as a first-generation American sheds light on the unique challenges students face navigating an education system unfamiliar to their immigrant parents. The lack of guidance and understanding from both educators and counselors can make the educational journey even more daunting for these students (Forster & Van De Werfhorst, 2019). Yolanda recalled that her first teacher in America was her kindergarten teacher and that "She [my teacher] showed me my desk, and the name said, 'Alejandra.' I told her that was not my name. She said Alejandra was close enough, and both are Mexican names, so that would be okay…I was sad. That entire year, all of my things said 'Alejandra'." Yolanda's father's undocumented status and

risk of deportation limited his movements which introduced an additional layer of complexity. The fear of exposing her family's situation in a rural farming community added pressure on Yolanda, who carefully treads the line between revealing her reality and protecting her family from potential repercussions. Latina students in rural Oklahoma navigate complex systems of oppression with the intersectionality of gender, race, ethnicity, nationality, and ability. These narratives collectively emphasize the negative impacts of oppressive systems and stress the importance of creating educational and social environments that celebrate and support the unique identities and aspirations of Latina students.

Assumptions and Limitations of Findings

The study's limitations, intrinsic to its design and methodology, influenced the interpretation of findings. A primary limitation was the small sample size, consisting of only five Latina participants from rural Oklahoma. Such a limited number restricted the generalization of the study's findings to a larger population, a common challenge in qualitative research focusing on depth rather than breadth (Cresswell & Poth, 2017; Merriam, 2009). The study's design, rooted in Critical Race Theory (CRT) and LatCrit, prioritized the individual and their unique experiences, emphasizing that generalizations across historically marginalized groups were not supported (Delgado & Stefancic, 2017; Solorzano & Yosso, 2001). Consequently, the findings were not intended to be broadly applicable, but rather, they were aimed at providing a complex understanding of the specific experiences of Latina students in the study. However, these narratives demonstrated the oppressive harm caused by structural racism, revealing its pervasive influence on societal institutions, policies, and interpersonal interactions, emphasizing the urgent need for systemic change and social justice initiatives. As a result of navigating these oppressive systems, a fundamental assumption was that each participant in the study possessed

remarkable determination. This resolve was evidenced by their deliberate entry into spaces where they were underrepresented. This assumption was further validated by their responses and internal dialog in the face of oppressive educational experiences. It was believed that their determination to navigate spaces characterized by underrepresentation would serve as crucial elements in shaping their unique educational narratives. This assumption highlighted a recognition of the participants' agency and tenacity in confronting systemic challenges within the educational system, contributing to a more comprehensive understanding of their experiences. As a researcher, acknowledging and scrutinizing these assumptions was vital to maintaining an unbiased and reflective approach throughout the study.

Implications of the Findings

When considering the findings of this study, the implications considered were fostered under educational contexts. The implications include the need for continued sharing of counter-narratives, the creation of inclusive spaces for young, aspiring builders, and the promotion of CareerTech STEM programs as alternate pathways. However, this work also aimed at contributing to the broader conversation regarding the lack of representation of women in STEM. With the increasing pace of innovation and technology, those in power to influence these developments often hold limited perspectives about women, and even fewer regarding Women of Color. Without diverse perspectives, the risk increases for the potential of society to neglect distinctive insights that have the capacity to propel technological progress and enhance abilities to solve complex problems. A lack of representation may result in technologies that unintentionally perpetuate biases or fail to address the needs of underrepresented communities. Diverse teams of engineers are better equipped to address complex challenges and drive innovation, contributing to the overall competitiveness of industries and nations. With the

recognition of a larger implication of the underrepresentation of women in STEM, the implications of this research emphasize the importance of the life experiences of these young Latina women.

The implications drawn from this study emphasize the need to sustain and amplify conversations in both educational and societal realms concerning representation, race, class, gender, and social barriers within and beyond STEM fields. The findings illuminated the intricate challenges faced by Latina students in rural settings, emphasizing the need for targeted interventions to dismantle these systemic impediments. Moreover, the study accentuated the transformative power of counter-storytelling, stressing the necessity of sharing marginalized students' narratives. By providing a platform for these stories, a broader audience can be informed about the lived experiences of underrepresented students and individuals in STEM, fostering awareness, empathy, and a collective commitment to equity. These narratives can serve a multitude of roles, including encouraging students to pursue STEM education and careers, inspiring and empowering others, and shedding light on existing societal and racial disparities.

As each of these women recounted narratives of oppression and adversity encountered in educational and societal spaces connected to immigration, the critical need became apparent for reforming both immigration policy and ideological frameworks within the broader American landscape. Each branch of the United States government has the ability to enact change for immigrant families, including these young women, yet they have failed to do so throughout history. This researcher believes that the lack of action is deeply rooted in bigotry, white fragility, and ethnocentrism, which have influenced immigration policies in the United States throughout history. Anti-immigrant sentiments centered on nativist ideologies have fueled resistance to immigration reform that would provide pathways to citizenship or legal status for

undocumented immigrants, particularly those from Latino communities. Additional irrational and unsupported beliefs surrounding immigration, including job displacement and access to social services, have influenced partisan gridlock. At the same time, powerful corporate industries reliant on cheap labor have wielded their influence to maintain the status quo to protect their economic interests. A resolution to immigration reform requires a systems approach that acknowledges and confronts the oppressive policies and practices in American governmental, legal, and educational spaces. This resolution must include fostering bipartisan cooperation through evidence-based policy solutions, combating racial hatred and ignorance through education and advocacy, and prioritizing the needs and rights of immigrants within the broader policy discourse. As research continues to center on historically marginalized communities and systemic transformation, emphasis should be placed on the deconstruction and reconstruction of the American immigration system. This systemic change will advance efforts toward achieving educational and societal equity and reducing barriers for Latina women.

To aid in the creativity and dismantling of gender barriers, elementary educational spaces could create inclusive spaces that encourage young builders from all backgrounds. These educational environments would be equipped with a diverse range of tools, materials, and resources that cater to various learning styles and interests. The significance of physically building and utilizing tools from a young age in a child's educational journey appears to cultivate a foundation of problem-solving, creativity, and critical thinking. This approach could promote a sense of equity and address preconceived notions about who can engage in hands-on learning and engineering. Educators could challenge traditional gender norms associated with specific tools or activities to foster an environment where students feel empowered to explore and build.

These spaces could contribute to the early breakdown of barriers that might hinder students' interest and participation in STEM fields later in their academic journey.

Unfortunately, gendered norms have persisted and created barriers for women throughout history and have only begun to fade in the United States within the last century. This researcher believes that to continue dismantling systemic gender norms, a comprehensive and sustained effort that addresses multiple levels of influence within institutional and societal practices is required. Policy and institutional reforms that promote gender equality across various domains, including education, employment, and healthcare, must be implemented and enforced. Concurrently, educational initiatives must be developed to raise awareness about gender stereotypes and discrimination, including integrating gender studies into school curricula and conducting training programs for educators and policymakers. Promoting diversity and inclusion is paramount and requires concerted efforts to ensure representation for women in all areas of society. Empowering marginalized communities, utilizing implicit bias training, and fostering cultural change through awareness and activism are all essential components of the broader effort to challenge and dismantle systemic gender norms, remove barriers, and create a more equitable and inclusive society free of this normativity.

CareerTech Education (CTE) programs emerged as a potential solution to connect STEM education with the rural classroom. Promoting these programs can link STEM and rural communities through partnerships with industries and local businesses. By providing exploration opportunities, advanced courses, and technological resources, CTE Pre-Engineering programs could impact STEM persistence and increase Latina students' confidence in STEM studies. These programs can also bridge the curriculum gap by offering prerequisite and advanced STEM courses. Work-based education and additional training can further enhance student success in

STEM careers, presenting an alternative pathway for rural students, including Latina students, to access local opportunities in STEM fields.

Suggestions for Future Research

To further enrich our understanding of the intersectionality of race, gender, and educational experiences for Latina students, future research endeavors could explore similar studies in urban settings. Urban environments often present distinct challenges and opportunities for Students of Color and examining the unique dynamics in metropolitan areas would contribute valuable insights to the existing literature. Additionally, expanding the focus to include other Women of Color, such as Black, Asian, or Indigenous women, would offer a more comprehensive understanding of the varied experiences within marginalized communities. Comparative analyses across different racial and ethnic backgrounds could unveil complex patterns and disparities, contributing to a more intersectional perspective.

In addition, extending this research to other states with flourishing CareerTech Systems similar to Oklahoma's could provide a broader view of the impact of Career and Technical Education (CTE) STEM programs on students' lives. Different regional contexts, policies, programs, and cultural landscapes may influence the effectiveness and outcomes of CTE initiatives, making it imperative to explore these variations for increased comprehension. Moreover, delving into the experiences of college students from rural areas who have completed a CareerTech program could shed light on the long-term impact of CTE education. Understanding how these students navigate higher education and career trajectories following their CTE experiences would be invaluable for shaping future educational policies and practices. These suggested avenues for future research aim to enhance the knowledge of the multifaceted dynamics surrounding CTE, race, gender, and STEM career development.

However, these research areas primarily emphasize strategies for historically minoritized communities to navigate existing systems rather than advocating for fundamental reforms within those systems. While such strategies may offer short-term solutions for individuals facing systemic barriers, they do not address the root causes of inequity embedded within societal and institutional structures. If society genuinely aspires to achieve equity across all communities, scholarly inquiry must undertake a more comprehensive approach. This inquiry entails turning inward to critically examine individual biases, implicit prejudices, and privilege dynamics, while simultaneously extending outward to interrogate the broader systemic policies and practices that perpetuate inequality. By shifting the focus toward systemic reform, researchers can uncover the deep-seated injustices entrenched within educational and societal institutions, thereby fostering meaningful change toward a more equitable and inclusive society. This transformative approach requires challenging deeply ingrained norms, confronting power imbalances, and advocating for policy reforms that prioritize social justice and the redistribution of resources to marginalized communities. Only through such concerted efforts can we begin to dismantle the structural barriers that perpetuate systemic inequities and create a more just and equitable society.

Closing

This research study aimed to share the stories and experiences of Latina students enrolled in CareerTech Pre-Engineering programs in rural Oklahoma. However, these young women and their mothers did so much more than that. They shared their histories, including the laughter, the fear, the joy, and the tears that surfaced during our exploration together. While the interviews highlighted and shared throughout this research attempted to express the intense feelings experienced throughout these conversations, the rawness of the emotional moments will never leave my mind nor my heart. Thank you, Yareli, Maria, Camila, Diana, Evita, Katherine,

Yolanda, Guadalupe, Mariana, and Marisol, for making yourselves vulnerable, trusting me to share your story, and for having the courage to advocate for change.

References

37th Congress of the United States. (1862). *A century of lawmaking for a new nation: U.S. congressional documents and debates, 1774-1875*. Library of Congress.

Alemán, E. (2009). LatCrit educational leadership and advocacy: Struggling over whiteness as property in Texas school finance. *Equity & Excellence in Education*, *42*(2), 183–201. https://doi.org/10.1080/10665680902744246

Amiot, N., Mayer-Glenn, M., & Parker, L. (2019). Applied Critical Race Theory: Educational leadership actions for student equity. *Race Ethnicity and Education*, *23*(2), 200–220. https://doi.org/10.1080/13613324.2019.1599342

Anzaldua, G. (1990). Haciendo caras, una entrada: An introduction. In *Borderlands/La frontera: The new mestiza* (pp. xv–xxviii). Aunt Lute Books.

Applebaum, B. (2016). Critical whiteness studies. *Oxford Research Encyclopedia of Education*. https://doi.org/10.1093/acrefore/9780190264093.013.5

Arciniega, G. M., Anderson, T. C., Tovar-Blank, Z. G., & Tracey, T. J. G. (2008). Toward a fuller conception of Machismo: Development of a traditional Machismo and Caballerismo Scale. *Journal of Counseling Psychology*, *55*(1), 19–33. https://doi.org/10.1037/0022-0167.55.1.19

Aronson, B., & Meyers, L. (2020). Critical race theory and the teacher education curriculum: Challenging understandings of racism, whiteness, and white supremacy. *Whiteness and Education*, *7*(1), 32–57. https://doi.org/10.1080/23793406.2020.1812109

Ashford, S. N., Wilson, J. A., King, N. S., & Nyachae, T. M. (2017). STEM SISTA spaces: Creating counterspaces for black girls and women. In *Emerging Issues and Trends in*

Education (pp. 3–37). Michigan State University Press. http://www.scopus.com/inward/record.url?scp=85037570563&partnerID=8YFLogxK

Azpeitia, J., & Bacio, G. A. (2022). Dedicado a mi familia": The role of familismo on academic outcomes among Latinx college students. *Emerging Adulthood*, *10*(4), 923–937. https://doi.org/10.1177/21676968221099259

Banda, R. M. (2020). From the inside looking out: Latinas intersectionality and their engineering departments. *International Journal of Qualitative Studies in Education*, *33*(8), 824–839. https://doi.org/10.1080/09518398.2020.1735565

Basham, R. (1976). Machismo. *Frontiers: A Journal of Women Studies*, *1*(2), 126–143.

Benavent, X., Ves, E., Forte, A., Botella-Mascarell, C., López-Iñesta, E., Rueda, S., Roger, S., Perez, J., Portalés, C., Dura, E., Garcia-Costa, D., & Marzal, P. (2020). Girls4STEM: Gender diversity in STEM for a sustainable future. *Sustainability*, *12*(15), 6051. https://doi.org/10.3390/su12156051

Benuto, L. T., Casas, J. B., Cummings, C., & Newlands, R. (2018). Undocumented, to DACAmented, to DACAlimited: Narratives of Latino students with DACA status. *Hispanic Journal of Behavioral Sciences*, *40*(3), 259–278. https://doi.org/10.1177/0739986318776941

Bloomberg, L., & Volpe, M. (2019). *Completing your qualitative dissertation: A road map from beginning to end* (Fourth). SAGE Publications.

Bonous-Hammarth, M. (2000). Pathways to success: Affirming opportunities for science, mathematics, and engineering majors. *The Journal of Negro Education*, *69*(1/2), 92–111.

Bottia, M. C., Mickelson, R. A., Jamil, C., Moniz, K., & Barry, L. (2021). Factors associated with college STEM participation of racially minoritized students: A synthesis of research.

Review of Educational Research, 91(4), 614–648. https://doi.org/10.3102/00346543211012751

Brown v. Board of Education II, 349 US 294 (Supreme Court 1955).

Brown v. Board of Education of Topeka, 347 US 483 (Supreme Court 1954).

Burnett, M., Cooper, S., Butler-Barnes, S. T., & McCoy, W. N. (2022). Gendered racial stereotype endorsement: A theoretical review and implications for Black girls' STEM identity. *Journal of African American Women and Girls in Education*, *2*(3), Article 3. https://doi.org/10.21423/jaawge-v2i3a137

Byrd, W. C., Dika, S. L., & Ramlal, L. T. (2013). Who's in STEM? An exploration of race, ethnicity, and citizenship. *Equity & Excellence in Education, 46*(4), 484–501. https://doi.org/10.1080/10665684.2013.838485

Cantor, N., Mack, K. M., McDermott, P., & Taylor, O. L. (2014). If not now, when? *Association of American Colleges and Universities*, *16*(2), 29–31.

Capra, F., & Luisi, P. L. (2014). *The systems view of life: A unifying vision*. Cambridge University Press.

CareerTech Education (CTE). (2016). *CTE is your STEM strategy*. CTE Advancements.

Casad, B. J., Franks, J. E., Garasky, C. E., Kittleman, M. M., Roesler, A. C., Hall, D. Y., & Petzel, Z. W. (2020). Gender inequality in academia: Problems and solutions for women faculty in STEM. *Journal of Neuroscience Research*, *99*(1), 13–23. https://doi.org/10.1002/jnr.24631

Castillo, L. G., Perez, F. V., Castillo, R., & Ghosheh, M. R. (2010). Construction and initial validation of the Marianismo Beliefs Scale. *Counselling Psychology Quarterly*, *23*(2), 163–175. https://doi.org/10.1080/09515071003776036

Chen, C.-S., & Lin, J.-W. (2019). A practical action research study of the impact of maker-centered stem-PJBL on a rural middle school in Taiwan. *International Journal of Science and Mathematics Education, 17*(S1), 85–108. https://doi.org/10.1007/s10763-019-09961-8

Cisneros v. Corpus Christi Independent School District, 330 (Texas Supreme Court 1971). https://law.justia.com/cases/federal/district-courts/FSupp/330/1377/2126406/

Civil, M. (2014). Why should mathematics educators learn from and about Latina/o students' in-school and out-of-school experiences? *Journal of Urban Mathematics Education, 7*(2).

Cobas, J. A., & Feagin, J. R. (2008). Language oppression and resistance: The case of middle class Latinos in the United States. *Ethnic and Racial Studies*, *31*(2), 390–410.

Cole, D., & Espinoza, A. (2008). Examining the academic success of Latino students in science technology engineering and mathematics (STEM) Majors. *Journal of College Student Development*, *49*(4), 285–300. https://doi.org/10.1353/csd.0.0018

Collins, K. H. (2018). Confronting color-blind STEM talent development: Toward a contextual model for Black student STEM identity. *Journal of Advanced Academics*, *29*(2), 143–168.

Contreras, A. R., & Valverde, L. A. (1994). The impact of Brown on the education of Latinos. *The Journal of Negro Education, 63*(3), 470–481.

Contreras Aguirre, H. C., Gonzalez, E., & Banda, R. M. (2020). Latina college students' experiences in STEM at Hispanic-serving institutions: Framed within Latino Critical Race Theory. *International Journal of Qualitative Studies in Education*, *33*(8), 810–823. https://doi.org/10.1080/09518398.2020.1751894

Corces-Zimmerman, C., & Guida, T. F. (2019). Toward a critical whiteness methodology: Challenging whiteness through qualitative research. In *Theory and Method in Higher Education Research* (pp. 91–109). Emerald Publishing Limited. https://doi.org/10.1108/S2056-375220190000005007

Corona, R., Rodríguez, V. M., McDonald, S. E., Velazquez, E., Rodríguez, A., & Fuentes, V. E. (2016). Associations between cultural stressors, cultural values, and Latina/O college students' mental health. *Journal of Youth and Adolescence*, *46*(1), 63–77. https://doi.org/10.1007/s10964-016-0600-5

Crenshaw, K. (1991). Mapping the Margins: Intersectionality, identity politics, and violence against Women of Color. *Stanford Law Review*, *43*(6), 1241–1299. https://doi.org/10.2307/1229039

Crenshaw, K. (2010). Twenty years of Critical Race Theory: Looking back to move forward commentary: Critical Race Theory. *Connecticut Law Review*, *43*(5), 1253–1354.

Cresswell, J., & Poth, C. (2017). *Qualitative inquiry and research design: Choosing among five approaches* (Fourth). 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. https://doi.org/10.3102/0002831209349460

Cromartie, J. (2020). Rural America at a glance: 2020 Edition. *United States Department of Agriculture (USDA) Economic Research*, 1–6.

Cross, C. J. (2020). Racial/Ethnic differences in the association between family structure and children's education. *Journal of Marriage and Family*, *82*(2), 691–712. https://doi.org/10.1111/jomf.12625

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process.* SAGE Publications.

DACA. (2023). National Immigration Law Center. https://www.nilc.org/issues/daca/

Davila, E. R., & de Bradley, A. A. (2010). Examining education for Latinas/os in Chicago. *Educational Foundations*, 39–58.

DeCuir, J. T., & Dixson, A. D. (2004). "So when it comes out, they aren't that surprised that it Is there": Using critical race theory as a tool of analysis of race and racism in education. *Educational Researcher*, *33*(5), 26–31. https://doi.org/10.3102/0013189X033005026

Delgado, R., & Stefancic, J. (2011). *The Latino condition* (Second). New York University Press.

Delgado, R., & Stefancic, J. (2017). *Critical Race Theory: An introduction* (Third). NYU Press.

Delgado v. Bastrop Independent School District, (Texas Supreme Court 1948).

Deming, D. J., & Noray, K. L. (2018). STEM careers and technological change. *National Bureau of Economic Research*, 56.

Dika, S. L., & D'Amico, M. M. (2016). Early experiences and integration in the persistence of first-generation college students in STEM and non-STEM majors. *Journal of Research in Science Teaching*, *53*(3), 368–383. https://doi.org/10.1002/tea.21301

Dixon, C. S. (2023). Barriers and solutions for STEM students from rural areas. In *Handbook of Research on Race, Culture, and Student Achievement* (pp. 136–154). https://doi.org/10.4018/978-1-6684-5705-4.ch008

Dixson, A. D., & Rousseau Anderson, C. (2017). Where are we? Critical Race Theory in education 20 years later. *Peabody Journal of Education, 93*(1), 121–131. https://doi.org/10.1080/0161956x.2017.1403194

Donato, R. (1997). *The other struggle for equal schools: Mexican Americans during the Civil Rights era*. SUNY Press.

Donato, R., & Hanson, J. (2012). Legally white, socially "Mexican": The politics of De Jure and De Facto school segregation in the American southwest. *Harvard Educational Review, 82*(2), 202–225. https://doi.org/10.17763/haer.82.2.a562315u72355106

Donnor, J. K., Rousseau Anderson, C., & Dixson, A. D. (2018). The more things change the more they stay the same: Race, education, and Critical Race Theory after 20 Years: An appraisal. *Peabody Journal of Education*, *93*(1), 1–4. https://doi.org/10.1080/0161956X.2017.1403168

Dou, R., & Cian, H. (2020). The relevance of childhood science talk as a proxy for college students' stem identity at a Hispanic serving institution. *Research in Science Education, 51*(4), 1093–1105. https://doi.org/10.1007/s11165-020-09928-8

Erete, S., Thomas, K., Nacu, D., Dickinson, J., Thompson, N., & Pinkard, N. (2021). Applying a transformative justice approach to encourage the participation of Black and Latina Girls in computing. *ACM Transactions on Computing Education, 21*(4), 1–24. https://doi.org/10.1145/3451345

Estrada, F., & Jimenez, P. (2018). Machismo and higher education: Examining the relation between Caballerismo and ethnic identity, support seeking, and sense of connectedness among college Latinos. *Journal of Latinos and Education, 17*(3), 215–224. https://doi.org/10.1080/15348431.2017.1319367

Ezzy, D. (2002). *Qualitative analysis*. Routledge.

Fay, B. (1987). *Critical Social Science: Liberation and its limits*. Ithaca: Cornell University Press.

Flores, G. M. (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. https://doi.org/10.1057/lst.2011.36

Forster, A. G., & Van De Werfhorst, H. G. (2019). Navigating institutions: Parents' knowledge of the educational system and students' success in education. *European Sociological Review*, jcz049. https://doi.org/10.1093/esr/jcz049

Fox, M. F., Sonnert, G., & Nikiforova, I. (2009). Successful programs for undergraduate women in science and engineering: Adapting versus adopting the institutional environment. *Research in Higher Education*, *50*(4), 333–353. https://doi.org/10.1007/s11162-009-9120-4

Freire, P. (2000). *Pedagogy of the oppressed* (30th anniversary ed). Continuum.

Fry, R., Kennedy, B., & Funk, C. (2021). STEM jobs see uneven progress in increasing gender, racial, and ethnic diversity. *Pew Research Center Science & Society*. https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

Fulcher, M., & Hayes, A. R. (2018). Building a pink dinosaur: The effects of gendered construction toys on girls' and boys' play. *Sex Roles*, *79*(5), 273–284. https://doi.org/10.1007/s11199-017-0806-3

Gallard Martínez, A. J., Pitts, W., Robles, S. L., Milton Brkich, K. L., Flores Bustos, B., & Claeys, L. (2019). Discerning contextual complexities in STEM career pathways:

Insights from successful Latinas. *Cultural Studies of Science Education*, *14*(4), 1079–1103. https://doi.org/10.1007/s11422-018-9900-2

Gandhi, M. (2002). *The essential Gandhi: An anthology of his writings on his life, work, and ideas* (2nd ed.). Random House.

General Accounting Office. (2014). *Science, technology, engineering, and mathematics education: Assessing the relationship between education and the workforce* (Report to the Chairman, Committee on Rules, House of Representative GAO-14-374). United States Government Accountability Office.

Gillborn, D., & Ladson-Billings, G. (2009). *Education and Critical Race Theory*. Routledge Handbooks Online. https://doi.org/10.4324/9780203863701.ch3

Gillborn, D., & Ladson-Billings, G. (2016). *Foundations of Critical Race Theory in education* (2nd ed.). Critical Educator.

Ginsburg, R. B. (2006, August 11). *American Sociological Association Annual Meeting* [Speech]. https://www.supremecourt.gov/publicinfo/speeches/viewspeech/sp_08-11-06

Goble, D. (2004). *Learning to earn: A history of career and technology education in Oklahoma*. Oklahoma Department of Career and Technology Education.

Golombek, P., Olszewska, A. I., & Coady, M. (2022). Humanizing power of counter-stories: Teachers' understandings of emergent bilinguals in rural settings. *Teaching and Teacher Education*, *113*, 103655. https://doi.org/10.1016/j.tate.2022.103655

Gonzales, M. G. (2019). *Mexicanos: A history of Mexicans in the United States* (Third). Indiana University Press.

Gonzales, S. M. (2019). Cultivating familismo: Belonging and inclusion in one Latina/O learning community. *International Journal of Inclusive Education*, *23*(9), 937–949. https://doi.org/10.1080/13603116.2019.1602362

Gonzalez, M. T., Matambanadzo, S., & Vélez Martínez, S. I. (2021). Latina and Latino Critical Legal Theory: LatCrit theory, praxis and community. *Revista Direito e Práxis*, *12*(2), 1316–1341. https://doi.org/10.1590/2179-8966/2021/59628

Granovskiy, B. (2018). Science, technology, engineering, and mathematics (STEM) education: An Overview. *Congressional Research Service*, 1–34.

Grossman, J. M., & Porche, M. V. (2014). Perceived gender and racial/ethnic barriers to STEM success. *Urban Education*, *49*(6), 698–727. https://doi.org/10.1177/0042085913481364

Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communications and Technology Journal*, *29*(2), 75–91. https://doi.org/10.1007/BF02766777

Guba, E. G., & Lincoln, Y. S. (1982). Establishing dependability and confirmability in naturalistic inquiry through an audit. *American Educational Research Association*, 1–31.

Guba, E. G., & Lincoln, Y. S. (1986). But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Directions for Program Evaluation*, *30*, 73–84.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In *Handbook of qualitative research* (pp. 105–117). SAGE Publications.

Gutierrez, K. S., Blanchard, M. R., & Busch, K. C. (2022). What effective design strategies do rural, underserved students in STEM clubs value while learning about climate change? *Environmental Education Research*, *28*(7), 1043–1069. https://doi.org/10.1080/13504622.2022.2032611

Gutiérrez, M. V., Willey, C., & Khisty, L. L. (2011). *(In)equitable schooling and mathematics of marginalized students: Through the voices of urban Latinas/os*. *4*(2), 18.

Gutiérrez, R. (2002). Beyond essentialism: The complexity of language in teaching mathematics to Latina/o students. *American Educational Research Journal*, *39*(4), 1047–1088. https://doi.org/10.3102/00028312039004104 7

Gutiérrez, R. (2018). *Rehumanizing mathematics for Black, Indigenous, and Latinx students*. 1–10.

Hamlyn, D. W. (1995). Epistemology, history of. In *The Oxford companion to philosophy* (pp. 242–245).

Harmon, H. L., & Smith, K. C. (2012). Legacy of the rural systemic initiatives: Innovation, leadership, teacher development, and lessons learned. *National Science Foundation*, 1–93.

Harris, R. S., & Hodges, C. (2018). STEM education in rural schools: Implications of untapped potential. *National Youth at Risk Journal*, *3*(1). https://doi.org/10.20429/nyarj.2018.030102

Hernandez Negrete, A., Mouavangsou, K. N., & Caporale, N. (2023). Toward asset-based LatCrit pedagogies in STEM: Centering latine students' strengths to reimagine stem teaching and Practice. *Frontiers in Education*, *8*. https://doi.org/10.3389/feduc.2023.1176913

Hernandez v. Texas, 347 US 475 (Supreme Court 1954).

Hernández-Truyol, B. E., Harris, A., & Valdés, F. (2006). Beyond the first decade: A forward-looking history of LatCrit Theory, community and praxis. *Berkeley La Raza L.J*, *169*.

Hill, C., Corbett, C., & St. Rose, A. (2010). *Why so few? Women in science, technology, engineering, and mathematics*. AAUW.

hooks, b. (2014). *Teaching to transgress*. Routledge. https://doi.org/10.4324/9780203700280

Huber, L. P. (2010). Using Latina/o Critical Race Theory (LatCrit) and Racist Nativism to explore intersectionality in the educational experiences of undocumented Chicana college students. *Educational Foundations, 24*(Win-Spr), 77–96.

Hughes, R., Schellinger, J., Billington, B., Britsch, B., & Santiago, A. (2020). A summary of effective gender equitable teaching practices in informal STEM education spaces. *The Journal of STEM Outreach, 3*(1). https://doi.org/10.15695/jstem/v3i1.16

Ihrig, L. M., Lane, E., Mahatmya, D., & Assouline, S. G. (2018). STEM excellence and leadership program: Increasing the level of STEM challenge and engagement for high-achieving students in economically disadvantaged rural communities. *Journal for the Education of the Gifted, 41*(1), 24–42. https://doi.org/10.1177/0162353217745158

IPUMS. (2020). *U.S. census data for social, health, and economic research* [dataset]. IPUMS:Integrated Public Use Microdata Series. https://usa.ipums.org/usa/

Jang, S. T. (2019). Schooling experiences and educational outcomes of Latinx secondary school students living at the intersections of multiple social constructs. *Urban Education*, 0042085919857793. https://doi.org/10.1177/0042085919857793

Josselson, R., & Hammack, P. L. (2021). *Essentials of narrative analysis*. American Psychological Association.

Kennedy, B., Fry, R., & Funk, C. (2021). 6 facts about America's STEM workforce and those training for it. *Pew Research Center Science & Society*.

https://www.pewresearch.org/short-reads/2021/04/14/6-facts-about-americas-stem-workforce-and-those-training-for-it/.

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. https://doi.org/10.1002/he.20150

Ladson-Billings, G. (2005). The evolving role of Critical Race Theory in educational scholarship. *Race Ethnicity and Education*, *8*(1), 115–119. https://doi.org/10.1080/1361332052000341024

Ladson-Billings, G. (2021). Critical Race Theory—What it is not! In *Handbook of Critical Race Theory in Education* (pp. 32–43). https://doi.org/10.4324/9781351032223-5

Ladson-Billings, G., & Tate, W. (1995). Toward a Critical Race Theory of education. *Teachers College Record*, *97*(1), 47–68.

Lara, H. (2017). *Latinx students in STEM education research: A CRT and LatCrit analysis of NSF funded projects*.

Lau v. Nichols, 414 U.S. 563 (Supreme Court 1974).

Lavalley, M. (2018). *Out of the loop: Rural schools are largely left out of research and policy discussions, exacerbating poverty, inequity, and isolation* (pp. 1–35). Center for Public Education. https://files.eric.ed.gov/fulltext/ED608842.pdf

Lee, Y.-T., Ottati, V., & Hussain, I. (2001). Attitudes toward "Illegal" immigration into the United States: California Proposition 187. *Hispanic Journal of Behavioral Sciences*, *23*(4), 430–443. https://doi.org/10.1177/0739986301234005

Liang, S., & Fu, Y. (2016). *Otter.AI* [Computer software]. Otter.AI. otter.ai

Lopez, I. H. (2005). Race and colorblindness after Hernandez and Brown. *Chicano-Latino Law Review, 25*, 61–76.

Lorde, A. (2007). *Sister outsider: Essays & speeches by Audre Lorde*. Crossing Press.

Malcom, L., & Malcom, S. (2011). The double bind: The next generation. *Harvard Educational Review, 81*(2), 162–172. https://doi.org/10.17763/haer.81.2.a84201x508406327

Malcom, S. M., Hall, P. Q., & Brown, J. W. (1976). *The double bind: The problem of being a minority woman in science*. 81.

Margot, K. C., & Kettler, T. (2019). Teachers' perception of stem integration and education: A systematic literature review. *International Journal of STEM Education, 6*(1). https://doi.org/10.1186/s40594-018-0151-2

Marín, G., & Marín, B. V. (1991). *Research with Hispanic populations* (pp. ix, 130). Sage Publications, Inc.

Marksbury, N. (2017). Monitoring the pipeline: STEM education in Rural U.S. *Forum on Public Policy, 2017*(2), 1–20.

Martin, J. P., & Garza, C. (2020). Centering the marginalized student's voice through autoethnography: Implications for engineering education research. *Studies in Engineering Education, 1*(1), Article 1. https://doi.org/10.21061/see.1

Martinez, M. A. (2013). Re)considering the role Familismo plays in Latina/o high school students' college choices. *The High School Journal, 97*(1), 21–40. https://doi.org/10.1353/hsj.2013.0019

Matsuda, M. J. (1987). Looking to the bottom: Critical Legal Studies and reparations. *Harvard Civil Rights-Civil Liberties Law Review, 22*(2), 323–400.

McDermott, P., & Mack, K. M. (2014). The twenty-first-century case for inclusive excellence in STEM. *Association of American Colleges and Universities*, *16*(2), 4–5.

McGee, E. O. (2020). *Black, brown, bruised: How racialized STEM education stifles innovation*. Harvard Education Press.

Mendez v. Westminster School Dist., Civil Action No. 4292 (U.S. District Court for the Southern District of California 1946).

Mensah, F. M. (2019). Finding voice and passion: Critical Race Theory methodology in science teacher education. *American Educational Research Journal*, *56*(4), 1412–1456. https://doi.org/10.3102/0002831218818093

Merriam, S. (2009). *Qualitative research: A guide to design and implementation*. John Wiley & Sons, Inc.

Miles, M. L., Brockman, A. J., & Naphan-Kingery, D. E. (2020). Invalidated identities: The disconfirming effects of racial microaggressions on black doctoral students in<scp>stem</scp>. *Journal of Research in Science Teaching*, *57*(10), 1608–1631. https://doi.org/10.1002/tea.21646

Miller, P. (2016). *Theories of developmental psychology* (Sixth). Worth Publishers.

Miller, R., Liu, K., & Ball, A. F. (2020). Critical counter-narrative as transformative methodology for educational equity. *Review of Research in Education*, *44*(1), 269–300. https://doi.org/10.3102/0091732X20908501

Mirandé, A. (2018). *Hombres y machos: Masculinity and Latino culture.* Routledge.

Miriti, M. N. (2020). The elephant in the room: Race and STEM diversity. *BioScience*, *70*(3), 237–242. https://doi.org/10.1093/biosci/biz167

Moll, L. C. (2019). Elaborating funds of knowledge: Community-oriented practices in international contexts. *Literacy Research: Theory, Method, and Practice*, *68*(1), 130–138. https://doi.org/10.1177/2381336919870805

Moon, K., & Blackman, D. (2014). A Guide to understanding social science research for natural scientists. *Conservation Biology*, *28*(5), 1167–1177. https://doi.org/10.1111/cobi.12326

Muñoz, L. K. (2001). Separate but equal? A case study of "Romo v. Laird" and Mexican American education. *OAH Magazine of History*, *15*(2), 28–35.

Mutambara, D., & Bayaga, A. (2021). Determinants of mobile learning acceptance for STEM education in rural areas. *Computers & Education*, *160*, 104010. https://doi.org/10.1016/j.compedu.2020.104010

National Assessment Educational Progress. (2022). *NAEP gaps—Achievement gaps*. National Center for Education Statistics (NCES. https://nces.ed.gov/nationsreportcard/studies/gaps/

National Center Education Statistics. (2023a). *COE - Postsecondary certificates and degrees conferred*. https://nces.ed.gov/programs/coe/indicator/cts/postsecondary-certificate-degree

National Center Education Statistics. (2023b). *Public high school graduation rates*. Condition of Education. U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/programs/coe/indicator/coi.

National Science Foundation. (2021). *Women, minorities, and persons with disabilities in science and engineering*. National Center for Science and Engineering Statistics. https://ncses.nsf.gov/pubs/nsf21321/report/introduction

Nayak, A. (2007). Critical whiteness studies. *Sociology Compass*, *1*(2), 737–755. https://doi.org/10.1111/j.1751-9020.2007.00045

Nelson-Barber, S., Trumbull, E., Sexton, U., & Johnson, Z. (2023). Indigenous rural students' attitudes and perceptions about ethnoscience in STEM instruction. *Sociocultural Explorations of Science Education*, 239–262. https://doi.org/10.1007/978-3-031-30451-4_13

Ngai, M. M. (2007). The architecture of race in American immigration law: A reexamination of the Immigration Act of 1924. In *Race, Law and Society*. Routledge.

Niemeyer, A. E., Wong, M. M., & Westerhaus, K. J. (2009). Parental involvement, Familismo, and academic performance in Hispanic and caucasian adolescents. *North American Journal of Psychology*, *11*(3), 613–631.

Nugent, G., Barker, B., Welch, G., Grandgenett, N., Wu, C., & Nelson, C. (2015). A model of factors contributing to STEM learning and career orientation. *International Journal of Science Education, 37*(7), 1067–1088. https://doi.org/10.1080/09500693.2015.1017863

Nuñez, A.-M. (2011). Counterspaces and connections in college transitions: First-generation Latino students' perspectives on Chicano studies. *Journal of College Student Development, 52*(6), 639–655. https://doi.org/10.1353/csd.2011.0077

Oklahoma Department of Career and Technology Education. (2023a). *Oklahoma department of career and technology education*. https://oklahoma.gov/careertech.html

Oklahoma Department of Career and Technology Education. (2023b). *Through the Years*. https://oklahoma.gov/careertech/about/history/through-the-years.html

Oklahoma State Department of Education. (2021). *Title V handbook: Rural initiative education*. OSDE.

Ong, M., Smith, J. M., & Ko, L. T. (2018). Counterspaces for women of color in STEM higher education: Marginal and central spaces for persistence and success. *Journal of Research in Science Teaching*, *55*(2), 206–245. https://doi.org/10.1002/tea.21417

Ong, M., Wright, C., Espinosa, L. L., & Orfield, G. (2012). Inside the double bind: A synthesis of empirical research on undergraduate and graduate Women of Color in science, technology, engineering, and mathematics. *Harvard Educational Review*, *81*(2), 39.

Organization of Rural Oklahoma Schools (Ed.). (2022). *Rural Oklahoma schools*. OROS.

Padilla, L. M. (2001). But you're not a dirty Mexican: Internalized oppression, Latinos & law. *Texas Hispanic Journal of Law & Policy*, *7*, 59–114.

Piña-Watson, B., Castillo, L. G., Jung, E., Ojeda, L., & Castillo-Reyes, R. (2014). The Marianismo beliefs scale: Validation with Mexican American adolescent girls and boys. *Journal of Latina/o Psychology*, *2*(2), 113–130. https://doi.org/10.1037/lat0000017

Plessy v. Ferguson, 163 US 537 (Supreme Court 1896).

Plyler v. Doe, 457 US 202 (Supreme Court 1982).

Preuss, D., Rodin J., C., Sosa E., M., Ramos J., D., Dorsett C., R., & Burleson C., R. (2019). *Hispanic-serving institutions in the south-central United States: A research report for Los Barrios de Amarillo*. National Science Foundation.

Ratcliffe, M., Burd, C., Holder, K., & Fields, A. (2016). Defining rural at the U.S. Census Bureau. *United State Census Bureau, American Community Survey and Geography Brief*, 1–8.

Rawhiya Jacob, S., Montoya, J., & Warschauer, M. (2022). Exploring the intersectional development of computer science identities in young Latinas. *Teachers College Record:*

The Voice of Scholarship in Education, *124*(5), 166–185. https://doi.org/10.1177/01614681221103932

Rice, L., Barth, J. M., Guadagno, R. E., Smith, G. P. A., & McCallum, D. M. (2013). The role of social support in students' perceived abilities and attitudes toward math and science. *Journal of Youth and Adolescence*, *42*(7), 1028–1040. https://doi.org/10.1007/s10964-012-9801-8

Ricento, T. K., & Burnaby, B. (1998). *Language and politics in the United States and Canada: Myths and realities*. Routledge.

Rippa, S. A. (1984). *Education in a free society: An American history*. Longman.

Roberto Alvarez v. Board of Trustees of the Lemon Grove School District., 146 (ACR 1931). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160ACR146

Robinson, T. N. (2022). The myths and misconceptions of change for STEM reform: From fixing students to fixing institutions. *New Directions for Higher Education*, *2022*(197), 79–89. https://doi.org/10.1002/he.20429

Rodriguez, K. M., Castillo, L. G., & Gandara, L. (2013). The influence of Marianismo, ganas, and academic motivation on Latina adolescents' academic achievement intentions. *Journal of Latina/o Psychology*, *1*(4), 218–226. https://doi.org/10.1037/lat0000008

Rodriguez, S. L., & Blaney, J. M. (2021). We're the unicorns in STEM": Understanding how academic and social experiences influence sense of belonging for Latina undergraduate students. *Journal of Diversity in Higher Education*, *14*(3), 441–455. https://doi.org/10.1037/dhe0000176

Rodriguez, S. L., Doran, E. E., Sissel, M., & Estes, N. (2022). Becoming la ingeniera: Examining the engineering identity development of undergraduate Latina students.

Journal of Latinos and Education, *21*(2), 181–200. https://doi.org/10.1080/15348431.2019.1648269

Rodriguez, S., Pilcher, A., & Garcia-Tellez, N. (2019). The influence of familismo on Latina student stem identity development. *Journal of Latinos and Education*, *1–13*. https://doi.org/10.1080/15348431.2019.1588734

Salinas, C. S., Fránquiz, M. E., & Rodríguez, N. N. (2016). Writing Latina/o historical narratives: Narratives at the intersection of critical historical inquiry and LatCrit. *The Urban Review*, *48*(3), 419–439. https://doi.org/10.1007/s11256-016-0361-1

Schmid, C. (2021). The Politics of English only in the United States: Historical, social, and legal aspects. In *Language Ideologies*. Routledge.

Schmidt, R. A., Caspary, K., & Jonas, D. (2016). *Study of experiences and needs of rural education achievement program grantees* (Office of Planning, Evaluation and Policy Development). United States Department of Education. https://eric.ed.gov/?id=ED571888

Schreuders, P. D., & Mannon, S. E. (2007). All in the (engineering) family? The family occupational background of men and women engineering students. *Journal of Women and Minorities in Science and Engineering*, *13*, 333–351. https://doi.org/10.1615/JWomenMinorScienEng.v13.i4.20

Showalter, D., Hartman, S., Johnson, J., & Klein, B. (2019). *Why rural matters 2018-2019: The time is now* (Why Rural Matters). A Report of the Rural School and Community Trust.

Smith-Morris, C., Morales-Campos, D., Alvarez, E. A. C., & Turner, M. (2012). An anthropology of Familismo. *Hispanic Journal of Behavioral Sciences*, *35*(1), 35–60.

Solorzano, D. G., & Bernal, D. D. (2001). Examining transformational resistance through a Critical Race and Latcrit Theory framework: Chicana and Chicano Students in an urban context. *Urban Education*, *36*(3), 308–342. https://doi.org/10.1177/0042085901363002

Solorzano, D. G., & Yosso, T. J. (2001). Critical Race and LatCrit Theory and method: Counter-storytelling. *International Journal of Qualitative Studies in Education*, *14*(4), 471–495. https://doi.org/10.1080/09518390110063365

Sparks, D. M., Przymus, S. D., Silveus, A., De La Fuente, Y., & Cartmill, C. (2023). Navigating the intersectionality of race/ethnicity, culture, and gender identity as an aspiring Latina STEM student. *Journal of Latinos and Education*, *22*(4), 1355–1371. https://doi.org/10.1080/15348431.2021.1958332

Stevens, E. P. (1973). Machismo and Marianismo. *Society*, *10*(6), 57–63. https://doi.org/10.1007/BF02695282

Stramel, J. K., & Legleiter, E. (2020). Call for special issue on rural STEM teacher development. *Theory & Practice in Rural Education*, *10*(2), 145–146. https://doi.org/10.3776/tpre.2020.v10n2p145-146

Stroh, D. P. (2015). *Systems thinking for social change*. Chelsea Green Publishing.

Sung, K. K. (2017). "Accentuate the positive; Eliminate the negative": Hegemonic interest convergence, racialization of Latino poverty, and the 1968 Bilingual Education Act. *Peabody Journal of Education*, *92*(3), 302–321. https://doi.org/10.1080/0161956X.2017.1324657

Tate, W. F. (1997). Critical Race Theory and education: History, theory, and implications. *Review of Research in Education*, *22*(1), 195–247. https://doi.org/10.3102/0091732X022001195

Taylor, E., Gillborn, D., & Ladson-Billings, G. (2009). *Foundations of Critical Race Theory in education*. Routledge.

Threeton, M. D. (2007). The Carl D. Perkins Career and Technical Education (CTE) Act of 2006 and the roles and responsibilities of CTE teachers and faculty members. *Journal of Industrial Teacher Education*, *44*(1), 66–82.

United States Bureau of Labor Statistics. (2020). *Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity* (Labor Force Statistics from the Current Population Survey).

Vaccaro, A., & Camba-Kelsay, M. J. (2016). *Centering Women of Color in academic counterspaces: A Critical Race analysis of teaching, learning, and classroom dynamics*. Rowman & Littlefield.

Valencia, R. R., & Solorzano, D. G. (1997). *Contemporary deficit thinking*. Routledge.

Valenzuela, A. (2020). STEM diversity and student Latina/o resilience: A reflection. *International Journal of Qualitative Studies in Education*, *33*(8), 898–904. https://doi.org/10.1080/09518398.2020.1786188

Velazquez, M. (2017). Primero Madres: Love and mothering in the educational lives of Latina/os. *Gender and Education*, *29*(4), 508–524. https://doi.org/10.1080/09540253.2017.1318206

VERBI Software. (2021). *MAXQDA* (Version 2022) [Computer software]. VERBI Software. maxqda.com

Yosso, T., Smith, W., Ceja, M., & Solórzano, D. (2009). Critical Race Theory, racial microaggressions, and campus racial climate for Latina/o undergraduates. *Harvard*

Educational Review, *79*(4), 659–691.

https://doi.org/10.17763/haer.79.4.m6867014157m707l

Zavala, M. (2014). Latina/o youth's perspectives on race, language, and learning mathematics. *Journal of Urban Mathematics Education, 7*(1).

Appendix A

IRB Approval

Institutional Review Board for the Protection of Human Subjects

Approval of Initial Submission – Expedited Review – AP01

Date: February 14, 2023 **IRB#:** 15500

Principal Investigator: Amanda S Cummings

Approval Date: 02/14/2023

Status Report Due: 01/31/2024

Study Title: The Perceptions of Latina Pre-Engineering Students in Rural Oklahoma CareerTech

Expedited Category: 7

Collection/Use of PHI: No

On behalf of the Institutional Review Board (IRB), I have reviewed and granted expedited approval of the above-referenced research study. To view the documents approved for this submission, open this study from the *My Studies* option, go to *Submission History*, go to *Completed Submissions* tab and then click the *Details* icon.

Requirements under the Common Rule have changed. The above-referenced research meets one or more of the circumstances for which continuing review is not required. However, as Principal Investigator of this research, you will be required to submit an annual status report to the IRB.

As principal investigator of this research study, you are responsible to:

- Conduct the research study in a manner consistent with the requirements of the IRB and federal regulations 45 CFR 46.
- Obtain informed consent and research privacy authorization using the currently approved, stamped forms and retain all original, signed forms, if applicable.
- Request approval from the IRB prior to implementing any/all modifications.
- Promptly report to the IRB any harm experienced by a participant that is both unanticipated and related per IRB policy.
- Maintain accurate and complete study records for evaluation by the HRPP Quality Improvement Program and, if applicable, inspection by regulatory agencies and/or the study sponsor.
- **Submit an annual status report to the IRB to provide the study/recruitment status and report all harms and deviations that may have occurred.**
- **Submit a final closure report at the completion of the project.**

If you have questions about this notification or using iRIS, contact the IRB @ 405-325-8110 or irb@ou.edu.

Cordially,

Kendra L Willan-Dsh

Appendix B

Recruitment Flyer

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/14/2023

Appendix C

Assent to Participate for Children over 12

Assent to Participate in Research for Children Over 12 years at the University of Oklahoma

You are invited to participate in research about Latina students' educational experiences.

Please read this document and ask any questions you may have **BEFORE** agreeing to participate in this research.

The purpose of this research is to share your story, experiences, and perceptions about your education and your decision to pursue engineering. This study will include five to eight Latina participants, their parent(s), and educator(s). To participate in this research, participants must identify as Latina and be enrolled in a rural CareerTech Pre-Engineering program.

I identify as Latina. ___ Yes ___ No

I am enrolled in a rural CareerTech Pre-Engineering program. ___ Yes ___ No

If you agree to participate, you will be interviewed three times which will be both video and audio recorded. The interviews will be semi-structured and should last approximately 60 minutes each.

If you approve, your confidential records will be used as data in this research. The records that will be requested are your ACT scores and High School Transcript and will be used to identify commonalities in coursework and aptitude of the participants.

I agree for my records to be assessed and used for research purposes. ___ Yes ___ No

There are no risks or benefits to participating in this research.

If you participate, you will receive a $25 Gift Card compensation per interview for your time.

Your participation is voluntary, and your responses will be confidential. There will be no information in research reports that will make it possible to identify you. All research records will be stored securely, and only approved researchers and the University of Oklahoma Institutional Review Board will have access to the records. Your information will not be shared nor used in any future research.

You also have the right to access the research data that has been collected about you as a part of this research. You will also be asked to verify the transcription of the interviews for validity and accuracy. To assist with the accuracy of your responses, the interviews will be audio and video recorded. You have the right to refuse such recordings without penalty.

I agree to include my pseudonym with any direct quotes. ___ Yes ___ No

I consent to audio and video recording. ___ Yes ___ No

I agree to review the transcripts of the interviews for accuracy. ___ Yes ___ No

Even if you choose to participate now, you may stop participating at any time and for any reason.

You might need to be contacted after the interviews to gather additional data.

I give permission for the researcher to contact me in the future. Yes No

If you have questions, concerns, or complaints about this research, please contact me, Amanda Cummings (405-331-0561) (amandacummings09@ou.edu) or my advisor, Dr. Stacy Reeder (reeder@ou.edu).

You can also contact the University of Oklahoma – Norman Campus Institutional Review Board at 405-325-8110 or irb@ou.edu with questions, concerns, or complaints about your rights as a research participant or if you don't want to talk to the researcher.

You will be given a copy of this document for your records. By providing information to the researcher(s), I agree to participate in this research.

Signature of Participant	**Date**
Name of Parent or Guardian	
Signature of Researcher Obtaining Consent	**Date**

Appendix D

Parental Permission to Participate for Children Over 12: English Version

Written Parental Permission to Participate in Research for Children Over 12 years at the University of Oklahoma

Your child is invited to participate in research about Latina students' educational experiences

Please read this document and ask any questions you may have **BEFORE** agreeing to participate in this research.

The purpose of this research is to share your child's story, experiences, and perceptions about their education and their decision to pursue engineering. This study will include five to eight Latina participants, their parent(s), and educator(s). To participate in this research, participants must identify as Latina and be enrolled in a rural CareerTech Pre-Engineering program.

Your child is enrolled in a rural CareerTech Pre-Engineering program. ___ Yes ___ No

If you agree for your child to participate, your child will be interviewed three times which will be both video and audio recorded. The interviews will be semi-structured and should last approximately 60 minutes each.

If you approve, your child's confidential records will be used as data in this research. The records that will be requested are your child's ACT scores and High School Transcript and will be used to identify commonalities in coursework and aptitude of the participants.

I agree for my child's records to be assessed and used for research purposes. __ Yes __ No

There are no risks or benefits to your child by participating in this research.

If your child participates, your child will receive a $25 Gift Card compensation per interview for their time.

Your child's participation is voluntary, and their responses will be confidential. There will be no information in research reports that will make it possible to identify your child. All research records will be stored securely, and only approved researchers and the University of Oklahoma Institutional Review Board will have access to the records. Your child's information will not be shared or used in future research.

You also have the right to access the research data that has been collected about your child as a part of this research. Your child will also be asked to verify the transcription of the interviews for validity and accuracy. To assist with the accuracy of their responses, the interviews will be audio and video recorded. You have the right to refuse such recordings of your child without penalty.

I agree to include my child's pseudonym with any direct quotes. ___ Yes ___ No

I consent to audio and video recordings of my child. ___ Yes ___ No

I agree to my child's review of interview transcripts for accuracy. ___ Yes ___ No

Even if you permit your child to participate now, you may revoke this permission at any time and for any reason.

Your child might need to be contacted after the interviews to gather additional data.

I give permission for the researcher to contact my child in the future. ___ Yes ___ No

If you have questions, concerns, or complaints about this research, please contact me, Amanda Cummings (405-331-0561) (amandacummings09@ou.edu) or my advisor, Dr. Stacy Reeder (reeder@ou.edu).

You can also contact the University of Oklahoma – Norman Campus Institutional Review Board at 405-325-8110 or irb@ou.edu with questions, concerns, or complaints about your rights as a research participant or if you don't want to talk to the researcher.

You will be given a copy of this document for your records. By providing information to the researcher(s), I agree to my child's participation in this research.

Signature of Parent or Guardian	**Date**
Name of Child Participant	
Signature of Researcher Obtaining Consent	**Date**

Appendix E

Parental Permission to Participate for Children Over 12: Spanish Version

Permiso por escrito de los padres para participar en investigaciones para niños mayores de 12 años en la Universidad de Oklahoma

Su hija está invitada a participar en una investigación sobre las experiencias educativas de las estudiantes Latinas.

Lea este documento y haga cualquier pregunta que pueda tener **ANTES** de aceptar participar en esta investigación.

El propósito de esta investigación es compartir la historia, las experiencias y las percepciones de su hijo sobre su educación y su decisión de estudiar ingeniería. Este estudio incluirá de cinco a ocho participantes latinas, sus padres y educadores. Para participar en esta investigación, las participantes deben identificarse como latinas y estar inscritas en un programa rural de preingeniería de CareerTech.

Su hijo está inscrito en un programa rural de preingeniería de CareerTech. ___ Sí ___ No

Si acepta que su hijo participe, su hijo será entrevistado tres veces, que se grabarán en video y audio. Las entrevistas serán semiestructuradas y deberán tener una duración aproximada de 60 minutos cada una.

Si lo aprueba, los registros confidenciales de su hijo se utilizarán como datos en esta investigación. Los registros que se solicitarán son los puntajes ACT de su hijo y la transcripción de la escuela secundaria y se utilizarán para identificar puntos en común en el trabajo del curso y la aptitud de los participantes.

Acepto que los registros de mi hijo sean evaluados y utilizados con fines de investigación. __ Sí __ No

No hay riesgos ni beneficios para su hijo al participar en esta investigación.

Si su hijo participa, su hijo recibirá una compensación de tarjeta de regalo de $25 por entrevista por su tiempo.

La participación de su hijo es voluntaria y sus respuestas serán confidenciales. No habrá información en los informes de investigación que permita identificar a su hijo. Todos los registros de investigación se almacenarán de forma segura y solo los investigadores aprobados y la Junta de Revisión Institucional de la Universidad de Oklahoma tendrán acceso a los registros. La información de su hijo no se compartirá ni se utilizará en futuras investigaciones.

También tiene derecho a acceder a los datos de investigación que se han recopilado sobre su hijo como parte de esta investigación. También se le pedirá a su hijo que verifique la validez y precisión de la transcripción de las entrevistas. Para ayudar con la precisión de sus respuestas, las entrevistas serán grabadas en audio y video. Tiene derecho a rechazar tales grabaciones de su hijo sin penalización.

Acepto incluir el seudónimo de mi hijo con cualquier cita directa. ___ Sí ___ No

Doy mi consentimiento para las grabaciones de audio y video de mi hijo. ___ Sí ___ No

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/14
IRB EXPIRATION DATE: 01/

Acepto que mi hijo revise las transcripciones de las entrevistas para verificar su precisión.
___ Sí ___ No

Incluso si permite que su hijo participe ahora, puede revocar este permiso en cualquier momento y por cualquier motivo.

Es posible que sea necesario contactar a su hijo después de las entrevistas para recopilar datos adicionales.

Doy permiso para que el investigador se comunique con mi hijo en el futuro. ___ Sí ___ No

Si tiene preguntas, inquietudes o quejas sobre esta investigación, comuníquese conmigo, Amanda Cummings (405-331-0561) (amandacummings09@ou.edu) o mi asesora, la Dra. Stacy Reeder (reeder@ou.edu).

También puede comunicarse con la Junta de Revisión Institucional del Campus Norman de la Universidad de Oklahoma al 405-325-8110 o irb@ou.edu si tiene preguntas, inquietudes o quejas sobre sus derechos como participante de la investigación o si no desea hablar con el investigador.

Se le entregará una copia de este documento para sus registros. Al proporcionar información a los investigadores, acepto la participación de mi hijo en esta investigación.

_____ _____
Firma de uno de los padres o tutor **Fecha**

_____
Nombre del niño participante

_____ _____
Firma del investigador que obtiene su consentimiento **Fecha**

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/1
IRB EXPIRATION DATE: 01/

Appendix F

Adult Participant Consent Form: English Version

Signed Adult Consent to Participate in Research at the University of Oklahoma

You are invited to participate in research about Latina students' educational experiences.

Please read this document and ask any questions you may have **BEFORE** agreeing to participate in this research.

The purpose of this research is to gather perceptions about Latina students' education and decisions to pursue engineering. This study will include five to eight Latina participants, their parent(s), and educator(s).

If you agree to participate, you will be interviewed once, which will be both video and audio recorded. The interview will be semi-structured and should last approximately 60 minutes.

There are no risks or benefits to participating in this research.

If you participate, you will receive a $25 Gift Card compensation per interview for your time.

Your participation is voluntary, and your responses will be confidential. There will be no information in research reports that will make it possible to identify you. All research records will be stored securely, and only approved researchers and the University of Oklahoma Institutional Review Board will have access to the records. Your information will not be shared nor used in any future research.

You also have the right to access the research data that has been collected about you as a part of this research. You will also be asked to verify the transcription of the interviews for validity and accuracy. To assist with the accuracy of your responses, the interviews will be audio and video recorded. You have the right to refuse such recordings without penalty.

I agree to include my pseudonym with any direct quotes. ___ **Yes** ___ **No**

I consent to audio and video recording. ___ **Yes** ___ **No**

I agree to review the transcript of the interview for accuracy. ___ **Yes** ___ **No**

Even if you choose to participate now, you may stop participating at any time and for any reason.

You might need to be contacted after the interviews to gather additional data.

I give permission for the researcher to contact me in the future. ___ **Yes** ___ **No**

If you have questions, concerns, or complaints about this research, please contact me, Amanda Cummings (405-331-0561) (amandacummings09@ou.edu) or my advisor, Dr. Stacy Reeder (reeder@ou.edu).

You can also contact the University of Oklahoma – Norman Campus Institutional Review Board at 405-325-8110 or irb@ou.edu with questions, concerns, or complaints about your rights as a research participant or if you don't want to talk to the researcher.

You will be given a copy of this document for your records. By providing information to the researcher(s), I agree to participate in this research.

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/14/2023
IRB EXPIRATION DATE: 01/31/2024

Page 1 of 2 **Initials** _____

Signature of Participant	**Date**
Signature of Researcher Obtaining Consent	**Date**

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/14/2023
IRB EXPIRATION DATE: 01/31/2024

Appendix G

Adult Participant Consent Form: Spanish Version

Consentimiento adulto firmado para participar en la investigación en la Universidad de Oklahoma

Está invitado a participar en una investigación sobre las experiencias educativas de estudiantes Latinas.

Lea este documento y haga cualquier pregunta que pueda tener **ANTES** de aceptar participar en esta investigación.

El propósito de esta investigación es recopilar percepciones sobre la educación y las decisiones de estudiantes latinas para estudiar ingeniería. Este estudio incluirá de cinco a ocho participantes Latinas, sus padres y educadores.

Si acepta participar, será entrevistado una vez, que será grabado tanto en video como en audio. La entrevista será semiestructurada y deberá tener una duración aproximada de 60 minutos.

No hay riesgos ni beneficios por participar en esta investigación.

Si participa, recibirá una tarjeta de regalo de $25 de compensación por entrevista por su tiempo.

Su participación es voluntaria y sus respuestas serán confidenciales. No habrá información en los informes de investigación que permita identificarlo. Todos los registros de investigación se almacenarán de forma segura y solo los investigadores aprobados y la Junta de Revisión Institucional de la Universidad de Oklahoma tendrán acceso a los registros. Su información no será compartida ni utilizada en ninguna investigación futura.

También tiene derecho a acceder a los datos de investigación que se han recopilado sobre usted como parte de esta investigación. También se le pedirá que verifique la validez y precisión de la transcripción de las entrevistas. Para ayudar con la precisión de sus respuestas, las entrevistas serán grabadas en audio y video. Tiene derecho a rechazar dichas grabaciones sin penalización.

Acepto incluir mi seudónimo con cualquier cita directa. ___ Sí ___No

Doy mi consentimiento para la grabación de audio y video. ___ Sí ___No

Acepto revisar la transcripción de la entrevista para verificar su exactitud. ___ Sí ___No

Incluso si elige participar ahora, puede dejar de participar en cualquier momento y por cualquier motivo.

Es posible que deba ser contactado después de las entrevistas para recopilar datos adicionales.

Doy permiso para que el investigador se comunique conmigo en el futuro. ___ Sí ___No

Si tiene preguntas, inquietudes o quejas sobre esta investigación, comuníquese conmigo, Amanda Cummings (405-331-0561) (amandacummings09@ou.edu) o mi asesora, la Dra. Stacy Reeder (reeder@ou.edu).

También puede comunicarse con la Junta de Revisión Institucional del Campus Norman de la Universidad de Oklahoma al 405-325-8110 o irb@ou.edu si tiene preguntas, inquietudes o quejas sobre sus derechos como participante de la investigación o si no desea hablar con el investigador.

Se le entregará una copia de este documento para sus registros. Al proporcionar información a los investigadores, acepto participar en esta investigación.

Firma del participante	**Fecha**
Firma del investigador que obtiene su consentimiento	**Fecha**

Appendix H

Observation Protocol

Date:	Time:
Duration of the Meeting:	Site:
Participants:	
Documents passed:	
Notes	
Descriptive: Description of participants, activities, interactions, and events Reflective: Questions to self, observations of nonverbal behavior, interpretations/inferences	

ADAPTED FROMJOHNSON, L. R. (2016). *COMMUNITY-BASED QUALITATIVE RESEARCH: APPROACHES FOR EDUCATION AND THE SOCIAL SCIENCES*. SAGE PUBLICATIONS. HTTPS://DOI.ORG/10.4135/9781071802809

Notes:

Appendix I

Educator Interview Protocol

Introduction

Thank you for your time and willingness to participate. I am Amanda Cummings, a Ph.D. candidate from the University of Oklahoma and a Pre-Engineering instructor from Mid-America Technology Center. As you know, I am interested in rural Oklahoma Latina students and their decisions to pursue a Pre-Engineering program at rural Oklahoma CareerTechs. Specifically, I am exploring what factors and experiences they perceive to contribute to a STEM education and career pathway. My research intends to explore these journeys to help other young Latina women pursue Pre-Engineering. The questions are intentionally general and abstract, as I hope to capture your lived experiences. Please feel free to share any additional details or expand on areas as you wish. I will ask clarifying questions as we cycle through together. You also have the option of declining to answer or passing on any of these questions. Do you have any questions about this process before we start?

Interview Questions:

First, I am going to ask about your basic demographic information and then transition to education:

1. What is your name? What name would you like me to use? Do you have a preferred pseudonym for the shared research? What pronouns do you prefer?
2. What is your age?
3. Can you share your story in education?
4. As the educator of Student Participant Name, what do you perceive to have influenced their educational decision to pursue Pre-Engineering?
5. What are your student recruitment strategies? Do any specifically focus on minoritized populations?
6. Given the lack of diverse representation in engineering, what do you perceive might help this situation?

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/14/2023

Closing

I want to thank you for sharing your story with me, taking the time to ensure my interpretation was accurate, and being patient with the research process. Now that I have completed my questions, do you have any questions you would like to ask me about this research project? If you want to contact me later, please feel free to reach out via email, phone call, or text. I may also need to contact you later for additional questions or clarification. I will use the same methods of communication. Thank you again for sharing your story!

IRB NUMBER: 15500
IRB APPROVAL DATE: 02/14/2023

Appendix J

Student Interview Protocol

Introduction

Thank you for your time and willingness to participate. I am Amanda Cummings, a Ph.D. candidate from the University of Oklahoma and a Pre-Engineering instructor from Mid-America Technology Center. As you know, I am interested in rural Oklahoma Latina students and their decisions to pursue a Pre-Engineering program at rural Oklahoma CareerTechs. Specifically, I am exploring what factors and experiences you perceive to contribute to your STEM education and career pathway. My research intends to explore your story to help other young Latina women pursue Pre-Engineering. The questions are intentionally general and abstract, as I hope to capture your story from lived experiences. Please feel free to share any additional details or expand on areas and stories as you wish. I will ask additional clarifying questions as we cycle through your history together. You also have the option of declining to answer or passing on any of these questions. Do you have any questions about this process before we start?

Interview Questions: Identity

First, I am going to ask about your basic demographic information:

1. What is your name? What name would you like me to use? Do you have a preferred pseudonym for the shared research?
2. What is your age?
3. What pronouns do you prefer?

Now we are going to transition to exploring your identity:

4. Who are you, and what is your story?
5. How would you describe yourself?
6. Can you define your identity?
7. Who and what has influenced this identity?

8. Now that we have begun thinking about the people in your life, can you tell me the story of your family?

Interview Questions: Educational Experiences

As we think about supports, expectations, and experiences in your life:

9. Can you share your educational journey beginning with as early as you can remember?
10. When considering your rural education settings, how has location influenced your education?

Interview Questions: Future Planning

Now that we have discussed your identity and history, let us explore your future:

11. Can you share your plans for the future?
12. What are your hopes and dreams?
13. What will you need to do to make this happen?
14. Can you describe your process of deciding what to do after high school?
15. What policies, practices, and expectations do you anticipate in your field of engineering?

Closing

I want to thank you for sharing your story with me, taking the time to ensure my interpretation was accurate, and being patient with the research process. Now that I have completed my questions, do you have any questions you would like to ask me about this research project? If you want to contact me later, please feel free to reach out via email, phone call, or text. I may also need to contact you later for additional questions or clarification. I will use the same methods of communication. Thank you again for sharing your story!

Appendix K

Parent Interview Protocol

Introduction

Thank you for your time and willingness to participate. I am Amanda Cummings, a Ph.D. candidate from the University of Oklahoma and a Pre-Engineering instructor from Mid-America Technology Center. As you know, I am interested in rural Oklahoma Latina students and their decisions to pursue a Pre-Engineering program at rural Oklahoma CareerTechs. Specifically, I am exploring what factors and experiences these young women perceive to contribute to a STEM education and career pathway. My research intends to explore these journeys to help other young Latina women pursue Pre-Engineering. The questions are intentionally general and abstract, as I hope to capture your lived experiences. Please feel free to share any additional details or expand on areas as you wish. I will ask clarifying questions as we cycle through together. You also have the option of declining to answer or passing on any of these questions. Do you have any questions about this process before we start?

Interview Questions:

First, I am going to ask about your basic demographic information and then transition to education:

1. What is your name? What name would you like me to use? Do you have a preferred pseudonym for the shared research? What pronouns do you prefer?
2. What is your age?
3. Can you share your story in education?
4. As the parent of Student Participant Name, what do you perceive to have influenced their educational decision to pursue Pre-Engineering?
5. As a parent, what challenges do you perceive in the education system? Did you encounter any of these as a student or parent?
6. Given the lack of diverse representation in engineering, what do you perceive might help this situation?