SELF-EFFICACY AND RESILIENCE: LATINAS IN STEM MAJORS

by

Maria L. Ramos, MS

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Maria L. Ramos

APPROVED BY

_____
Timothy Richardson, PhD, Chair

_____
Renée Lastrapes, PhD, Committee Member

_____
Roberta Raymond, PhD, Committee Member

_____
Kathryn Matthew, EdD, Committee Member

RECEIVED/APPROVED BY THE COLLEGE OF EDUCATION:

_____
Terry Lynn Shepherd, EdD, Associate Dean

_____
Joan Pedro, PhD, Dean

Dedication

This dissertation is dedicated to Rick, my husband, champion, and best friend.

Acknowledgments

Many individuals supported me through my doctoral studies. I want to thank my committee, classmates, colleague, study participants, and spouse.

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ABSTRACT

SELF-EFFICACY AND RESILIENCE: LATINAS FEMALES IN STEM MAJORS

Maria L. Ramos
University of Houston-Clear Lake, 2023

Dissertation Chair: Dr. Timothy Richardson

Despite various initiatives to enhance diversity in STEM disciplines, women and minorities remain underrepresented (Gonzalez et al., 2021, Chapter 5). Higher education institutions can help enhance gender and racial equity in STEM disciplines in the U.S. (National Academies of Sciences, Engineering, & Medicine, 2011). This study's purpose was to investigate self-efficacy and resilience based on traditional (25 and less) and non-traditional (26 and higher) age ranges and ancestral regions. In this mixed-methods study, 36 STEM major Latinas from a mid-sized comprehensive university in South Texas answered a survey, and ten Latina STEM-major students participated in semi-structured individual interviews. The Generalized Self-Efficacy and Connor-Davidson Resilience Scales were administered to participants. According to the findings of this study, there is a statistically significant relationship between self-efficacy and resilience based on age range. However, there was no statistically significant relationship between self-efficacy and resilience and ancestral region.

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CHAPTER I:

INTRODUCTION

Science, Technology, Engineering, and Math (STEM) occupations account for 7% of all jobs in the U.S. (U.S.), but they are critical to U.S.'s inventiveness and competitiveness (Martinez & Christnacht, 2021). Despite the low percentages of jobs this represents in the U.S., businesses anticipate a shortage of skilled STEM applicants by 2030 when the last of the baby boomers reach retirement age (Ennis et al., 2011; Lewis, 2019). Numerous STEM leaders in the U.S are concerned about the shrinking pool of highly skilled candidates (Vespa et al., 2018). Even though the U.S employs STEM labor from other countries, this only accounts for only about 17% of the total STEM workforce (Carnevale et al.). However, Carnevale et al. (2011) argue that as wages in other countries rise, the U.S. may no longer be able to attract foreign talent. The solution appears straightforward increase the number of people studying STEM fields like engineering, computer science, and medicine.

STEM degree completion increased in the U.S. between 2000 and 2017; however, various groups remain underrepresented (National Science Board, National Science Foundation, 2019). The STEM industry in the U.S. may purposefully overlook growing populations as potential educational candidates. Martinez and Christnacht (2021) claim that the proportion of women in STEM occupations has increased from 8% in 1970 to 27% in 2019, yet men continue to dominate the STEM field, accounting for 73% of the STEM labor force. A closer examination of the U.S. population reveals viable yet underrepresented groups for STEM majors. According to Rincon et al. (2020), the U.S. estimates that the Latina/o population will account for more than half the labor force. Even though the Latina/o population is growing and a viable source of STEM major candidates, Kennedy et al. (2021) argue that Latinas are disproportionately

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underrepresented in STEM majors and the STEM labor market in the U.S. Therefore, scholars should investigate the characteristics and barriers individuals of Latin American descent face when pursuing STEM majors.

This study focused on individuals of Latin American and Spanish heritage who identify as a woman. Latin American pan-ethnic identities include Chicano, Chicana, Latino, Latina, Latinx, Hispanic, Mexican American, Cuban American, and Spanish American. These terms have continuously evolved since the 1970s to describe people from Latin America and Spain (Noe-Bustamante et al., 2020). Salinas (2020) claims that the use of the word Latinx is gaining momentum with scholars and activists when referring to persons of Latin American origin. However, a large percentage of Latina/o adults, 76%, is not familiar with the term Latinx (Noe-Bustamante et al., 2020). While there are various reasons for the "x" in Latinx, this study's main reason was to acknowledge diverse gender identities (Logue, 2015; Milian, 2017) and to use the term, "Latinas", to refer to individuals of Latin American descent who identify as women. The study uses Latinas and Latina/o to describe individuals of Latin American ancestry in general.

Latina/o individuals are one of the fastest-growing ethnic groups in the U.S., accounting for 16% of the population (Ennis et al., 2011). According to the U.S. Census housing data, the Latina/o population grew at a 43% higher rate than the overall population, which grew at a rate of 10%. According to the 2020 Census, 62.1 million Latina/o people of any race live in the U.S. Furthermore, by 2050, the Latina population is predicted to increase from 16% to 23% (Ennis et al., 2011). However, Latinas account for 18% of impoverished U.S. citizens (Ennis et al., 2011). Moreover, Latina household incomes, on average, do not reflect the country's wealth. Their median household income is $51,450, lower than the $63,179 national average (Semega & Kollar, 2018). According

to Sandler & Szembrot (2020), working women with a newborn experience a temporary but large salary decreases during the first months of having their first infant. Since the average Latina is already below the poverty line, the additional income decrease is magnified. The 2017 American Community Survey (ACS) results indicated that educated women were more likely to be employed after giving birth. The survey results demonstrated that, of women who held four-year degrees and gave birth to their babies during the prior 12 months, 60.9% were employed, 8.2% were on leave, 2.3% were not working, and 28.6% were not actively in the workforce (Knop, 2021).

Although the data shows that Latinas are completing undergraduate STEM degrees (Kennedy et al., 2021), the pace is not in step with their growing numbers (National Center for Education Statistics, 2019; Ennis et al., 2011). There are various reasons for Latinas not entering or staying in STEM majors. Students may encounter multiple barriers to college retention and persistence, including negative classroom experiences, social background, negative stereotypes (Sithole et al., 2017), and lack of financial aid and college prep course awareness (Reyes et al., 2012). Academic scholars assert that student resiliency (Banks & Dohy, 2019) and self-efficacy (Tinto, 2017) help students overcome barriers and challenges such as racism, a sense of belonging, and academic difficulties. This chapter discusses the research problem, the study's significance, the research purpose and questions, and the definitions of key terms.

The Research Problem

Latina students completed more than 41,000 STEM degrees in 2014, while their white counter parts completed 177,806 STEM degrees (NSCRC, 2017). White and Asian students graduate at a higher rate than Latinx students (NSCRC, 2017). Although Latinas graduated at a higher rate than male students, Latina students predominantly chose non-STEM fields (IPEDS, 2016). According to the National Science Foundation (2017),

Latinas were more than three times less likely to complete a STEM degree than white women. As a result, minority women in STEM remain underrepresented (Oakes, 1990; IPEDS, 2016; National Center for Education Statistics, 2019). While the number of Latinas completing STEM-related degrees is increasing (Completing College, 2017), this study attempts to understand why some Latinas seek and remain in STEM majors while others do not, despite increased access to higher education.

Minority students confront various retention obstacles, including negative classroom experiences, socioeconomic disadvantage, and negative perceptions (Sithole et al., 2017). Additionally, educational perspectives on Latinxs' academic journeys are ideologically hostile (Zambrana & Hurtado, 2015). Utilizing students' ethnic and cultural features to explain academic failures is a narrow emphasis that overlooks the complexity of particular groups' needs and the inequities encountered by minority groups such as Latinx students (Zambrana & Hurtado, 2015). Zambrana and Hurtado (2015) argue that too much focus is placed on achievement gaps when the focus should be on educational inequality. Hurtado (2015) contends that inequities continue to harm minority student enrollment levels in higher education. Access to higher education has evolved significantly since the creation of the first university, Harvard College (Rudolph & Thelin, 2011), in 1636 especially with the GI Bill following World War II that made higher education accessible to service members returning from war. However, students of color today continue to face significant obstacles they must overcome.

Student resiliency and self-efficacy are essential to student retention (Banks & Dohy, 2019; Tinto, 2017). Tinto (2017) argues that students' self-efficacy to overcome challenges and endure is critical for the persistence in higher education. Additionally, evaluating students' needs and providing them with academic support and other transitional services are crucial to their success throughout their critical first two years

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(Tinto, 2017). Students must complete their first two years successfully to increase the probability of degree completion. Colleges and universities should provide timely assistance to students to help keep them motivated and confident (Tinto, 2017). Additionally, higher education institutions should consider programming to encourage students to take chances and develop their self-efficacy (Tinto, 2017).

Banks and Dohy (2019) contend that the growing minority groups must enroll and graduate from colleges and universities with marketable skills to maintain economic equity and for the economic and social health of the U.S. (Cerezo, 2013). Obtaining higher education credentials positively affects an individual financially and intellectually throughout their life (Mayhem et al., 2016). Therefore, scholars contend that academic support is critical, but students also need additional positive support such as mentoring (Banks & Dohy, 2019). The research concerning Latinas is limited since the focus is on low-income families (Zambrana & Hurtado, 2015) and ethnicity. Because Latinas remain underrepresented in STEM majors and the STEM workforce, this study examined the relationship between resiliency and self-efficacy in Latinas in STEM majors. The researcher examined students' perceptions of their higher education experience as well as usage of organizations and resources.

Significance of the Study

This study benefits the U.S. and the Latinx population who identify as a woman. Although STEM occupations account for only 7% of all jobs in the U.S., these are vital positions in engineering, medicine, and other technical jobs (Martinez & Christnacht, 2021). Americans with some education have a better quality of life (Why Education Matters, 2015), while those in STEM fields have additional financial resources (Occupational Outlook Handbook, n.d.), leading to less dependency on social services. The Virginia Commonwealth University Center on Society and Health examines data on

the relationship between education and health and its long-term impact. The Center determined a connection between education and healthier individuals due to various opportunities such as for more nourishing foods, medical access, and safer neighborhoods (Why Education Matters, 2015). Research from the 1960s claims that educated Americans practiced better eating and exercise habits (Why Education Matters, 2025).

Additionally, the study's findings may benefit institutions of higher education and industry seeking to recruit and retain skilled individuals both in STEM fields and in STEM education (Diekman & Benson-Greenwald, 2018). With the need and demand for graduates in the STEM fields, there is a need for colleges and universities to ensure they are recruiting and retaining students in STEM fields. Higher education institutions with low graduation rates may benefit from the study's results by creating programs to address and develop students' self-efficacy and resilience. College and university administrators can use the findings to guide funding to support mentoring programs and hire supportive faculty and staff. Students will also benefit when their colleges and universities are better prepared to guide them through challenging obstacles or times of self-doubt. The study may help discover other critical areas of student engagement and support and develop persistence programming.

As U.S. demographics become more diverse, the U.S. population must have marketable skills (Kerr et al., 2015). To build economic strength locally and globally, individuals need an education. According to Payscale's College Salary Report: Updated for 2021, the highest-paying fields are STEM, Petroleum Engineering, Electrical Engineering, and Computer Science (Payscale, 2021). Ennis et al. (2011) stress that as the Latinx population increases, the U.S. will benefit from having an educated workforce ready to address today's science and technology needs. An educated workforce also

consists of contributing members of our society who will rely less on government services.

Research Purpose and Questions

The purpose of the study was to examine whether a difference exists in self-efficacy and resilience for Latinas in STEM majors based on age range and self-identified ancestral origin and to determine if a statistically significant relationship exists between self-efficacy and resilience. The study examined the following quantitative and qualitative questions:

Quantitative questions:

1. Is there a difference in self-efficacy for Latinas in STEM majors based on age range?

2. Is there a difference in resilience for Latinas in STEM majors based on age range?

3. Is there a difference in self-efficacy for Latinas in STEM majors based on self-identified ancestral origin?

4. Is there a difference in resilience for Latinas in STEM majors based on self-identified ancestral origin?

5. Is there a statistically significant relationship between self-efficacy and resilience?

Qualitative questions:

6. What are Latina STEM-major students' perceptions of their college experience?

7. What are Latina STEM-major students' perceptions of campus resources and organizations?

Definition of Key Terms

The following key terms were defined and used in the study:

First-generation college student: A student whose mother or father did not earn bachelor's degrees (Stuber, 2010).

Freshmen-to-sophomore retention rate: A first-time-in-college student enrolled full-time fall-to-fall (Student success, retention, and graduation: Definitions, 2008).

Latinas: A term that refers to person of Latin American ancestry who identify as women (Alexander, 2022).

Latinx: A term that refers to persons of Latin American ancestry (Salinas, 2020) and acknowledges various gender identities (Logue, 2015; Milian, 2017).

Non-traditional: Defined in reference to a student who is 26 years of age or older (Cantwell et al., 2001; Chung et al., 2017; Martin et al., 2013).

Persistence: Defined as a college student continuously enrolling until degree completion (Hagedorn, 2012).

Pell Grant: Defined as federal monies for low in-come students that assist in paying for higher education (Unidos US, 2019).

Retention: Defined by a given time frame (Hagedorn, 2012) in which a student is continuously enrolled from year one to year two (Bean, 1980; Burke, 2019; Spady, 1970).

Resiliency: Defined as the ability to bounce back from adversity (Flinchbaugh et al., 2015).

Self-efficacy: Defined as a person's conviction of their potential to succeed (Bandura, 1997).

Traditional: Defined in reference to a student's age which is between 17 years of age and 25 years of age (Cantwell et al., 2001; Chung et al., 2017; Martin et al., 2013).

Conclusion

Student persistence impacts the institution of higher education and the student's finances (Burke, 2019). Hispanic female household incomes do not represent the wealth of the country. Their median household income is $51,450, below the national average of

$63,179 (Income & Poverty, 2018). As demographics shift in the U.S., colleges, and universities, admit a more diverse student population, including first-generation students of color, students from different countries, and students with various academic, social, and equity gaps (Banks & Dohy, 2019). The 2020 census indicated that Texas' second-largest ethnic group, Hispanic or Latina/o, represented 39.3% of the state's population (Jensen et al., 2021). Therefore, the researcher considered studying Latina students' self-efficacy and resilience when pursing science, technology, engineering, and math (STEM) degrees essential. The study surveyed and interviewed students from a midsize comprehensive four-year public university in South Texas. Chapter two explored concepts from chapter one and reviewed the existing literature on Latinas students in higher education, college demographics, and factors influencing university enrollment. The literature review covered retention and persistence theories, engagement, equity, and inclusion in higher education. In addition, the literature reviewed included barriers to retention and completion of academic credentials, as well as a sense of belonging in colleges. Furthermore, the literature on student self-efficacy and resilience in higher education and high-impact practices was reviewed.

CHAPTER II:

LITERATURE REVIEW

Citizen education has been a priority to the United States (U.S.) since the nation's first university was established in 1636. (Klassen, 1962). The U.S. government anticipated the need to invest in education. Therefore, the Morrill Act of 1862, widely regarded as initiating financial assistance for higher education, was established to provide states with public land on which to build colleges (Marcus, 2015). These colleges emphasized agricultural and mechanic arts studies (Milestone documents: Morrill Act 1862, 2022). In the nineteenth century, mechanics arts referred to engineering and other technological fields (Academic Dictionaries & Encyclopedias, 2010). However, the targeted U.S. population to educate did not necessarily include women (Klassen, 1962) or people of color (Connors, 2022; Milestone documents: Morrill Act 1862, 2022). Even as the country's demographics have become more diverse and access to higher education has increased, the U.S. continues to struggle with a lack of women of color in particular STEM disciplines (Kennedy et al., 2021; Fayer, 2017). While biology is seeing more female representation, there continue to be fewer females in engineering and computer science (Heilbronner, 2013). Moreover, despite the rapid population growth of women of Latina descent in the U.S., they remain underrepresented in STEM fields (Kennedy et al., 2021; Fayer, 2017).

As discussed in Chapter One, the U.S. STEM field anticipates a skilled STEM labor force scarcity by 2030, when the last individuals born between 1946 and 1964 reach retirement age (Ennis et al., 2011; Lewis, 2019; Vespa et al., 2018). In addition, the National Science Board's Science and Engineering Indicators report (2018) underlined that the U.S.'s overall STEM skills were not on the level of those of other countries. Furthermore, the report stated that the U.S. only produced 10% of the world's STEM

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degrees, while India and China have produced 25% and 22%, respectively (Fayer, 2017). However, the demand for skilled STEM workers in the U.S. has grown (Fayer, 2017). Because STEM-educated persons earn higher salaries regardless of whether they work in STEM or non-STEM occupations (Fayer, 2017), a STEM-educated workforce would benefit the country and the growing Latina population. Even with the ever-increasing population of Latinas as possible STEM recruits, they continue to be underrepresented in STEM fields (Kennedy et al., 2021; Fayer, 2017). As a result, we need to understand the reasons for the slow progress in Latina representation in STEM fields and majors. Additionally, motivational factors such as family and environment influencing interest in STEM need to be explored (Dabney et al., 2013; Maltese et al., 2014).

This chapter summarizes the current research on the Latina population in higher education, including their demographics, profile, and predictors of college enrollment, such as student, family, and high school characteristics. It was also necessary to conduct a literature review on classical and contemporary retention and persistence theories, barriers for Latinas in STEM, and Latina engagement, equity, and inclusion. In addition, research on students' self-efficacy and resiliency in higher education and high-impact practices for Latinas in STEM was examined. Also included in the literature review was a section on high-impact practices. Finally, the theoretical framework was provided. The body of literature served as the basis for the investigation conducted by the researcher.

Latina Students in Higher Education

Researchers agree that Latina enrollment in postsecondary education has increased (Hurtado, 2015). From 2000 to 2016, the Latina/o college student participation population grew from 22% to 39% and in 2016 there were more women than men across all racial/ethnic groups (de Brey et al., 2019). As a result of the diversification of the student population in the U.S., an increase in studies examining Latina students'

experiences in higher education and in STEM programs is evident (Blackburn, 2017), and research concerning their obstacles and support systems are vital (Kouyoumdjian et al., 2017). However, Gonzalez et al. (2020) stressed that Latinas were underrepresented in the literature concerning their retention and degree completion related to their cultural identity. The literature reviewed examined the Latina students in higher education, their demographics, profile, and enrollment predictors.

Demographics of Latina/o College Students in Higher Education

Latina/o student demographics were summarized below based on an analysis of the U.S. Department of Education, the National Center for Education Statistics, and the 2015 – 2016 National Postsecondary Student Aid Study (Excelencia in Education, 2019). Students identified with the following ancestries: 50% of Mexican descent, 26% of other Hispanic descent, 12% of Puerto Rican descent, 8% of mixed Hispanic descent, and 4% of Cuban descent (Latinos in Higher Education, 2019). According to the Excelencia in Education 2019 analysis, Latino/a students identified as U.S. citizens (89%) or U.S. residents (9%), with the remainder being international – moreover, 84% of Latino/a students identified as second or third generation immigrants. Of the second-generation immigrants, 47% reported that one or both of their parents were born outside the U.S., and 37% of third generation students reported that both parents were born in the U.S.. The remaining 16% of students were first generation immigrants. These percentages aligned with two immigration studies. In a 1987 study of the Latino community, Pascal and Woodrow found that individuals from Mexico had the highest rate of immigration to the U.S.. Another study examined migratory patterns and country of origin (Donato, 1999). Their research centered on how gender and various factors influenced Mexico-US migration (Donato, 1999). The results indicated a fast-growing number of men and

women in their forties from west central Mexico immigrating to the U.S. during the 1990s (Donato, 1999).

The gender distribution of college students was consistent with previous findings. The literature found that more than 50% of Latinx college students identified as women (Latinos in Higher Education, 2019; Nunez & Kim, 2012). Nonetheless, the existing literature indicates that Latina and Latino ratio disparities are due to various factors. Saenz and Ponjuan (2009) claimed that fewer Latino men than Latinas applied to postsecondary institutions. In addition, the researchers found that Latino men were more likely to drop out of high school to seek employment or leave college before earning a degree (Solorzano et al., 2005). Zarate & Gallimore's (2005) longitudinal study used data from 15 years of randomly selected data which observed Mexican American girls' and boys' college planning process. They found that girls visited their counselors more than boys (Zarate & Gallimore, 2005). Moreover, the researchers found that girls were more comfortable interacting with school counselors and sought specialized college assistance (Zarate & Gallimore, 2005). According to Santos & Esqueda's (2015) study, another factor that may contribute to a larger percentage of Latinas versus Latinos may be military service. According to their research, 75% of their male participants identified as serving in the military or as veterans, compared to 25% of their women participants (Santos & Esqueda, 2015).

Profile Latina College Students

Latin American students differ from other ethnic groups in their choice of academic program, type of higher education institution, and number of credit hours enrolled per semester. Latin American and African Americans, students choose STEM majors at a lower rate than Asians and white (Latinos in Higher Education, 2019). Baker & Orona (2020) examined gender and racial differences in academic program awareness

and consideration. They discovered that Asian students were more informed about various academic programs that Latino/a students. Female students were less knowledgeable about academic programs than male students, although the differences were not statistically significant (Baker & Orona, 2020). Furthermore, the study found that Latina/o students consider more academic programs than white students but fewer options than Asian students (Baker & Orona, 2020). Female students, on the other hand, consider fewer academic programs than male students (Baker & Orona, 2020). The study by Mejia-Smith and Gushue (2017) examined Latina student's perceptions of job barriers and self-efficacy via the lenses of ethnic identity and acculturation. Their findings revealed that Latinas with a favorable self-image saw fewer barriers to career opportunities. Furthermore, the study found that Latina/os, with higher acculturation levels to an Anglo culture, maintained strong beliefs regarding professional choices (Mejia-Smith & Gushue, 2017). However, in a previous study, Latina/os with an Anglo perspective favored careers dominated by women (Rivera et al., 2007).

Students of Latin American descent attend various types of colleges and universities, with 41% attending public community college, 28% attending public universities, 11% attending private for-profit universities, and 10% attending private non-profit universities (Latinos in Higher Education, 2019). Additionally, Ma & Baum's (2015) analysis of trends in community colleges found greater number of minorities and first-generation college students begin their academic career at 2 year colleges. Latina/os students account for 38% of community college students in Texas (Ma & Baum, 2015). According to the research, several factors can influence the choice of institution type for Latinas. Malcom (2010) found Latinas' pathway to a STEM bachelor's degrees was through the community college system. Moreover, the students' average age was 25 years or they were first-generation college students (Malcom, 2010). The second factor that

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may impact institution type is parents. In a qualitative study, the researchers explored the experiences of nine Latina parents from the Rio Grande Valley as they attempted to assist their children through the higher education process (Chlup et al., 2016). Despite the parents' willingness to learn more about preparing their children for higher education, the data revealed that Mexican-educated parents were unfamiliar with the American educational system (Chlup et al., 2016). In addition, due to some language barriers and new terminology, parents felt uncomfortable asking questions and interacting with school administrators and teachers (Chlup et al., 2016). Furthermore, parents reported that university recruitment teams were unfriendly and steered students with questions to brochures or websites (Chlup et al., 2016).

Most Latin American students enrolled in courses part-time or a combination of full-time and part-time during their academic careers. Although 40% of Latin American students were enrolled full-time, 60% were enrolled part-time, of which 36% enrolled part-time only, and 24% enrolled in a combination of full-time and part-time (Latinos in Higher Education, 2019). The research indicates that Latina students have personal responsibilities and other variables, such as working, type of institution attended, cost, and funding, that may impact their transition into higher education. As indicated by Ma & Baum (2015), there was an overrepresentation of Latino/a students in community college who typically worked fulltime and enrolled part-time in school. Attewell et al. (2016) examined the effect of enrolling in 12 and 15 college credits. Overall, they discovered a positive effect for students enrolled in 15 college credits at a community college or university, as well as a high likelihood of degree completion (Attewell et al., 2016). Additionally, they found that taking fewer credits was academically unfavorable (Attewell et al., 2016). However, the researchers conducted an analysis of subgroups of students, Black, Latino, white, and found no benefits to enrolling in 15 credits for

students with heavy work schedules (Attewell et al., 2016). Sy (2006) investigated the impact of family responsibilities and part-time work on Latinas transitioning to higher education. They found that student's obligation to translate for their family indicated higher level of stress, but work-school conflict was not significant (Sy, 2006).

Latina Student Predictors to Enroll at a University

The literature identified various factors and a decision-making model that may influence Latina student's enrollment at a university. Nunez & Kim (2012) and Perna (2006) studies examined predictors for Latinas' enrollment in a university, which used a multi-layered approach to provide a more comprehensive understanding of predictors of university attendance that tracked students after high school graduation. Additionally, one possible decision-making strategy involves a model with a cultural characteristic viewpoint. Hossler and Gallagher's (1987) three-stage college-going decision-making model was considered as an option with Alvarez (2010) cultural perspective.

The researchers investigated the effects of three variables student characteristics, high school characteristics, and state's characteristics on Latina students' enrollment in a university within two years of graduating from high school (Nunez & Kim, 2012). Student characteristics may include demographics, family influences, finances, academic preparation, educational goals and expectations, and social capital (Perna & Thomas, 2008; Nunez & Kim, 2012). High school characteristics include curricula and teacher education (Nunez & Kim, 2012; Oakes et al., 2006), and socioeconomic statuses, such as the number of students on free or reduced lunch (Engberg & Wolniak, 2010; Nunez & Kim, 2012; Konstantopoulos, 2006). State's characteristics include the state's history and economic conditions, such as poverty and unemployment rates (McLendon & Hearn, 2007; Perna & Titus, 2004; Kim & Rury, 2007; Nunez & Kim, 2012).

Student Characteristics

Based on students' characteristics, the following results were found. Latinas were three time more likely than Latinos to enroll at 4-year institutions of higher education (Nunez & Kim, 2012). Also, the study found that students from Central and South America were more likely than students of Mexican descent to enroll at a university (Nunez & Kim, 2012). The students' financial variable had a complex relationship with enrollment prediction. Nunez and Kim (2012) discovered that students from families with incomes ranging from $25,000 to $75,000 were less likely to enroll in a university than those with incomes greater than $75,000 (Nunez & Kim, 2012). On the other hand, students from the lowest-income families did not show a significant difference in attending university compared to students from the highest-income families (Nunez & Kim, 2012). Furthermore, the study found that students concerned about funding their education were still 20% more likely to enroll in a university (Nunez & Kim, 2012). According to Zarate and Pachon's (2006) survey of California Latina/o students' financial aid perceptions, 98% believe higher education is necessary, while 38% believe higher education was not cost-effective. Although survey respondents reported a general lack of financial aid knowledge, students of Latin descent applied for financial aid in greater numbers than other groups (Zarate & Pachon, 2006). In their study of the overrepresentation of Latinx students in community colleges, O'Connor et al. (2010) discovered that Latinx students' parents were less likely to have a college fund for their children than White parents.

Family Influence of Latina College Students

The family influence extends beyond financial considerations regarding Latinx students enrolling in four-year colleges and universities. Nunez and Kim (2012) asserted that their study revealed a link between Latinx student enrollment at four-year institutions

and parents' college career expectations for their children. Furthermore, the researchers discovered a more significant impact on enrollment for students whose parents were heavily involved in their college planning process (Nunez & Kim, 2012). On the other hand, students' self-expectations of higher education were associated with lower odds of university enrollment (Nunez & Kim, 2012).

It was also important to investigate the research on students' decision-making behavior. Alvarez's (2010) qualitative research data used Hossler and Gallagher's (1987) multi-stage decision process. In the first stage, students explored their options after high school, such as higher education, work, or a combination of the two (Hossler & Gallagher, 1987). Students explored colleges and universities for enrollment in the latter two stages and then chose a college or institution (Hossler & Gallagher, 1987). Nonetheless, Alvarez (2010) suggested that the family played a key part in the decision-making process for Latinas. According to Alvarez's (2010) interview with participants, students depended on informal conversations or commercial television during the exploring phase. For example, when considering a major, one student learned about forensics from television shows such as *CSI: Crime Scene Investigation* (Alvarez, 2010). During the interviews, parents claimed they did not learn about the higher education process through formal sources (Alvarez, 2010). Latinas sought information from older family members and pastors during the search process because they perceived these individuals as experts (Alvarez, 2010). Parents with questions concerning cost, best universities, campus safety, curriculum, and demands placed on their daughters, sought information from people they knew who had gone through the process (Alvarez, 2010). Furthermore, parents stated that they wanted to be a part of the process and understand curriculum and academic demands to motivate their daughters to succeed (Alvarez, 2010). In the final phase, Latina students relied on siblings or friends who were already in

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college to answer questions regarding cost, academic requirements, and job availability (Alvarez, 2010). Parents had the same questions they had during the search period, but they relied on their daughters for answers (Alvarez, 2010). Nonetheless, in order to ensure that their daughters could complete their education, parents frequently inquired about the expected cost of attending their daughters' preferred college (Alvarez, 2010). The researcher emphasized that more research was needed to investigate the complicated selection phase (Alvarez, 2010).

High School Characteristics as Predictors of University Attendance

High school characteristics that included were the effect of curricula, teacher education and salary, and free or reduced lunch, and absenteeism on the predictability of Latina students' enrollment in a university were investigated. Latina students who developed their middle school math skills such as arithmetic, fractions, spatial reasoning, mathematical reasoning, and pre-algebra (Thompson, 2017), were four time more likely to enroll in a university after high school graduation (Nunez & Kim, 2012). In comparison, Latina students who developed their advanced math skills such as algebra, calculus, and statistics are examples of advanced high school math courses (Thompson, 2017), were 45 times more likely to enroll in a university when they developed their math skills (Nunez & Kim, 2012). Interestingly, neither standardized test scores nor the number of high school graduates significantly impacted Latino enrollment in universities. (Nunez & Kim, 2012).

According to Nunez and Kim (2012), Latina enrollment in a four-year university was more likely to occur in states where teachers held master's degrees than in states where teachers did not have a graduate degree. Based on the study, the average teacher salary did not affect Latina students' probability of enrolling in four-year college (Nunez & Kim, 2012). However, high school free or reduced lunch programs and absenteeism

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were negatively associated with students attending a four-year university (Nunez & Kim, 2012).

Similar to Nunez and Kim, (2012), Cuellar (2019) claims that characteristics such as gender, student's birthplace, parents' birthplace, and native language may influence Latina/o students' preferred college or university. Cuellar's (2019) study followed a national sample of first-time college students who enrolled in a postsecondary institution for the first time. Cuellar (2019) found that student characteristics like demographics, family influences and family finances, academic preparation, educational goals and expectations, and social capital (Perna & Thomas, 2008; Nunez & Kim, 2012), and high school characteristics, such as curriculum and teacher education (Nunez & Kim, 2012; Oakes et al., 2006), had a more significant impact on students enrolling in higher education after high school graduation than state characteristics, such as economic conditions, poverty, and unemployment rates (McLendon & Hearn, 2007; Perna & Titus, 2004; Kim & Rury, 2007; Nunez & Kim, 2012).

Retention and Persistence Theories in Higher Education from Classical to Contemporary

When reviewing the literature on retention and persistence, classical and contemporary models were considered. Classical theoretical models, such as, Spady, Tinto's Models and Bean's Attrition Model provided a foundation based on decades of application but they focus on students' departure (Lane, 2016; Padilla, 2009). In comparison, contemporary models like the expertise model of student success (EMSS) (Padilla, 2009), community cultural wealth model (CCW) (Yosso, 2005), and sense of belonging (Strayhorn, 2012) models focus on successful student outcomes to develop strategies for retention and persistence (Lane, 2016; Padilla, 2009). Zambrana & Hurtado

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(2015) stressed that literature and theories address culture as a weakness instead of viewing its strengths that leads to student success.

Classical: Spady's Undergraduate Dropout Process Model

Spady's (1970) retention theory is a sociological model that considers both the student and the institution of higher education. Furthermore, the theory considers how students adjust academically and socially to their new academic environment (Spady, 1970). Students consider academic success, learning for knowledge, the opportunity to make new friends, a sense of belonging, and a connection to the institution when deciding whether to reenroll each semester (Burke, 2019; Spady, 1970). Although students' grades appear to be the most apparent reason for their departure, they often have personal reasons for departing (Spady, 1970). There are various reasons that may influence a student's decision not returning to school, such as cost, academic demands, time management challenges, not being a good fit, and life (College stats.org, n.d.).

Furthermore, the literature stressed that students would drop out if they could not form a social network and feel a sense of commitment to the institution (Spady, 1970). According to Spady (1970), a student's departure was caused by a lack of social connection, a component of Durkheim's theory of departure, in which an individual flees a negative situation. Students are said to return semester after semester because they feel a sense of belonging and pride in the institution. Like Spady's theory, the institutional departure theory examines the social and academic factors influencing a student's decision to return to school. Spady's retention theory and Van Gennep's tribal rite of passage are the departure model's foundation for student persistence (Burke, 2019). In Van Gennep's (1960) tribal rite of passage, individuals must experience and adapt to their new societal position and experiences.

Classical: Tinto's Institutional Departure Model

The institutional departure model is a well-known theory of retention. Tinto's theory has investigated the impact of the academic setting and social environment on student retention in higher education based on four decades of research (Tinto, 2012). According to the institutional departure model, students must undergo a transitional period, such as academic and environmental assimilation (Tinto, 1987). Students struggle to leave the familiar, make new friends, and find their place or sense of belonging in a new setting during their first year of college (Burke, 2019; Tinto, 1987; Tinto, 2012). In addition, students may have difficulty navigating new ideas and values that contradict their prior beliefs and values (Burke, 2019; Tinto, 1987). Therefore, the resulting stress may prevent students from returning to their higher education institution. Academic performance and dedication to credential completion may influence students' decision to return to school (Tinto, 1987). Like Spady's theory, the institutional departure theory examines the social and academic factors influencing a student's decision to return to school.

Classical: Bean's Student Attrition Model

Burke (2019) contends that Bean's theory was based on empirical evidence. The student attrition model differs from Spady and Tinto's theories. Bean (1980) asserted that most theories did not examine causality. As a result, Bean employed an organizational behavior approach to determine why students leave their college or university. According to Bean (1980), the reasons employees quit their jobs were comparable to why students left their educational institutions. Bean (1980) contends various factors as reasons for students leaving, dropping out, or transferring out of their institutions. According to Bean's (1980) research findings, women are more likely to be retained at their current institution if they express contentment and are committed to their college or university.

According to the three models described, student retention is essential for students and institutions (Burke, 2019). The perspectives of these models range from social to empirical in their view of retention (Burke, 2019). However, we must recognize that student retention is complex and lacks a straightforward solution (Burke, 2019); therefore, additional research is required (Hurtado & Carter, 1997). For instance, Hurtado and Carter (1997) noted that, due to its intricacy, the definition of integration into higher education might vary for marginalized students. Additionally, social, and ethnic environmental challenges may make it difficult to grasp students' social integration perspectives (Hurtado & Carter, 1997). Although Spady's and Tinto's theories did not define integration, their work was essential, and a relationship was found between integration and persistence (Hurtado & Carter, 1997).

Contemporary: Retention and Persistence Models for Latina STEM Students
Expertise Model of Student Success (EMSS)

Padilla (2009) expertise model of student success empowers students to problem solve to overcome challenges during their college career and persist to degree completion. The model closely resembles Tinto's theory of social and academic integration (Tinto, 1987). However, Padilla's (2009) model encourages students to problem solve and learn the processes and terminology early in their academic careers to be able to successfully navigate the higher education system. The EMSS model utilizes a qualitative approach to determine students' barriers and successful strategies employed by students (Padilla, 2009).

Yosso's Community Cultural Wealth (CCW) Model

Yosso's community cultural wealth model examines the Latino culture as an asset that advances Latina/os in higher education aspirations (Yosso, 2005). The CCW model acknowledges various tactic employed by students of color (Yosso, 2005) and

"aspirational capital, linguistic capital, familial capital, social capital, navigational capital, resistant capital" as pillars (Kouyoumdjian et al., 2017, p. 63), which provides Latina/os with the tools needed to succeed academically (Kouyoumdjian et al., 2017). Peralta et al. (2013) conducted a mixed-method study to determine Latina/o STEM students' success factors. The study's interviews revealed a Latina student's lack of support. Marcela, whose father had died, and whose mother had her leg amputated, who was persuaded by her counselor to give up a scholarship since she already had one (Peralta et al., 2013). However, the scholarship went to a student who did not need the scholarship financially (Peralta et al., 2013). Marcela was motivated by her mom's bravery to continue with her dream of completing her graduate program (Peralta et al., 2013). Another interview participant shared that her teacher had low academic expectations for her since English was her second language, yet she pressed on and earned her bachelor degree (Peralta et al., 2013). Other students in the study who were academically successful in high school were never advised about attending college and another student was encouraged to join the Job Corps, a vocational program, because college was "not realistic" (Peralta et al., 2013, p.912). Although they did not have supportive educators, they made sure they knew the requirements for admissions to their university and their resistance capital (Peralta et al., 2013).

Sense of Belonging

A sense of belonging occurs in higher education when students feel accepted and supported by classmates, faculty (National Academies of Sciences, Engineering, and Medicine, 2017; Strayhorn, 2012), and the institution (Hurtado & Carter, 1997; Strayhorn, 2012). A sense of belonging or fitting in is a fundamental human need, a behavioral motivator (Strayhorn, 2012), and necessary for good mental health (Cooley et al., 2021; Sims et al., 2020). Furthermore, the literature demonstrated how essential it is

for students to feel a sense of belonging at their college or university so they feel motivated to reenroll each semester (Cooley et al., 2021; Sims et al., 2020; National Academies of Sciences, Engineering, and Medicine, 2017; Olbrecht et al., 2016). However, the sense of belonging for students of color in non-diverse colleges or universities was not strong compared to white students (Hurtado & Carter, 1997; Johnson et al., 2007). The researchers found that Latinx students indicated less sense of belonging than their white classmates (Johnson et al., 2007). Hurtado and Carter (1997) and others focused their research on Latina/o students' sense of belonging on campus because they believe it influences the student's higher education experience. Various studies supported the importance of a sense of belonging for retention. Additionally, practices like collaborative learning may positively impact persistence as well as a student's connection to peers (Loes et al., 2017).

According to the literature, cohort models of students with similar characteristics or interests may foster a sense of community (Burke, 2019). To create an internal support system, some colleges, and universities have formed cohorts in meta-majors such as STEM (Burke, 2019; Sithole et al., 2017). Furthermore, the retention rate of minority students in the cohort models increased yearly (Huerta & Bray, 2013; Sithole et al., 2017). Huerta and Bray (2013) surveyed first-year Learning Community students at Texas A&M University-Corpus Christi (TAMU-CC) in the fall of 2005. In the fall of 2005, the TAMU-CC student population was 8,365, with the two dominant ethnic groups being white (55%) and Latino (38%) (Huerta & Bray, 2013). Students who participated in "classroom integration, active learning, and collaborative learning" reported a positive impact during their first year (Huerta & Bray, 2013, p.12). Furthermore, these students perceived a positive effect on their first-semester GPA (Huerta & Bray, 2013). However,

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Huerta and Bray (2013) indicated that the Latino item on the survey, after pre-college controls, did not demonstrate statistical significance.

Hurtado and Carter (1997) examined how Latino students' characteristics and college perceptions contribute to their sense of belonging in higher education. Their study used Tinto's model of students' departure to test their connection to the sense of belonging (Hurtado & Carter, 1997). The findings indicated that engaging in conversation with classmates outside of class and belonging to campus organizations strongly correlate with students' sense of belonging (Hurtado & Carter, 1997). Likewise, positive first-year experiences benefited the student's sense of belonging, while perceptions of hostile racial tension had a negative impact (Hurtado & Carter, 1997). During the student's second and third college years, the benefits of their sense of belonging were linked with peer-to-peer interactions, such as serving as a tutor and interacting with faculty (Hurtado & Carter, 1997). However, the researchers claim that Latino students' collaboration on a research project with a faculty member or social interaction with a professor were unrelated to Latino students' sense of belonging (Hurtado & Carter, 1997). The existing research supported Hurtado and Carter's findings and demonstrated that peer-to-peer interaction on campus might be essential for student success (Tinto, 1989). However, Hurtado and Carter (1997) found no statistically significant link between students' GPAs and their sense of belonging during their second and third years.

Rodriguez and Blaney's (2021) qualitative study investigated the impact of academic and social experiences of undergraduate Latinx female STEM majors' sense of belonging at a tier-one predominantly white university. The study's findings provided insight into the hostile experiences endured by Latinas in STEM majors. Latinas were acutely aware of gender and racial stereotypes perpetrated by their classmates and, to a

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lesser extent, by their science professors (Rodriguez & Blaney, 2012). These female students did not feel welcome as future STEM professionals or in their STEM departments (Rodriguez & Blaney, 2012). These students stated that the sexism they encountered made them doubt their futures in STEM (Rodriguez & Blaney, 2012). To combat such hostile experiences, colleges and universities must prioritize underrepresented STEM students' transition to higher education and provide support and programming to assist students in adjusting to their new educational environments (Banks & Dohy, 2019: Hurtado & Carter, 1997).

Barriers for Latinas STEM Students

Unfortunately, in the 21st century, students continue to face barriers inside and outside the classroom in higher education (Banks & Dohy, 2018). When students' abilities are judged by their skin color or nationality, this can negatively affect their confidence (Banks & Dohy, 2018). The literature contends that racism blocks students' connection or sense of belonging to the college or university (Banks & Dohy, 2018). The focus was narrowed to familismo and college financing issues as possible barriers for Latinas in STEM.

Familismo: Latinas in STEM

Undergraduate Latina/o STEM students' perception of familismo and the barriers to familismo study has been examined. Lopez et al. (2019) defined familismo as a cultural value among Latina/o students characterized by "reciprocity, trust, and caring (Lopez et al., 2019, p. 85).

The barriers to promoting familismo noted by survey participants included "reinforcing a culture of hyper-competition through pedagogical and assessment techniques, and individualism through large class sizes and professor-student contact" (Lopez et al., 2019, p. 96). Due to a lack of camaraderie and student-faculty connections,

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many described grade curving as a barrier (Lopez et al., 2019). Students stated that grade curving hampered their interest in the subject and their ability to form relationships (Lopez et al., 2019). Furthermore, students' impressions of heavy competition in the classroom and large class sizes did not foster a sense of camaraderie and did not encourage the development of familismo. One Latina described her experience visiting her professor's office for help with MatLab homework, where she was dismissed and made to feel inadequate (Lopez et al., 2019).

Rodriguez (2021) examined Latinas' familismo, and the role of family influence on Latinas' STEM identity. The study revealed three themes. Latina students' STEM identities were shaped by their family's support (Rodriguez, 2021). One of the study's participants shared that she was on medication to handle her stress levels, but her mom provided emotional support (Rodriguez, 2021). Familismo could also be a source of barriers, especially if Latinas were the first in the family to a pursue STEM career (Rodriguez, 2021). Latina STEM students were expected to succeed academically but also to prioritize their commitment to family and non-school obligations (Rodriguez, 2021). Samantha, a study participant who was the first STEM major in her family, shared that her family did not understand her field and simply found her choice of science documentaries weird, which added distance between her and the family (Rodriguez, 2021).

Financing College Education

Education financing in the 21st century is more challenging due to rising tuition, fewer Pell Grant dollars, and a lack of knowledge about financial aid (Bustillo & Collins, n.d., 2016). First-generation college students and their families may be perplexed by the FAFSA's multitude of questions (Unidos US, 2019). According to the Young Invincible report (2017), 17% of undergraduate Latino students did not file a FAFSA application

during the 2011-2012 academic year. These students may have qualified for federal assistance. Kantrowitz's (2009) policy analysis paper claims that 95% of students did not apply for federal financial aid for various reasons. Students stated that they did not complete an application for financial assistance because they did not believe they were eligible, did not want to borrow money, and did not know how to apply (Kantrowitz, 2009). However, the Class of 2022 has contributed to the rise in federal financial aid application submissions (DeBaun, 2022). Notably, Texas witnessed a considerable increase in financial aid submissions because the application for financial assistance was required as part of the high school graduation process for the 2021-2022 school year (DeBaun, 2019; DeBaun, 2022). The concentration of the increase was in high-minority public schools, where more than 40% of students were students of color (DeBaun, 2022).

Latinas Engagement, Equity, and Inclusion

MacAulay (n.d.) emphasized the significance of diversity, equity, and inclusion in light of recent racial and societal divisions in the U.S. Therefore, engagement, equity, and inclusion terms are frequently encountered in higher education. Wilson et al. (2012) examined the mission statements of 80 colleges and universities and found the word "diversity" recurred often. However, "diversity" was merely a buzzword in predominantly white higher education institutions that were found to lack genuine dedication to diversity (Wilson et al., 2010; Harper & Hurtado, 2007). Despite people's general discomfort with the subject, researchers in higher education encourage ongoing data collection, self-reflection, and discussion of inclusion and equity so that diversity will continue to grow in higher education institutions (Harper & Hurtado, 2007).

Student participation and engagement inside and beyond the classroom are critical in determining student success and retention (Kuh,1995). Although research in this area has frequently focused on predominantly white institutions and affluent student

populations, recent studies have revealed the critical role student engagement plays in developing positive racial and gender identities and the success of students from underrepresented groups (Correia et al., 2022; Kuh, 1995). As a result, sustaining a high level of student involvement and addressing food insecurities throughout the coronavirus pandemic may have been especially critical for strengthening the demographics of underrepresented STEM students, such as Latina/os (Correia et al., 2022). In a study conducted Fall 2020 at a large university in the southern U.S. aimed to address food insecurity and the stressors of contracting the virus, revealed Latinas were more concerned with the pandemic than white students or male students (Correia et al., 2022). The researchers' findings supported the need to have various students and stakeholders at the table to ensure an inclusive decision making process.

The literature also introduced the following topics student engagement inside and outside of the classroom, how Florida, Texas, and Washington handle access and equity of minority students, diverse settings and educational outcomes in higher education, and the perceptions of minority females enrolled in engineering programs. Cuellar and Gandara's (2021) case study examined the extent to which community college baccalaureate programs in Florida, Texas, and Washington handle access and equity for minority students. The study examined administrators' perspectives in terms of increasing equity for students. Additionally, the research examined how the programs include policies and practices that promote minority students' access and success. According to the researchers, administrators focused limited attention on access for minority students (Cuellar & Gandara, 2021). The primary focus was on the number of minorities interested in participating in the program (Cuellar & Gandara, 2021). Furthermore, all three state administrators focused on meeting local workforce needs rather than on equity and inclusion of minority students (Cuellar & Gandara, 2021).

Texas focused on low-income students due to rising university tuition, and Florida's goal was to promote upward mobility for all students (Cuellar & Gandara, 2021). Finally, Cuellar and Gandara (2021) indicated that Washington state mentioned access and equity plans for admission for students of color, but the focus was on gaining skills for the workforce. For example, the college consider reviewing their nursing program to was expand admissions criteria to not only include GPA but to consider experience and use a lottery type system for admissions (Cuellar & Gandara, 2021).

Gurin et al. (2002) sought to determine whether a relationship existed between students' experiences in a diverse setting and educational outcomes in higher education. The researchers attempted to demonstrate why diversity is critical for developing one's identity. Additionally, Gurin et al. (2002) investigated the effects of classroom diversity and informal interactions between minority and white students on educational outcomes. Their findings highlighted the academic and civic benefits of informal interaction between diverse racial and ethnic groups during college. The researchers discovered that classroom instruction on race and ethnicity and interaction with peers from varied racial and ethnic origins positively influenced students' active thinking and intellectual engagement (Gurin et al., 2002).

Banda and Flowers' (2017) qualitative study of minority females enrolled in engineering programs identified several emerging themes, including "meeting academic and social needs, seeking a sense of belonging, and refusing to coalesce based on race" (p.364). The findings confirmed that race-specific campus organizations provided a safe space for students of similar backgrounds to study, socialize, and form support networks (Band & Flowers, 2017). While participating in a campus organization is a positive experience, several participants indicated that their non-racial or non-gender-specific organization was unwelcoming, with members grouping in silos (Band & Flowers, 2017).

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However, students not born in the U.S. or those who are more acculturated did not see the need to join race organizations or felt uncomfortable in race-oriented organizations, according to the findings (Band & Flowers, 2017). Although students in the study initially chose race-based organizations, they ultimately chose academic-specific organizations (Band & Flowers, 2017). Recognizing these distinctions reinforces the concept that the Latina/o community varied by nature and that the designation of "Hispanic or Latin" does not automatically suggest friendships with people of the same ancestral background (Band & Flowers, 2017). These findings demonstrate the complexities of ethnic groups and the importance of additional research on Latin cultural differences and values based on heritage and country of origin.

Self-Efficacy and Resilience

Cognitive theorists study self-esteem, self-concept, outcome expectations, and locus of control (van Dinther et al., 2011). However, these concepts are sometimes confused with self-efficacy and resilience, which are distinctly different. Self-esteem, for example, is a belief in one's self-worth, while self-efficacy (SE) is intellectual beliefs about the human potential (Bandura, 1997). Resilience (RE) is the determination to survive and do well in spite of difficulties, trauma, and other roadblocks that negatively impact personal, professional, and academic experiences (Building your resilience, 2012; Lightsey, 2006). The terms "self-efficacy and resilience" come from sociological and psychological theoretical frameworks, which may help provide a foundation for persistence and retention (Tinto, 2017). The literature suggests a relationship between self-efficacy and resilience (Chemers et al., 2001; Keye et al., 2013; Lightsey, 2006; Schwarzer & Warner, 2013). A substantial body of literature on self-efficacy and resilience is briefly introduced in this chapter to provide a foundation for understanding students' experiences and persistence in higher education. The following section will

review self-efficacy and resilience in general then review the literature of SE of minorities/Latinas, SE of first-generation college students and RE of minorities/Latinas, and RE based on college students' age.

Self-Efficacy

According to Bandura's work (1997), perceived self-efficacy focuses on what students believe they can accomplish based on current skills in various situations. Decades-long attempts have been made to predict human behavior using Bandura's social learning theory (Gore, 2006). Individuals facing challenges may choose tasks and determine how long to pursue them based on their level of self-efficacy (Bandura, 1977; Gore, 2006). Individuals with a strong sense of self-efficacy are more likely to tackle a task aggressively, while the opposite effect is true of those with a weaker sense of self-efficacy (Tinto, 2017). While self-efficacy is essential for student success in higher education during students' first year (Tinto, 2017), the more significant impact is on students who maintain and continuously develop their belief in the ability to complete their academic goals (Gore, 2006). Students who enter their first year in college with a strong sense of self-efficacy may encounter obstacles that weaken their self-efficacy (Tinto, 2017). Additionally, the literature indicates that students who enter with low self-efficacy tend to have higher self-efficacy by graduation (MacPhee, 2013).

Therefore, self-efficacy is not a static attribute but can ebb and flow based on various social influences and experiences (Bandura, 1997: Tinto, 2017) and age (Baush, 2014). Additionally, Tinto (2017) also agrees that self-efficacy is not something people were born with but an attribute that can be learned. However, one's self-efficacy may not apply to all challenges or scenarios (Artistico et al., 2003; Tinto, 2017) and may not influence the student's GPA (Gore, 2006). Baush's (2014) study about training found that older women demonstrated higher self-efficacy than men. Another study also examined

traditional and non-traditional age students and found that levels of self-efficacy were based on the unique situation or challenge (Artistico et al., 2003).

Gore's (2006) study on academic self-efficacy as a predictor of college outcomes administrated the College Self-Efficacy (CSEI), and Academic Self-Confidence (ASC) scales to 629 (335 males and 294 females) first-year college students in a first-year seminar course at a large public university. The demographics of the participants were predominantly white (78%), African American (13%), Latino (3%), and Asian American (2%). Their average age was 18. The 20-question CSEI scale, which measured students' perceived ability to perform well in their college-level assignments or tasks, was administered during the first two weeks of the fall semester (Gore, 2006). The descriptive statistics and correlations indicated a moderate relationship between ASC and CSEI scores (Gore, 2006). Although ASC and CSEI were significant, they were not a predictor of the student's GPA. Gore (2006) noted a correlation between end-of-semester CSEI scores and students' GPAs. However, students' ACT composite scores demonstrated a predictor of students' GPAs during the first year and a half (Gore, 2006). There may be an association between persisting through the first year and the development of students' self-efficacy.

Researchers were interested in examining factors affecting students' self-efficacy in higher education (van Dinther et al., 2011). The researchers argued that a student's self-efficacy was critical to academic performance (van Dinther et al., 2011). Furthermore, van Dinther et al. (2010) contended that high self-efficacy boosts students' motivation, influencing their learning process. The researchers chose 39 studies from 1995 to 2010 that included research in the following settings: the medical domain (three studies), psychology/counseling domain (seven studies), educational/educational psychology domain (two studies), teacher education domain (14 studies),

business/business administration/business policy domain (three studies), health and computing domain (one study), social work/social sciences domain (two studies), physical education/sport sciences domain (two studies), and postgraduate research students (several disciplines, one study), as well as students recruited from all or a number of universities (several disciplines, four studies)"(van Dinther et al., 2011, p. 99). During the last decade, student self-efficacy has appeared as a subject in education studies as researchers attempt to understand what influences self-efficacy (van Dinther et al., 2011). One recurring theme in the research was that students' self-efficacy is not static (MacPhee et al., 2013). Furthermore, various college programming efforts based on social cognitive theory may help develop students' self-efficacy (MacPhee et al., 2013).

Self-Efficacy of Minorities/Latinas

In a longitudinal study, MacPhee et al. (2013) investigated the academic self-efficacy and performance of underrepresented STEM majors. The study focused on female and male STEM undergraduates with low socioeconomic status (MacPhee et al., 2013). They assessed the influence of the student's college experiences at the point of college admission and at graduation (MacPhee et al., 2013). The researchers were multidimensional in their viewpoint and examined intersections of student characteristics, including underrepresentation, gender, ethnicity, socioeconomic status, and participation in a mentoring program to achieve their study's goal (MacPhee et al., 2013). This study aimed to identify patterns of academic self-efficacy in a diverse group of socially disadvantaged but academically prepared female and male STEM students (MacPhee et al., 2013). Previous research has indicated that males appear more academically confident than females (Friedman, 1989). At the first administration of the assessment, females' perceptions of academic self-efficacy were lower than that of the male students (MacPhee et al., 2013). However, by the end of the mentoring program, females' academic self-

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efficacy was close to the male students' scores (MacPhee et al., 2013). According to the researchers, students who faced multiple barriers, such as gender, ethnicity, and socioeconomic status, greatly benefited from the mentoring program pertaining to critical analysis and self-perceived creativity (MacPhee et al., 2013).

Self-Efficacy of First-Generation College Students

In a study of first-generation college sophomores at five California State University campuses, the effects of self-efficacy on academic outcomes was investigated (Vuong et al., 2010). Researchers compared first and beyond-generation college students to learn more about the impact of gender and ethnicity on self-efficacy, as well as the effects of college size on academic success (Vuong et al., 2010). Coursework, roommate, and social aspects were the independent variables, while GPA from the previous term and cumulative GPA were the dependent variables (Vuong et al., 2010). Students' self-efficacy in coursework was a predictor of the dependent variables, semester GPA, and overall GPA (Vuong et al., 2010). However, there was no correlation between the self-efficacy of a roommate and the social aspect on GPA and overall GPA outcomes (Vuong et al., 2010). While the self-efficacy perceptions of all college sophomores were similar, the self-efficacy of first-generation college students may significantly impact their academic success (GPA and persistence rates) (Vuong et al., 2010). However, the researchers emphasized that additional research was necessary (Vuong et al., 2010).

Resilience

Drs. Kathryn M. Connor and Jonathan R.T. Davidson, the creators of the Connor-Davidson Resilience Scale, became interested in resilience from treating and researching women and men with posttraumatic stress disorder (PTSD) (Connor & Davidson, 2021; Connor & Davidson, 2003). Resilience, defined as a psychological term, is a characteristic that enables some people to bounce back from stressful events and not

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allow those events to deter the individual from their present course (Lightsey, 2006; Masten et al., 1991; Psychology Today Staff, n.d.). While stressful events have always existed for college students (Morrow, 2009), the pandemic added further stressors to students' lives (Blanco et al., 2022; Enriquez et al., 2022; Fruehwrith et al., 2021). Students of various backgrounds, ages, and experiences responded and adapted to stressors differently, as indicated by the literature.

Resilience Based on Age

Chung et al. (2017) compared the levels of resilience of traditional and non-traditional-age students. The researcher administered the Connor-Davidson Resilience Scale (CD-RISC 10) survey to 442 undergraduates (316 females and 126 males) at a public university (Chung et al., 2017). Within the survey, participants could self-identify as either traditional or non-traditional. In addition, the participants were asked to identify factors such as "age, cultural background, geographical background, household income, role as a parent, role as an employee, mode of study, university entry pathway, or other reasons." (Chung et al., 2017, p.80). The survey results indicated age as the most prevalent reason (58%, n=66) for identifying as non-traditional (Chung et al., 2017). In addition, students cited cultural background (43.4%, n=50), admission pathway (42.5%, n=48), geographical origin (30.1%, n=34), employment (25.7%, n=29), household income (20.4%, n=23), parenthood (18.2%, n=21), and mode of study (14.2%, n=16) as reasons for self-identification as non-traditional (Chung et al., 2017). The findings supported the researchers' supposition that non-traditional students are more resilient (Chung et al., 2017) than traditional students. Comparing the resilience of traditional and non-traditional students was complicated. Students who were coded non-traditional based on working fulltime (35 hours per week) were more resilient than those who worked part-time or were not employed (Chung et al., 2017). When researchers

coded non-traditional participants, who worked part-time (1 to 9 hours per week) or full-time, they found no difference in resilience between non-traditional and traditional participants (Chung et al., 2017). Additionally, non-traditional students with a gap between finishing secondary education and entering postsecondary education demonstrated greater resilience and academic success (Cantwell et al., 2001; Chung et al., 2017; Martin et al., 2010). There was no significant difference based on the age cutoffs used to define traditional and non-traditional (Chung et al., 2017). Those who perceived themselves as non-traditional regarding age, family roles, and employment status exhibited greater resilience (Chung et al., 2017). Students with more life experiences may have developed coping skills to overcome challenges and obstacles.

Resilience of Minorities/Latinas

Gonzalez et al. (2020) conducted a qualitative study to examine the success and persistence of Latinas majoring in STEM majors at a Texas four-year research university. The qualitative study utilized Greene's resilience theory as its theoretical framework (Gonzalez et al., 2020). The researchers addressed the following question: *What are the roles of culture, family support, and social climate in the development of resilience for Latinas' STEM college degree attainment at an R1 higher education institution in Texas?* (Gonzalez et al., 2020). The study invited ten Latinas majoring in STEM majors to participate in an interview (Gonzalez et al., 2020). The participants did not live on campus, and most were employed (Gonzalez et al., 2020). After analyzing the qualitative data analysis, the researchers identified four themes: "Latinas' experiences in STEM, overcoming challenges, self-efficacy, and networking and support system" (Gonzalez et al., 2020, p.5-6). The findings revealed that students felt unsupported and lacked a positive perception of gender and cultural fit (Gonzalez et al., 2020). When Latinas' STEM experiences were unfavorable, they sought a support system. Students reported

that joining an organization with classmates of similar backgrounds, majors, and challenges provided the necessary support; however, they felt lonely in class due to their gender (Gonzalez et al., 2020). In addition, participants reported classmates and friends were essential for academic support and stressed an increased need during their junior and senior years (Gonzalez et al., 2020).

In the study, the qualitative data revealed that Latinas in STEM majors faced various obstacles. Samantha, one of the participants, stated that her first year in college was challenging because her family was not supportive of her being away from home and encouraged her to drop out of school and come home (Gonzalez et al., 2020). Additionally, Samantha had to work to pay for school, and balancing work and school was becoming untenable (Gonzalez et al., 2020). Furthermore, Jennifer, a study participant, described how her family opposed her choice to major in mechanical engineering and used stereotypes to discourage her from studying in her chosen field (Gonzalez et al., 2020). These Latinas, according to the researchers, required a supportive environment and supportive family members (Edwards et al., 2016; Gonzalez et al., 2020). Nonetheless, Samantha demonstrated resilience when she discussed her time management challenges with the interviewer taking a problem-solving approach (Gonzalez et al., 2020).

According to Gonzalez et al. (2020), the participants' self-efficacy was evident because they were aware of their challenges but knew they had to overcome obstacles to achieve their goals for themselves and their families. Furthermore, student organizations with members with similar experiences and backgrounds provide a sense of belonging (Gonzalez et al., 2020). Tania, a study participant, explained that her campus organization members were her family way from home, and they actively encouraged each other (Gonzalez et al., 2020). Moreover, campus events such as recruiting fairs

enable students to network with companies for internships and establish relationships (Gonzalez et al., 2020). Latinas in STEM disciplines require college and family support to complete their degrees (Gonzalez et al., 2020). The Latina students used strategies from their ethnicity and personal backgrounds (Gonzalez et al., 2020; Shelton et al., 2021), which colleges and universities can utilize as strengths. Understanding these students' needs gives colleges and universities a starting point for developing programming to support their diverse student populations.

In a similar study, researchers examined the relationship between supportive parents and the level of resilience of 161 students, ages 16 to 21 (Edwards et al., 2016). The findings determined that healthy relationships with parents corresponded with students' positive levels of resilience (Edwards et al., 2016; Morgan Consoli & Llamas, 2013).

Portnoi's (2019) qualitative study examined the experiences of 16 female, first-generation students (FGU) of color navigating K-12 schooling and higher education systems. The data analysis revealed the resistance and resilience of their participant through interviews (Portnoi, 2019). *Resistance* is the strategy employed when dealing with barriers to improve one's situation socially (Ward, 1999). Resilience is how an individual adapts to stressful barriers and continues moving forward to achieve a goal (Masten et al., 1990). Additionally, the study revealed the importance of high school teachers and counselors (Portnoi, 2019). Valeria and Roxanna, study participants, shared that their teachers expressed interest in them as individuals (Portnoi, 2019). Another participant shared that she did not know what Honors or Advance Placement meant, but her history introduced her to honors courses and provided her with encouragement and support (Portnoi, 2019). This factor contributed to the development of students' resilience. However, other experiences were not favorable. Valeria and Tanisha shared

that their teacher or counselors did not support them as women of color (Portnoi, 2019). Additionally, Tanisha explained that her high school teachers seemed underprepared, and she never spoke to her counselor about her class schedule, which was mailed to her (Portnoi, 2019). The students exposed to adverse experiences used them as motivators to succeed (Portnoi, 2019).

High Impact Practices (HIP) for Latinas in STEM Majors

Overview of HIP

George Kuh's research focuses on high-impact strategies that affect students' academic progress. His research examines undergraduate student learning, campus cultures, and institutional elements that support student learning (Kuh, 2008). As the originator of the widely used National Survey of Student Engagement and College Student Experiences Questionnaire, Kuh has decades of evaluating high-impact educational techniques that correspond to greater student achievement levels (Kuh, 2008). The paragraph that follows discusses Kuh's factors of student persistence.

High-impact practices require students to commit daily to their academic and professional objectives (Kuh, 2008). Furthermore, Kuh (2016) argues that students must actively participate in their educational program and the institution to succeed. The student can build rapport with faculty during their first semester by actively participating in a writing intense first-year seminar with low enrollment taught jointly by a professor/advisor and an assigned peer (Kuh, 2008). Additionally, students need a built-in advisor with whom they interact at least twice a week, both in and out of class (Kuh, 2008).

Boggs (2019) contends that assessing student learning outcomes shifts the focus to students. As O'Banion (1997) insists, a learning college creates an environment for student learning and prioritizes the student. Additionally, Maki (2017) contends that

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"…real-time student assessment…" helps both the student and instructor adjust as needed. By receiving continuous feedback on their academic performance in class, the students can seek tutoring, add extra study hours, or drop the course. Faculty can help by adjusting their classroom instruction, reviewing the student learning outcomes, or identifying those students needing support outside the classroom. An institution with an "Early Alert" program can rely on academic advising or student success centers to follow up with students needing additional support.

Sometimes, the instructor may not assess their student's learning level until the middle of the semester, and by that point, student recovery is not likely. Non-traditional students with multiple responsibilities must know their institution's support systems and available interventions to help them stay in school. More importantly, these students need flexibility (Macdonald, 2018). Students who work to care for families need class schedules offering evening or weekend, hybrid, or online courses (Macdonald, 2018). Moreover, class size is vital for students to connect with classmates and instructors (Macdonald, 2018). Classroom instruction for adult learners needs to be "…task-centered…" Adult learners need to understand how to apply the new material they are learning (NHI, n.d.).

High Impact Practices for Latinas

An example of HIP is a proactive peer-to-peer coaching program that provides academic and social assistance to first-year STEM students to boost perseverance (Cruz et al., 2021). Cruz et al. (2021) found that peer-to-peer coaching program students perceived an opportunity to build rapport with the coach, and coaches provided valuable information concerning academic support (Cruz et al., 2021). The study also found that Latina/o students assigned a peer coach had significantly higher GPAs than those without one (Cruz et al., 2021). The researchers encouraged colleges and universities to consider

assigning peer coaches with the same cultural background (Cruz et al., 2021) as the students.

Salas et al. (2014) set up a mentoring program at a predominately white university provided that Latina/o students with academic support, social support, and leadership experiences. The program's goal was to assign a mentor, who used to be a mentee, to help first-year and transfer Latina/o students transition into the university environment (Salas et al., 2014). The qualitative results found that participants in the mentoring program felt a sense of community, learned to navigate the system, and gave back to other students (Salas et al., 2014). Most importantly, these students' identities were valued, which promoted persistence (Salas et al., 2014).

In a qualitative case study, Aguirre and Banda (2019) explored the impact of mentorship on the persistence of ten Latina STEM undergraduate students. According to the study, Latinas seek faculty members as unofficial mentors for academic support and career guidance (Aguirre & Banda, 2019). Many reported seeking their professors for professional advice and interviewing recommendations; some felt a connection comparable to the advising relationship (Aguirre & Banda, 2019). The participants stressed the importance of encouragement and assistance from their instructors outside the classroom (Aguirre & Banda, 2019).

Academic Support Programs for Latinas in STEM

Numerous programs and best practices exist to assist and support Latino students. In its 2022 What Works for Latino Students in Higher Education report, Excelencia in Education highlighted various programs that promoted Latino success and degree completion at the associate, baccalaureate, graduate, and community college levels.

The Latino Promise and HACER (Hispanics Achieving College Education Recognition) Programs at Fairleigh Dickinson University-Metropolitan Campus

focused on bilingual first-year students (Excelencia, 2022). The goal was to increase student access to associate degrees leading to bachelor's degrees in a university setting for students aged 25 and under (Excelencia, 2022). HACER uses a strength-based approach to enhance the student's native language while transitioning from bilingual to English classes, whereas Promise provides courses in English (Excelencia, 2022). The program aims to help students and their families transition into the higher education setting. Promise and HACER offer financial literacy, summer bridge programs with small class sizes, grants, and comprehensive support (Excelencia, 2022). Additionally, the curriculum provided cultural opportunities outside of school (Excelencia, 2022). The program's outcomes have shown some success. Latino Promise has a graduation rate of 40%, compared to 18% for Latinos who do not participate in the program. In the last three years, the Latino Promise has maintained a fall-to-spring retention percentage of 93% (Excelencia, 2022).

The Institute Cayey's of Interdisciplinary Research (IIR) at the University of Puerto Rico focuses on mentoring and student research. According to the program description, its objective is to encourage and support undergraduate applied research projects impacting Puerto Rico (Excelencia, 2022). The IIR program provides students with research and hands-on training opportunities, interdisciplinary course options, and additional professional support (Excelencia, 2022). Additionally, the project has assisted students in coping with the pandemic by providing mentoring and coaching, financial aid for school expenses, and paid opportunities to enroll in and engage in research initiatives (Excelencia, 2022). The program has produced successful outcomes. Graduation rates differ between cohort-year participants and non-participants. The graduation percentage among participants was 90%, compared to 50% among non-participants. In addition, graduate school application rates were more significant among participants than non-

participants. Between 2015 and 2018, 762 of 968 program participants (79%) applied to graduate schools, the majority were accepted into their programs (Excelencia, 2022). Only 41% of non-participants applied to graduate school (Excelencia, 2022). Ultimately, the university has established a culture of research. Since 2003, the number of students participating in the program has increased yearly from eight to over 200 (Excelencia, 2022).

The University of Texas in San Antonio's Master of Science in Environmental Science program focuses on the discipline and on mentoring. The initiative aims to motivate students to pursue careers as environmental scientists by encouraging research and developing students' science identities (Excelencia, 2022). In addition, the program aims to provide science mentoring to support students through their journey as future scientists (Excelencia, 2022). Additionally, the program focused on recruiting mentors and assisting professors by deliberately recruiting professional role models and training stakeholders to address Latino students' challenges in science (Excelencia, 2022). The program's revealed some encouraging outcomes. Before the program's implementation, 33% of Latino students selected a thesis option, compared to 45% after implementing the initiative (Excelencia, 2022). After implementing the initiative, the environmental science program, Latino retention increased by 7%. (Excelencia, 2022). Additionally, the number of students enrolled in the Environmental Science M.S. program grew from 9 (32%) to 32 (60%) individuals. (Excelencia, 2022). After participating in the program's intervention, which included mentoring and developing written and verbal communication, Latino students were more likely to complete their thesis, graduate, and find employment (Excelencia, 2022).

Numerous programs in higher education were considered to have a high impact on the lives of Latino students. Supporting Latino students through mentorship, dual

language programming, proactive wrap-around services, support, and transition services, and boosting access to and through graduate programs while fostering a sense of belonging is a trend among the many programs deemed impactful for Latino students in the 2022 Excelencia report.

Summary of Findings

Education has traditionally been a top focus in the U.S., emphasizing agricultural and engineering professions (Klassen, 1962; Milestone documents: Morrill Act 1862, 2022). However, minorities have only been prioritized occasionally (Connors, 2022). As college and university enrollment became increasingly diverse, research concerning students' experiences also was readily available (Blackburn, 2017). With the upsurge in Latino enrollment in postsecondary institutions (de Brey et al., 2019: Hurtado, 2015), the literature has revealed the challenges and worries of students. According to Hurtado and Carter (1997), the personalities and perspectives of Latinx college students influence their sense of belonging in higher education, which in turn affects their academic achievement. To persist in higher education, a sense of belonging is necessary (Hurtado & Carter, 1997). Especially during their first year of college, as they move into the higher education environment, students must have a connection to their college to return the following semester to pursue their academic aspirations (Burke, 2019; Tinto, 1987; Tinto, 2012). In addition, the literature indicates that self-efficacy is essential for students to confidently face challenging courses (van Dinther et al., 2011) and apply the necessary effort to overcome obstacles and earn their degree (Bandura, 197). Moreover, resilience is essential for students to recover from stressful events or situations and achieve their academic objectives (Masten et al., 1991).

Theoretical Framework

The study's theoretical framework utilized Self-Efficacy and Resilience Theories.. These two theories come from sociological and psychology theoretical frameworks, which provides a foundation for persistence and retention (Tinto, 2017). Bandura's (1977) Self-Efficacy, which has been used to study students' academic performance in higher education and other settings. The theory discusses the role an individual's determination to complete a task or activity play in circumstances when they perceive the possibility of failure. Therefore, students may be influenced by their own sense of self-efficacy when choosing their major. Furthermore, students more likely to choose STEM majors may complete their STEM degree due to their resilience and ability to navigate obstacles (Stajkovic, Bandura, Locke, Lee, & Sergen, 2018). Individuals' self-efficacy and resilience enable them to thrive despite stressful situations or life events (Conner & Davidson, 2003). Resilience researchers' findings offered hope that resilience can be modified and improved (Conner & Davidson, 2003).

As applied to the present study, students' self-efficacy and resilience may have a statistically significant relationship. Additionally, the literature stated that individuals with a strong level of self-efficacy achieve their goals despite obstacles can react positively to difficult tasks, and see themselves as able to complete tasks or goals (Stajkovic, Bandura, Locke, Lee, & Sergent, 2018).

The study also used Resilience Theory, as developed by Dr. Norman Garmezy (1991), to determine an individual's ability to reroute and rebound from an adverse situation and continue along their path. As applied to the present study, this theory holds that the independent variable (resilience) influences or explains the dependent variable (students staying in a STEM major) because Dr. Norman Garmezy stated that individuals with resilience were "not impervious to stress, rather, they can recover and continue

demonstrating the new behaviors." Some of the theory's elements are individual, familial, and supportive factors (Garmezy, 1991, p.463).

Conclusion

Although higher education has become more accessible and diverse, it is more important than ever to continue researching the growth of Latinas and their underrepresentation in STEM fields (Kennedy et al., 2021; Fayer, 2017). Latina students in higher education are of diverse ancestry, are first-generation college students, and identify as second or third-generation immigrants (Latinos in Higher Education, 2019). Typically, these students balance school and work (Excelencia, 2019) and rely on financial aid to pay for their education (Radwin et al., 2018). Participation and involvement of students are crucial to student retention (Kuh, 1995). Connecting with their college campus is vital for persistence (Olbrecht et al., 2016). In addition, self-efficacy and resilience are essential for students to successfully tackle their coursework (van Dinther et al., 2011) and apply the necessary effort to overcome hurdles they encounter in higher education (Bandura, 197). Colleges and institutions may require impactful measures to support the personalities of Latino students. In their What Works for Latino Students in Higher Education study, Excelencia (2022) featured several programs. The Promise and HACER programs assist students and their families with the transition from high school to college. The programs provide financial assistance workshops, small-class size summer bridge classes, grant opportunities, and wrap-around services (Excelencia, 2022).

In contrast, other programs emphasize the scientific discipline and mentoring to encourage students to pursue STEM-related careers (Excelencia, 2022). Numerous programs in higher education are regarded as having a significant influence on the lives of Latino students. Supporting Latino students through mentorship, dual language

programming, proactive wrap-around services, support, transition services, and increasing access to and completion of graduate programs while fostering a sense of belonging is a trend among the numerous effective programs for Latino students.

CHAPTER III:

METHODOLOGY

The purpose of this study was to examine differences in self-efficacy and resilience among Latinas STEM students who identify as women, based on whether they are traditional and non-traditional age students and their self-identified ancestral origins and to determine if there is a correlation between self-efficacy and resilience. This mixed-methods study obtained data from a four-year comprehensive institution in South Texas using an online survey and semi-structured one-on-one interviews. The sample of students was selected from the university's Latina STEM majors student population. The researcher utilized the t-test and Pearson's r correlation to assess quantitative data. While using an inductive method, the qualitative data were examined to uncover emerging themes and construct a narrative. This chapter outlines the research problem, operationalizes theoretical concepts, and identifies the research objectives and questions of the study. Also mentioned was the study's design, population, sample selection procedures, data gathering, and analysis approaches. In addition, the chapter discussed privacy, ethical considerations, and the research methodology's limitations.

Overview of the Research Problem

Minority females are underrepresented in STEM majors among students seeking STEM degrees (Oakes, 1990; IPEDS, 2016). According to the National Science Foundation (2017), Latinas are more than three times less likely to complete a STEM degree than white females. There are various reasons for their underrepresentation. Banks and Dohy (2019) assert that minority students must navigate obstacles such as perceptions of inequalities and feeling unwelcome at their university. Institutions sometimes refuse to admit their limitations, blaming academic failures on students (Banks & Dohy, 2019). Colleges and universities are encouraged by scholars to assist

students who face barriers and opportunity gaps, such as a lack of role models, inadequate high school preparation, college prep classes, and tutoring resources (Banks & Dohy, 2019). According to the research, higher education institutions should help alleviate opportunity gaps and provide needed support through academic and social programming (Banks & Dohy, 2019). As a result, it is necessary to analyze all STEM degree students' levels of self-efficacy and resilience for higher education institutions to develop effective programs to assist students in developing self-efficacy and resilience.

Operationalization of Theoretical Constructs

The study utilized the following three constructs: 1.) self-efficacy, 2.) resilience scales, and 3.) traditional and non-traditional age ranges. Self-efficacy is psychologically sound personal characteristic, which brings about positive change (Bandura, 1977). Those with a positive perception of their abilities are more likely to devote more focused time and energy when facing a challenging situation (Bandura, 1977). Self-efficacy is connected to an individual's career pursuits (Bandura, 1982). The General Self-Efficacy Scale (GSES) consists of 10 questions that measure students' self-efficacy (Jerusalem & Schwarzer, 1992). The second construct in the study is resilience. Norman Garmezy developed the Resilience Theory, which has various applications. Resilience is an individual's ability to navigate out of a stressful or traumatic event or situation and seek a new path to stay on course (Garmezy, 1991). For example, resilience is an essential student personality trait (Lee & Johnston-Wilder, 2017). The *Connor-Davidson Resilience Scale (CD-RISC)* survey consists of ten questions that measure students' resilience levels. The third construct is traditional and non-traditional age ranges. Students age 17 to 25 years are considered traditional (Cantwell et al., 2001; Chung et al., 2017; Martin et al., 2013), while students over 25 were deemed non-traditional (Cantwell et al., 2001; Chung et al., 2017; Martin et al., 2013).

Research Purpose and Questions

The purpose of the study was to examine if a difference exists in self-efficacy and resilience for Latina students of traditional and non-traditional age as well as, the ancestral country they identified with, and determine if a statistically significant relationship exists between self-efficacy and resilience. The study examined the following quantitative and qualitative questions.

Quantitative

1. Is there a difference in self-efficacy for Latinas in STEM majors based on age ranges?

2. Is there a difference in resilience for Latinas in STEM majors based on their age ranges?

3. Is there a difference in Latinas' self-efficacy in STEM majors based on self-identified ancestral country?

4. Is there a difference in Latinas' resilience in STEM majors based on identified ancestral country?

5. Is there a relationship between self-efficacy and resilience?

Qualitative

1. What are students' perceptions of their college experience?

2. What are students' perceptions of the campus resources and organizations?

Research Design

The study utilized an explanatory sequential mixed method design to collect both qualitative and quantitative data in two stages within this study. This research design was needed to examine the differences in self-efficacy and resilience and students' perceptions of their college experiences and campus resources. A representative sample of Latinas majoring in STEM disciplines at a comprehensive four-year university system in Texas was recruited for this study. The participants were invited to complete the

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General Self-Efficacy Scale (GSES) and Conner-Davidson Resilience – 10 (CD-RISC-10) surveys to assess students' self-efficacy and resilience levels. Quantitative data were analyzed using the *t*-test and Pearson's *r* correlation and the averages of both self-efficacy and resilience were calculated. Qualitative data was collected from a semi-structured one-on-one interview which was analyzed using an inductive coding process, manually transcribed, and carefully read multiple times to reveal themes.

Population and Sample

The study population was selected from a public comprehensive four-year university system in the Southern U.S. The targeted campus offers bachelor's, master's, and doctoral degrees and serves over 9000 students. The minority-serving university consists of 39.5% Hispanic, 35.5% white, 9.3% black, 9.1% Asian, 3.9% International, and 2.7% unspecified students during the fall 2020 semester. During the data collection time frame, 359 STEM students self-identified as women, and 202 (56%) of these were first-generation college students. The sample consisted of students enrolled in STEM majors after Census (Day of Record). The criteria for participation in the study included students enrolled in the semester of the survey administration. The university was selected due to participant access and the researcher's interest in the population.

Table 3.1

STEM Students Self-Identified as Women and Latinx

	Frequency (*n*)	Percentage (%)
Classification		
Freshmen	22	6
Sophomore	30	8
Juniors	114	32
Seniors	154	43
Post bach	6	2
Graduate	33	9
First Generation	202	56
Total	359	

Data retrieved from the university student record system (Spring 2022)

Participant Selection

The study's population comprised the university's College of Science and Engineering students. STEM majors who self-identified as women, of Latinx descent, and 18 years of age or older made up the sample. Participants were not selected randomly from across the institution. The objective was to recruit students from STEM-related majors. The selection procedure was based on their accessibility, known as "convenient accessibility" (Martinez-Mesa, 2015, p. 327).

After the university's Committee for the Protection of Human Subjects (CPHS) approved the study, the recruitment of participants commenced. Participants' recruitment and participation time ran from spring 2022 and fall 2022. The recruitment strategy consisted of sending students emails inviting them to participate in the study and including a survey link. The researcher utilized STEM students' email addresses retrieved from the university's student record system. The next stage was communicating with the target demographic and inviting them to participate in the voluntary study via email.

Students who completed the survey were invited to a one-on-one semi-structured interview to discuss their perceived academic and student support experiences. If students were interested in participating in a one-on-one semi-structured interview, they were prompted to enter their contact information at the end of the survey. Students interested in participating in the interviews were contacted within 24 to 48 hours to schedule an interview date and time.

Participate Demographics

Sixty-six students consented to participate in the Self-Efficacy and Resilience study; however, only 36 students completed the survey (a response rate of 55%). Ten students consented to the semi-structured one-on-one interview and participated. Seventy-eight percent of the 36 women of Latino ancestry were of Mexican genealogy. Their ages ranged between 18 and 42, with a mean of 24. The most common majors reported by participants were life sciences (69%) and mathematics, engineering, and computer science (31%).

Nine out of the ten Latina STEM students who participated in the semi-structured one-on-one interview were first-generation college students. However, seven participants indicated having siblings who had or were pursuing a college degree. Eight (80%) of the individuals self-identified as Hispanic, 1 (10%) as Hispanic/Latina, and 1 (10%) as Latina. In addition, there were seven (70%) traditional-age (18 to 25) individuals and three (30%) non-traditional-age participants (over 25) with an average age of 25. Seventy percent reported a major in life or physical science, while thirty percent reported a major in mechanical engineering, mathematics, or computer information systems.

Table 3.2

Semi-Structured Interview Participants

Pseudonym	Age	Field/Major	First Generation
Amy	22	Mechanical Engineering	Yes
Anna	32	Biology	Yes
Diana	22	Bio Tech	Yes
Helen	25	Computer Science Info	No
Iliana	23	Biology	Yes
Irene	22	Biology (Micro)	Yes
Laura	22	Math	Yes
Linda	35	Environmental Science	Yes
Maggie	31	Environmental Science	Yes
Rachel	22	Environmental Science	No

Instrumentation

Self-Efficacy

The GSES 10-item and CD-RISC-10 surveys assessed participants' self-efficacy and resiliency. The GSES was designed by Jerusalem and Schwarzer (1992) to assess individuals' perceptions of their abilities when confronted with challenging tasks, activities, and other stressors (Statistics Solutions Advancement Through Clarity, n.d.). Schwarzer et al. (1999) asserted that the GSES ten-item scale was appropriate for cross-

cultural research. Additionally, perceived self-efficacy is a universal theoretical construct that is not culturally dependent (Schwarzer et al., 1999). Schwarzer (1999) claims that the reliability and validity of the scale have been proved to correlate significantly with self-esteem and optimism and negatively with anxiety.

The GSES scale's Cronbach's alpha ranges from .76 to .90 and the Pearson's r correlation coefficients between individual items and the overall number of questions ranged from .54 to .83 (Statistics Solutions Advancement Through Clarity, n.d.). The survey is in Appendix A.

Connor-Davidson Resilience Scale 10 (CD-RISC-10)

According to Luthar et al. (2000), resilience refers to an individual's characteristics that contribute to their ability to recover from and develop positively following adversity. Resilience is a psychological construct (Luthar, 2000) that facilitates the exploration of persons in various settings. The Conner-Davidson resilience scale assesses an individual's capacity to cope with challenging conditions or occurrences across ethnic groups and college student populations (Statistics Solutions Advancement through Clarity, n.d.). The survey is available in two formats: ten-item and twenty-five-item. The CD-RISC-10 was employed in this study. The scale has a score range of 0 to 40 (Introduction CDRISC, 2021). Drs. Campbell-Sills and Stein developed the CD-RISC-10 scale, including items 1, 4, 6, 7, 8, 11, 14, 16, 17, and 19 from the CD-RISC-25 scale (Introduction CDRISC, 2021). The original and 2007 validation studies found that the mean score for the U.S. population was 80.7 (Introduction CDRISC, 2021).

Data Collection Procedures

Before beginning data collection, the researcher obtained consent from the university's Committee for the Protection of Human Subjects (CPHS). Following approval by the CPHS, the researcher began the data collection process. The researcher

used the student record system to retrieve a list of STEM students' university email addresses. The next step involved communicating and sending an invitation to participate in the study to the target population.

STEM Students' university emails were retrieved via the researcher's access to university email addresses. The student sample was one of convenience due to the set number of Latinx STEM students identifying as female. Because the study focused on participants with similar characteristics from a specific university, the findings were not generalizable to all students (Martinez-Mesa et al., 2015). Convenience sampling, on the other hand, aided the researcher's ability to complete the study. The GSES and RE online survey links were emailed using students' university email accounts following Census (Day of Record) to ensure students were enrolled in STEM courses. The survey cover letter included the study's purpose, a brief explanation of the instrument, the number of questions, and the projected time (30 minutes) to complete the survey. Additionally, the survey cover letter indicated that participation was voluntary, students' identities were kept confidential, participants must be 18 or older, and a secure internet connection was utilized for data integrity.

Participants read and agreed to participation and that they were 18 years or older before clicking the link to start the survey. By continuing to the next page, the student acknowledged age requirements, agreed to engage in the study, understood the could stop participating at any time, and understood that they would not benefit from the study. Participants received a copy of the cover letter attached to the initial email invitation to participate in the study.

The anonymous 20-question GSES and RE online survey also collected participants' demographics, including age and self-identifying ethnic group or nationality. Participants' names and contact information were only collected if the student

participated in the one-on-one semi-structured interview, or if, the participants have questions or concerns during or after the survey, they could request that the researcher contact them by providing their contact information. The researcher contacted any participant with questions within 24 to 48 hours.

If students agreed to participate in the interview, they were prompted to include their names and contact information at the end of the survey. The 10-question semi-structured interview took about 30 minutes. The interviews took place on-campus and virtually for the students and researchers' convenience. All interviews were recorded and transcribed within 24 hours, and data was saved on password-protected university computers (University's cloud), password-protected personal iPhone, and the researcher's external hard drive.

The Qualtrics survey data was queried into an Excel document, and raw data was preserved on password-protected university computers (University's cloud) and the researcher's external hard drive. The study's data was uploaded and analyzed in a Statistical Package of Social Science (SPSS) software database. The researcher's university computers and an external hard drive were secured in a secure file cabinet on campus and at home. Finally, the data will be kept for three years before being destroyed per the institution's process.

Data Analysis

Mixed methods design incorporates components of qualitative and quantitative research procedures (Schoonenboom & Johnson, 2017). The Statistical Package of the Social Sciences software was used to perform quantitative analysis to ensure reliable calculation. Data collected via an online survey were analyzed using SPSS to determine statistical mean differences by calculating an t-test for self-efficacy and resilience based on traditional, non-traditional, and self-identifying nationality. Quantitative research

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questions one through four were answered using a two-step process. The qualitative

research questions were answered by collecting data via interview transcripts. Qualitative

data were analyzed using an inductive method.

Quantitative

Quantitative research question one was answered using a two-step process. The

continuous age variable was recoded and split into two distinct categories. Participants 25

or under were coded as traditional, and those 26 or older were labeled non-traditional.

Next, an independent sample t-test was conducted.

Quantitative research questions three and four, *Is there a difference in Latinas'*

self-efficacy in STEM majors based on their identifying nationality? and Is there a

difference in Latinas' resilience in STEM majors based on their identifying ancestry?,

were answered using a two-step process. First, the countries identified by the participants

were recoded into regions. These regions included Mexico, Central America, and South

America then an independent samples *t* test was conducted.

Quantitative research question five was answered by calculating the averages of

GSES and RE and calculated the Pearson's *r* to determine if a relationship existed.

Qualitative

Data acquired from ten semi-structured one-on-one interviews answered

questions six and seven. The researcher noted participant information such as age, race,

and college enrollment status on an interview form. Students' perceptions of their

academic experiences, campus resources, and organizations were gathered using nine

prompt questions, which can be found in appendix E. Each participant interview was

digitally recorded and transcribed into Microsoft Word 24 hours later. After carefully

transcribing each interview, the researcher examined and compared the transcripts

(Saldana & Omasta, 2018). A thematic analysis was used to analyze the data collected (Lichtman, 2013).

Qualitative Validity

The validation of the qualitative analysis approach involved three steps. Participants were given identical prompt questions to ensure validity. In addition, all interviews were digitally recorded to prevent issues with recalling accurate responses. Although the researcher did not perform a member check, she is familiar with Latina cultural norms and expectations. Finally, the researcher conducted a formal exercise to identify personal and professional biases, values, influences, and experiences that may have influenced qualitative data analysis.

<div align="center">

Privacy and Ethical Considerations

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Following permission from the Committee for the Protection of Human Subjects, data collection commenced. Survey administration necessitated student approval and stated that participation was entirely optional. Only students who were 18 years of age or older were considered for recruitment. Any personal information was kept in a secured file and a locked office. Furthermore, all electronic materials were saved on password-protected university and researcher computers and external hard drives. After three years, all information, physical or electronic copies, will be destroyed.

Participants were briefed on the purpose of the study, the survey, and the time commitment. In addition, it was stated that participation was voluntary and that participants were free to withdraw at any time without penalty. Participants were also informed that their information would be kept confidential and secure. Before gaining access to the survey, students were required to review and agree to the participation criteria at the bottom of the cover letter.

Pseudonyms were used to protect the privacy of interview participants. Only the researcher had access to the names and aliases of the participants, which were stored on a password-protected computer and external drive. The information provided by participants in one-on-one semi-structured interviews was treated with the same level of confidentiality and security. All data was saved on a password-protected university and researcher computer and an external hard drive. All data will be appropriately destroyed following the university's process and timeline. The names on printed interview forms will be blacked out and shredded using the university's shredding service. Electronic data will be overwritten with a series of characters and deleted from the computer and external drive. All digital recordings on the mobile device will be deleted.

Conclusion

Chapter three outlined the methodology for the study. The purpose of this explanatory sequential mixed-methods study was to determine if there was a statistically significant relationship between self-efficacy and resilience for Latina students. Participants' self-efficacy and resilience were measured using the GSES and CD-RISC scales during the quantitative stage. Each SELSD question addressed how individuals perceived their academic experiences and campus resources.

Moreover, the researcher discussed possible interventions for students with lower self-efficacy and resilience. The qualitative stage consisted of one-on-one semi-structured interviews. Interviews collected students' perceptions of academic experiences and resources.

CHAPTER IV:

RESULTS

The purpose of the research was to study Latina STEM students based on their age range, self-identifying ancestral origin, and whether there was a difference in self-efficacy and resilience among them. The mixed method study employed two scales, Self-Efficacy and Resilience, and semi-structured one-on-one interviews. The quantitative and qualitative findings from the study's data analysis were presented in this chapter. The results were presented alongside the five quantitative and two qualitative research questions the study aimed to answer. This chapter describes the participants and data analysis for each research question. Finally, a summary of the findings was provided.

Description of Participants

Participants were STEM majors identifying as Latina from a public four-year comprehensive university in Texas. Thirty-six of the 359 students responded to the online survey, yielding a 10% response rate. Ten of 36 students accepted an invitation to participate in a semi-structured one-on-one interview. Overall, the study's participants ranged in academic classification from first year to graduate students. There was also a diverse range of STEM majors represented. The participants' majors and classifications are shown in tables 4.1 and 4.2.

The participants were graduate and undergraduate students. The majors represented were biology, mechanical engineering, computer science, mathematics with teacher certification, biotech, and environmental science. One out of the ten interviewed participants was not a first-generation college student. Seven participants reported siblings who had or were pursuing a college degree. The participants' ages ranged from 22 to 35, with an average age of 25.

Table 4.1

Population: STEM Students Self-Identified as Latina

	Frequency (*n*)	Percentage (%)
Classification		
Freshmen	22	6
Sophomore	30	8
Juniors	114	32
Seniors	154	43
Post bach	6	2
Graduate	33	9
First Generation	202	56
Total	359	

Table 4.2

Sample: Programs/Majors Represented

		Frequency (*n*)	Percent (*%*)
Programs	Graduate Student	3	6.8
	Biological Sciences B.A.	5	11.4
	Biological Sciences B.S.	14	31.8
	Chemistry B.A.	1	2.3
	Chemistry B.S.	3	6.8
	Computer Information Systems B.S.	2	4.5
	Environmental Sciences B.S.	2	4.5
	Mathematical Sciences B.A.	3	6.8
	Mathematical Sciences B.S.	1	2.3
	Mechanical Engineering B.S.	1	2.3
	Pre-Engineering - Chemical Engineering	1	2.3
Total		36	

Research Questions: Self-Efficacy and Resilience by Age Range

Research questions one and two, *Is there a difference in self-efficacy (SE) for Latinas in STEM majors based on age range?* and *Is there a difference in resilience (RE) for Latinas in STEM majors based on age range?*, were answered using a two-step process. The continuous age variable was recoded and split into two distinct categories. Participants' ages were recoded as traditional for those 17 to 25 and non-traditional for those 26 and older. In the second step, the researcher conducted independent samples t-tests. The use of a t-test was appropriate to compare the means between the two groups (Livingston, 2004; Mishra et al., 2019). It was determined that there were significant differences for SE $t(39) = -2.45$, $p = .02$, Cohen's $d = .89$; and RE $t(40) = -3.48$, $p = .001$, Cohen's $d = 1.3$. The analysis revealed that non-traditional students had higher self-efficacy and resilience than traditional students.

Table 4.3

Self-Efficacy and Resilience by age range

	Classification	N	M	SD
Self-Efficacy	Traditional	31	2.98	.45
	Non-traditional	10	3.39	.43
Resilience	Traditional	32	3.51	.83
	Non-traditional	10	4.48	.46

Statistically significant (p < .02 and p < .001) Note: *N* varied due to missing data

Research Questions: Self-Efficacy and Resilience by Regions

Research questions three and four, *Is there a difference in Latinas' self-efficacy in STEM majors based on* identified ancestral country*?* and *Is there a difference in Latinas' resilience in STEM majors based on* identified ancestral country*?*, were answered using a two-step process. Most interviewees identified Mexico as their ancestral country rather

than other Latin American countries. As a result, the countries were recoded into regions. These regions included Mexico, Central America, and South America. The researcher then conducted an independent sample t test. The analysis revealed no significant difference in self-efficacy and resilience $t(35) = .98, p = .34$, Cohen's $d = .37$ and $t(36) = .39, p = .68$, Cohen's $d = .37$.

Table 4.4

Self-Efficacy and Resilience by Regions

|	Regions	N	M	SD
Self-Efficacy	Mexico	28	3.10	.44
	Central and South America	9	2.93	.53
Resilience	Mexico	28	3.75	.80
	Central and South America	10	3.63	.90

Note: N varied due to missing data.

Research Question: Relationship between Self-Efficacy and Resilience

Research question number five, *Is there a relationship between self-efficacy and resilience?*, was answered by collecting survey data using the Self-Efficacy and Resilience scales. A Pearson correlation was computed to assess if there were a significant relationship between self-efficacy and resilience. During the analysis, all participants were included and not separated out by age range or region. The results indicated a statistically significant relationship between self-efficacy and resilience, $r(40) = .738, p = .001, r^2=.54$. Therefore, 54% of the variation in self-efficacy is accounted for by resilience. The scatterplot in figure 4.1 demonstrates the link between self-efficacy and resilience. When self-efficacy increases, so does resilience.

Figure 4.1

Self-Efficacy and Resilience Relationship

Scatter Plot of R1_Total by SE_Total
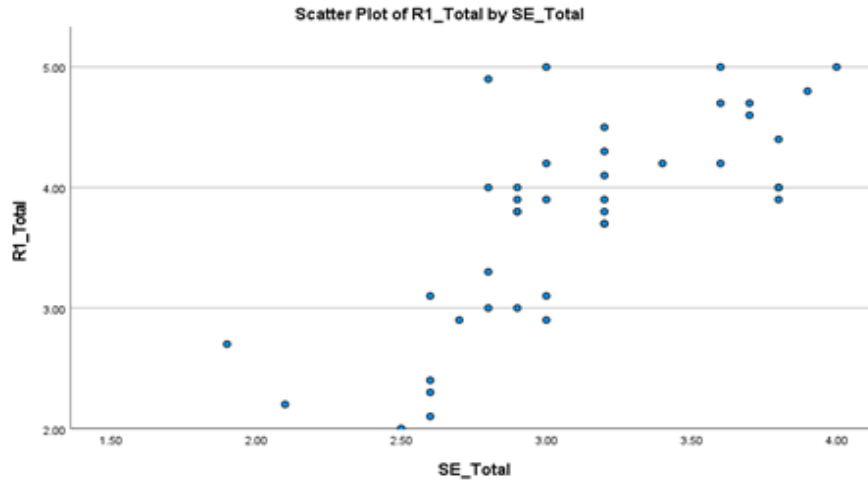
Research Question: Perceptions of College Experiences

The sixth research question, *What are students' perceptions of their college experience?*, was addressed using inductive coding to data from individual transcripts of the semi-structured interviews. The data analysis aimed to identify themes to comprehend students' experiences. Prompt questions served as conversation starters during the interviews. Additionally, pseudonyms were used to protect the ten participants' privacy.

The four major themes derived from ten semi-structured interviews with undergraduate and graduate students are outlined in Table 4.7: (a) Sense of Belonging/Transition, (b) Motivation/Influencers of majoring in Science, Technology, Engineering, and Math (STEM), (c) Campus Resources and Organizations, and (d) Student Feedback. Additionally, the participants' statements were included in the chapter.

Table 4.5

STEM Semi-Structured Interviews: Emergent Themes

Themes	Subthemes
Sense of Belonging/Transition	Participants perceptions of recruitment and admissions processes, financial aid, onboarding, feel welcome, respected, and supported, academic transition, and finding their place within the subject, faculty interactions and the institution,
Motivation/Influencers-STEM	Participants' perception of who influenced or motivated their choice of field or major.
Campus Resources and Organizations	Participants' perception and use of campus resources and organizations.
Feedback/Advice	Participants' feedback on what they perceive students need to be successful or needed help with navigating the higher education environment.

During one-on-one interviews, students were asked open-ended questions about their college experiences and motivations for pursuing STEM majors. Participants described their reasons for pursuing STEM degrees, transition experiences, and obstacles and offered advice to higher education leaders. This section of the chapter concentrates on the narratives of the participants.

Sense of Belonging and Transition

A sense of belonging and transition were recurring topics that participants linked to their perceptions of their college experiences. Nine out of ten interviewees discussed their experiences transitioning into their university setting, feeling accepted, and managing a new environment, all related to students' sense of belonging and transition into university life.

Three students shared being interested in forming a community with students from similar backgrounds. Laura, a 22-year-old undergraduate student majoring in

mathematics at a public four-year university near a large city in Texas, indicated that mathematics had always been her passion. Laura stated that her K-12 teachers were excellent math role models during her school years. As a result, she built a solid math foundation and intended to be a math teacher, majoring in it in college. Despite her academic preparation, Laura struggled to transition to her small private institution in Northeast Texas and her last four-year university. Laura said being away from home and dealing with Covid-19 made her anxious. Even when she returned home to attend a public institution, she struggled with the transfer due to the pandemic. She remarked that her classmates and lecturers lacked a sense of community on campus. "At first, when I arrived at the new university, there was no community due to Covid-19," Laura explained. However, after she joined a few clubs and progressed to her senior year, she said, "I felt I could become social as if I were on a smaller campus." Laura emphasized that meeting with people like herself helped her develop a strong sense of community, which aided her transition into higher education and eventually led to her graduation in the fall of 2022. However, she admitted that students must be motivated to find their place within the university. Similarly, a 22-year-old microbiology senior, Irene, stated that the pandemic made her adjustment to university life difficult. "It was crazy. I transferred in the fall of 2020. It was chaotic and difficult," she said. Irene remarked that having a lab partner during the pandemic made the experience bearable. Laura and Irene stated that having classmates of the same ethnicity helped them adjust to a new academic setting during Covid-19. They believed that only someone similar to themselves could genuinely comprehend their plight. Iliana, a 23-year-old biology major, shared some of Laura and Irene's experiences and views. She thought that having peers from similar backgrounds facilitated her transition to college. "Having the same people around helps

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build a connection with others on campus," Iliana said. She also found a smaller campus was friendlier, and she had easier access to her biology instructors.

Iliana, Helen, and Diana had similar challenges and experiences. Although Iliana had completed college-level courses while still in high school, she had academic transition issues. She sought academic assistance but encountered some difficulties. "Sometimes the tutors were not quite at that high level yet to help you," Iliana said. Helen, a 25-year-old Computer Information System major, emphasized similar academic obstacles she faced seeking assistance. "I went to tutoring to get help with a web application class, but they did not have that help," she said. Others had more complicated challenges. Diana, a 22-year-old STEM student with Early College credits, described her academic transfer difficulties. "I did not take many science classes in my early undergraduate period. I took lower-level core," she said. Diana attributed her academic challenges to a lack of a scientific foundation. However, after finishing her lower-level college biology, chemistry, and physics coursework, which was stressful, challenging, and required many hours of study, "It got better and easier," she said. As she moved through her upper-level subjects, Diana claimed she became familiar with her teachers' teaching styles and assessment methods. Diana also discovered her future career path through lab work and independent study classes. As a result of her experiences, she has also decided to pursue a career in biotechnology. Diana found her sense of belonging through interactions with her lab teachers and peers.

Linda, age 35, earned her bachelor's degree in computer engineering from a public university. According to Linda, living on campus was one of the contributing factors to her success. She recalled her time as an undergraduate attending the university's orientation and registration session. She felt lost, as neither of her parents had attended college, and her brother was enrolled at a different college. The advisor, at

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orientation, recruited her to join a STEM organization for minority students during her advising appointment. Linda described the organization as supporting minority engineering students. The program's goal was to group the students to take courses together. Linda said, "You traveled with this group year to year and class to class, which greatly supported me during those years." Although Linda was a member of a first-year support group for STEM Latinas, she had difficulty transitioning from the high school support system to the university support system. "My high school did a wonderful job organizing basic college information sessions. Once you arrived at the university campus and began navigating the system, you were on your own," she said. Linda also disclosed that she was required to visit numerous university departments for questions related to her degree, campus housing, work-study, financial aid, and other matters. Linda stated that she preferred to speak with one person for all her college-related questions.

Maggie, the oldest of four children, was raised by a single mother who completed two years of nursing school in another country. While her mom could not afford to finish her degree, Maggie went on to earn a bachelor's degree in a STEM from a Southeast Texas university. Maggie left home to attend college, but she felt out of place. Maggie offered two examples of what made her feel like an outsider. "When I went to the university, I felt like an outsider. I did not feel close to anyone," she said. Maggie shared that she joined a church group which was a new experience for her. "We did not grow up going to church. Going to church was something I did during my first year. One of my friends took me to church, and from then on, I was a member until I graduated," she said. Additionally, Maggie did not come from a family who could afford to send her to school, so she had to work, which added to her sense of not belonging. She shared,

> Even after the years have passed, I still feel like an outsider. Many of my friends had both parents, and their parents were college graduates. They had financial

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support from their parents. I had to work. I always work. I had to earn what I did. Even now, I am working. I went through a phase where I thought life was unfair.

Some of Maggie's classroom experiences also made her feel unwelcome and out of place. "There were times when some professors made me feel foolish. So, as an undergraduate, it made me question many things, but now I am more confident," she said. She shared that her graduate experience has been positive due to her chemistry professors and classmates. "I have had a wonderful graduate experience," she said. Students also have other personal challenges when attempting to belong and transition into a new environment.

Linda and Maggie, of similar backgrounds and experiences, expressed the need for assistance navigating the college experience. Linda struggled with how universities support services function due to the volume and complexity of higher education and the various services such as financial aid. Having to go to multiple offices for each question was a challenge. In addition, they both emphasized the significance of their faculty and academic support. Maggie shared the importance of supportive university stakeholders. She stated that her graduate chemistry faculty was approachable. They were willing to interact and answer her questions. These students confirmed that first-generation college students need assistance from their university to help them understand and navigate the university setting to increase the chances of a smoother transition into higher education, leading to greater completion rates.

The size of the campus was a factor that impacted the students. Anna earned her Bachelor of Science degree in Biology at a large public university. She discussed the differences between large and medium-sized university experiences. "It has been a far better experience here than at a larger university. You receive little assistance or cannot even communicate with the professor over there," she said. Anna emphasized that locating support at a large university is nearly impossible. Based on the student-to-

teacher ratio, Anna realized that the instructor could not reach all students. Although the university has a teaching assistant (TA), Anna believed that the TA needed more knowledge of the subject to assist her. "Here, you can speak directly with the instructor," she stated. Anna's challenge at a large university was not being able to speak directly and to interact with her faculty.

Amy is a 22-year-old mechanical engineering major in her sophomore year who lives on campus. The student transferred from a small community college that shared a space with a large university in a metropolitan area with over four million people. She is a first-generation college student with a sister who is about to graduate in the fall of 2022. Amy shared that her experiences between the two schools she has attended have been significantly different. "This area is very calm. It is not what you think of a college town, especially with a high school across from us," she said. Amy feels able to focus on school and is not distracted. "Yet, I still have a social aspect," she said. In addition, the student stated that she was an active member of a campus organization for first-generation college students in engineering. "Even though it can be scary, I am learning everything on my own. I think having a group similar to you helps," she said. Amy shared that she and her first-generation classmates formed study groups and interacted socially.

Overall, the respondents expressed that they had encountered one or more challenges like lack of knowledge, difficulties, and perceived lack of support during their higher education experience and transition into the university. Most participants concentrated on their transition challenges and finding their place at their college or university. Although they had struggled, their resilience was strong, and they completed their undergraduate degrees or were on track to finish. One participant did not indicate problems adjusting to university life. She was primarily concerned about the course schedule and her inability to plan her time to completion.

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Motivators and Influencers-STEM

The second emergent theme from the semi-structured interviews arose from the variables that motivated or influenced academic choices. During the interviews, students mentioned various factors and elements that influenced their academic route, such as K-12 school exposure, family, courses, and the outdoors. The influence theme was a common topic in the responses of nine out of ten individuals. Furthermore, there was a wide variety of motivations and influencers in participants' decision to pursue STEM programs.

Laura, Irene, Linda, and Iliana were exposed to math and science during their K-12 years. Laura had a math teacher who was a positive role model. "I had an instructor who made me see math differently," she said. Laura credits her math teacher as an influencer in her decision to be a math teacher. Additionally, she indicated that she enjoyed being challenged in school. Likewise, Irene had a positive pre-college experience. "In elementary, they had separate classes for each subject. I liked science better than math and music," said Irene. She claimed that she was naturally drawn to science and loved it. Linda earned her bachelor's degree in STEM from a comprehensive four-year public university. Currently, she is enrolled in a graduate engineering management program. Linda expressed an interest in STEM technology early in her life. She was among the few participants who stated that their high schools had programs to expose students to different professions. "So, I had a passion from a young age. They used to take us to different companies in high school to show us different fields of study," she said. Linda shared that she had participated in a school field trip to Compaq. The company demonstrated the high-tech electronics and algorithms they used to solve a particular problem. "So, throughout my undergraduate career, what intrigued me was the mathematics involved in solving the problem to obtain the solution, "Linda said. During

Iliana's high school career, her school offered a variety of dual credit courses. Her high school began offering lower-level biology courses for dual credit and had added a biology technology course. Initially, she was interested in art but was hooked after taking her first dual credit biology course. Iliana claimed that the experiments performed in class sparked her imagination. "She showed, you know, biotech stuff. You can make a fish glow in the dark. Little experiments like that made it very interesting," she said.

Rachel and Maggie attribute their outdoor surroundings as influencers when choosing their major. Rachel is a 22-year-old graduate student in an environmental science graduate program at a four-year public university. Although a STEM career was not her first choice, she obtained a Bachelor of Science in Marine Biology and Marine Fisheries. Rachel had initially wanted to seek a career at a symphony orchestra organization. However, she claimed that professionals in the field were discouraging. Rachel's second career choice resembles that of her parents. She shared that her mother had earned a STEM degree, and her parents were employed in the oil and gas industry. Additionally, Rachel commented that her time at the beach and environmental factors influenced her decision to pursue a STEM field. She disclosed the experiences that influenced her to choose environmental science. She said,

> I grew up in Galveston. My dad, grandfather, and great-grandfather were fishermen. So, we spend many summers and winters beachcombing and fishing, looking at the different ecosystems. However, what interested me in marine biology and my bachelor's, was how the coast is changing on the Texas side.

Rachel also shared that her professional goal was to help the oil and gas industry have minimal impact on the environment and the coast. However, she expressed concern about her university's course schedule and offerings, which made it hard to anticipate a graduation date.

Maggie, the oldest of four children, was raised by a single mother and has not seen her father in over ten years. She attributes her interest in a technical field to his profession as a welder. "I always found his work (blue prints). He would draw his blueprints. I wanted to be like him. I remember taking his graph paper and making a drawing," Maggie said. Additionally, Maggie indicated that at an early age she had access to science books at her elementary school. "Somehow, I got a hold of a biology textbook. I read most of the book. I was fascinated by biology. Then I started liking natural science in general," Maggie said. Living on the bayou, she was exposed to various plants and animals. "I was interested in animals since we grew up on the bayou. The bayou was our backyard which was full of alligators and fish. I was fascinated by that environment," she said. While her initial major was pre-med, she changed due to negative classroom experiences.

Anna and Helen had illnesses that influenced the direction of their education. Anna is a graduate student at a mid-sized public university pursuing a master's degree in biology. Although Anna planned to attend optometry school, she could not do so due to her health. Even though optometry may no longer be an option for her, Anna is continuing her studies in biology. "Because of the field, I suppose. There are numerous options with biology," she said. Helen, 25, Computer Information System senior, shared that she chose a STEM field due to personal influences. "I was going to major in Art, but that was not going to make money," she said. Helen stated that her mom was ill and implied that she needed to be able to support her family. Also, she had considered the military but decided to go into cyber security.

Amy, a 22-year-old sophomore majoring in mechanical engineering, lives on campus. The student transferred from a small community college. Initially, she was undecided about her major and was contemplating a different path. Amy said she wanted

to be a graphic animator for a time but did not indicate the motivation. However, as a child, Amy was curious about how electronics functioned. She would interact with her father when he was doing home repairs. "I was his little helper," she said. Amy was not actively exposed to science during her high school year. She took it upon herself to read science books from her school library. "Honestly, I did not choose engineering immediately. It took me a year and a half to decide whether or not I wanted to pursue this path," she said.

Overall, one or more factors influenced the participants' decision-making process. These students determined their path based on their environment, life experiences, and natural curiosity. Their internal love for science may have motivated them to overcome any obstacles, while others chose STEM for financial reasons. Furthermore, based on the personal information they shared during the interviews, their resiliency in STEM is evident. Due to their opportunity to explore nature, Rachel and Maggie were influenced by their surroundings to choose environmental science programs. Although Maggie comes from a single-parent household, they have indirect familial influencers in their respective fields. Because Rachel's family was involved in the fishing industry, she enjoyed spending time on the water.

Maggie resided in a rural area where she could interact directly with nature and became interested in environmental sciences. Laura, Irene, Linda, and Iliana were provided with math and science programming or courses to expose them to various STEM fields. Anna and Helen had personal challenges that influenced their choices. However, adding that they had the aptitude for STEM was essential. Finally, Amy was motivated to pursue a STEM major by her curiosity and her father's willingness to share in her interests.

Campus Resources and Organization

Another common theme that emerged from the individual interviews was campus resources and organizations. Students perceived campus resources and organizations in both positive and negative ways. Notably, interviewees expressed concern regarding the need for assistance, but there were some intriguing findings regarding resource utilization. The qualitative data included undergraduate and graduate representation from ten participants. The underlying perception of the participants was that campus organizations and resources served a much-needed support system. The message was that students lack the time or participated in a limited number of ways. However, some students attributed their success to campus organizations.

Linda, Maggie, and Iliana shared their experiences. A first-generation college student, Linda obtained a bachelor's degree in a STEM major from a four-year public comprehensive university. She struggled to understand how to traverse the higher education system as an undergraduate. "My parents were not much help guiding you through the process, but they were supportive. So, it was all up to you," she said. During her college onboarding process, her academic advisor recruited her into an organization for minorities. "So, I went to the university and met with the counselor for the first time, and at that meeting, I ended up joining a program for engineering minorities," she said. However, Linda did not join other groups and only attended study groups within her organization. Linda shared that, although she had to work, she could focus on school based on her living arrangements. She said, "Living on campus was the biggest thing that was a success factor." Linda claimed that her success was partly due to her daily exposure to her academic setting. Additionally, Linda mentioned that the library and the STEM areas provided her with space to study or hangout. Since Linda had to work during her undergraduate college career, she focused on her study groups over social groups. "I

work on and off campus. I worked two years on-campus, then I needed to work in a field related to my major and did co-ops," she said. Maggie, the oldest in her family, earned her undergraduate degree at a four-year college away from home. She also would be the first in her family to earn a graduate degree. Maggie shared that her initial academic goal was to attend medical school, so she joined a pre-medical organization. "Initially, I was pre-med. I was in a group called American Medical Student Associates (AMSA). So, I was involved in that, but that group fell apart. Then I decided that medical school was not for me," she said. After the organization fell apart, she joined an off-campus church group which was introduced to her by a friend. Maggie demonstrated her resilience by seeking out research opportunities as an undergraduate student. Although university research was not an organization, she immersed herself on her research topic. "I did biochemistry research for two years. I was studying carrots. We were trying to isolate enzymes," she said.

Similarly, Iliana, a senior biology major, lives on-campus. Although she lives on campus, attending various organization events or finding time to participate was difficult. However, she indicated she participated in a few groups and utilized multiple campus resources. "I have been part of an organization focusing on Latinos in STEM careers. I sometimes had a hard time managing my time. So, it would be hard for me to attend the social events," she said. During her last year in school, Iliana is considering joining a sorority. The sorority focuses on charities and diversity. While Iliana was interested in belonging to organizations, her school demands were her priority. Of the campus resources, she indicated using the Tutoring Center, Math Center, and Food Pantry. "Recently, I started using the food pantry. It helped me save money. I should have used it earlier. But I didn't know it was for students," she said.

Both Anna and Rachel were not as concerned about joining organizations. They indicated a desire to interact more with their instructors. Anna mentioned a professor who welcomed students to discuss topics in the STEM field and opportunities after class. These students were more focused on their field of study versus socializing. Rachel, a graduate student in an environmental science department did not seem to consider campus resources and groups as important. She shared an interest in art and environmental organizations in general but did not provide direct names. "I am not too active due to a busy semester. I plan to apply to my university's Student Government Association (SGA) in fall 2022 and graduate in fall 2023," she said. Anna, a graduate student in biology, participated in an organization that focused on dolphins. "Yeah, it fell apart. It was about dolphins, saving them, and going to the Amazon. I think it lasted maybe two years, and then it faded away," she said. Anna believed that the organization was no longer active. She attributed the organization's failure to students being unable to participate due to long commutes and other responsibilities. "We had some people that worked, and others had things to do. It was hard to get together on certain nights," she said.

Three participants, Diana, Helen, and Irene, indicated little involvement in campus organizations. Diana was not active in an official student organization but bonded with her lab group from an independent study course. Additionally, she indicated that she learned and grew as a scientist from her classmates. "Two of my lab partners were doing their dissertation, I learned a lot, and I got to go to their dissertation defense," Diana said. Irene's lack of involvement on-campus was attributed to living far from campus and wanting to focus on studying. She indicated utilizing campus resources such as advising and counseling services. Helen suggested that the limited number of student

organizations and their low level of activity were reasons for her lack of involvement on campus.

Amy and Laura both belonged to university organizations that support and promote student success among Latinas or low-income students in STEM fields. Laura shared that she found her place at her university through active participation in the organization. "They were the first sense of community I felt," Laura said. Amy, also an active participant in the STEM organization, shared the benefits of belonging to the group. Being a first-generation college student, she felt the organization and its members could offer the support that her parents could not provide. The campus resources that she has utilized were financial aid and counseling services.

Participants provided similar experiences concerning campus organizations and resources, with only one indicating using a food pantry and two using counseling services. While they seem to understand the importance of campus organizations, they find making time to participate somewhat challenging due to their personal and school schedules. Few indicated participation in social events and activities on campus. Most were more interested in interacting with classmates and faculty. When referring to other services, they expressed a need for the campus to demonstrate an interest in them as individuals and future members of society. They indicated a need for their university stakeholders to assist with job placement.

Feedback and Advice

The fourth emerging theme was student feedback and advice for colleges. All ten interviewees shared their perspectives on various functions and processes that first-generation Latina STEM students needed to navigate their higher education careers.

Helen and Amy both suggested academic support during their interviews. Helen suggested instructors should continue recording lectures so students could listen to the

lecture after class. "It helped me," she said. Amy suggested having open study groups weekly for high-demand topics or courses. Other students indicated a need for additional types of support, as indicated in the following section.

Diana suggested that colleges should focus on mental health and academic support groups. She was especially concerned about STEM students who were stressed out. "I understand why, and their feelings are valid," she said. Diana shared that these students were stressed out in the STEM courses due to the lack of a solid science foundation. She suggested that students need STEM tutoring and mentoring to help them students take research-type STEM courses and don't know how to do research." Diana stressed that these students need additional support to get through these courses. Additionally, she shared that students do not know about counseling services or how to use the services. Going to a website or having to schedule an appointment is discouraging. "Maybe having a chat or email option would be more helpful for students in need. I think like in crisis," she said. Diana recommended that mental health should be promoted year-round. "You only hear what they tell you in orientation," she said. Diana advises colleges to learn about their student's unique needs in order to provide the appropriate campus resource.

Eight out of ten students responded that financial aid and scholarship assistance are beneficial, yet each student indicated facing unique challenges. Linda agreed to share her thoughts on what first-generation college students like herself would find beneficial. While she was familiar with the fundamentals of the university admissions process, on the other hand, the onboarding process and navigating university services were confusing. "I knew that an application and SAT scores were requirements for admission. Otherwise, you are in the dark," she said. During her onboarding process, Linda said she brought her acceptance letter to campus and met with several advisors. However, she was

transferred to a different office when she asked questions unrelated to advising. "If you had any questions, the counselor would refer you to another counselor," Linda said. She would have preferred to have spoken with a single campus representative. In addition, Linda stated that dealing with financial aid was her most challenging experience on campus. "I wish there was more assistance available for scholarship applications instead of directing you to the website," she said. Linda proposed that colleges hold information sessions on how to apply for scholarships and other forms of financial aid. In addition, she recommended that colleges learn more about their students' unique needs and challenges to provide the appropriate services at the appropriate time. According to Linda, colleges should know their students' living situations and whether they need to work to finance their education. Her suggestions for programming included providing peer support for new students, offering a modified course schedule for working students, and permitting students to submit assignments late without penalty. Finally, she stated that working students require online and virtual services at flexible times.

Maggie will be the first in her family to earn a graduate degree. She intends to apply to a doctoral program and possibly remain in the petrochemical industry. Maggie has always worked while attending college. She expressed strong feelings about knowing that many of her classmates were financially supported by their parents. "Even now, I am working. I went through a phase where I thought life was unfair," she said. Maggie suggested that colleges recognize that their students come from diverse backgrounds and may require extra support and patience from faculty and staff. She recommends that student programming includes a mentoring program. Maggie explained that students need someone to demonstrate an interest in their academic careers, "Asking about your goals and how we can help you achieve your goals," she said. Additionally, Maggie stressed that it is essential to be heard and not brushed aside by college stakeholders.

Rachel shared that the financial aid staff seemed distant and not helpful. "The financial aid people here are less welcoming than at my previous school. They don't know about loans and stuff. Here the response is to go to the website," she said. Rachel recommended that financial aid staff receive training on answering questions about school loans. Irene indicated needing financial aid since she comes from a single-parent home. She said she would advise students to first attend community college due to the lower cost unless they get a full financial aid ride to a university. Amy, Iliana, Diana, and Laura shared their limited experiences with their financial aid office. Amy said, "It was very interesting." Moreover, she is now seeking employment, which implies she is not moving forward with the financial aid process. Iliana indicated that she used financial aid during her first two years but is no longer utilizing aid. However, she did begin using the food pantry to help her save money. Diana's first two years at university were overwhelming. "I was worried about financial aid and completing assignments," she said. Diana needed assistance navigating through the red tape of financial aid to focus on school. When asked what support or services students need to be successful, Laura stated that learning about financial aid and scholarships early on is essential. However, she did not indicate using financial aid services on her campus.

One participant recommended tapping into students' research interests. Rachel is a graduate environmental science program student who wishes to join the military. Growing up on the Texas coast, she was exposed to the fishing industry, influencing her academic decision to pursue marine science research. She indicated an interest in research. "I did not know if you offer an undergraduate research program," she said. Therefore, Rachel also suggested improving the website content and searchability to find events and research opportunities. "I would start with creating tabs and advertising more

about what you want to promote. Do reminders. Keep reminding," she said. She also advocated for a long-term class schedule so students could plan out their graduation date.

Anna, Irene, and Laura shared their viewpoint concerning advising on their campus. Anna, a biology graduate student, shared her perspective on her experience as a transfer student from a community college. Her challenge was completing organic chemistry I and II. She took part I at the community college and attempted to complete the second part. However, two different advisors provided different information and advice. The situation was complex since the organic chemistry courses were indeed transferrable. However, the two institutions cover different content in each part, making it challenging for students who did not take the two organic chemistry courses sequentially at the same college or university. "I took organic chemistry II here, and I could not catch up. I went to a different advisor who took the time to listen to me and understand. They advise that I take part II back at my community college," she said. Irene also shared her perspective on advising and course offerings. From her viewpoint, there are not enough advisors to promptly serve all students needing assistance. She said, "If we can have more advisors or be allowed to see multiple advisors, which would help. Additionally, she is concerned with the limited class availability when choosing or retaking courses. "I don't like having to wait for courses," she said." Similarly, Laura shared that she is concerned about advisors' workloads and instructor relationships. She worried about the volume of students and work that advisors must handle. "Your advisor may have personal issues and can't see everything. Communication comes into play and having a proper conversation," she said. Also, she shared, "I wish there could be a different way to have classroom discourse. Rather than the instructor saying it and students copying it."

According to Iliana, a senior biology major, a centralized office for all questions would have been helpful. During her first year, she was puzzled by numerous processes.

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"I recall being very confused about the distribution of my financial aid funds, and they answered all my questions. Orientation was also helpful," she said. Iliana described how beneficial the help desk was at her university during her first year. She remarked, however, that the office has not been visible in recent years. Iliana suggests promoting the office and making it more accessible to students to increase its visibility. As students navigate new experiences, she wants to see the college promote campus life as valuable to students. Furthermore, Iliana emphasized that campus events are difficult to attend due to their scheduled times. Finally, she stressed that campus jobs should pay more to compensate students for their time and effort.

Maggie and Linda shared similar recommendations. Colleges should learn more about their students and the factors influencing their academic success. Maggie, a graduate student, explained that students must be supported and not brushed aside. Maggie's undergraduate experience was not positive. "They would not answer a question. They would say if you can't read the book and figure it out, this class was not for you," she said. However, her graduate professors at her current university encourage students to get involved and serve as unofficial mentors. She said, "Dr. D is wonderful." Maggie stressed that she sought affirmation and someone to listen to her. Linda also expressed a need for mentorship-type relationships on campus, especially for first-year students. "Don't call it mentoring. No one wants to be mentored," she said. Linda expressed that she wanted someone to know her challenges and be sympathetic to working students by allowing them flexibility when submitting assignments, modified class schedules, help with a resume, and team building. For example, when asking about scholarships, they refer you to the website, "I hated that. They send you to the website and say apply. More guidance would be helpful," she said. Rachel also indicated that colleges need to know their students better and support their student's interests and future

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professions. Respondents indicated a need for guidance from recruitment through graduation. Students were eager to discuss their fields, research, and internships with faculty. In addition, participants want college stakeholders to be interested in their endeavors as students. In general, they want a more empathetic orientation to the procedures and terminology of higher education.

Research Question: Perception of Campus Resources and Organizations

Research question seven, *What are students' perceptions of the campus resources and organizations?,* was also answered by applying inductive coding on data collected from individual interview transcripts. The second goal of one-on-one semi-structured interviews was to provide a narrative of students' experiences and perceptions of campus organizations and resources. The ten one-on-one interviews yielded the following three themes: (a) Sense of Belonging/Transition and (b) Campus Resources and Organizations. These themes are presented in the form of participant discussions and statements.

Sense of Belonging and Transition

College students must feel welcomed and supported as they transition from high school or community college to a four-year university. The various interviews revealed a common theme: a sense of belonging. Participants shared their views and discussed their lived experiences. The participants' discussions were organized into groups. Laura, Amy, Iliana, and Linda were grouped because the pandemic impacted their college experiences. Maggie, Anna, and Rachel were considered as a group because they all earned their undergraduate degrees at various universities, whereas Helen, Irene, and Diana transferred from a community college. Their diverse remarks provided valuable insight.

Laura, Amy, Iliana, and Linda's college experiences were impacted by the pandemic. Laura was a part of the volleyball team at her small private institution, but she did not connect with her college and had anxiety about being away from home.

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Unfortunately, Laura did not stay to complete her undergraduate degree. She returned home and applied to a local mid-size university but claimed that the pandemic prevented her from fully integrating into her new university during her first two semesters. However, after the pandemic, she said, "Returning to campus, I was able to get the feel of things." According to Laura, college students are responsible for the experiences they create for themselves. She added that it is easy for minority students not to be involved. Likewise, Amy said that the pandemic hindered her transition from community college to university life. Moreover, she reported feeling alone when she completed her undergraduate degree. "You are on your own. Trying to find a job, research group, or a company to hire you," she said. Amy did not mention being aware of Career Services or contacting faculty or advisors. Iliana participated in her high school's dual credit program and took courses at a large community college. Now, a biology major at a mid-size university, she said, "I get properly challenged, and I have made some friends. It is nice to be on a smaller campus. I have met most of my biology teachers, so I like interacting with most of the professors." Both Linda and Iliana live on campus. Linda attributed her success to living on campus. Iliana indicated that she had enjoyed the smaller campus, which lends itself to getting to know your faculty and classmates. She stressed that she liked seeing students like herself. "Having individuals like yourself helps build a connection with others. Overall, I think it is good," she said.

Three participants indicated attending community colleges before transferring to a university. Helen shared that she started at a community college due to the lower tuition. She shared one experience concerning incorrect information: "I went to tutoring to get help with a web application course, but they did not have that. But the website stated differently," she said. Helen also found it challenging to understand some of her professors because English was their second language. Similarly, Irene initially attended

a community college and earned an associate degree in science. She experienced the challenges of the pandemic. "I transferred in the fall of 2020. It was very hectic and tough," she said. She emphasized that her first semester was extremely stressful. She was confused about why most STEM courses were not in the science building. Also, she struggled to connect with her advisor until she was assigned her permanent advisor. "My advisor did not help me a lot. I was nervous, and he did not help me," she said. However, she did not blame him due to the pandemic and its stressors. Irene indicated that the following semester was better. "The next semester, I had a better advisor. I was put in various academic support services and therapy. It has been great," she said. Diana also attended a community college. She thought the community college was much easier than her first year at her university. "I remember my first year at the university, taking biology, chemistry, and physics with labs. I was so stressed since it was so much work. However, it slowly got better and easier," she said.

Maggie, Anna, and Rachel completed their undergraduate degrees at different universities before starting their graduate programs. Maggie shared that she felt like an outsider and not smart enough during her undergraduate years. "I did not feel close to anyone. There were times when some professors made me feel stupid," she said. However, her graduate experience at her current university is much different. "I've had a wonderful graduate experience. The professors in the chemistry department care about their students," she said. Maggie also shared that she connected with students close to her age and background. Maggie said, "In graduate school, I feel like I fit in since everyone works and works in similar fields." Anna also shared a positive graduate school experience. "This campus has been way better," she said. Anna stressed that she could communicate with all her professors due to the university's smaller size. "I can interact with them more and learn more," she said. Anna shared that one instructor meets with her

students to explore the field and its possibilities. She said, "Being able to communicate with your professors and people at school" was essential to her. Rachel's experiences were based on what her university did not offer, such as a long-term schedule to plan her remaining coursework. She had personal goals that were impacted by not knowing when she could graduate.

Campus Resources and Organizations

Campus resources and organizations are critical to students' academic and social development. The concept of student perception of campus resources and organizations also provided college stakeholders with valuable information. The ten individual interviews yielded a wide range of remarks, including the advantages of joining an organization and the difficulty of participating and finding support off-campus.

Laura, Amy, Iliana, and Linda stated that their participation in a STEM program for Latinas at their university positively influenced their present and future perspectives. Laura joined the Latina STEM organization early in her academic career. "I started as a mentor. Then I moved up to a research assistant," she said. Although Laura participated virtually during the pandemic, "They were the first sense of community I felt," she said. Once back on campus, Laura joined an organization related to teaching, where she became an officer. Laura had the distinction of creating a local chapter of her organization. Once back on campus, Laura shared that she utilized the library to study, the math center for assistance with a few math courses, and her academic advisor. She added, "My university teachers have been a great resource." Likewise, Amy served as an officer in her STEM organization. As a first-generation college student, Amy did not have parents to offer support as she started her academic career. "My parents did not go to college. But having a group going through the same things as you helped," she said. Amy has bonded with her classmates by developing study groups or hanging out. Since

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her group comprises many first-generation college students, Amy may feel she is part of a similar group instead of an outsider. Her campus resource usage consists of Counseling Services. She also visited Financial Aid which was "Very interesting," she said. Iliana lives on campus and is active in two STEM organizations, one social and one academic. She shared that attending the social organization's meetings was challenging, "I have a hard time managing time," she said. Iliana took advantage of various campus resources like Tutoring, the Math Center, and the Food Pantry," she said. Linda shared that being a first-generation college student meant that having an on-campus support system was necessary. "They were my second family away from home," she said. Linda shared that having an on-campus place to study or hang out was important. There were two STEM organizations in which Linda indicated she actively participated from which study groups were developed. Linda found her current university's processes were easy to understand and used all online services available. The library was the service she indicated utilizing the most.

Irene has a long commute between campus and home. "I have not joined any organization. I wanted to focus on school. Also, I do not live near my campus," she said. However, she did utilize various campus resources. She has visited financial aid, career services, advising, and counseling. Similarly, Diana was not active in an on-campus organization. Nonetheless, she developed a bond with her independent study classmates. She said, about her lab group experience, "It was an experience I appreciated, and I still talk to them. I appreciated being part of that lab group since it helped me grow as a tech in the lab." As a graduate student, Diana shared that she was only on campus once per week. Therefore, she only uses the library and computer lab occasionally.

Initially, Maggie was pre-med and joined a medical school organization, but the organization fell apart. After changing her major and enduring negative experiences in

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her department, she joined an off-campus church group and participated in missionary work. At her current university, Maggie has not joined an official campus organization. However, she shared plans to work with her graduate faculty over the summer on a project. Maggie utilized the university library and faculty. "At this level, I have enough skill to do everything independently," she said. Similarly, Rachel utilized limited campus resources. She indicated that she used the Veteran Services to process her tuition assistance. Rachel said she participated in two social and one academic campus organization.

Anna and Helen both shared limited to no campus organizations participation. Anna shared that she joined a marine biology-type organization. However, she said, "I don't think it is together. It fell apart." She claimed that that organization was around for about two years before it disbanded. Helen attributed the failure to due to students' commute and other responsibilities. She utilized various campus resources such as tutoring, the library, the computer lab, and accessibility services. Similarly, Helen's information technology organization was not active on campus. She, too, utilized various campus resources like the math center, library, and computer lab. Helen added that she wished the campus had a swimming pool.

Summary of Findings

Students at a comprehensive public four-year university near a major city in South Texas were sent a Self-Efficacy and Resilience Scale questionnaire and invited to one-on-one semi-structured interviews. The students of interest were Latinas in STEM majors. A Qualtrics survey was distributed via university email to 359 STEM subjects, yielding a 10% response rate. Additionally, the respondents to the online survey were invited and actively recruited to participate in a semi-structured interview. Ten participants agree to an one-on-one interview.

The quantitative analysis revealed statistically significant differences in self-efficacy and resilience between traditional and non-traditional-aged students. Furthermore, there was no statistically significant difference between students' self-efficacy and resilience across all three regions, Mexico, Central America, and South America. However, self-efficacy and resilience were found to have a statistically significant relationship.

The qualitative, semi-structured interviews generated informative data, which was analyzed using an inductive method to identify emerging themes. The four major themes that emerged were: transition and sense of belonging, motivation and influencers, campus resources and organizations, and advice and recommendations offered by students. Participants indicated that college faculty and staff assistance was crucial to their college experiences. Even though campus organizations and resources serve a purpose, there were usage challenges due to the organization itself and students' availability. Students indicated a lack of time to participate in campus organizations or groups due to school, work obligations, and commuting to and from campus. In addition, it was noted that campus resources were not always helpful but were essential for navigating the maze of higher education. Most respondents agreed that colleges should learn more about their students and offer appropriate assistance during critical times throughout their academic careers.

Conclusion

This chapter presented the results of both quantitative and qualitative data analyses. The chapter briefly described the participants' demographics and characteristics. Also included were the answers to the quantitative and qualitative research questions. In Chapter 5, the researcher compared the study's findings to previous

research. In addition, the researcher summarized the research, its implications for practice, future research recommendations, and research limitations.

CHAPTER V:

SUMMARY, IMPLICATIONS FOR PRACTICE, RESEARCH

RECOMMENDATIONS, AND LIMITATIONS

This chapter summarized the findings, implications for practice, research recommendations, and limitations. The study examined self-efficacy and resilience in Latinas in STEM majors of traditional and non-traditional ages and various ancestral countries identified. The study also looked into whether there was a statistically significant link between self-efficacy (SE) and resilience (RE). Additionally, the study examined students' perceptions of their academic experiences and campus resources and organizations. The following quantitative and qualitative questions were used in the investigation.

Quantitative Research Questions

1. Is there a difference in self-efficacy for Latinas in STEM majors based age range?

2. Is there a difference in resilience for Latinas in STEM majors based on age range?

3. Is there a difference in Latinas' self-efficacy in STEM majors based identified ancestral country?

4. Is there a difference in Latinas' resilience in STEM majors based on identified ancestral country?

5. Is there a relationship between self-efficacy and resilience?

Qualitative Research Questions

6. What are students' perceptions of their college experience?

7. What are students' perceptions of the campus resources and organizations?

An explanatory sequential mixed method design technique was used to collect and utilize quantitative and qualitative data in a two-stage process within this study. The study was conducted from spring 2022 through fall 2022. Using Qualtrics, a survey link

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was sent to 359 Latina students in STEM majors. Out of 359 students, 36 completed the survey which provided the basis for the quantitative analysis. Ten students participated in a semi-structured one-on-one interview from which the qualitative data were collected. The participants were Latina undergraduate and graduate students in various STEM based academic programs like mechanical engineering, biology, math, and environmental science.

The quantitative data were analyzed through a two-independent sample *t*-test to determine whether there was a statistically significant difference between self-efficacy and resilience based on traditional and non-traditional age students for questions one and two. Questions three and four were analyzed using an independent samples *t* test. For question five, a Pearson correlation was computed to determine if there was a statistically significant relationship between self-efficacy and resilience. Questions six and seven were answered using data collected through the one-on-one semi-structured interviews. After transcribing the interviews, the resulting qualitative data were analyzed using inductive coding to answer questions six and seven.

Summary of Findings

The purpose of the study was to examine if whether a difference exists in self-efficacy and resilience for Latina STEM students based on traditional and non-traditional age and region of ancestry and to determine if a statistically significant relationship exists between self-efficacy and resilience for these students. In addition, the study investigated student perceptions of their college experiences and campus resources and organizations.

Research questions one and two examined: *Is there a difference in self-efficacy (SE) for Latinas in STEM majors based on traditional and non-traditional age ranges?* and *Is there a difference in resilience (RE) for Latinas in STEM majors based on traditional and non-traditional age ranges?* The analysis indicated significant differences

in self-efficacy and resilience between traditional and non-traditional age students. The results for questions three and four indicated no significant difference between SE and RE by region. Analysis of question five, *Is there a relationship between self-efficacy and resilience?,* resulted in a statistically significant relationship between SE and RE. Finally, answers to questions six and seven yielded qualitative data from ten semi-structured interview transcripts. The interviews yielded students' perceptions of their academic experiences, campus resources, and organizations.

Self-Efficacy and Resilience by Age Range

Research questions one and two examined self-efficacy and resilience for Latinas in STEM majors based on age range. The researcher used a two-step process to answer these questions. First, the continuous age variable was divided into two categories. Traditional for participants 17 to 25 and non-traditional for those 26 and older. Then, a two-independent sample t-test was used to determine if the two groups had a statistically significant mean. The results demonstrated a statistical significance difference between traditional and non-traditional age and self-efficacy and resilience. Older students demonstrated higher levels of self-efficacy and resilience. This study's findings and literature are somewhat contradictory based on the available research. Bausch (2014) found that older women demonstrated a more positive sense of self-efficacy toward training success than older men. However, other research indicates that particular situations or problems influence self-efficacy. Artistico et al. (2003) found that students 20 to 29 had higher levels of self-efficacy when dealing with computer issues, motivation to finish a degree, coping with shyness, and relationship challenges than the older students. Older students had higher self-efficacy when dealing with having blood drawn, the tone of a meeting, excessive demands of family, and coping with family lifestyles (Artistico et al., 2003). Chung et al. (2017) claimed that the literature indicated a positive

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relationship between resilience and age. A study of students aged 25 or older or those who delayed entry between high school and college indicated they were arguably more resilient and academically successful (Cantwell et al., 2001; Martin et al., 2010). Additionally, there are other variables to consider when addressing resilience. Edwards et al. (2016) examined the parental relationship of 161 students, ages 16 to 21to determine if there was a link between resilience and the students' relationship with their parents.. The study found that a healthy relationship with parents or guardians corresponded with a higher level of resilience.

Self-Efficacy and Resilience by Region

Research questions three and four investigated whether Latinas' self-efficacy and resilience differed based on identified ancestral country. The researcher coded the countries identified by students into three regions Mexico, Central America, and South America. In the second step, an independent samples *t* test was performed. However, the analyses revealed no significant differences in SE or RE amongst the three regions. The current body of literature sheds light on the complexity of the questions. In a cross-sectional study, researchers assessed the self-efficacy of 519 undergraduate engineering students by gender and ethnicity and found no statistically significant differences in the means (Concannon et al., 2009). Additionally, the study found no significant relationship between self-efficacy and gender. Other literature emphasized a specific ethnic group and cultural adaptability impact on self-efficacy. According to the study of 408 Mexican American college students, cultural assimilation was associated with better levels of self-efficacy (Aguayo et al., 2011). In addition, the study discovered that students who identified both with their own culture and with the new culture had a higher level of self-efficacy (Aguayo et al., 2011). The literature found that the resilience of minority female entrepreneurs was higher than males (Shelton et al., 2021). The researcher attributed this

finding to gender barriers that women face and overcome (Shelton et al., 2021). Morgan Consoli & Llamas (2013) investigated the role of cultural values in the resilience of 124 college students who self-identified as Mexican Americans. The results of the mixed methods study found that students with a robust family support system were a predictor of resilience. The literature demonstrates that the questions are complex and require further reading and examination.

Self-Efficacy and Resilience Relationship

Research question five, *Is there a relationship between self-efficacy and resilience?*, was answered using a Pearson correlation to determine whether SE and RE had a significant difference. All participants were included in the analysis. The results indicated a significant relationship between self-efficacy and resilience. The literature on self-efficacy and resilience is available; however, there are questions about the definition of resilience. Research conducted on predictors of resilience examined self-efficacy and being present in the moment (mindfulness) as predictors of resilience (Keye et al., 2013). The results indicated a statistically significant correlation between being in the present moment and academic self-efficacy (Keye et al., 2013). A longitudinal study of 1600 first-year students examined the impact of academic self-efficacy and optimism on academic performance and persistence (Chemers et al., 2001). One of the study's findings suggests that self-efficacy and resilience are linked (Chemers et al., 2001; Lightsey, 2006). Furthermore, students' belief in their abilities to succeed enables them to overcome obstacles and achieve their academic goals (Chemers et al., 2001). In counseling, resilience is defined as an individual's ability to overcome obstacles and achieve their goals through adversity (Lightsey, 2006). Moreover, Lightsey's (2006) theory claims that self-efficacy and resilience are intertwined.

Perception of College Experiences

Research question six examined students' perceptions of their college experiences. The interview data revealed a wide range of experiences among college students. Participants in the interviews revealed both positive and negative college experiences. The following themes emerged from the students' comments: a sense of belonging and transition, motivation and influences, and advice and feedback. The results and literature align with the themes.

Sense of Belonging and Transition

Nine students shared their struggles adjusting to their college or university. Multiple researchers have concluded that a sense of belonging and a smooth transition into higher education are essential for students' good mental health, persistence, and retention (Cooley et al., 2021; Sims et al., 2020). The interviews revealed students' lack of connections to their colleges, classmates, and faculty during the pandemic. Laura went to college five hours away from home during the pandemic. She said, "It was hard getting used to being away from home, and Covid-19 happened." Irene described her experience during the pandemic as "crazy." The findings and literature confirm that the pandemic increased students' stress and anxiety (Enriquez et al., 2022). The student's inability to interact with extended family and friends added to their stressors (Blanco et al., 2022).

Students reported that interactions with peers and faculty were crucial to their sense of belonging and mental health on campus. Sims et al. (2020) stressed that a sense of belonging for Latinas is significantly associated with positive mental health outcomes on campus. These students emphasized the significance of interacting with peers who share similar backgrounds and interests. The findings are consistent with the literature in demonstrating that students from comparable backgrounds can build supportive relationships (Burke, 2019). Creating student groups on college campuses, such as STEM

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meta-majors, serve as support systems (Burke, 2019; Sithole et al., 2017). The literature revealed that the cohort models exhibited increased retention (Huerta & Bray, 2013; Sithole et al., 2017). Additionally, researchers stressed that peer interaction outside the classroom strengthens students' sense of belonging (Hurtado & Carter, 1997; Rodriguez & Blaney, 2021). Similarly, faculty interaction can positively influence students' sense of belonging. Students reported that they enjoyed discussing their majors and career opportunities with faculty outside the classroom. Gayles et al. (2011) maintains that interactions with faculty significantly impacted student retention and degree completion. Furthermore, STEM immersion is needed both inside and beyond the classroom. Szelenyi (2011) stressed that residence hall and Living-Learning programs encouraged women's long-term commitment to STEM education. Four study participants perceived living on campus as a factor leading to their degree completion.

The National Academies of Sciences, Engineering, and Medicine (2017) emphasized the need for students to feel welcomed, respected, included, and supported on campus by faculty, staff, and fellow students. Hurtado and Carter (1997) concurred that students who successfully transitioned and felt welcomed in their new higher education environment would persist.

Motivations and Influences

The second emergent theme revealed how motivations and influences impacted students' academic choices. Students shared that exposure to STEM courses, books, and science demonstrations influenced their academic route and prepared them for STEM in college experiences. Nine out of ten participants shared what motivated and influenced their STEM career paths.

Participants indicated that their pre-college exposure to STEM built their science and math identities. Their K thru 12 STEM experience ranged from unique math teaching

styles, dedicated STEM teachers and courses, and field trips where companies demonstrated high-tech electronics and algorithms. The literature confirmed that the need for students to develop a science identity was essential for the persistence of women of color in STEM majors (Bottia et al., 2015; Espinosa, 2011). In addition, the literature aligns with the findings that primary and secondary education is vital to building a foundation of STEM academically and strengthening interest (Bottia et al., 2015). Allowing students to explore different STEM fields through various programming permits them to narrow down to their field of primary interest (Smith et al., 2021).

Other participants shared that their outdoor and family experiences influenced their STEM interests. For one participant, spending time with her family members who were fishermen, and many summers fishing and beachcombing influenced her decision to choose the marine biology and environmental science programs in college. Additionally, parents employed in the oil and gas industry were another influence. Another student recalls spending many hours exploring the waterways and wildlife on the bayou. She became interested in the science behind the ecosystem. The student demonstrated their self-efficacy and resilience when navigating their college experiences. The literature aligns with the results that outdoor activities (Maltese et al., 2014), and family influence plays a role in STEM interest (Dabney et al., 2013).

Advice/Feedback

Students shared the need for awareness and easy access to campus academic assistance, mentoring, and mental health support. Two students claimed that recording lectures was helpful so students could listen outside of class to determine what they had missed or did not fully understand in class. Additionally, students indicated the need for open study groups for gate-keeper-type courses. Other students' concerns were centered on mental health. One participant explained that STEM students have greater stressors,

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academically and emotionally. The literature supported the study's participant's claim that students in STEM-related majors had the most academic challenges and personal stressors (Schweitzer, 1996). The literature stressed that early intervention was critical to student success and camp adjustment (Winograd et al., 2014).

Academic advising was also mentioned as a needed resource. Students stressed the need to work with knowledgeable advisors who had a manageable caseload. Students must navigate various new terms, processes, and rules and may need assistance. The literature consistently demonstrates an association between advising and retention (Swecker et al., 2013; Tinto, 1993). Additionally, advising is critical for students transitioning into the college setting (Tinto, 1993).

The seventh research question examined participants' perceptions of campus resources and organizations. Students had a broad view of on-campus organizations and resources. They indicated using the food pantry, financial aid, academic advising, library, and math center. Furthermore, interviewees reported varying levels of involvement in campus organizations, ranging from inactive to active.

One interviewee stated that she was unaware of the food pantry and would have used it sooner if she had known about it earlier. Several barriers to food pantry underutilization on campus were identified by researchers (Brito-Silva et al.; Zein et al., 2018). They identified a lack of awareness, shame, and operating hours as barriers to utilization. Financial assistance was also mentioned as a service. While the service is critical, students reported that obtaining assistance was complex. These difficulties may explain why students seek information from various sources when making financial aid decisions (Harper et al., 2021). According to the available research, students seek financial aid information from their parents, financial aid offices (Harper et al., 2021), teachers, counselors, coaches, and college representatives (De La Rosa, 2006). Students'

perceptions of college affordability may be influenced by their primary source of financial aid information, their parents (De La Rosa, 2006).

Two students mentioned academic advising as a campus resource they utilized. In this study, a first-generation college student described her experience with the university orientation event. During her advising session at orientation, she felt confused and lost. Her advisor encouraged her to join a STEM organization that supports first-generation and minority students. However, the same student struggled with having multiple offices to address other questions and needs. Another participant believes advising is essential but is concerned with her advisor's multiple responsibilities, caseload, and availability. The findings of the study are consistent with academic advising literature. While academic advising is essential for retention and persistence (Swecker et al., 2013; Tinto, 1993), advisors have many responsibilities such as committee work, teaching seminar courses, and campus event that limit their time for direct student interactions (Robbins, 2013).

Students who participated in first-generation or ethnic-based STEM organizations found it rewarding. They had opportunities to interact with students of similar backgrounds and to take on leadership roles within the organization. Belonging to a campus organization helped them with their sense of belonging and transition. Additionally, students' membership in organizations was crucial to their retention and degree completion. However, some students found attending meetings and participating difficult due to time constraints; therefore, some students focused on academic organizations or unofficial study groups. Banda et al. (2017) demonstrated that Latinas join organizations to fulfill their sense of belonging as well as their academic and social needs. Participants in this study enjoyed interacting with other students who were similar to themselves. The literature supports the study findings, which show that many students

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sought ethnic-specific STEM organizations (Banda et al., 2017). In addition, the literature demonstrated that students wanted to socialize and interact academically with other Latina engineering majors (Banda et al., 2017). Students believe classmates of similar backgrounds can sympathize with them and provide emotional support (Banda et al., 2017). On the other hand, some students did not see the value of an ethnic base organization and did not want to feel isolated from the rest of the university (Banda et al., 2017).

Implications for Practice

Based on the study's findings, four main implications for practice were outlined. The first implication for practice is learning about new first-year and transfer students who may consider enrolling at the university. The institution could consider collecting student information from feeder high schools and community colleges. Through a collaborative effort, an online survey can be developed to understand students' social and academic needs. The goal would be to determine students' awareness of the admission process, financial aid, and career exploration needs. With a clear understanding of needs, the university could update printed materials, website, internal processes, and programming, leading to a smoother onboarding, retention and graduation. While assessment is critical to ensure programming is efficient or needs updating, it is essential to understand what is being assessed. Also, the assessment works in junction with the data collection implication.

The second implication for practice is a STEM bridge program. The program would encourage high schools and community colleges to partner with the university to connect their STEM students with the university. Programming could include a Summer STEM camp to build students' STEM identities and interest in science through hands-on projects and demonstrations, provide academic support and connect students to STEM

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faculty. Within the STEM bridge program, faculty could develop an entry-level research project and recruit students to participate in a summer research project. Additionally, students participating in the bridge program could be allowed to join the university's STEM organizations because transfer students are less likely to join an organization (Concannon et al., 2019). Finally, the STEM bridge program should maintain an office on the community college and high school campus, offering tutoring assistance, advising, other support services, and encourage involvement.

The third implication for practice is a STEM peer mentoring program. Programming would focus on new first-year and new transfer Latinas in STEM majors. These students would be assigned a STEM peer mentor who used to be a mentee. The peer mentor and new student would connect before orientation, during onboarding, and throughout the semester. The goal would be for the peer mentor to provide academic and social guidance and support. While orientation provides essential information about campus services, incoming students would benefit from learning about the many campus resources and organizations from a fellow STEM classmate.

The fourth implication for practice is a career service and faculty mentoring programming. For first-generation Latinas in STEM fields, the university must consider their preparedness for the workforce and career outcomes. The underrepresentation of Latinas in the STEM workforce (Kennedy et al., 2021) may be seen as a lack of a positive career outcome. Faculty and career counselors could assist Latina STEM graduates by informing them of career opportunities, networking, resume development, interviewing skills, and options for graduate school. Since the Latinx population will soon account for half of the labor force in the U.S. (Rincon et al., 2020), Latina students must complete their academic credentials and develop their self-efficacy and resilience to navigate the workforce environment. Additionally, the university must track STEM

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graduates concerning where students found employment, determining whether the skills learned were applicable on the job, identifying additional skills needed, and encouraging graduate school plans.

Research Recommendations

The following recommendations were made in light of the study's findings and limitations. First, future studies should include other ethnic and gender groups in STEM and other disciplines. Examining all students' experiences and perceptions would yield a broader range of data. Data collection would include quantitative and qualitative methods to ensure that the students' narratives are fully conveyed. The second recommendation would be to compare Latinas' and Latinos' self-efficacy and college experiences in STEM and non-STEM majors. The research would examine for any differences in self-efficacy and resilience across majors. Additionally, it is essential to understand how different types of campus organizations support students through their STEM careers in college and beyond. Future studies should examine how organizations use cultural and socioeconomic differences as strengths to achieve their academic goals. Also, it is essential to examine how students learn to be inclusive when interacting with individuals of different ethnic groups. Finally, future research should examine the sense of belonging of Latinas in the STEM workforce, which continues to be dominated by men and people of other ethnicities.

Limitations

The researcher identified three main limitations. Convenience sampling and a relatively low sample size was the first limitation. Participants were recruited from one university located in South Texas. These two factors limit the generalizability of the results. Additionally, the survey and individual interviews depended on self-reported data, which included only information that participants were willing to disclose.

Moreover, the possible differences in responses between students who responded versus those who did not may impact the results. Additionally, the researcher was compelled to assume that the data was accurate. The third limitation of the study was that it was undertaken soon after the pandemic. According to the researcher, students were reluctant to be interviewed in person. Once the researcher offered interviews over Zoom, the virtual option increased participation. Also, the pandemic may have added a stressor not ordinarily present.

Conclusion

This mixed methods study found that Latina STEM students' needs are complex and differ for each student. They may benefit from a variety of services and support. According to the findings, colleges, and universities must fully understand the individual needs of first-generation Latina STEM students. The results indicated that students have varying levels of social capital in terms of knowledge about navigating the college admissions process and support from their families to achieve their academic goals. In addition, the results demonstrated that students need to work to finance their education, and they depend on campus stakeholders to guide them throughout their academic careers. Therefore, financial aid, academic support, advising, peer mentoring, faculty mentoring, student organizations, and other campus resources should all be considered high-impact practices, which must be delivered intentionally and continuously assessed. One reoccurring statement during the one-on-one semi-structured interview revealed students want and need to intentionally interaction with faculty to feel connected to their college and major. Colleges and universities may want to focus on how they are supporting unique students' needs. Moreover, higher education institutions should assess students' needs before they arrive on-campus.

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APPENDIX A:

EMAIL TO STUDENTS

Dear

Hello! You are being solicited to complete an online survey. The purpose of the survey is to investigate the link between self-efficacy, which is a person's conviction in their potential to succeed (Bandura, 1997), and resilience *is the ability to bounce back from an adversity* (Flinchbaugh et al., 2015) among STEM majors. The findings of this research may shed light on the influence of self-efficacy and resilience on STEM students. It may also highlight the need for enhanced student support services.

Please answer all questions to ensure that the survey data is as valuable as possible. It should take approximately 15 minutes to complete the survey. Because participation in this survey is entirely voluntary, you may stop participating at any time. This survey will not directly benefit you but may provide valuable insight into students' self-efficacy and resilience in STEM fields.

Your confidentiality will be kept to the degree permitted by the technology being used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties. Please be aware that accessing the survey via an unprotected wireless network may potentially compromise your confidentiality.

Your willingness to take part in this study is much appreciated. You imply that you consent to participate in the study and are 18 years of age or older by clicking the [Survey Link](#) and proceeding with the survey. If you have any further questions, please feel free to contact me at Mary Ramos at Ramos@uhcl.edu.

 I appreciate you taking the time to complete this survey!

Thank you,

Mary Ramos, M.S.
Doctoral Candidate
College of Education
University of Houston-Clear Lake

APPENDIX B:

SURVEY COVER LETTER

Dear Participant:

Hello! You are being solicited to complete an online survey. The purpose of the survey is to investigate the link between self-efficacy, which is a person's conviction in their potential to succeed (Bandura, 1997), and resilience *is the ability to bounce back from an adversity* (Flinchbaugh et al., 2015) among STEM majors. The findings of this research may shed light on the influence of self-efficacy and resilience on STEM students. It may also highlight the need for enhanced student support services.

Please answer all questions to ensure the survey data is as valuable as possible. It should take approximately 25 to 30 minutes to complete the survey. Because participation in this survey is entirely voluntary, you may stop participating at any time. This survey will not directly benefit you but may provide valuable insight into students' self-efficacy and resilience in STEM fields.

Your confidentiality will be kept to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties. Please be aware that accessing the survey via an unprotected wireless network may potentially compromise your confidentiality.

Your willingness to take part in this study is much appreciated. You imply that you consent to participate in the study and are 18 years of age or older by proceeding with the survey. If you have any further questions, please feel free to contact me at Mary Ramos at Ramos@uhcl.edu.

 I appreciate you taking the time to complete this survey!

Thank you,

Mary Ramos, M.S.
Doctoral Candidate
College of Education
University of Houston-Clear Lake

INFORMED CONSENT STATEMENT

You are being asked to participate in the research project described below. Your participation in this study is entirely voluntary, and you may refuse to participate, or you may decide to stop your participation at any time. Should you refuse to participate in the study, or should you withdraw your consent and stop participation in the study, your decision will involve no penalty or loss of benefits to which you may otherwise be entitled. You are being asked to read the information below carefully and ask questions about anything you don't understand before deciding whether or not to participate.

Title: Self-Efficacy and Resilience of Latinas in STEM Majors

Principal Investigator(s): n/a

Student Investigator(s): Maria L. Ramos "Mary"

Faculty Sponsor: Dr. Renee Lastrapes

Purpose of the Study: The survey's goal is to look at the relationship of student's belief in their ability to succeed, and the ability to bounce back from a setback. The results of this study could provide insight on how STEM students navigate and experience their college careers.

Procedures: The interview has about 9 questions to help guide our conversation. This should take about 30-minutes. Your participation is voluntary, and you stop at any time or not answer a particular question. Our interview will be recorded on my iPhone (which is password protected) and also saved on password-protected computers and external hard drive.

Expected Duration: Interview length is about 30 minutes.

Risks of Participation: There are no anticipated physical risks. The interview questions are regarding normal everyday activities such as work, school, and life. If any discomforts arise, the student researcher will refer students to campus resources as needed.

Benefits to the Subject

There is no direct benefit received from your participation in this study, but your participation will help the investigator(s) to better understand students' beliefs in their ability to succeed, and the ability to bounce back from a setback during their college careers.

Confidentiality of Records

Every effort will be made to maintain the confidentiality of your study records. The data collected from the study will be used for educational and publication purposes, however, you will not be identified by name. For federal audit purposes, the participant's documentation for this research project will be maintained and safeguarded by the Principal Investigator or Faculty Sponsor for a minimum of three years after completion of the study. After that time, the participant's documentation may be destroyed.

Compensation

There is no financial compensation to be offered for participation in the study.

Investigator's Right to Withdraw Participant

The investigator has the right to withdraw you from this study at any time.

Contact Information for Questions or Problems

The investigator has offered to answer all of your questions. If you have additional questions during the course of this study about the research or any related problem, you

may contact the Student Researcher, Maria L. Ramos "Mary" by telephone at 281-283-3082 or by email at Ramos@uhcl.edu The Faculty Sponsor, Dr. Renee Lastrapes may be contacted by email at Lastrapes@uhcl.edu

Identifiable Private Information *(if applicable)*

Student's names will not be used instead a pseudonym using a student's direct quote.

Signatures

Your signature below acknowledges your voluntary participation in this research project. Such participation does not release the investigator(s), institution(s), sponsor(s) or granting agency(ies) from their professional and ethical responsibility to you. By signing the form, you are not waiving any of your legal rights.

The purpose of this study, procedures to be followed, and explanation of risks or benefits have been explained to you. You have been allowed to ask questions and your questions have been answered to your satisfaction. You have been told who to contact if you have additional questions. You have read this consent form and voluntarily agree to participate as a subject in this study. You are free to withdraw your consent at any time by contacting the Principle Investigator or Student Researcher/Faculty Sponsor. You will be given a copy of the consent form you have signed.

Subject's printed name: Click or tap here to enter text.

Signature of Subject: Click or tap here to enter text.

Date: Click or tap here to enter text.

Using language that is understandable and appropriate, I have discussed this project and the items listed above with the subject.

Printed name and title: Maria L. Ramos "Mary", Student Researcher

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Signature of Person Obtaining Consent: Click or tap here to enter text.

Date: Click or tap here to enter text.

THE UNIVERSITY OF HOUSTON-CLEAR LAKE (UHCL) COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS HAS

REVIEWED AND APPROVED THIS PROJECT. ANY QUESTIONS REGARDING YOUR RIGHTS AS A RESEARCH

SUBJECT MAY BE ADDRESSED TO THE UHCL COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

(281.283.3015). ALL RESEARCH PROJECTS THAT ARE CARRIED OUT BY INVESTIGATORS AT UHCL ARE GOVERNED

BY REQUIREMENTS OF THE UNIVERSITY AND THE FEDERAL GOVERNMENT. (FEDERALWIDE ASSURANCE

#FWA00004068

APPENDIX D:

STUDENT SURVEY

Part I. Generalized Self-Efficacy Scales (GSE)

By Ralf Schwarzer and Matthias Jerusalem (1995)

	Not at all true	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough.	☐	☐	☐	☐
2. If someone opposes me, I can find the means and ways to get what I want.	☐	☐	☐	☐
3. It is easy for me to stick to my aims and accomplish my goals.	☐	☐	☐	☐
4. I am confident that I could deal efficiently with unexpected events.	☐	☐	☐	☐
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	☐	☐	☐	☐
6. I can solve most problems if I invest the necessary effort.	☐	☐	☐	☐
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	☐	☐	☐	☐
8. When I am confronted with a problem, I can usually find several solutions.	☐	☐	☐	☐
9. If I am in trouble, I can usually think of a solution.	☐	☐	☐	☐
10. I can usually handle whatever comes my way.	☐	☐	☐	☐

Part II. Connor-Davidson Resilience Scale 10 (CD-RISC-10)

By Kathryn M. Connor and Jonathan R.T. Davidson (2001)

Please indicate how much you agree with the following statements as they apply to you over the last month. If a particular situation has not occurred recently, answer according to how you think you would have felt.	Not true at all (0)	Rarely true (1)	Sometimes true (2)	Often True (3)	True nearly all the time (4)
1. I am able to adapt when changes occur.	☐	☐	☐	☐	☐
2. I can deal with whatever comes my way.	☐	☐	☐	☐	☐
3. I try to see the humorous side of things when I am faced with problems.	☐	☐	☐	☐	☐
4. Having to cope with stress can make me stronger.	☐	☐	☐	☐	☐
5. I tend to bounce back after illness, injury, or other hardships.	☐	☐	☐	☐	☐
6. I believe I can achieve my goals, even if there are obstacles.	☐	☐	☐	☐	☐
7. Under pressure, I stay focused and think clearly.	☐	☐	☐	☐	☐
8. I am not easily discouraged by failure.	☐	☐	☐	☐	☐
9. I think of myself as a strong person when dealing with life's challenges and difficulties.	☐	☐	☐	☐	☐
10. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	☐	☐	☐	☐	☐
Add up your scores for each column	0	+____	+____	+____	+____
Add each of the column total to obtain CD-RISC score	=_____				

APPENDIX E:

SEMI-STRUCTURE INTERVIEW PROMPT QUESTIONS

Prompt Questions

Question #1: What factors or interests motivated you to select your major?

Question #2: Could you share your college experiences?

Question #3: Tell me about any organization(s) or study group(s) to you belong to on-campus?

Question #4: Tell me what helps or would help students navigate higher education (college)?

Question #5: What advice would you give Middle School and High School students interested in majoring a STEM field in college?

Question #6: Please provide suggestions the university, your advisors, and instructors.

Question #7: Please provide other questions to ask STEM students in relation to their academic success.

Question #8: Name the academic and non-academic office and/or resources you use on-campus at UHCL. (If student say they don't use any, I will follow-up with do you use off-campus resources? If no, could I ask why?).

Question #9: In the future, where do you see yourself working? What industry are you drawn to in STEM? (I am attempting to determine if they have long term vision concerning themselves and their profession.).

Question #10: Do you have any questions for me?