## Dissertations

Spring 3-3-2024

# Help or Hindrance: Latinx College Graduates' From STEM Majors Perceptions of University Culture Following Vincent Tinto's Theoretical Framework of Student Persistence

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## Recommended Citation

Help or Hindrance: Latinx College Graduates' From STEM Majors

Perceptions of University Culture Following Vincent Tinto's

Theoretical Framework of Student Persistence

A Dissertation by

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A Private Nonprofit Affiliate of the University of Massachusetts

Irvine, California

School of Education

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Education in Organizational Leadership

November 2023


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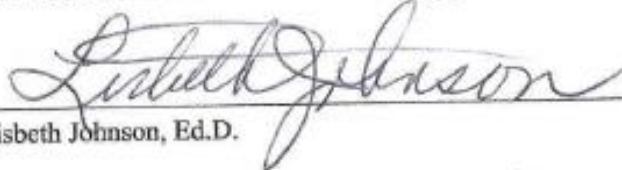
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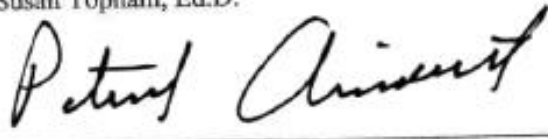
Doctor of Education in Organizational Leadership

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December 2023

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# ACKNOWLEDGEMENTS

"Success is stumbling from failure to failure with no loss of enthusiasm.  Courage is what

it takes to stand up and speak; courage is also what it takes to sit down and listen."

—Winston Churchill

If I had known how long I would struggle, how much I would edit, or how exhausted

I would feel at the end of this doctoral journey, I would not have done it, which is exactly

why I'm grateful that I had no clue. Dr. Lisbeth Johnson, my dissertation chair, friend,

and mentor, knew what the journey entailed, and she signed up to walk with me anyway.

I am so grateful for Dr. J. She pulled me kicking and screaming all the way to the finish

line. There is no way I would have finished my dissertation without her. Dr. Susan

Topham also walked with me these past years, and I am grateful to say that she is more

than a member of my dissertation committee; she is a friend. Finally, I want to thank Dr.

Jonathan Greenberg for stepping in recently to make my committee complete.

As I researched and studied and researched and wrote and researched and cried,

lamenting the life choices that led me to write a dissertation, my family stood with me.

I cannot express how much I appreciate and love all of you.  My parents, my sisters, and

my nieces and nephews, you are everything to me. My eight-year-old nephew Pablito

recently said, "Monkey, when are you going to be done with your homework?" Now I

can say I am finally done with my homework.

ABSTRACT

Help or Hindrance: Latinx College Graduates' From STEM Majors

Perceptions of University Culture Following Vincent Tinto's

Theoretical Framework of Student Persistence

by Carmen Gonzalez

**Purpose:** The purpose of this phenomenological study was to explore how Latinx college graduates who have achieved STEM degrees perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.

**Methodology:** A qualitative phenomenological approach was the methodology selected for this study. This phenomenological research captured and described the lived experiences of study participants through interviews and artifacts.

**Findings:** The findings of this research illustrate (a) Research participants all perceived that creating relationships with STEM program faculty was important in supporting them toward degree completion, (b) Building relationships with peers is necessary for students to commit to the goal of graduation, (c) Assimilating into the STEM culture was perceived as having a negative effect on participants' confidence and self-esteem, (d) The support participants received from their family and Latinx affinity groups was pivotal in supporting them to graduation, (e) Participants perceived that joining Latinx affinity groups provided significant academic and social-emotional support for them, (f) Participants indicated that their parents and family motivated them to complete their education.

**Conclusions:** Five significant conclusions emerged from this research: (a) Latinx affinity support groups play an important role in the academic achievement, (b) STEM university faculty need to provide support and access to students from all cultures, (c) Competitive STEM program culture creates rejection and negative experiences that are detrimental to STEM program graduation rates, (d) Family support was overwhelmingly important to study participants, and (e) Affinity groups are an influential source of support for Latinx STEM students.

**Recommendations:** One recommendation is for universities to train STEM faculty in teaching pedagogy, communication strategies, active listening, cultural awareness, and individual bias awareness. Also, universities can provide social and cultural events that encourage faculty and peer engagement, mentorship, and socialization outside of the classroom environment. Additionally, universities should diversify their STEM faculty as well as offer smaller class sizes for prerequisite STEM courses.

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CHAPTER I: INTRODUCTION

Talent recruiters in STEM fields, science, technology, engineering, and math, are struggling to fill their available positions with qualified 4-year STEM graduates. There is currently a shortage of prepared STEM professionals for the next decade of employment needs. That shortage will leave the workforce with a deficit of over 1,000,000 STEM graduates (Ayres, 1982; Bahi et al., 2015; Chang et al., 2016; Xu, 2016). Filling this need will require a higher presence of representatives from diverse cultures in the STEM workforce.

The Latinx population in particular is severely underrepresented in the STEM field. Also, the minimal presence of Latinx professionals in the STEM workforce is significantly disproportionate to the population of the Latinx population who are of working age and living in the United States (Chen, 2013; Stepler & Lopez, 2016). In 2010, based on U.S. Census Bureau information, the Latinx population of the United States was 50.5 million of the total U.S. population of 308.7 million. In 2010, Latinx people accounted for 16% of the total U.S. population (Ennis et al., 2011). Yet Latinx students comprise less than 2% of the STEM workforce in the United States (Krogstad, 2016).

Population growth projections indicate that by 2040, the number of Latinx living in the United States will increase to 111 million. This will double the number of Latinx people living in America (Vespa et al., 2018). Meanwhile, the non-Latinx White population is expected to decrease by 20 million by 2040 (Vespa et al., 2018). In California and Texas, for example, Hispanics account for 39% of the states' total

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populations. The only state with a higher concentration of Latinx people is New Mexico, which is 49% Latinx (Stepler & Lopez, 2016).

### U.S. Education Statistics for Latinx Students

In 2015, 42% of White students in the United States enrolled in a degree-granting institution of higher education ("Demographic Profile of Hispanics in California, 2014," 2017; Krogstad, 2016). For Latinx students, that number dips down to 37% of the Latinx population enrolling in a college or university, and the majority of those students are entering a community college, not a 4-year college ("Demographic Profile of Hispanics in California, 2014," 2017; Krogstad, 2016). This difference in enrollments is 5 percentage points apart, but the college completion rates between the two groups are significantly different. In 2014, only 15% of Latinx held a bachelor's degree or higher. In comparison, 41% of Whites and 63% of Asians held bachelor's degrees or higher (Gramlich, 2017; Krogstad, 2016).

There is a contributing factor to the discrepancy between the number of Latinx students enrolling in college and the number persisting to graduation with a 4-year degree. Comparatively, 48% of Latinx students are choosing to enroll in 2-year colleges versus 4-year colleges (Chen, 2013; Krogstad, 2016). Of the Latinx students who enroll in 2-year colleges, only 22% transfer to a 4-year college (Mau, 2016). Of the Latinx students who enter a STEM bachelor's degree-granting program, 48% drop their major. For Latinx who enter a STEM major at a 2-year college, the statistic of students who drop out is far higher, 69% (Krogstad, 2016; Nora & Crisp, 2012). For Latinx students, persistence to college graduation across all majors is markedly lower than their White counterparts (Chen, 2013).

**Latinx in STEM majors**

Latinx students in 4-year or graduate-level STEM programs are at risk of dropping out of their chosen major or university. This risk is much higher than for their White and Asian counterparts (Ortiz & Sriraman, 2015; Palmer et al., 2011). The enrollment of Latinx in 4-year STEM programs is significantly lower than their Asian, White, and Black counterparts (Chen, 2013; "The Top Producers of Minority STEM Graduates," 2016). Therefore, fewer Latinx students are graduating from STEM majors because they are enrolling in lower numbers and dropping out at a higher rate than White, Asian, and Black STEM students as well (Arcidiacono et al., 2016).

Some research suggests that the reason for the attrition rates of Latinx in STEM majors is due to a lack of academic preparedness prior to entering college and a lack of financial resources to pay for tuition and supplies (Arcidiacono et al., 2016; Borman et al., 2017; Fry, 2011; Wagner, 2015). Aguinaga and Gloria (2015) researched the persistence of Latinx students in 4-year universities and found that another reason that causes Latinx to drop out of school is a lack of cultural and ethnic identification with peers and the institution. Historically, Latinx students are less likely to apply to a 4-year college than their White and Asian counterparts (Desmond & Turley, 2009).

Until the advent of affirmative action, prestigious universities such as Yale, Harvard, and Princeton had institutional practices that set admission caps on the number of minority students admitted to their universities (Synnott, 1979). This type of institutional exclusion of Latinx from higher education was not exclusive to prestigious universities and contributed to the historically low numbers of Latinx attending 4-year institutions (Kidder, 2012). More recently, a commentary shared about attrition in STEM

majors is that minority students would be better served attending universities with less academic rigor rather than attempting to complete a degree at a competitive or top tier university (Arcidiacono et al., 2016).

Researchers have found that a contributing factor to the low percentage of Latinx in STEM college programs is that many STEM college programs are not creating cultures of inclusion for diverse students including Latinx (Toven-Lindsey et al., 2015; Estrada et al., 2016; Hernandez & Lopez, 2004). The culture of a majority of STEM programs at 4-year universities is based on the needs of individualist, White, male scientists (Arbona et al., 2018; Castillo et al., 2006; Gonzalez & Morrison, 2016). The culture of academics, meaning professors, administrators, and researchers, within STEM programs at 4-year universities is a genesis of the historical evolution of universities in the United States (Aguinaga & Gloria, 2015).

Universities in the United States were established as an educational and social system to support the conglomeration of wealth, power, and privilege among the nation's White elite (Thelin, 2008). Minority students were summarily denied access to education and the opportunity for advancement that was offered by attending and graduating from a university (Thelin, 2008). Minority students, meaning students who were not of White, Anglo-Saxon, Protestant descent, were thought to have lower intellectual aptitude than their White peers (Crouch, 1997). The faculty within what is now known as STEM programs shared these negative perceptions that universities held of minority students. Latinx students continue to face this bias within the culture of STEM programs. They are not welcomed and/or are perceived to have limited academic aptitudes for the rigor of STEM majors (Estrada et al., 2016; Flynn, 2016; Hernandez & Lopez, 2004).

The historical institutional exclusion of Latinx in higher education influences the perception that Latinx students should not apply to top tier universities but also supports the perception that Latinx students are not welcomed into rigorous 4-year universities (Castillo et al., 2006; Synnott, 1979; Toven-Lindsey et al., 2015). Yet Latinx students continue applying and gaining admission at competitive and prestigious universities though in lower numbers than their White and Asian peers (Crisp & Nora, 2012; Gramlich, 2017; University of California San Diego, 2015). Therefore, although the university application issue is important to understand and improve, research about the persistence of students to graduation ultimately plays a vital role toward increasing the number of Latinx students graduating from 4-year STEM programs (Estrada et al., 2016; Hernandez & Lopez, 2004; Toven-Lindsey et al., 2015).

**Background**

In 1975, Tinto published, "Dropout From Higher Education: A Theoretical Synthesis of Recent Research." Within this research, Tinto formulated the longitudinal model for dropout. Tinto's model for student dropout assesses students' commitment to the goal of graduation and their commitment to the institution of higher education that they are attending. The model was based on Durkheim's theory of "Egoistic Suicide," which indicates that suicide is more prevalent for those individuals who are not sufficiently integrated into their community and society (Durkheim, 1966). Likewise, Tinto's (1975) model indicates that students in higher education drop out of school if they are insufficiently committed to their goal of graduating from college and/or insufficiently committed to their institution of higher learning.

Tinto's research into student persistence in higher education became a foundation for future persistence researchers to build upon (Davidson & Wilson, 2013; Guiffrida, 2006; Kerby, 2015; Metz, 2004). At the time that Tinto published his research, the overwhelming majority of students in higher education were White and male (Davidson & Wilson, 2013; Guiffrida, 2006). Minority students were not factored as a significant population within the larger purview of a college or university's student body (Arbona et al., 2018; Gonzalez & Morrison, 2016; Synnott, 1979).

Tinto (1975) proffered that poor integration into the social system of the student's college or university would result in a higher probability of that student dropping out of school. According to Tinto, for minority students, this would mean more than physically desegregating institutions of higher education; it would mean assimilating and becoming acculturated to the dominant values, beliefs, and societal norms of an affluent White, male, protestant majority (Gonzalez & Morrison, 2016; Synnott, 1979; Zurita, 2004).

**Affirmative Action**

Before the advent of affirmative action as a legal mandate of diversification in higher education, race was used to exclude students from universities (Johnson, 2017; Synnott, 1979). After the turmoil created by the Vietnam War and the upheaval of traditional racially divided sociopolitical constructs by the Civil Rights Movement; colleges and universities were left with a history of segregation and a mandate to desegregate their student populations (Glasener et al., 2018; Johnson, 2017; Synnott, 1979).

The culture of exclusion of racial minorities at prestigious public and private universities persisted (Johnson, 2017; Kidder, 2012). Equal opportunity programs,

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followed by affirmative action, demanded that students from minority populations have equal access to universities and colleges from which they had once been systematically barred (Allen et al., 2002). In 1975, Black students were the only minority population of discussion as it pertained to higher education (Anderson, 2004; Ayres, 1982; Butler, 1994). The effects of Jim Crow oppression on the educational attainment of Blacks, and by default, other racial minorities, created a massive disparity in the numbers of minority students prepared to enter college (Allen et al., 2002; Boddie, 2016; Reardon et al., 2018).

The central aim of affirmative action was to remediate the disparity created by legislated oppression (Allen et al., 2002; Boddie, 2016). Some success in increasing the numbers of minority students was gained with the implementation of affirmative action (Allen et al., 2002; Boddie, 2016). Perhaps as a result of affirmative action legislation, White women began to increase their college enrollment and degree attainment by almost 48% from the late 1970s to 1999. Black and Hispanic students also increased their college enrollment and degree attainment though not at the same rates as White women (Allen et al., 2002). A momentum of educational equity was building across the landscape of higher education until the state of California repealed affirmative action from its admission processes (Allen et al., 2002; Boddie, 2016; Johnson, 2017).

Other states followed suit, stating reverse discrimination as a salient factor in the decision to remove race as a factor in university admission policies (Boddie, 2016; Johnson, 2017). Black and Latinx student enrollments in the University of California system plummeted after affirmative action repeal (Cherlin, 2010; Crisp & Nora, 2012; University of California San Diego, 2015). The sharp drop in minority student

enrollments derailed the diversity efforts of some prestigious universities (Chang et al., 2016; Palmer et al., 2011; Xu, 2016). This prompted some universities to offer scholarships for high-achieving minority students as a recruitment tool to improve campus diversity (Castillo et al., 2006; Chang et al., 2016). Yet the retention of minority students continues to be a challenge within STEM programs (Ortiz & Sriraman, 2015; Palmer et al., 2011; Xu, 2016).

## Culture of STEM Programs

At prestigious universities in the United States, the majority of STEM faculty are White males (Killpack & Melón, 2016; Wieman et al., 2010). The identity of STEM faculty is often based on the role of researcher and academic (Killpack & Melón, 2016; Wieman et al., 2010). This is most likely because STEM faculty are focused on moving their scientific disciplines forward with new research, publications of findings, and scientific discoveries (Castillo et al., 2006; Wieman et al., 2010). This identity influences the culture of STEM programs such that the focus on inclusivity and student support is not paramount but rather secondary or tertiary to the main aim of making progress on the faculty member's individual scientific agenda (Castillo et al., 2006; Museus et al., 2008; Wieman et al., 2010). In addition, professors are often very secretive with their research and practices until they publish their findings. This is due in large part to the competition to reach scientific advances first among the scientific community (Wieman et al., 2010). The effects of competition, exclusion, and individual self-aggrandizement on the part of STEM academics foments a culture that is not readily approachable or welcoming for students of color (Castillo et al., 2006).

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Conversely, access to professors, learning groups, internships, and research opportunities are proven to be important in student retention, particularly for minority students in STEM programs (Kendricks & Arment, 2011; Lisberg & Woods, 2018; O'Meara et al., 2017). In his research on student persistence, Tinto (1975) noted that student involvement in the university is important in supporting students to achieve graduation. Yet current STEM culture in higher education does not offer all students the same opportunities for student involvement (Castillo et al., 2006; Lisberg & Woods, 2018; Wieman et al., 2010).

There is also a prevailing belief among STEM faculty members, the gate keepers to research and internship opportunities, that students can either think scientifically or they cannot (Killpack & Melón, 2016; Mian et al., 2008). This bias informs faculty decisions and perceptions of students who are culturally diverse, have different learning styles, and/or different communication styles from the prevalent and existing culture of the STEM program that they are in (Castillo et al., 2006; Frost et al., 2018; Killpack & Melón, 2016).

There is also racial bias inherent in many STEM programs in higher education (Estrada et al., 2016; Lisberg & Woods, 2018; Museus et al., 2008). Latinx students in STEM majors at 4-year universities often experience negative stereotyping, racial aggressions, and racial microaggressions (Estrada et al., 2016; Museus et al., 2008; O'Meara et al., 2017). The deep historical roots of bigotry and institutional exclusion of minority students from higher education perpetuates the negative bias against Latinx and other racial minorities (Allen et al., 2002; Boddie, 2016; Johnson, 2017). Stereotyping and bias against Latinx and other underrepresented students in STEM majors is a

formative part of STEM culture in higher education (Estrada et al., 2016; Killpack &

Melón, 2016; Museus et al., 2008).

## Culture of Latinx Students

Contrary to the individualistic nature of university STEM programs' culture,

Latinx students often identify with a culture of *familialism* (Desmond & Turley, 2009).

Familialism, as defined by Desmond and Turley (2009), is the "social pattern whereby

individual interests, decisions, and actions are conditioned by a network of relatives

thought in many ways to take priority over the individual" (p. 314). Oftentimes, Latinx

students also hold interdependence among family and community in high value, many

times prioritizing the success and well-being of the group over that of the individual

(Manzano-Sanchez et al., 2018). Also, Latinx students seek connection to their teachers

and peers as a form of support to develop a sense of belonging within their educational

community (Rios-Ellis et al., 2015). These cultural traits are in contrast to the cultural

environment found within STEM programs.

## Effects of STEM Culture on Latinx Students

Cultural integration is what Tinto said was a necessary metamorphosis for

students to persist to graduation. His research did not address what this would mean for

Latinx students (Estrada et al., 2016; Killpack & Melón, 2016; Museus et al., 2008). One

pillar of Tinto's theory on student persistence is students' integration into the culture of

their peers and the collegiate institution. For Latinx students, integration into the

prevalent culture of STEM programs often means that their familial ties and ethnic

culture must be deprioritized to assimilate into the culture of their peers and professors in

their chosen field of study (Estrada et al., 2016; Gonzalez & Morrison, 2016; Museus et

al., 2008). Latinx students who separate from their home and community cultural influence also leave behind the cultural protective factors and supports that could be valuable in assisting them to persist to graduation (Chun et al., 2016; Manzano-Sanchez et al., 2018; Zurita, 2004).

In addition to or as a result of assimilating into STEM culture, Latinx students in STEM programs have reported finding themselves experiencing depression, isolation, stress, and anxiety (Gonzalez & Morrison, 2016; Museus et al., 2008; Toven-Lindsey et al., 2015). The psychological effects, depression, anxiety, isolation, and stress that Latinx students experience as a result of their enrollment in STEM majors at 4-year universities often lead Latinx students to change their major or to drop out of the university entirely (Arbona et al., 2018; Estrada et al., 2016; Gonzalez & Morrison, 2016).

Latinx students in STEM are also not always aware of the racial microaggressions that they face though they experience the psycho-social results of the microaggressions (Estrada et al., 2016; Museus et al., 2008). A form of racial microaggressions is expressed by faculty and peers perceiving Latinx students as less academically capable and less prepared than White and Asian students in their major (Estrada et al., 2016; Museus et al., 2008; O'Meara et al., 2017). Racial microaggressions of Latinx students also include actions such as not selecting Latinx students to participate in groups, research, or internships (Castillo et al., 2006; Estrada et al., 2016; Frost et al., 2018; Museus et al., 2008). Racially aggressive behavior has also been reported by Latinx students in STEM majors (Estrada et al., 2016; Ojeda et al., 2011; Wagner, 2015). Racial microaggressions and racial aggressions toward Latinx students in STEM programs

contributes to the low numbers of Latinx students graduating from STEM programs (Estrada et al., 2016; Killpack & Melón, 2016; Wieman et al., 2010).

**Value of Latinx Culture in STEM Program Persistence**

Latinx students have described feeling marginalized and alienated in their college experiences (Arbona et al., 2018; Castillo et al., 2006; Storlie et al., 2014). They have also described a divergence between a supportive familial environment and negative experiences at college that contribute to feelings of being rejected by their chosen institution of higher learning (Rios-Ellis et al., 2015; Storlie et al., 2014). For Latinx students in STEM programs specifically, the assimilation process of integrating into the prevalent STEM culture echoes the sentiments and experiences of the larger Latinx population in college, feeling alienated and marginalized from the more prevalent White culture (Joseph, 2012; O'Meara et al., 2017).

The assimilation process, or acculturation, into the prevalent STEM culture without the added support of the Latinx student's own culture has been demonstrated to produce lower levels of personal and academic satisfaction among Latinx students (Caldera et al., 2003; Ojeda et al., 2011). This finding is in opposition to Tinto's theory of college persistence. Tinto's (1975) theory of college persistence states that students who assimilate into the university culture are more successful than students who do not.

Latinx students must learn to navigate the cultural constructs of STEM programs to build connections and obtain career opportunities (Flynn, 2016; Ojeda et al., 2011; Ortiz & Sriraman, 2015). It is also valuable and beneficial for Latinx students to maintain their cultural identity that includes familial and community support systems and positive self-perceptions with which to bolster their personal and academic satisfaction levels as

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well as improve persistence to graduation (Cano & Castillo, 2010; Fiebig et al., 2010; Ojeda et al., 2011; Ortiz & Sriraman, 2015).

## Statement of the Research Problem

In states like California, New Mexico, and Texas, the population of college-age Latinx comprises up to 49% of the total population (Flores, 2017; Stepler & Lopez, 2016; University of California [UC] San Diego, 2015). Therefore, in some states, Latinx are a majority group in population rankings (UC San Diego, 2015; Stepler & Lopez, 2016). Yet Latinx students enter college, and in particular STEM majors, at lower rates than their Caucasian and Asian counterparts, who are the largest populations within STEM majors (Crisp & Nora, 2012; "The Top Producers of Minority STEM Graduates," 2016). When Latinx students do enter a STEM major, they are at greater risk of leaving their chosen major and college studies altogether with a dropout rate of 50% more than their Caucasian and Asian peers (Chen, 2013).

Racial and cultural bias in STEM programs can cause Latinx students to question their own ability to academically succeed in STEM coursework and doubt their personal motivation to continue in STEM majors (Chen, 2013; Estrada et al., 2016). A sense of belonging has also been found to be an important factor in the successful or unsuccessful persistence of minority students in STEM majors (O'Meara et al., 2017). Yet Latinx students do not express a sense of belonging to the culture of STEM programs for many reasons including racial microaggressions and biases that professors and peers communicate (Estrada et al., 2016; Museus et al., 2008).

Tinto's (1975) model of student persistence focuses on college students assimilating into the greater culture of the college or university that they attend. The

assimilation process for Latinx students in STEM programs implies that the Latinx

culture is not desired, valued, or relevant to success within a STEM major where the

predominant culture is that of competitive, individualistic, White, middle-aged, and older

males (Castillo et al., 2006; Guiffrida, 2006; Metz, 2004; Museus et al., 2008). Familial

ties and cultural identification have been shown to provide psychologically protective

factors that aid in college persistence for Latinx students (Arbona et al., 2018; Vela et al.,

2018). The relationship of Latinx students' cultural affiliation and the value of their

Latinx culture has a direct relationship with their persistence in STEM (Caldera et al.,

2003; Hernandez & Lopez, 2004).

## Purpose Statement

The purpose of this phenomenological study was to explore how Latinx college

graduates who have achieved STEM degrees perceive the culture of their university and

the STEM program they were enrolled in as supporting or not supporting a Latinx college

student's persistence to graduation.

## Research Questions

### Central Research Question

How do Latinx college graduates who have achieved STEM degrees perceive

university and STEM program culture as supporting or not supporting a Latinx college

students' persistence to graduation? Some examples of STEM degrees include chemistry,

physics, mathematics, biology, computer engineering, computer science, and so forth.

**Research Questions**

1. How do Latinx graduates of 4-year university STEM programs perceive the culture of STEM programs at 4-year universities to have influenced or not to have influenced their persistence to graduation?

2. In what ways do Latinx graduates of 4-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?

## Significance of the Problem

STEM industries are experiencing a yearly deficit of 1,000,000 educated and skilled employees (Chang et al., 2016; "Demographic Profile of Hispanics in California, 2014," 2017). At 4-year universities, the typical persistence rate for students in STEM majors is approximately 50% (Chen, 2013; Flynn, 2016). Thus, approximately half of all students who enter a STEM major drop their major or drop out of school entirely (Chen, 2013; Rooney, 2002). This means that universities are unable to meet the industry demand for educated STEM professionals, and a clear need for research into the persistence of Latinx students entering a STEM major is needed (Chang et al., 2016; Palmer et al., 2011).

Latinx students account for approximately 40% of potential student enrollment in the United States in the K-12 environment (Ortiz & Sriraman, 2015). Yet they comprise only 17% of all college enrollments in the United States (Gramlich, 2017; Ortiz & Sriraman, 2015). Only 7.3% of all STEM students in higher education are Latinx. Only 16% of those Latinx students in STEM majors will graduate, which is 10% lower than their White counterparts (Chen, 2013). In more rudimentary numbers, out of 100 students

who enter a STEM major, only seven of those students are Latinx. Of those seven students, only 1.12 students out of 100 will graduate from a STEM major. Persistence research for Latinx students in STEM is paramount to the improvement of increasing graduation rates for Latinx students in STEM (Hernandez & Lopez, 2004; Ojeda et al., 2011; Zurita, 2004) and fulfilling the demand for STEM professionals in the United States.

The originator of persistence theory, Vincent Tinto, created a model of student persistence that focuses on student assimilation into the majority student culture of the university environment (Cullen & Tinto, 1975). Tinto's (1975) theory of persistence has shaped the majority of persistence research to date. Tinto influenced all subsequent research on college persistence. Although his research did not involve students of different cultures and racial backgrounds, he built the model that many current persistence researchers use to study the success of these students. Yet a significant critique of Tinto's research and persistence research modeled after Tinto's theory is the lack of inclusion of students from different cultural backgrounds and their diverse needs as related to university persistence (Estrada et al., 2016; Gonzalez & Morrison, 2016; Hernandez & Lopez, 2004). The importance of culture in supporting Latinx students to graduation is an emerging field of study within the realm of research related to college persistence (Castillo et al., 2006; Gonzalez & Morrison, 2016). For Latinx students in STEM majors at 4-year universities, the need for further research on the influence of Latinx culture on their persistence to graduation is relevant and necessary (Arbona et al., 2018; Estrada et al., 2016; Ojeda et al., 2011).

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**Theoretical Definitions**

The following terms are defined based on research as the theoretical definitions. They establish how the variables are used in this study and/or provide meaning to a variable that may be interpreted in various ways.

**Assimilation.** Integration of a student into college systems whereby the students shed their previous culture and cultural perceptions in favor of the predominant culture of their university (Tinto, 1975).

**Cultural identity.** Identity is a person's self-concept and self-perception and is related to race, religion, socioeconomic level, generation, or any other kind of social group that has its own culture (Joseph, 2012; Merriam-Webster, n.d.-a; O'Meara et al., 2017).

**Culture.** Culture is most commonly characterized by a high level of internal uniformity within a social system. This concept is not limited to ethnicity or nationality. It also applies to various social systems, for example, corporate culture, religious culture, and so forth (Polat, 2019).

**Diversity.** The presence of difference in a given setting. For example, a diverse group of students includes students from different ethnic, racial, cultural, and socioeconomic levels (Bolger, 2020).

**Equity.** Equity ensures everyone access to the same opportunities. Equity recognizes that everyone does not start from the same place and that barriers and challenges exist. Equity works to correct the imbalance (Bolger, 2020).

**Inclusion.** Inclusion is about people with different identities, feeling and being valued, welcomed, and leveraged within a given group (Bolger, 2020).

**Latinx.** Latinx is a person of Latin American descent or origin irrespective of their ability to speak Spanish or their country of birth. This is the newest gender-neutral term for people of Latinx descent (Merriam-Webster, n.d.-b; Rios-Ellis et al., 2015; Torres-Harding, Torres, & Yeo, 2020).

**Persistence theory.** Persistence theory, based on Tinto's research, is the theory that college students must be academically integrated as well as socially integrated into their university to successfully persist to graduation. Social and academic integration occurs when a student assimilates into the dominant peer and faculty culture (Cullen & Tinto, 1975).

**Racial microaggression.** A perceived slight, offense, invalidation, or harmful messaging related to race and communicated to people of color on a frequent basis (Torres-Harding et al., 2020).

**STEM.** Science, technology, engineering, and math and all majors that fall under these categories (Mau, 2016; Merriam-Webster, n.d.-c; Perez et al., 2014).

## Delimitations

This study was delimited to Latinx students who have graduated from STEM majors from a 4-year university or college and met the following criteria:

- Identify as Latinx

- Graduated from a STEM major at a 4-year university in Southern California having earned a bachelor's or graduate degree

- Been out of school postgraduation for no longer than 5 years

## Organization of the Study

This study is organized into five chapters, references, and appendices. Chapter I provided an introduction to persistence theories and the status of Latinx students in STEM majors. Chapter I also included study variables, the statement of the problem, the research purpose, theoretical definitions, and the delimitations of the study. Chapter II presents more extensive research about persistence theory, history of Latinx in education, the impact of culture on individual persistence, motivation, and commitment as well as the research about the urgent need for STEM professionals in the United States. Chapter III explains the research design and methodology of the study including the study population and sampling procedures for data gathering and analysis. Chapter IV presents and analyzes the findings of the study. Chapter V concludes the study with a summary of findings, conclusions, and recommendations for future research.

CHAPTER II: REVIEW OF THE LITERATURE

**History of American University Culture**

As Thelin (2008) author of "Access and Excess: Selective College Admissions in Historical Perspective" indicated, American universities were focused on serving the privileged class. The American university system was also focused on preventing the downward socioeconomic regress of the privileged class, thus enabling the society's upper echelons to maintain or improve their financial and social standing.

Within the founding universities of America—Harvard, Yale, and Princeton—admission standards were created by the elite of society. The members of society's elite defined and redefined the admission standards as they saw fit (Thelin, 2008). University admission standards of the time were intended to exclude those students who did not fit into the social ideals that these universities most valued (Malkiel, 2016; Synnott, 1979). For example, in the early 1900s through the 1930s, the president of Harvard limited the number of students able to gain admission to the university. He, Harvard's president, also included character references in the application process, the purpose of which was to systematically exclude the undesirables. Undesirables were students who came from poor, ethnic, religious minorities, and lower class individuals (Thelin, 2008). Yale and Princeton followed suit and also instituted character references, or letters of recommendation, as part of their admission standards.

For centuries in the United States of America, only affluent, White, male students from suitable protestant Christian religious and social backgrounds were admitted into universities (Glasener et al., 2018). Catholics, Jews, and other religions were systematically excluded from admission to universities along with foreigners, women,

and people of color (Allen et al., 2002). Prior to the creation of women's colleges in the United States, women could only attend private secondary schools or seminary schools. The first women's college founded in the United States was Wesleyan College in Macon, Georgia. Wesleyan College was founded in 1836, 1 year prior to the founding of Oberlin College. Wesleyan followed the traditions of male universities and provided admission to White, protestant Christian women from affluent backgrounds.

For perspective, in 1663 Harvard University became the first university within the United States of America (Thelin, 2008). In 1836, nearly 2 centuries after the founding of Harvard, Wesleyan College was founded and 1 year later, in 1837, Oberlin College in Ohio became the first private university to become coeducational (Malkiel, 2016). Oberlin College admitted women into their college, but the education standards were different based on gender. Women learned curriculum that was deemed appropriate and traditional for their role in society. Women learned tasks such as laundry, cooking, and social etiquette while men were given an academic curriculum that would prepare them for profitable careers such as engineering, business, and law (Malkiel, 2016).

The educational marginalization of women continued into the 20th century when prior to the 1960s, most women who chose to go to college could only attend women's colleges. Oberlin College being coeducational was not the norm; in fact, it was the exception. It was not until after 1960 that women had more access to the elite and previously all-male universities. The push toward coeducation occurred because the U.S. elite males no longer wanted to attend male-only schools. Women were brought in to appeal to the male student body and increase faltering enrollments (Malkiel, 2017).

**Black and Latinx Students in Higher Education**

Women were the first minority beneficiaries of admission to America's universities. For both female and male Black students, admission to universities would come much later. The law did not allow Black students of any gender to attain an education or equal rights in the United States because of their status as slaves. At the end of the Civil War in 1865, slaves were emancipated. This was nearly 30 years after the establishment of the first women's college, Wesleyan, 200 years after the establishment of Harvard, and 100 years before prestigious universities such as Yale and Princeton integrated White women into their student population (Malkiel, 2017; Synnott, 1979). The education of Black Americans after emancipation was a low priority for the national government. The majority of all Black Americans lived in what was considered the confederate south, and the national government did little to promote the education of the largely illiterate emancipated slaves (Crouch, 1997).

For prestigious universities, the concept of freely opening their doors to Black and Latinx students was not a part of their admissions framework or the culture academia at large (Synnott, 1979). In fact, it was common practice for academically advanced students of color or from an undesirable background to be rejected in favor of students with lower academic achievements whose parents were influential in society and philanthropic to the benefit of the university. Biased accounts of good character aided students from affluent and desirable backgrounds. A student's ability to get letters of recommendation from other influential citizens such as politicians, businessmen, and historically prestigious families greatly increased the probability for their admission into a university.

A Yale administrator was quoted as saying that students who were in need of scholarships had to demonstrate exemplary character through academic and civic excellence (Thelin, 2008). Yet most prestigious members of society were not willing to write letters of recommendation for Black and Latinx students. Therefore, if you were a Black or Latinx student, finding a character reference from a White community member of social stature was extremely rare if not impossible. Socially influential and affluent Whites were also reticent to serve as character witnesses for students without adequate social and fiscal access irrespective of their ethnic or religious background. Students from poor backgrounds were not only marginalized for their poverty but also deemed to be of poorer character and therefore who were less desirable in the admissions pool (Del Toro & Hughes, 2020).

**Higher Education in a Jim Crow Era**

The first Black degree recipients from Harvard were Edwin C. J. Howard (Campbell, 2016), George L. Ruffin (Estrada et al., 2018), and Robert T. Freeman (Estrada et al., 2018) in 1869, 4 years after the emancipation of slaves and 1 year after the ratification of the 14th amendment to the U.S. Constitution, which gave all people born or naturalized in the United States full citizenship (Crouch, 1997). W. E. B. DuBois attended Harvard in 1888. In a personal account of his time at Harvard, DuBois wrote about his solitude and isolation (Du Bois, 2013). He spoke of not seeking out friends among his White peers and of them not seeking him out for friendship. His rationale was that he accepted racial segregation and sought the comfort and familiarity of a Black community to support and sustain him (Du Bois, 2013).

Less than 10 years after W. E. B. DuBois attended Harvard in 1896, the Supreme Court ruled on *Plessy v. Ferguson*. This ruling indicated that facilities for Blacks and Whites could be separate but equal (Crouch, 1997). Post-Civil War Reconstruction was over, and the era of Jim Crow segregation began (Reed, 1965). Jim Crow laws made the systematic racism in higher education legal. Universities could lawfully continue excluding minorities from their student populations (Aguinaga & Gloria, 2015).

The cultural impacts of this legal shift on education meant that the federal government sanctioned institutions of higher education in excluding minorities and continuing to serve only the White elite. Slavery was abolished, and Black people could no longer be owned. Yet the perceived value of Black Americans in society was not elevated in correlation to their legal stature as full citizens of the United States of America (Crouch, 1997). The federal government, through legal segregation, validated that though Blacks were free people, they were not the intellectual or social equals to White people and therefore needed to be kept separate (Crouch, 1997). Latinx people were also viewed as inferior to White people. They also faced segregation within the United States (Allen et al., 2002).

**The Civil Rights Movement**

The formation of the Civil Rights Movement grew from years of strategic preparation by Black scholars and leaders. The Civil Rights Movement was focused on Black and White race relations as was the 13th Amendment (Crouch, 1997). Therefore, Latinx people were not included in the rhetoric of the Civil Rights Movement (Crouch, 1997; Reed, 1965). Other minority populations living in the United States were left out of the discussion for equal rights though they were impacted by the laws and discriminatory

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practices that affected Blacks and continue to affect people of color in the United States (Delgado, 2012).

Segregation not only affected the Black population of the United States, but it also affected the Latinx population. Latinx people in the Southwestern states such as Texas, Arizona, California, and New Mexico also experienced segregation in the same ways that Blacks were experiencing segregation (Rochmes, 2007). Schools for Latinx students were generally vastly inferior to the schools for White children. As with schools for Black students, Latinx students often lacked learning materials, supplies, and adequate facilities including water, electricity, and appropriate buildings (Contreras & Valverde, 1994). Latinx people were seen as racially, intellectually, and socially inferior to Whites and were therefore disenfranchised from the educational system through segregation and discriminatory practices (Contreras & Valverde, 1994).

In Orange County, California, Mexicans and Mexican Americans were forced to attend separate schools from their White counterparts (Aguirre, 2005). The belief was that the difference in language was an intellectual deficiency. Grace Stanley, an influential educator, wrote in 1920 that Mexican children had "different mental characteristics than Anglo children" and that "Mexican children grow listless under mental pressure" (Strum, 2014). Other academics of the time also wrote that Mexican children were of lower IQ than White children (Garcia, 1999; Strum, 2014).

The schools for Latinx children, known as Mexican schools, focused on teaching the male children to do agricultural work, fix boots, and other low-paying labor jobs. The female children were taught housekeeping, sewing, and cooking in case they might enter into the service of White families as housekeepers (Garcia, 1999). Mexican schools often

also had different hours and attendance policies so that children could help with the various harvests and agricultural tasks that were required by the farmers of the area. Teachers often thought Mexican children were dirty and schools had shower facilities installed so that teachers could force the "dirty" children to shower and to put on clean clothes prior to entering the schoolhouse. Mexican schools, as Black schools, were subpar in educational requirements, curriculum, supplies, and facilities to the White schools (Garcia, 1999; Strum, 2014).

An example of resistance to the state sanctioned segregation aimed at Latinx students is the *Mendez v. Westminster* case of 1946 (Strum, 2014). In this case, Soledad Viadurri took her two daughters, her niece, and two nephews to the Westminster school house in Orange County, California. She wanted to register all five children in school. The teacher in the school accepted the Viadurri children because they were light skinned and their surname was European sounding. The three Mendez children, the niece and nephews of Soledad Viadurri, were denied admission and sent to the Mexican school because their complexions were too dark, and their surname was Mexican. Viadurri refused to enroll any of the children at the Westminster school house. Her brother and father of the Mendez children, who were refused access to the White school, brought together a group of other Mexican parents in the community and took the Westminster school house to federal court to challenge the law of separate but equal (Strum, 2014). In the case of *Mendez v. Westminster*, the Court of Appeals for the Ninth Circuit court ruled in 1946 that separate Mexican schools were illegal. *Mendez v. Westminster* became the predecessor of the 1954 Supreme Court decision that abolished state-sanctioned

segregation in public schools in the case of *Brown v. The Board of Education* (Strum, 2014).

### *Civil Rights and Education*

School segregation was abolished in 1954, but integration in schools was not readily accepted. Through the 1950s and 1960s, the majority population in universities continued to be White males. The culture of admissions departments at universities had not evolved and continued to demonstrate a belief that students from poor and ethnic backgrounds were not academically prepared or intellectually able to succeed at institutions of higher learning (Ayres, 1982). Given the difference in educational resources and the poor academic standards of previously segregated schools for students of color, there was a deep educational chasm that minority students would have to overcome to meet university admission standards (Aguinaga & Gloria, 2015). The negative perceptions of the intellectual ability of students of color by university professors as well as university leadership then and in the current day continues to be a determining factor in the rates of persistence to graduation for students of color in higher education (Del Toro & Hughes, 2020).

### *Affirmative Action*

The Civil Rights Movement continued to gain momentum and shed light on the disparities in education, economic access, and civil liberties between White and Black people in America (Allen et al., 2002). As a result of the Civil Rights Movement, the federal government implemented affirmative action protocols that were originally introduced to diversify the workforce. The goal of affirmative action was to force labor markets that received government funding to integrate and hire ethnic minorities at a

percentage more commensurate with the percentage of diversity in a given region (Glasener et al., 2018). Affirmative action, the law with its existing logistical requirements, was later introduced to universities as a vehicle to force the diversification of their student bodies (Johnson, 2017). The implementation of affirmative action in higher education required a high degree of oversight from the federal government and was difficult to manage. Universities had to provide documentation to the government that demonstrated the diversification of their staff and then their student population.

In the mid-1960s when affirmative action was being implemented, the overwhelming majority of university professors and administrators were White. Many universities claimed diversity in their work force because they could demonstrate moderate percentages of ethnic minorities working within their systems. Yet the bulk of ethnic minorities working at universities held service positions in the janitorial, maintenance, and food service departments, not faculty or leadership roles (Boddie, 2016; Glasener et al., 2018). This continues to be true for the majority of universities in America (Allen et al., 2002; Kidder, 2012).

**The Vietnam War**

Concurrent with the Civil Rights Movement, the United States was also involved in the Vietnam War. U.S. troops were in Vietnam from 1968 to 1975. During that time, troops were cycling into combat and out of combat. Those who were cycling out of combat and returning to the United States were facing a poor economy, social unrest, and political upheaval. Rather than being welcomed back to civilian life, many troops found they were being vilified and ostracized for their participation in the war (Cox, 2006). Yet many soldiers returned home with the goal of seeking higher education as a tool to

advance out of poverty, develop new skills, and improve their individual and familial socioeconomic standing (Cohen et al., 1992; Mattila, 1978).

During the late 1960s and the 1970s there were many GI's coming into the educational system (Mattila, 1978). They were using their veteran benefits to pay for college. The Vietnam veterans who were entering college at that point in time were older than traditional college students and most had witnessed combat or the ravages of combat (Cohen et al., 1992). Many came from disadvantaged backgrounds meaning that their families did not have histories of college education or affluence. Also, many veterans entering college were from ethnic backgrounds other than White (Cox, 2006; Mattila, 1978). Veterans were taking advantage of the push for affirmative action and of the funding that the government was providing via the G.I. Bill. Veterans benefitted from the enforced racial integration of universities to take advantage of educational opportunities that had previously been unattainable for many of them because of their race or economic background (Mattila, 1978).

The veteran student typically had different motivating factors influencing their decision to enter higher education than their peers who were not veterans (Mattila, 1978). This created challenges for both universities and students because University culture of that time was not in tune with the needs of the different type of students who were in attendance (Rahat & Ilhan, 2016). At many universities, there was a culture heavily steeped in tradition, hazing, and Greek life (Ethier & Deaux, 1990). Freshmen at some schools had to distinguish themselves with specific garb, or were expected to behave in deference to senior class members (Del Toro & Hughes, 2020; Eastman et al., 2019). These traditions did not go over well with the veteran men entering college. Many

veterans did not engage in the customary university traditions (O'Meara et al., 2017).

They were focused on entering school, getting a job, and caring for their responsibilities

and families (Mattila, 1978).

University culture continued to be deeply entrenched in its traditional

exclusionary practices, and military students suffered for it. The preponderance of

students at universities continued to be from affluent, White backgrounds (Allen et al.,

2002; Hardre et al., 2013). Military students who had survived war and combat

conditions were not persisting to graduation in this traditional university environment.

Their dropout rates were much higher than traditional students (Mattila, 1978).

## The Study of University Persistence

The dropout rates of Vietnam veterans motivated scholarly exploration of this

phenomenon. Toward the end of the Vietnam War, Vincent Tinto, a sociologist, began

publishing research related to academic persistence. As a professor and academic

researcher, Tinto hailed from the tradition of segregation and elitism. Tinto wrote one of

his first publications in conjunction with Francis Cullen. The paper was called *A

Mertonian Analysis of School Deviance* (Cullen & Tinto, 1975). In this work Tinto

(1975) began to lay the groundwork for his seminal work, "Dropout From Higher

Education: A Theoretical Synthesis of Recent Research."

### Deviant Behaviors in University Persistence

In *A Mertonian Analysis of School Deviance*, Cullen and Tinto (1975)

extrapolated that when people are socialized to value a particular goal, in this case

education, and they are institutionally and legitimately hindered from achieving that goal,

there is pressure to participate in nonconformist behavior. For example, prior to racial

integration in the school system Black and Latinx students were prohibited from entering

higher education. Going to college was not a legitimate option for people of color

(Crouch, 1997; Del Toro & Hughes, 2020). For students of color who experienced

generational institutional and economic oppression, the available education was not at the

same quality as the education being offered to White children (Hipolito-Delgado, 2016;

Majors, 2019). Therefore, not only were Black and Latinx students denied equal

education, but their educational opportunities were truncated (Synnott, 1979).

In addition to Cullen and Tinto's (1975) theories, educational achievement is

often related to financial and societal success. In the centuries preceding the Civil Rights

Movement and the forced integration of people of color into educational establishments,

minorities were specifically banned from being educated (Crouch, 1997). Then people of

color were offered limited education and segregated in an educational system that did not

provide adequate or equal access to resources for them as for their White counterparts

(Del Toro & Hughes, 2020). Racial minorities, including Latinx, were systematically

denied the same access to financial and societal success as their White counterparts.

**Nonconforming Behaviors Affecting University Persistence**

Based on Cullen and Tinto's (1975) analysis, if a student is confronted with

pressures that fissure the means to access the goal, they have five nonconforming

behaviors in which they respond:

- The first nonconforming behavior is conformity. By conforming to the education
  system and the pressures that come with it, the students continue to value the goal
  of education and persist toward the attainment of their goal.

- Second, a student innovates. The student who innovates will find ways to cheat the system. Innovation, as a strategy of deviance, means the student is still holding onto the educational goal but pursuing illegitimate means to meet the goal.

- Ritualism is the third deviant behavior that Cullen and Tinto cited as a coping mechanism for impeded access to educational goal attainment. For Cullen and Tinto, ritualism means that a student no longer ascribes to the goal, but they continue to go through the motions of achieving the goal and therefore have a higher probability of achieving their goal.

- The fourth nonconformist behavior is retreatism. Retreatism means that the student rejects both the goal and the legitimate means of attaining the goal. Therefore, this student opts to drop out of school, thus exhibiting deviant behavior.

- Rebellion is the fifth nonconforming behavior Cullen and Tinto identified. At this fifth stage, the student rejects the educational goal, rejects the legitimate means of attaining the goal, and opts instead for illegitimate means to obtain a new goal.

Retreatism and rebellion are the two behaviors that demonstrate the most aberrant behaviors as related to the attainment of a stated educational goal. The example that Cullen and Tinto (1975) used to illustrate rebellion as a deviant behavior was students protesting at a university to change the system. The students who were protesting now had a new goal. The new goal no longer included completing their degree but rather deconstructing the system that had oppressed them. Cullen and Tinto stated that

retreatism and rebellion behaviors are a result of the student's inability to satisfy the commonly held educational goal and standards with which to achieve it.

**Race and Deviant Behaviors in Education**

Cullen and Tinto (1975) also noted that the deviant behaviors they outlined in their research were related to race. White students were more likely to adopt conformity, innovation, and ritualism behaviors. In other words, White students were more likely to respond to the pressures inhibiting their ability to achieve their educational goal by following rules and conforming to the cultural and institutional norms to achieve their goal, the goal being graduating from their chosen university. White students also participated in cheating to achieve their goal, and/or going through the motions to achieve their educational goal. Black students, according to Cullen and Tinto, were most likely to retreat or rebel and therefore not achieve their educational goals. Cullen and Tinto also noted that Black students began their schooling with a positive attitude and the hope of achieving their educational goals very similar to their White peers. Yet as Black students continued in the educational system, their commitment to achieving an educational goal such as college graduation became lower and lower. As the belief of being able to achieve the educational goal decreased, the commitment to education also declined (McGee, 2016).

The educational system for Black and Latinx students pre-Civil Rights Movement included open racism and discrimination (Crouch, 1997). Covert racial aggressions such as very poor-quality facilities and supplies, different curriculums leading students toward menial and service positions, and lower academic expectations overall decreased the hope and belief of achieving educational goals for Black and Latinx students. The educational

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system was built to support White students and to continue to oppress the intellectual and societal evolution of Black and Latinx people (Crouch, 1997; Reed, 1965).

## Vincent Tinto on Dropout From Higher Education

The systematic educational and civil oppression that universities and the federal government purposefully perpetrated against students belonging to racial and ethnic minorities was not taken into account when Cullen and Tinto (1975) wrote their paper, *A Mertonian Analysis of School Deviance*. There were so few students of color in the traditional college system leading up to forced integration after the Civil Rights Movement that the study of their attrition in college was not feasible (Synnott, 1979). During the early to mid-1970s, Black students were integrating and entering traditionally White-only universities in increasing numbers. In Tinto's (1975) seminal research, "Dropout from Higher Education: A Theoretical Synthesis of Recent Research," he said that the best of the Black students from historically Black colleges were gaining admission to prestigious and higher quality universities. Tinto also said that there was insufficient longitudinal data on the dropout rates of Black students because of the limited number of Black students in traditionally White colleges and universities (Cullen & Tinto, 1975).

Tinto observed that the poor socioeconomic and educational background of minority students were factors in their high rate of attrition from college (Cullen & Tinto, 1975). He also mentioned that minority students came from low to lower middle-class backgrounds with poor educational histories. As Synnott (1979) noted, Black and other minority students were purposefully kept from educational and employment opportunities that would potentially raise their financial and societal stature. The institutional

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oppression of minority students created a cycle of poverty and exclusion that impacted

the educational achievement of minority students (Crouch, 1997; Graham, 2016).

Students of color in contemporary society continue to have higher rates of attrition within

higher education than their White counterparts (Majors, 2019; Ojeda et al., 2011).

**Tinto's Theoretical Framework**

Tinto's theoretical model of dropout behavior is based on the theory that students

who drop out of institutions of higher learning are poorly integrated into the social system

of the university and/or not in congruence with the prevalent values of the university

(Cullen & Tinto, 1975). Tinto intimated that students who drop out of college are solely

responsible for their failure to achieve their educational goal. University culture and

traditions of exclusion, segregation, and beliefs that people of color have inferior

character and intellect than their White counterparts were not considered by Tinto to be

significant or relevant contributing factors to the high dropout rates of minority students.

*Durkheim's Theory of Suicide*

Tinto's theory on the factors influencing students to drop out of higher education

is largely based on Durkheim's theory of suicide (Cullen & Tinto, 1975). Durkheim's

(1966) theory of suicide contends that individuals who commit suicide have not

sufficiently integrated into society and have values that are distinctly different from the

values held by society. Therefore, people who commit suicide have little personal

interaction with society.

Cullen and Tinto's (1975) theory of dropout indicates that students with

insufficient interactions and attachment to their social peers, insufficient commitment to

their educational goal, and a value system differing from the values of the university and

the peer group have a significantly higher propensity of dropping out than those who are socially and culturally integrated into the university. According to Tinto, a student's background including socioeconomic standing, community of residence, and previous educational experiences also plays a large factor in dropout rates. Students from communities with lower economic and social status, based on Tinto's research, dropped out at a higher rate than students from affluent backgrounds as a result of less social engagement within the university system.

For Tinto (1975), students from affluent backgrounds benefitted from parental and community support exerting positive pressure on their success in college. Affluent White students experience the most success in college because their families held high expectations of them (Cullen & Tinto, 1975). Affluent White students also benefit from the high expectations that the university has of them. The high expectations that the parents and university have of affluent White students stems from a desire to continue a lineage of economic and social success, perhaps also maintaining a history or relationship with a prestigious university based on a tradition of familial attendance to a particular university.

For students from low economic standing, Tinto's (1975) research indicated that the parental influence and community influence to complete a degree program are much less. For example, students who come from families who do not have filial histories with a university, parents who did not attend a university, and who come from a community that is largely working class with low educational attainment are missing the positive pressures that assist them to continue their education. In addition, these students have

adverse impacts on their educational outcomes because of the lowered expectations that universities have of them.

### *Tinto's Predictive Model of Student Persistence*

Tinto's model first examined the student's family background, individual attributes, and precollege schooling. Prior to the Civil Rights Movement and desegregation, students of color were simply not allowed to enter many universities because universities were designed to serve the White majority (Del Toro & Hughes, 2020; Aguinaga & Gloria, 2015). According to Tinto's predictive model of dropout behavior and the historical perceptions that universities hold about students of color, minority students are at higher risk for dropping out based on their educational, personal, and familial backgrounds than White students are (Cullen & Tinto, 1975).

### *Commitment to Educational Goals*

Tinto's model indicates that students must have a commitment to the goal of completing their higher education. Also, students must be committed to the university they are attending. Students' commitment to both their goal and the university were equally important to Tinto in terms of predicting student persistence to graduation. In 2017, Terenzini and a group of researchers found that Tinto's predictive model of student persistence was highly accurate (Terenzini et al., 2017). Terenzini et al. (2017) found that the students who were committed to their university, such as those students who embraced the values of their school and integrated themselves into the social structure, also experienced a higher degree of persistence to graduate versus students who were not as integrated.

In Figure 1 is Tinto's diagram, "A Conceptual Schema for Dropout From College" (Tinto, 1975). This figure demonstrates Tinto's theory of assimilation into university culture. It is a flow chart demonstrating the pathway for a student who enters college and then proceeds on to either successful graduation or drop out from school. In this figure, Tinto demonstrated that a student would have to commit to the institution and commit to their goal of graduation before reaching the critical stage of deciding to drop out or continue in school. Tinto placed value on academic integration as well as social integration. He included faculty interaction as well as peer interaction as a major component of his diagram. The diagram demonstrates that if students are well integrated with their faculty and peers, they will be more likely to commit to their institution and goal of graduation. These factors combined inhibit the decision to drop out of college based on Tinto's research (Cullen & Tinto, 1975).

**Figure 1**
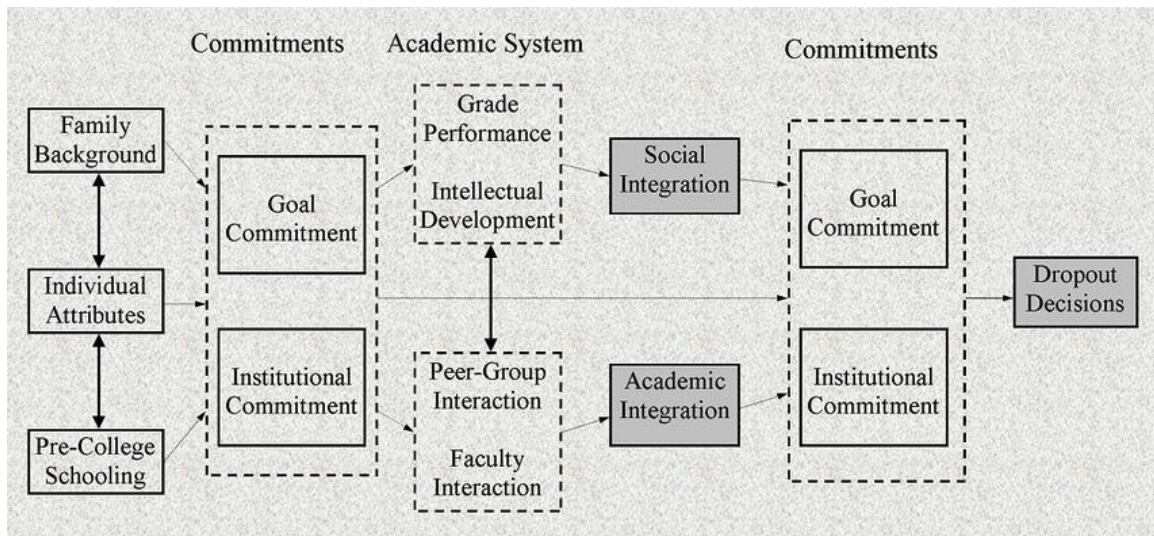
*A Conceptual Schema for Dropout From College*



*Note*. From "Dropout From Higher Education: A Theoretical Synthesis of Recent Research," by V. Tinto, 1975, *Review of Educational Research*, *45*(1), p. 95 (https://doi.org/10.2307/1170024).

Latinx students are equally committed to the goal of graduating from college as White students (Palmer et al., 2011). Yet they are graduating at significantly lower rates than their White counterparts. This is particularly true in STEM (science, technology, engineering, and mathematics) majors (Palmer et al., 2011; U.S. Department of Education, n.d.).

## Institutional Commitment

Tinto's (1975) model for dropout from college has institutional commitment as a major component of a student's potential academic success and retention to graduation. The assumption in Tinto's research was that students must be committed to their institution of higher education. The students' commitment can be gauged through their participation in social and academic opportunities at their school. A student's commitment to the university is also measured by a student's integration into the prevalent school culture (Cullen & Tinto, 1975).

As previously mentioned, universities in America were created for the purpose of educating and building social ties for socially elite, White, Protestant males (Harper, 2012; Malkiel, 2017). Harper (2012), the author of the article, "Race Without Racism: How Higher Education Researchers Minimize Racist Institutional Norms," defined racism as intentional and unintentional actions that marginalize minorities and cause them harm. Harper shared that institutions of higher education have created structures that "cyclically remanufacture racial inequity; and [create] institutional norms that sustain White privilege and … the subordination of minoritized persons" (p. 10). Harper found that the majority of research on race relations in higher education is conducted by White academics and that they tend to cite other White academics. This is problematic because

the research is limited in scope as it relates to the effects of racism and racist stratification within institutions of higher learning (Eastman et al., 2019; Harper, 2012; Lewis et al., 2000). Additionally, in the post-Civil Rights era, researchers including Tinto did not address racism as a factor influencing the persistence or attrition of minority students from higher education. Yet racism in its many forms is a prevalent factor that influences the admission, social integration, and academic success of minority students at the university level (Majors, 2019; Scarritt, 2019).

When Tinto (1975) created his framework for student persistence, a gap in his research that he did not explore was the effects of universities with normative cultures of exclusion and the marginalization of minority students on student attrition (Davidson & Wilson, 2013). Yet Tinto's model does not account for the damaging effects that Black or a Latinx students experience when their university is not desirous or accepting of their attempts to demonstrate commitment to their academic goal and to the institution itself (Cullen & Tinto, 1975).

According to Tinto (1975), a student's individual background, their financial status, community status, educational background, familial educational history, and ethnicity are all influential factors working toward the success or detriment of a student's ability to achieve his or her academic goal. Tinto wrote that a student from an affluent background with family ties to a prestigious university will have more success than an economically disadvantaged student whose family has no previous experience with higher education. Tinto's assertion has been proven correct by other persistence researchers (National Center for Education Statistics, 2019a; Rooney, 2002; Terenzini et al., 2017). Yet Tinto's (1975) research did not delve into the cultural stereotypes and

biases foisted upon minority students who come from poor backgrounds and are the first in their family to attend college.

Subsequent researchers such as Rendon (1994), author of the article "Validating Culturally Diverse Students: Toward a New Model of Learning and Student Development," indicated that students from nontraditional backgrounds often enter higher education with doubts inherent to their ability to succeed in college and ultimately graduate. Rendon's findings also demonstrated that contrary to the self-doubt that minority students experience, students from affluent, White, and college-educated backgrounds do not enter the college system with the same intrinsic self-doubt (Rendon, 1994). Rendon's research is consistent with Tinto's findings in that in her study, as well as in Tinto's, students who come from families with a history of college attendance and a certain level of socioeconomic prosperity will experience a higher degree of success in college than those who do not come from similar backgrounds. Ladson-Billings (2021), a race and education researcher, also found that Black students in mathematics were not graduating at the same rate as their White peers. Ladson-Billings found that Black students entering mathematics majors were subject to social disparity in teaching and access to resources that would be of benefit in helping them to persist to graduation. In her article, "Does That Count?" Ladson-Billings explored the concept that mathematics education is directly related to issues of diversity, equity, and justice. Ladson-Billings and Rendon's research support the idea that a student's culture and race have a direct impact on their probability of persisting to graduation.

**Analysis of Tinto's Student Integration Model**

Tinto's (1975) student integration model was created to explain the process by which students decide to continue with their goal of graduation and completing their college program or dropping out of school. Tinto's premise began with three factors: family background, individual attributes, and precollege schooling. According to Tinto, those three factors are integral in determining the ease students will have in integrating into their college environment.

Family background, according to Tinto, is extremely important in fomenting the success college students will have in achieving their goal. Research has shown that students who have parents who are college graduates are more likely to enter college and graduate than students who are the first in their family to attend college (Hernandez & Lopez, 2004; Ross et al., 2012). Also, students who come from families that are financially well off, meaning they do not struggle with poverty and have affluence, are more likely to enter college and successfully graduate as opposed to students who experience poverty or financial difficulties (Trevino & DeFreitas, 2014; Zurita, 2004). Furthermore, students who come from families that have both parents in the home demonstrate a higher level of academic success that those students who have single parent households (Aguinaga & Gloria, 2015; Kerby, 2015).

In the early 1970s when Tinto was developing his student integration model, four out of every 1,000 marriages for White families ended in divorce. For Black families, that figure was 257 out of 1,000 marriages, and for Latinx families it was 59 out of every 1,000 marriages (U.S. Bureau of Labor Statistics, 2013). The numbers of minority students living in single parent homes was significantly higher than for White students.

These statistics indicate that there were more minority students coming from single parent households than White students from single parent households. Based on Tinto's (1975) integration model, the students coming from single parent households were entering college at a deficit and with less probability of succeeding than their counterparts from two-parent households.

Research has also shown that families that have two parents in the household tend to be more financially stable and well off than those families where the head of household is single (Spiers, 1971). In the early 1970s, the financial disparity between White families and minority families was significant irrespective of the household being a single parent or two parent home. The 1970 census indicated that the median income for a White family was approximately $10,240 per year. For a Black family, the median income was $6,520 (Spiers, 1971). That is a difference of $3,720 or 36% less than the median income for White families. Based on U.S. Census information, Latinx families had a similar family income as Black families in 1970 (Garmezy, 1991).

Furthermore, the average family size for White families was four people: two parents and two children. Figure 2 shows the average family size for Latinx families as compared to other ethnicities. For Latinx families the average family size was larger than the average reported by the census (Spiers, 1971; U.S. Bureau of Labor Statistics, 2013). At the time, many Latinx families had more than two children. Currently, Latinx families continue to be larger than White families with over 50% of Latinx families having three or more children (Livingston, 2015; U.S. Bureau of Labor Statistics, 2013). The larger family size of the Latinx population in America, coupled with their smaller annual

income, put the college-going population at increased risk for dropout from college

according to Tinto's (1975) research and integration model.

**Figure 2**

*Among Hispanics, Big Families Are the Norm*
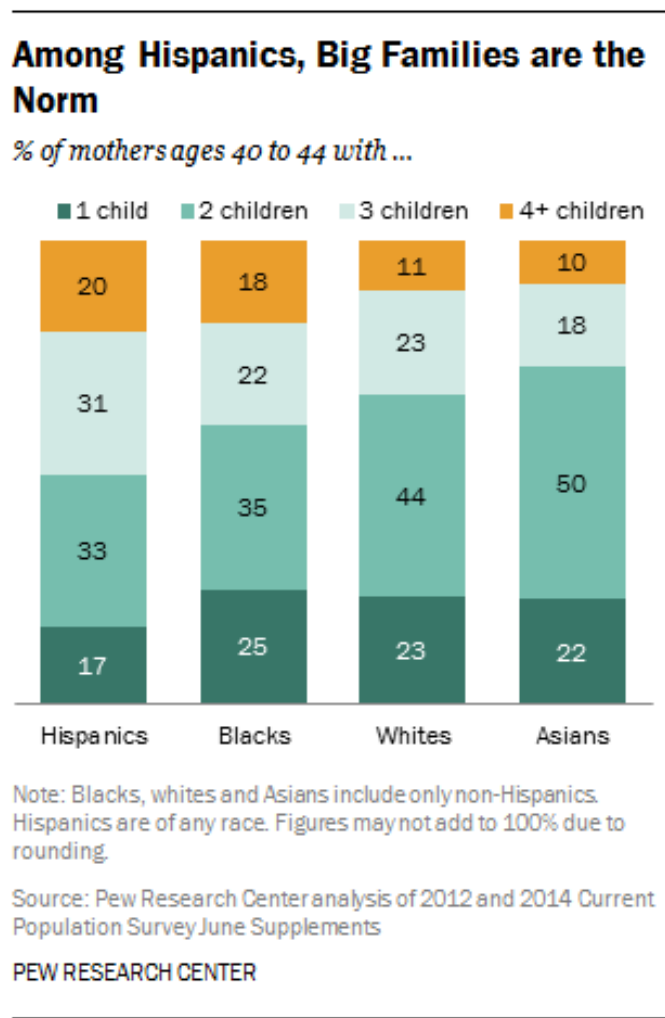


*Note*. From "Childlessness Falls, Family Size Grows Among Highly Educated Women" (p. 3), by G. Livingston, 2015, Pew Research Center (https://www.pewresearch.org/social-trends/2015/05/07/childlessness-falls-family-size-grows-among-highly-educated-women/).

Another elemental factor contributing to college success per Tinto's student

integration model was precollege schooling. For Latinx students at the beginning of the

1970s, high school completion rates were significantly lower than their White

counterparts. For example, in 1975, based on the U.S. Census, over 60% of White

students had a high school diploma. For Latinx students, the number was much lower;

less than 40% of all Latinx people in the United States aged 25 years or older had a high

school diploma (U.S. Census Bureau, 2022).

Precollege schooling for Latinx and Black students in the era before 1975, the

year that Tinto published his student integration model, was undergoing massive

transformation (Allen et al., 2002; Glasener et al., 2018). Depending upon the region of

the United States where a student was from, segregation in public schools persisted

through the early 1970s despite the fact that it had been legally abolished in 1954 by the

Supreme Court (Glasener et al., 2018). Within schools that were integrated, the

educational background of Black and Latinx students was not comparable to the

educational background of their White peers (Glasener et al., 2018). In 1975, over 60% of

White students obtained high school diplomas (U.S. Census Bureau, 2022). For Black

students, that number fell to roughly 40% followed by Latinx students, who graduated at

a rate of less than 40%. Fewer than four of every 10 high school age Latinx students

graduated from high school. Figure 3 illustrates educational attainment by race and

Hispanic origin.

The third factor that Tinto (1975) cited as elemental to the success or failure of a

student in achieving their goal to graduation was the student's individual attributes.

Individual attributes, for Tinto, included a student's intellectual potential, character,

personality, social abilities, communication skills, and additional qualities that could

influence a student's success. In the Jim Crow era, people of color were systematically

**Figure 3**

*Census Graph of Educational Attainment by Race and Hispanic Origin*



**Table 3. Detailed Years of School Completed by People 25 Years and Over by Sex, Age Groups, Race and Hispanic Origin: 2021**

(Numbers in thousands. Civilian noninstitutionalized population.[1])

| Detailed years of school | White | | White alone, not Hispanic | | Black | | Asian | | Hispanic (of any race) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| **Bachelor's degree or higher** | | | | | | | | | | |
| Bachelor's degree | 41,797 | 23.9 | 37,251 | 26.0 | 4,853 | 17.2 | 4,798 | 33.7 | 5,206 | 14.5 |
| Master's degree[2] | 18,348 | 10.5 | 16,865 | 11.8 | 2,432 | 8.6 | 2,788 | 19.6 | 1,710 | 4.8 |
| Professional degree | 2,762 | 1.6 | 2,539 | 1.8 | 264 | 0.9 | 332 | 2.3 | 257 | 0.7 |
| Doctorate degree | 3,504 | 2.0 | 3,309 | 2.3 | 372 | 1.3 | 775 | 5.4 | 219 | 0.6 |

[1] Plus armed forces living off post or with their families on post.

[2] Detail on graduate school attendance and length of master's degree program, available in previous years, discontinued due to questionnaire changes in 2015.

"Z" Represents rounds to zero. 0 represents true zero.

Details may not sum to totals due to rounding.

Source: U.S. Census Bureau, Current Population Survey, 2021 Annual Social and Economic Supplement (CPS ASEC).

Information on confidentiality protection, sampling error, nonsampling error, and definitions is available at <https://www2.census.gov/programs-surveys/cps/techdocs/cpsmar21.pdf>.

*Note*. From "Educational Attainment in the United States: 2021, Table 3, Detailed Years of School Completed by People 25 Years and Over by Sex, Age Groups, Race and Hispanic Origin: 2021," by the U.S. Census Bureau, 2022 (https://www.census.gov/data/tables/2021/demo/educational-attainment/cps-detailed-tables.html).

oppressed (Anderson, 2004). They did not have freedom of speech (Anderson, 2004; Crouch, 1997). They could not use public facilities such as schools, hospitals, and government support without restriction. The system of governance explicitly forbade people of color from congregating and socializing with White people (Crouch, 1997). Even after the official end of Jim Crow, the societal inertia to continue the marginalization of non-White people persisted (Bickel, 2008; Clark & Blue, 2004).

Tinto's inclusion of individual attributes as a major component of student success and persistence in college illustrates the vast divide in self-concept and opportunity between White students and Latinx students along with Black students (Davidson & Wilson, 2013). Research has found that societal and environmental expectations and opportunities are significantly influential on the "individual attributes," which Tinto described (Davidson & Wilson, 2013; Ethier & Deaux, 1990).

For example, two children of the same age may begin life with the same level of hope that they will achieve their desired dreams. In more sophisticated adult terms, those dreams may include a safe and comfortable home, the work of their choice, sufficient economic means to provide sustenance and leisure for themselves and their family, and a respectable social standing within a community where they are valued. For Black and Latinx students in the late 1960s and early 1970s, the opportunity to be respected and valued within the community at large was limited (Glasener et al., 2018; Hartley, 2011; Holt et al., 2002). The first example of different standards of value and respect between White and Black or Latinx people is that in many communities, Black and Latinx people had to refer to White people of all ages, even those younger than them, as Sir, Ma'am, Mister, or Miss. White people could refer to people of color in a myriad of racial epithets

along with the use of the word, boy or girl, regardless of whether the person of color was the White person's elder or not (Johnston-Guerrero, 2016). Another example of the different standards of value and respect afforded to White people versus people of color was the differentiation of "Colored" facilities and White facilities. White facilities were often exceedingly better than those offered to Black and Latinx people (Hughey, 2019). If a restaurant had no designated seating for Black or Latinx people, they would not allow them to dine inside with the White population. The same practices of differentiating the quality and variety of services and facilities between White people and people of color were generalized to the school environment. As Black and Latinx students experienced the negative differences in schools and educational standards because of the system of segregation in the United States, they also experienced a negative effect on their perception of the future. Namely, students who live and experience a society and system in which their opportunities are truncated because of the color of their skin will often experience a negative decline in their belief that the "American dream" of prosperity can be theirs (Allen et al., 2002).

As Tinto was researching his framework, the United States was in tumult. The Civil Rights Movement had abolished segregation and overturned Jim Crow statutes (Clark & Blue, 2004). Yet it took military intervention to forcibly desegregate some schools. Universities were also forced to desegregate and begin admitting Black and Latinx students (Comas-Díaz et al., 2019; Contreras & Valverde, 1994). In Tinto's (1975) framework, the concept of "Individual attributes" is a key factor in student success at the university level. The individual attributes Tinto named in his research—intellectual potential, character, personality, social abilities, communication skills to name a few—

did not take into account that White students and Latinx and Black students were not entering college from an equal starting point (Allen et al., 2002). The disparity in educational and societal opportunities between White students and students of color created social, academic, and financial challenges for Black and Latinx students (Allen et al., 2002). In Tinto's framework, the challenges experienced by Black and Latinx students were interpreted as shortcomings in their individual attributes (Guiffrida, 2006). Based on Tinto's (1975) student integration model, Latinx and Black students were starting their college journey at a deficit because their family background often included divorce and poverty. Precollege schooling for Latinx and Black students was also disadvantaged because of racism and segregation (Rochmes, 2007; Rothstein, 2014). Finally, the individual attributes that Tinto deemed favorable for success in the college system were challenges for Black and Latinx students because of the social and educational opportunities denied to them (Rochmes, 2007).

Tinto's model next points to goal commitment and institutional commitment. These factors appear twice in Tinto's model (see Figure 4).

Goal commitment and institutional commitment appear twice because these are the critical points where, according to Tinto (1975), a student needs to commit to the academic system and to their goal of completing their college degree. Tinto stated that students must be committed to the goal of completing their degree and they must also be committed to their institution. If there is only commitment to one or the other, be it the goal or the institution, the student will have less probability of persisting to graduation. Once the students have made their commitments, the integration model moves on to the academic system.

**Figure 4**

*Tinto's Student Integration Model, Highlighted*
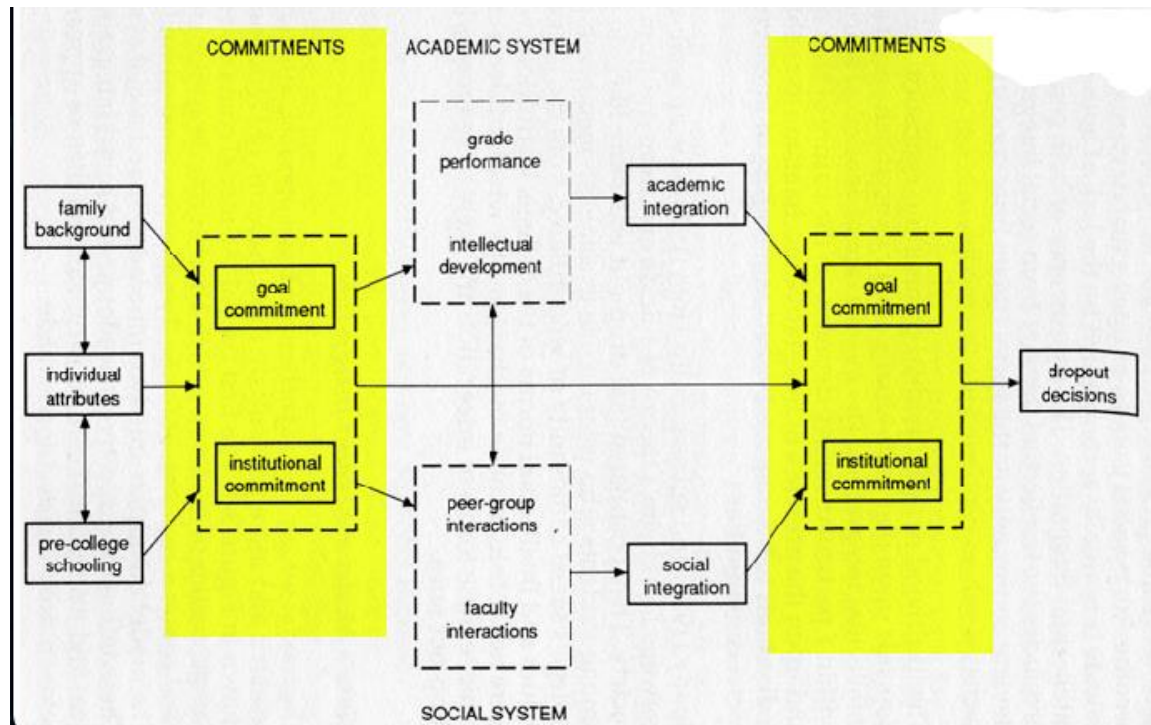


*Note*. From "Dropout From Higher Education: A Theoretical Synthesis of Recent Research, by V. Tinto, 1975, *Review of Educational Research*, *45*(1), p. 95 (https://doi.org/10.2307/1170024).

Within the academic system component of the model, students must demonstrate that they are intellectually competent enough to successfully pass their courses. If they are unable to earn passing grades, then they will not persist to graduation (Tinto, 1975).

Another component of commitment to the institution is the interaction that the student has with their peers and faculty (Tinto, 1975). For example, a student who comes from a long line of alumni to a particular university and who has a strong educational background will find that their commitment to the university and to graduating is buoyed by their family legacy (Cullen & Tinto, 1975). A student who does not have the benefit of parents who attended college and who is of a marginalized background because of their

race, religion, or level of poverty will have a more difficult time assimilating into the academic rigors and social culture of their university (Ayres, 1982; Bean & Metzner, 1985). Subsequent components of Tinto's (1975) integration model are part of the academic system as well. These are academic integration and social integration.

Academic and social integration are key factors leading to persistence to graduation. For Tinto, integration meant that a student must release their cultural background and adopt the cultural expectations and norms of their chosen university (Tinto, 1975). For Tinto, integrating fully into the social, cultural, and academic constructs of a university was the outward demonstration of the student's commitment to their goal and the institution. Yet Tinto's model is flawed because it does not account for the challenges that students of color faced upon entering a largely homogenous White, affluent environment with a history of foundational discrimination (Nora & Crisp, 2012).

During the late 1960s and early 1970s, there were many GIs coming into the educational system (Mattila, 1978). They were using their veteran benefits to pay for college. The Vietnam veterans who were entering college at that point in time were older than traditional college students and most had witnessed combat or the ravages of combat (Cohen et al., 1992). Many came from disadvantaged backgrounds, meaning that their families did not have histories of college education or affluence. Also, many veterans entering college were from ethnic backgrounds other than White (Cox, 2006; Mattila, 1978). They were taking advantage of the funding that the government was providing and the integration of universities to take advantage of educational opportunities that had previously been unattainable Mattila, 1978).

At many universities, there was a culture heavily steeped in tradition, hazing, and Greek life (Ethier & Deaux, 1990). Freshmen at some schools had to distinguish themselves with specific garb, or were expected to behave in deference to senior class members (Del Toro & Hughes, 2020; Eastman et al., 2019). These traditions did not go over well with the veteran men entering college. Many veterans did not engage in the customary university traditions (O'Meara et al., 2017). They were focused on entering school, getting a job, and caring for their responsibilities and families (Mattila, 1978). The veteran student typically had different motivating factors influencing their decision to enter higher education than their peers who were not veterans. This created challenges for both universities and students because University culture of that time was not in tune with the needs of the different type of students who were in attendance (Rahat & Ilhan, 2016). In Tinto's model, these war veterans would experience success and persistence to graduation only if integrated into university culture (Strayhorn & Johnson, 2014).

It was not only Vietnam veterans who struggled to integrate academically and socially. Latinx students experienced tremendous difficulty gaining admission to 4-year universities (Chapman, 2014; Wagner, 2015). Upon being admitted, Latinx students were often viewed as charity or affirmative action cases, meaning that they were admitted to the university not because of their intellectual abilities but because of a federal mandate requiring the integration of different races into previously homogenous White population (Lutz et al., 2018). Faculty interaction was one of Tinto's tenets of success. If students have positive faculty interactions, there is a higher probability that they will integrate socially and be more committed to their institution. Thus, they will successfully complete their chosen degree (Herzig, 2004).

Research has shown that many faculty in higher education have a bias against Latinx and other minority students (Jones et al., 2013). This bias manifests itself in several forms. One is that Latinx students are less likely to be selected to participate in faculty research and mentoring opportunities than their White peers (Lisberg & Woods, 2018). Another way that negative bias is demonstrated by faculty toward Latinx students is that faculty often perceive Latinx students as less intellectually able than their White peers (Lisberg & Woods, 2018; McGee, 2016). Therefore, Latinx students are not called on as frequently in classes and are also often excluded from study groups, which are highly important in building support networks and having positive peer-group interactions.

Tinto's (1975) student integration model puts the onus of integrating academically and socially squarely on the shoulders of the student. Figure 5 describes the four student integration needs that carry a student to persist to graduation. Per Tinto, it is the student who must work to integrate into the prevalent school culture and find a way to fit in. This will enable to the student to have continued and enhanced commitment to their goal of graduating and to the institution. Yet it does not take into account the challenges that students of color face in the integration process. The inability, or unavailability of opportunity to integrate academically and socially is detrimental to student success and persistence to graduation. This is a challenge not addressed by Tinto's student integration model.

### Culture of Latinx College Students

Latinx college students often face challenges assimilating into a university culture that has been created predominantly by White males (Manzano-Sanchez et al., 2018). As

**Figure 5**

*Four Student Integration Needs*
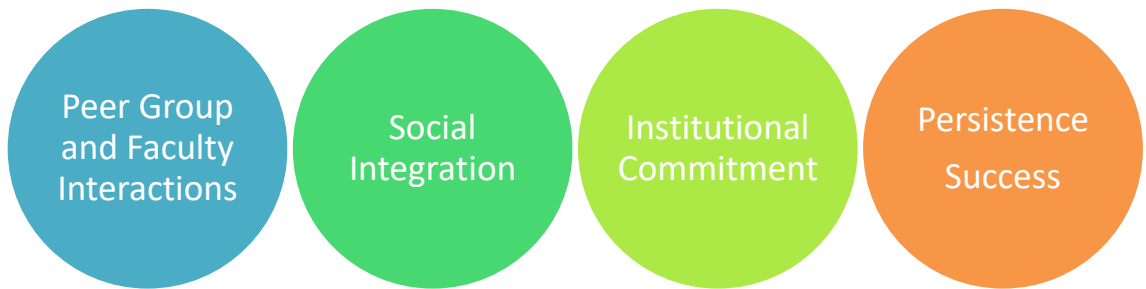


discussed previously, Tinto's (1975) theory of persistence relies heavily on shedding one's previous cultural attachments to fully assimilate into the culture of the university or college the student is attending. For Latinx students, coming from a culture that values the interconnectedness of immediate and extended family, community, and friend groups, leaving that cultural support produces distress reactions for the student (Manzano-Sanchez et al., 2018; Rios-Ellis et al., 2015). These distress reactions may lead to poor academic performance, difficulty with social integration into peer groups, and possibly dropout behaviors (Chun et al., 2016).

Familial support, community support, and friend groups are valuable cultural capital for Latinx students (Chun et al., 2016). For example, there exists a perception that Latinx families do not value a college education (Wagner, 2015). Yet researchers have found that the majority of Latinx families prioritize education (Storlie et al., 2014). One of the possible causes of the misperception that Latinx families are not supportive of higher education is that many Latinx students are the first in their family to attend college (Trevino & DeFreitas, 2014). Immigration is a large contributor to this phenomenon. For many Latinx college students, they are the first in their family to attend college because

they are the first in their family born in the United States and/or, they are the first in their family to receive primary and secondary education in America (Fry, 2011; Trevino & DeFreitas, 2014).

Nonimmigrant Latinx students who are the first in their family to attend college must also contend with the misperception that culturally, Latinx do not value education (Aguinaga & Gloria, 2015). This is a misperception that Black students also contend with (Guiffrida, 2006). The perception that Black and Latinx populations do not value education results from centuries of bigotry, oppression, and poverty that barred Latinx and Black students from aspiring to and attending college (Allen et al., 2002; Robinson, 2016). In addition to familial support, peer group and faculty support are extremely important to the success and persistence to graduation of Latinx college students (Estrada et al., 2018; Kidder, 2012).

**Latinx Student Persistence in STEM Programs**

In general, Latinx students enter higher education at lower rates than their White counterparts (Mau, 2016). Women as well as minority students are less likely to declare a STEM major than their White male counterparts (Chang et al., 2016; Mau, 2016; U.S. Department of Education, n.d.). Once in a STEM major, Latinx students are at higher risk of dropping out than their White peers, and if they graduate with an undergraduate degree, they are less likely to pursue graduate and doctoral degrees in STEM fields as well (Estrada et al., 2016).

For Tinto (1975), student assimilation into university culture was a cornerstone of his persistence theory. Assimilation into university STEM program culture for a Latinx student means that the student must depart from their home culture and influences, adopt

new patterns of communication and socialization, and accept the new culture's belief system and expression of those beliefs as their own (Holloway-Friesen, 2018). Assimilating into an identity that was historically created and generationally fomented to believe that White males from affluent backgrounds are the best, brightest, and most desirable students to work with is psychologically detrimental to Latinx students (Cano & Castillo, 2010; Torres-Harding et al., 2020). Assimilation into STEM academic culture is also difficult for Latinx students because they are often excluded from academic engagement opportunities such as research positions and faculty mentoring relationships that have been proven to support student persistence behaviors (Estrada et al., 2016; Ojeda et al., 2011).

There are additional detrimental factors of assimilation into STEM culture for Latinx students. One of these is the departure from familial and community support systems that provide beneficial psycho-social protective factors for the Latinx student (Gonzalez & Morrison, 2016). Another is the perceived need to adopt the belief that they are less academically capable than their White counterparts (McGee, 2015). This is particularly egregious and damaging to the well-being and academic success of Latinx students (McGee, 2015; Morales, 2010). For affluent, White males from protestant religious backgrounds, entering a university system that was specifically developed to create opportunity and connection for them poses limited challenges for successful social and cultural integration into the academic system. The experience of social and cultural integration into the academic system for Latinx students is far different than that of their White peers (Arbona et al., 2018; Castillo et al., 2006).

**Social Integration for Latinx Students**

For Tinto (1975), socially integrating into the culture of the university meant to integrate with peers and faculty as well as leaving behind one's own culture. Researchers Cano and Castillo (2010) in their article, "The Role of Enculturation and Acculturation on Latina College Student Distress," found that Latinx students who enter predominantly White universities experience marginalization from their White peers. Marginalization for Latinx students in STEM majors can be identified as Latinx students not being given the same access to resources, excluded from social and educational opportunities, and perceived as less worthy or academically adept than their White counterparts (Cano & Castillo, 2010; Mills, 2020). Cano and Castillo (2010) found that marginalization was a cause for depression and stress in Latinx students and was a determining factor in a student's decision to drop out of college.

Cano and Castillo (2010) and other researchers found that acculturation, otherwise known as the process of learning and adopting a different set of cultural norms and behaviors, created stress and depression and contributed to dropout behaviors (Cabassa, 2003; Cano & Castillo, 2010; Fiebig et al., 2010). Latinx students who departed from their home culture in favor of acculturating to the dominant White university culture expressed feeling a sense of loss of support from their family and community (Cano & Castillo, 2010; Fiebig et al., 2010). This was in part because Latinx students reported that kinship support was beneficial to their continued participation and success in college (Fiebig et al., 2010). Kinship support by family, community, and friends in the Latinx community is not about competition and solitary achievement. It is about supporting the community as well as receiving support from the kinship circle. This

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is quite different than the competitive and solitary achievement norms of STEM program culture (Cavazos et al., 2010). Also, low behavioral enculturation for Latinx students was a source of distress (Cano & Castillo, 2010). In other words, Latinx students who did not participate in Latinx familial or community traditions, experiences, and relational behaviors while in college experienced a higher level of distress and depression than those who did (Cano & Castillo, 2010; Fiebig et al., 2010).

Wagner (2015), in her study on Latinx students at selective colleges, found that maintaining ties with their familial and community connections was an expectation for them. For Latinx students, following Tinto's model of assimilation into the new and prevalent culture within a university is not in alignment with Latinx culture (Wagner, 2015). The pressure to assimilate into university culture that has been historically created by and for White, affluent males from protestant backgrounds creates discord and stress for the Latinx student (Chun et al., 2016; Desmond & Turley, 2009).

Marginalization, as mentioned previously, also contributes to depression, stress, poor academic performance, and feelings of isolation for Latinx students (Mills, 2020; Torres-Harding et al., 2020). Marginalization, or being treated as less valuable and less significant than another, takes on many forms (Estrada et al., 2016). In previous generations, the marginalization of Latinx students was overt racial bias that included segregation, institutionalized and enforced exclusion from universities, and other racially motivated aggressions (Aguirre, 2005; Del Toro & Hughes, 2020). In more recent times, a less overt type of racism and bias intended to marginalize Latinx students has been labeled as a racial microaggression (Estrada et al., 2016).

Sue et al. (2007) defined a racial microaggression as "brief and commonplace daily verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults" (p. 271) to the target population or group. Racial microaggressions that Latinx students in higher education experience have negative emotional and academic effects too (Estrada et al., 2016; Mills, 2020).

For Latinx students in STEM programs, marginalization is often perpetrated by faculty and university administration (Estrada et al., 2016). For example, a faculty member who assumes that a Latinx student has entered college through a type of affirmative action or university diversity initiative rather than by academic merits can demonstrate a type of racial bias that can negatively impact the student. This example of racial bias is often a reason why Latinx students in STEM programs are less frequently selected to join research and study groups than their White peers (Estrada et al., 2016). This is particularly injurious to success within a STEM major because research opportunities as well as academic and social integration opportunities equate to higher levels of success and satisfaction within the student (Lisberg & Woods, 2018).

Research opportunities in STEM are of seminal importance in helping students commit to their program of study and commit to their university (Museus et al., 2008). Research opportunities in STEM also mean access to additional academic support and mentorship from professors, access to technology and learning materials, and networking opportunities that can then lead to career opportunities. Within Tinto's (1975) framework, research opportunities and integration into study groups support a student's commitment to the attainment of college graduation. Yet Latinx students, irrespective of

their academic background, are often believed to be less intelligent and less capable than their White and Asian peers, irrespective of the rigor and success of their academic background (Estrada et al., 2016; Museus et al., 2008). Latinx students also have to manage stereotypes that faculty have of them (Estrada et al., 2016).

As Latinx students progress into more challenging coursework, additional peer and institutional support is required. If students are not receiving this additional support from their faculty and university and they are not receiving support via study groups and social integration from their peers, they fall prey to dropout behaviors. This affects their grade point average, feelings of belonging to a university, and ultimately their decision to stay in their major or stay in school.

Also, if Latinx students follow Tinto's (1975) model of assimilating into the university culture, they lose their cultural supports. As a result of this, Latinx students lose the community that does accept and support their endeavors, and they are often rejected from the community they are attempting to assimilate into. This creates a chasm of not belonging to their cultural social groups and not belonging with their STEM peers and professors.

<div align="center">

**Gap**

</div>

For Tinto (1975), committing to the goal of graduating from college is a key component to reaching graduation. He indicated that lack of commitment to the goal on the part of the student is a major contributing factor to a student dropping out. In addition, Tinto's research stated that committing to the university is also a key indicator in the completion of a degree. Yet Tinto's research did not delve into the effects that students

from Latinx backgrounds feel when they are marginalized from the university and community that they are trying to commit to.

The effects of marginalization, racism, and historical institutional racism have on Latinx students can be measured with the rate of dropout of Latinx students. Davidson and Wilson (2013) in their paper, "Reassessing Tinto's Concepts of Social and Academic Integration in Student Retention," critically analyzed Tinto's concepts of academic and social integration as they apply to nontraditional and minority students. Davidson and Wilson found that the terms *academic integration* and *social integration* are detrimental in assessing the persistence to graduation of minority and nontraditional students. Yet Tinto's research relied heavily on social and academic integration into university culture for a student to succeed and reach the goal of graduation.

Tinto's (1975) research focused on the university experience as a whole. It did not delve into the specifics of the culture of STEM programs. STEM programs are notorious for their rate of attrition and have lower completion rates than most other majors at universities in general (Estrada et al., 2016; O'Meara et al., 2017). Some researchers have posited that building a sense of community for minority students in STEM programs will help (Munson et al., 2013; Museus et al., 2008; Ricks et al., 2014). Yet there is a gap in the research that explores what Latinx students perceive the culture of STEM programs to be and how this culture affects or influences their decisions to continue in a STEM major or drop out of their STEM major.

Higher education in the United States has a long history of elitism and bias (Thelin, 2008). The systematic exclusion of racial and religious minorities from higher education has had profoundly negative impacts on the educational attainment of minority

students (Del Toro & Hughes, 2020). With the advent of desegregation and the Civil

Rights Movement, Black and Latinx students were allowed to attend any university that

they could gain admission to (Synnott, 1979). Yet because of the disparity in the quality

of educational opportunities that Latinx and Black students experienced, their admission

opportunities to colleges remained limited (Majors, 2019; Rochmes, 2007).

Affirmative action was implemented to augment the number of students of color

admitted into universities (Johnson, 2017). Though many students benefited from

affirmative action, many university faculty and administration members, as well as other

students, demonstrated they perceived that the intellectual abilities for Latinx students

were lower than those of their White peers (Allen et al., 2002; Estrada et al., 2016).

Within STEM programs, this is particularly egregious because it hinders Latinx students

from receiving research opportunities, peer support, and faculty attention (Estrada et al.,

2016). In STEM programs, substantial engagement with faculty and peers enables

increased persistence to graduation (O'Meara et al., 2017).

In his research, Tinto (1975) contended that persistence to graduation for students

is directly related and proportional to the social and academic integration of the students

into their university environment and culture. Tinto also contended that the level of

commitment students have to their goal of graduating and assimilating into the prevalent

university culture is directly related to their goal attainment or deviation from the goal.

For Latinx students, persistence to graduation is more complicated than just committing

to the goal of completing their degree (Lisberg & Woods, 2018).

According to Museus et al. (2008), Latinx student persistence to college

graduation rates are adversely affected by institutional racism and isolation. Furthermore,

in contrast to Tinto's theory of persistence, Latinx students who assimilate into university and STEM program culture lose very important familial and community supports that may aid in reaching college graduation (Holloway-Friesen, 2018; Ojeda et al., 2011). Tinto's theory of college persistence does not account for the effects of isolation, depression, and stress that Latinx students experience because of exclusion, racial microaggressions, and negative stereotypes in university and STEM program cultures (Mills, 2020; Torres-Harding et al., 2020).

## Summary

Chapter II provided the research information behind students' persistence to a STEM university degree, including a theoretical framework for this persistence. Chapter II also reviewed the gap in the research, which was that there were limited studies on Latinx students' persistence strategies in completing STEM college degrees. Chapter III describes the study design and methodology. Also included in Chapter III are the instruments used for data collection, the sample size and population being studied, and the data analysis procedures. Chapter IV reports the results found through the data collection and analysis. Chapter V describes the major and unexpected findings of the study. Chapter V also includes conclusions from the findings and discusses implications of the research. Chapter V concludes with recommendations for further research.

CHAPTER III: METHODOLOGY

**Overview**

Chapter III begins with the purpose of the study and the specific questions that this study addressed. It also includes the methodology, rationale for the research design, the research instrument, and the methods of data analysis, all of which are discussed in detail. Chapter III also describes the population, sample, validity, and reliability of the study. In addition, ethical procedures to protect participants of the study are also discussed. In the final section of the chapter, the limitations of the study are summarized. The chapter concludes with a brief summary of the information that is presented.

**Purpose Statement**

The purpose of this phenomenological study was to explore how Latinx college graduates who have achieved STEM degrees perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.

**Research Questions**

**Central Research Question**

How do Latinx college graduates who have achieved STEM degrees perceive university and STEM program culture as supporting or not supporting a Latinx college students' persistence to graduation?

**Research Questions**

1. How do Latinx graduates of 4-year university STEM programs perceive the culture of STEM programs at 4-year universities to have influenced or not to have influenced their persistence to graduation?

2. In what ways do Latinx graduates of 4-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?

## Research Design

Qualitative inquiry is aimed at getting an in-depth, individualized, and contextually sensitive understanding of the subject matter being studied (Patton 2015). Qualitative inquiry also uses an interactive and personal approach to data collection. Specifically, phenomenological inquiry, as part of qualitative research, focuses on the exploration of how human beings make sense of or understand an experience. Also, phenomenological research informs researchers how those individuals transformed their experience into consciousness and meaning. Phenomenological researchers capture and describe how the subjects experience a phenomenon. Patton said that phenomenological researchers study how subjects "perceive, describe, feel about, judge, remember, make sense of, and talk about [their experience and perceptions] with others" (p. 190).

Patton (2015) included 16 types of qualitative research methods in his book. Phenomenological inquiry is one of those methods. A core question of a phenomenological study is to ask, "What is the meaning, structure, and essence of the lived experience of this phenomenon for this person or group of people?" (Patton, 2015, p. 167). Phenomenological research studies the way people interpret the world, and a main assumption of a phenomenological study is that there is a shared meaning that relates to commonly occurring phenomena within a culture (Creswell, 2014).

A phenomenological design is also particularly suited to individuals and groups for which there is little published research (Creswell, 2014; Patton, 2015). There are

limited studies about Latinx students in 4-year STEM programs and no research related to the effects of the culture of STEM programs on the persistence of Latinx students to graduation. Therefore, phenomenology was an appropriate method to explore the lived experiences of Latinx students who graduate from 4-year college STEM programs (Patton, 2015). After an exhaustive review of research design methods, a qualitative phenomenological approach was the methodology selected to explore how Latinx students who graduate from 4-year college STEM programs perceive the culture of their STEM program in affecting their persistence to graduation because this research intends to describe the lived experiences of the participants.

## Population

According to Patton (2015), a population is defined as a group that a researcher is interested in studying. Also, a population is a group of people who conform to or are consistent with a set of common characteristics or criteria (Creswell, 2014; McMillan & Schumacher, 2010). The population of this study are college graduates of Latinx descent who graduated from 4-year college STEM programs in the last 5 years. These graduates share similarities in that they either transferred into a traditional 4-year college or university or were admitted into a 4-year college as freshmen. The Latinx STEM career majors graduated with degrees in science, technology, engineering, or mathematics.

In 2016, 1.8 million bachelor's degrees were awarded. Of that total, approximately 331,000, or 18%, were in STEM fields. To break that figure down even further, of the 331,000 STEM degrees that were awarded, 15% were earned by Latinx students. To put this number into further perspective, of the 1.8 million bachelor's

degrees that were awarded in 2016, only 49,650 were STEM degrees earned by Latinx

students (National Center for Education Statistics, 2019b).

The chart in Figure 6 depicts visually the total number of bachelor's degrees

earned in 2016. The color blue represents the total number of BA degrees that were

earned. The red portion of the chart demonstrates the total of STEM degrees earned. The

smallest portion of the chart in green is the total number of STEM degrees earned by

Latinx students.

**Figure 6**

*Total Numbers of Undergraduate Degrees Earned in 2016*
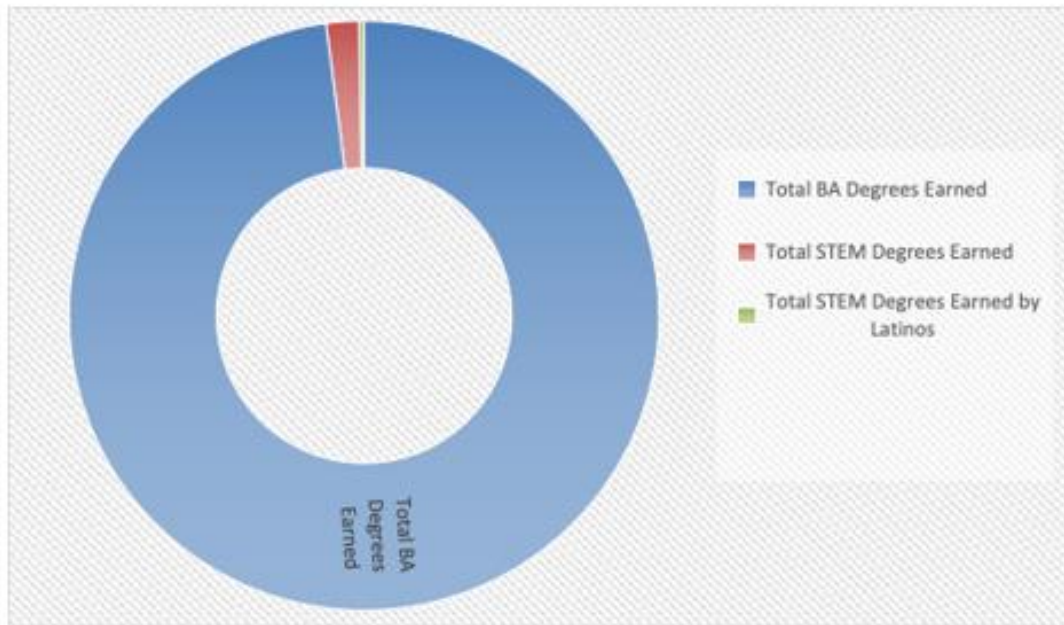


*Note*. Adapted from "Indicator 26: STEM Degrees. *Status and Trends in the Education Racial and Ethnic Groups*," by National Center for Education Statistics, 2019b (https://nces.ed.gov/programs/raceindicators/indicator_reg.asp).

The graph in Figure 7 shows the type of STEM degree earned by Latinx students

along with the percentage of the total population which that figure represents. For

example, in approximate numbers, in 2018, 10% of all STEM bachelor's degrees earned

by Latinx students were awarded in the area of physics. If the number of graduates in

2018 is proportionately similar to the number who graduated in 2016, that means that

roughly 4,900 physics degrees were earned by Latinx students throughout the United

States. In 2021, the number of STEM degrees awarded is not significantly different than

the number of STEM degrees awarded to Latinx students in 2016 (see Figure 8).

**Figure 7**

*Bachelor's Degrees Earned by Hispanic Americans*
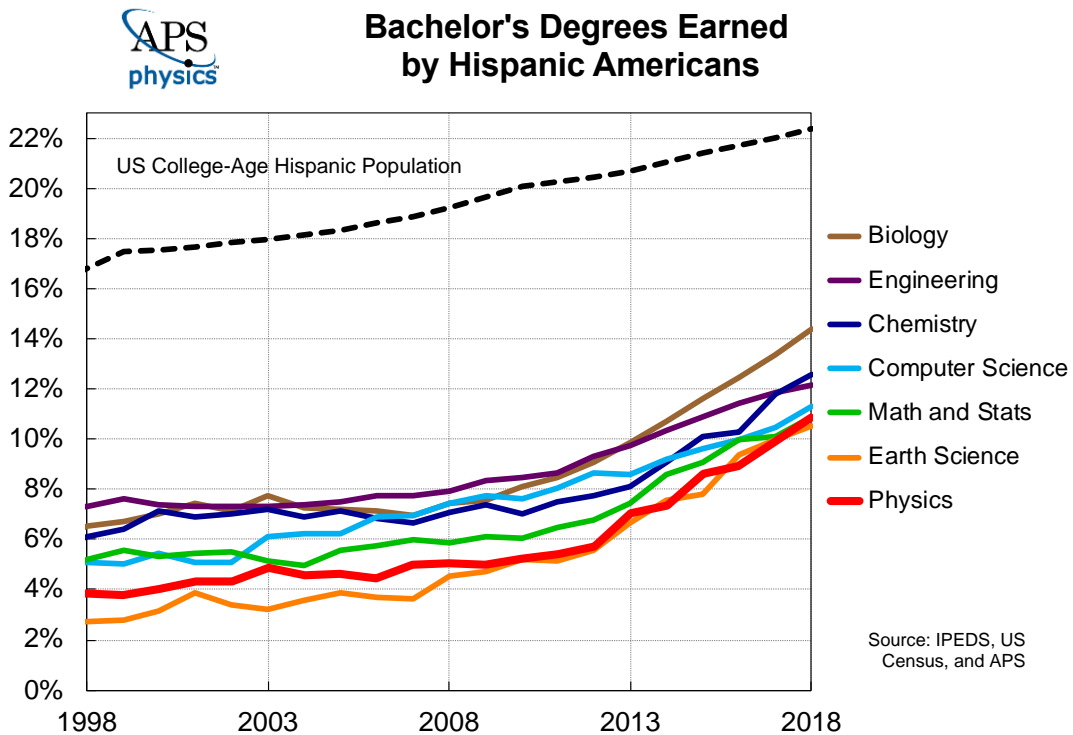


*Note*. From "Bachelor's Degrees Earned by Hispanic Americans," by American Physical Society,
n.d. (https://www.aps.org/programs/education/statistics/upload/Bachelor-Hispanic-AllMaj-
2020.pdf).

**Figure 8**

*Total Number of Bachelor's Degrees Awarded 2021*
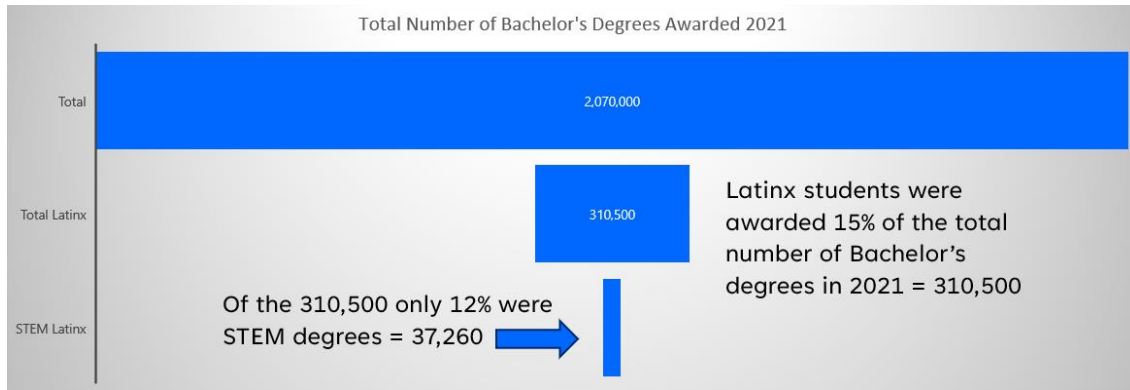


*Note*. Adapted from *STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity*, by R. Fry, B. Kennedy, and C. Funk, 2021, Pew Research Center (https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/).

## Target Population

A target population is a group who in addition to meeting a common set of characteristics also meet a narrower set of determining factors or criteria that distinguishes them from the larger segment of the population (Patton, 2015). This differentiation is necessary to narrow the field of potential research subjects and allows a researcher to conduct a more concise and focused study (Creswell, 2014). According to Creswell (2014), "The target population is the actual list of sampling units from which a sample is selected" (p. 393). The researcher chose to collect a variety of perceptions from Latinx students across various universities from Southern California. Latinx students from University of California, California State University, and private nonprofit 4-year universities were selected for participation in this study.

The target population in this study included the following characteristics:

- participants who graduated with a STEM major in the last 5 years;

- participants who identified as Latinx students;

- students from Southern California Counties. Southern California includes Los Angeles, Imperial, Riverside, Orange, San Bernardino, Santa Barbara, San Diego, Ventura, Kern, and San Luis Obispo Counties ("World Population Review," 2023);

- participants who graduated from nonprofit university or college STEM programs. This includes five University of California (UC) schools: UC San Diego, UC Riverside, UC Irvine, UCLA, and UC Santa Barbara. It also includes 12 California State University (CSU) campuses: San Diego State University, CSU San Marcos, CSU Fullerton, CSU San Bernardino, CSU Pomona, CSU Long Beach, CSU Dominguez Hills, CSU Los Angeles, CSU Northridge, CSU Channel Islands, CSU San Luis Obispo, and CSU Bakersfield. There are additional private nonprofit colleges which are also included.

Figure 9 is a map of California. It shows the different counties within the state. Southern California is denoted in green.

The map in Figure 10 shows all of the University of California campuses as well as the California State University campuses within the state of California. The portions of the image highlighted in yellow are campuses that fall into the region of Southern California. Finally, the map in Figure 11 is a representation of all of the 4-year nonprofit colleges in Southern California.

## Sample

In scientific studies, researchers often collect data from a representative subset of the population. This is referred to as a sample population (McMillan & Schumacher,

**Figure 9**

*Map of California With Counties*



*Note*. From California Counties by Mental Health and DMC-ODS Region," by California Department of Health Care Services, n.d. (https://www.dhcs.ca.gov/formsandpubs/ Documents/Attachment_B_.pdf).

**Figure 10**

*Map of All University of California and California State University Schools*



CALIFORNIA STATE UNIVERSITY AND UNIVERSITY OF CALIFORNIA LOCATIONS

University of California (UC)
UC Website: www.ucop.edu/pathways
UC, Berkeley
UC, Davis
UC, Irvine
UC, Los Angeles
UC, Merced
UC, Riverside
UC, San Diego
UC, San Francisco
UC, Santa Barbara
UC, Santa Cruz

UNIVERSITY OF CALIFORNIA CAMPUSES

CALIFORNIA STATE UNIVERSITY CAMPUSES

California State University (CSU)
CSU Website: www.csumentor.edu
CA Polytechnic State University, San Luis Obispo
CA Polytechnic State University, Pomona
CSU, Bakersfield
CSU, Channel Islands
CSU, Chico
CSU, Domingues Hills
CSU, East Bay
CSU, Fresno
CSU, Fullerton
CSU, Long Beach
CSU, Los Angeles
CA Maritime Academy
CSU, Monterey Bay
CSU, Northridge
CSU, Sacramento
CSU, San Bernardino
CSU, San Marcos
CSU, Sonoma
CSU, Stanislaus
Humbolt State University
San Diego State University
San Francisco State University
San Jose State University

*Note*. From "California State University and University of California Locations," Riverside Community College District, 2016-2017 (https://www.sca-edu.org/documents/College--Career/College-Exploration/Map%20of%20UC-s%20and%20CSU-s.pdf).

**Figure 11**

*Map of all Private Nonprofit 4-Year Universities and Colleges in Southern California*
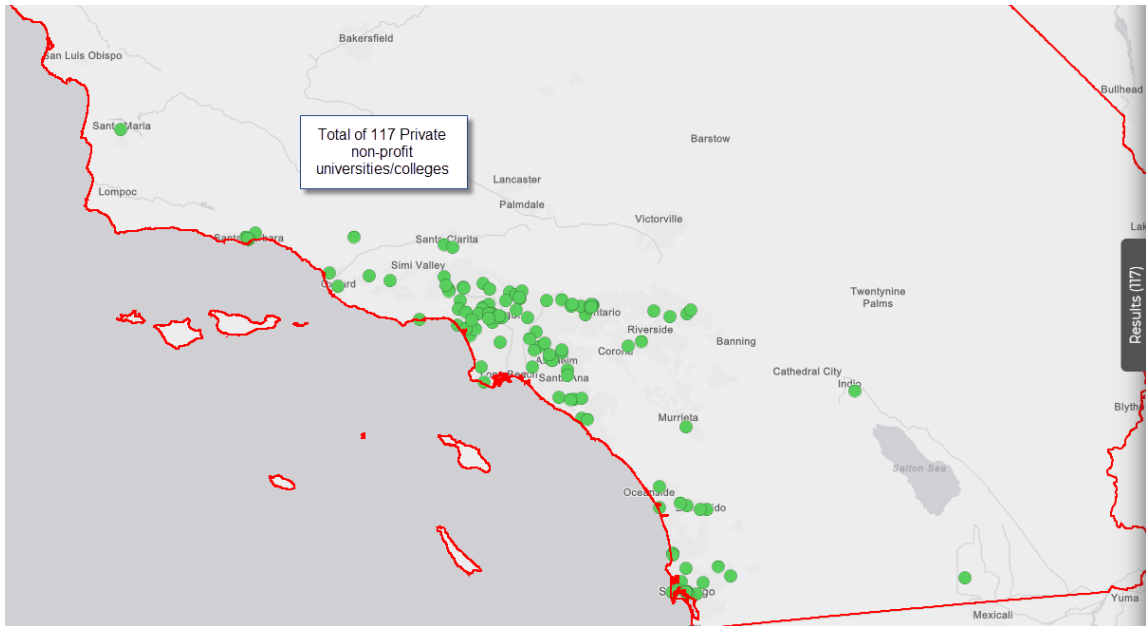


*Note*. From College Map, National Center for Education Statistics, n.d. (National Center for Education Statistics).

2010). Sample size is another aspect of data collection. The researcher selected 12

participants who met the criteria for this study. In qualitative studies such as

phenomenological studies, sample sizes are often smaller than sample sizes of

quantitative studies. Patton (2015) stated that there are "no rules to sample size in

qualitative studies" (p. 311). He also noted that the value of in-depth studies that involve

a smaller group of participants is high when the "cases are information-rich" (p. 311).

This is due to the nature of qualitative research. Qualitative research is concerned with

gathering an in depth understanding of a phenomenon. The in-depth interview work

associated with gathering qualitative data is much more concerned with drawing

connections and understanding the lived experiences of the participants than testing a

hypothesis.

**Sampling Procedures**

It is highly important to choose a sampling method that best supports the purpose of the study. The four sampling procedures used in this study included nonprobability sampling, convenience sampling, purposeful sampling, and snowball sampling.

**Nonprobability Sampling**

Nonprobability sampling is a method of sampling that is most commonly associated with qualitative educational research (Patton, 2015). Nonprobability sampling does not include any type of random selection from the larger population. It uses subjects who happen to be available and accessible to the researcher. The subjects also represent certain types of characteristics that the researcher categorizes as relevant to the study. Patton named three different types of nonprobability sampling approaches: convenience sampling, purposeful sampling, and quota sampling. For this study, the researcher chose to use convenience sampling.

**Convenience Sampling**

Convenience sampling is when a researcher samples a group of subjects based on their accessibility or expediency (McMillan & Schumacher, 2010). Convenience samples are used in both quantitative and qualitative studies. This type of sampling is often used among researchers because of practical constraints, access to subjects, and the efficiency of this type of sampling. Convenience sampling was used to reduce the pool of participants to 12 Latinx students who met the criteria and who were accessible in the Southern California region. Additionally, convenience sampling was used to gain access to participants based on the geographic region of Southern California.

**Purposeful Sampling**

Purposeful sampling, also known as purposive sampling, is when a researcher selects a particular element or elements of a population that will be representative or informative about the research topic (Patton, 2015). In purposeful sampling the researcher makes a judgement about which subjects should be selected to participate in the study. This judgement is based on the researcher's knowledge of the population and the interests of the research.

All 12 participants in the study had to have these following purposeful characteristics:

- participants who graduated with a STEM major in the last 5 years with either a science, technology, engineering, or mathematics degree;

- participants who identified as Latinx students;

- participants from Southern California Counties. Southern California includes Los Angeles, Imperial, Riverside, Orange, San Bernardino, Santa Barbara, San Diego, Ventura, Kern, and San Luis Obispo Counties ("World Population Review," 2023).

Students who graduated from one of either of the University of California or California State University schools. The nonprofit universities in this study include five University of California 4-year schools: UC San Diego, UC Riverside, UC Irvine, UCLA, and UC Santa Barbara. It also includes 12 California State University campuses: San Diego State University, CSU San Marcos, CSU Fullerton, CSU San Bernardino, CSU Pomona, CSU Long Beach, CSU Dominguez Hills, CSU Los Angeles, CSU Northridge, CSU Channel Islands, CSU San Luis Obispo, and CSU Bakersfield.

The following steps were used to recruit participants for this study:

1. Once permission to collect data was received through the University of Massachusetts Global Institutional Review Board (IRB; see Appendix A), the researcher contacted the Latinx alumni associations from the universities and colleges within the designated region of Southern California. The researcher requested to be put in contact with or have her contact information shared with Latinx alumna who graduated from STEM programs. Also, the researcher contacted community outreach programs throughout Southern California. These outreach programs, such as Hispanas Organized for Political Equality, Girls Inc., and others, support Latinx students entering college. Some additional organizations that the researcher contacted to recruit study participants were Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), Society of Hispanic Professional Engineers (SHPE), National Society of Hispanic Physicists (NSHP), Society of Mexican American Engineers and Scientists (MAES), the Latino Community Foundation, the Hispanic Foundation of Silicon Valley, and HSI STEM Hub.

2. The researcher contacted the identified Latinx graduates through email with the Participants Information Letter (see Appendix B). The researcher explained the purpose of the study and requested that the participants self-identify their eligibility for the study using the established criteria.

The researcher verified that the potential study participants who responded met the criteria through their self-eligibility identification by using online sources such as LinkedIn, Facebook and profiles posted on alumni websites. Participants were also asked

whether they knew and would refer a former student STEM graduate who met these criteria. Patton (2015) described this type of sampling as "snowball" sampling (p. 298). Snowball sampling is a way in which a researcher can locate "information-rich" participants by asking "well-situated" people questions such as "Do you recommend I connect with someone in particular" or "Can you refer me to a participant that supports this study" (p. 298). In this manner, the researcher is able to increase their access to potential study participants based on "generating a chain of interviewees based on people who know people who know people who would be good sources of inquiry" (p. 298).

## Instrumentation

For the purposes of this study, two interview approaches were combined—an open-ended and a structured interview guide approach—in interviewing. This interview style allowed the researcher to ask probing questions, request clarification from research subjects, and also explain the meaning of questions should the subject need it. The instrument used was an interview questionnaire aligned with the theoretical framework and the synthesis matrix (Appendix C), which aligned with the research questions. A theoretical framework for the research study was developed to explore the lived experiences of Latinx students who have graduated from 4-year STEM programs and how they perceive the culture of their university and the culture of the STEM program that they attended as having influenced their journey to completing their degree. The framework was founded on Tinto's (1975) "A Conceptual Schema for Dropout From College" (see Figure 1, repeated here for ease of reference).

The framework includes a student's individual attributes. Individual attributes include the student's family background and their precollege schooling. Next, the

framework includes the commitment level the student has toward their goal of graduating

and also toward the institution they attended. The final component of the theoretical

framework is the academic system. The academic system encompasses a student's grade

performance, intellectual development, and interactions with their peers and faculty.

Additionally, the academic system informs the researcher about the quality of the

student's social and academic integration into their university and chosen program, and

the decision to drop out or complete their degree (Tinto, 1975).

**Figure 1**
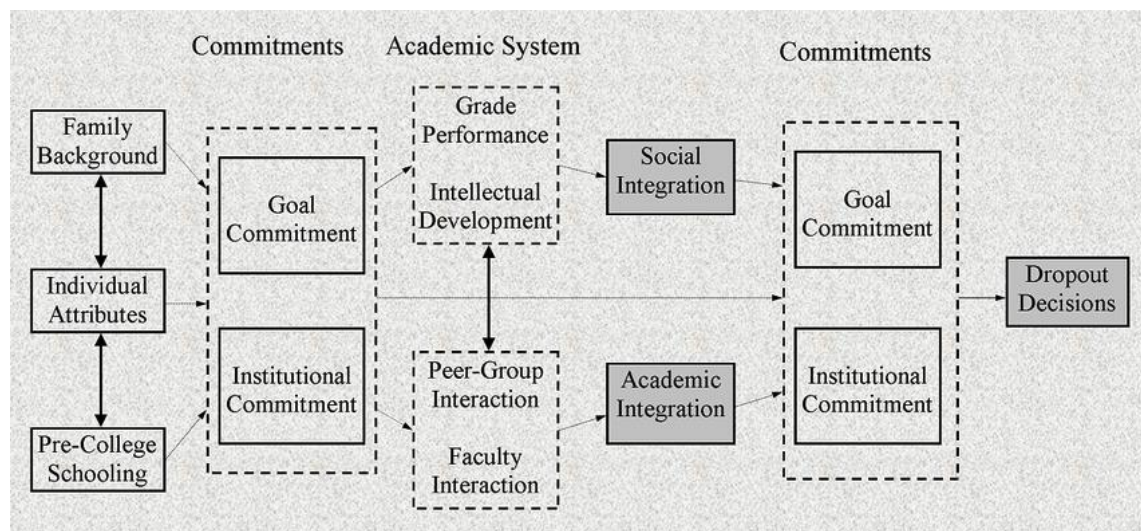
*A Conceptual Schema for Dropout From College*



*Note*. From "Dropout From Higher Education: A Theoretical Synthesis of Recent Research," by
V. Tinto, 1975, *Review of Educational Research*, *45*(1), p. 95 (https://doi.org/10.2307/1170024).

Interviewing has a diversity of applications and approaches (McMillan &

Schumacher, 2010). For example, in-depth interviews are particularly useful for

obtaining data (Patton, 2015). In-depth interviews involve speaking to research subjects

at length with the intention of getting a wide breadth of their experience and perceptions.

The interview can take place in a natural environment or a clinical one and can be

structured in a variety of different ways. For the purpose of this study, interviewing was the primary instrument of data collection.

According to McMillan and Schumacher (2010), "Qualitative in-depth interviews are noted more for their probes and pauses than for their particular question formats" (p. 450). A good researcher is able to establish trust with his or her subject by being genuine, maintaining eye contact, participating in active listening, and using a welcoming and calm tone of voice. Being approachable and receptive is also important for successful data-rich interviews. In addition to the personable traits and effective communication skills of the researcher in the interview, a protocol was also necessary. The interview instrument is provided in Appendix D.

**Interview Protocol**

Prior to scheduling or involving participants in interviewing the researcher was approved to collect data through the University of Massachusetts Global IRB process (Appendix A). The researcher was also trained in guidelines for selecting participants for the study and has an NIH certificate (Appendix E) as proof of this training. Prior to each interview, participants received a letter inviting them to participate in the study and this letter provided information about what the study was about (Appendix B). Participants also received the University of Massachusetts Global Research Participant's Bill of Rights (Appendices F and G), the informed consent letter (Appendix H), and an audio recording release (Appendix I).

The researcher reviewed with the participant whether it was convenient to complete the interview in person or virtually.  Also, the participant and researcher agreed

on the desired venue. All participants were interviewed virtually based on the agreement between the participant and researcher.

**Researcher as an Instrument**

As an instrument for research, researchers must explicitly identify their biases, values, and personal background such as gender, history, culture, and socioeconomic status that would shape the interpretations formed during the study (Creswell, 2014). The researcher is a Latinx woman with two bachelor's degrees and a master's degree and a history of developing curriculum for underrepresented minorities to gain access to higher education as well as creating support programs to assist in college level student persistence. In addition, she is currently working in higher education supervising a team of academic advisors and working with nontraditional college-level students. It was of paramount importance that as an instrument of research biases be examined. Self-reflection on the researcher's history and personal experience that could influence the examination of the collected interviews and data analysis was also mindfully explored.

<div align="center">

**Validity and Reliability**

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Validation of research occurs throughout the entire research process. Creswell (2014) defined qualitative validity as a means that the researcher checks for the accuracy of the findings by employing certain procedures. There are many terms that address validity including trustworthiness, authenticity, and credibility. He went on to say that qualitative reliability indicates that the researcher's approach is consistent across different researchers and different projects.

**Validity**

Multiple strategies were used to increase the validity of this research study. These strategies included:

- Participant language and verbatim accounts. All transcripts were recorded verbatim. Participant language and verbatim accounts assist in the validity of the research by utilizing the language that the interviewee uses (McMillan & Schumacher, 2010). This method of providing validity is important because it does not translate or change the participants' language and therefore helps to maintain the participants' meaning during their interviews. In addition, the researcher the transcripts to each participant to have them verify that the transcript was correct.

- Similar to recording interviews, data coding software was another checkpoint to ascertain the validity of the data.

- The interview questions were aligned with the research questions (Appendix D) and the theoretical framework (Appendix J) to ascertain that the interview questions asked would entail responses that elicited data as findings for the specific research questions in the study and supported the research identified in the theoretical framework.

- Finally, to check for validity, three colleagues from UMass Global who had their doctoral degrees reviewed the interview instrument to determine the validity of the questions. Feedback provided was used to modify and revise questions in the interview.

**Reliability**

Reliability in a qualitative study is referent to the consistency of the research procedures and study results. Reliability deals specifically with the dependability of the data being collected in a qualitative study as well as the ability of the study results to be consistent if the study is repeated (Patton, 2015). Most researchers maintain that reliability factors are still relevant and important because they require the researcher to pay attention to the rigor of the qualitative research. Thus, an independent researcher conducting the same study will arrive at similar or equivalent findings. Internal reliability is the consistency of results over time and the use of the study methods used by the researcher. Also, adhering to the data collection instrument and protocol increased the reliability of the study findings because the same protocol was used with every participant. Also, the researcher used the feedback from the field test and modified any protocol issues the field-test participant identified.

**Field Test**

To ensure the reliability of the research in this study, a field test was performed. This field test was conducted as a pilot interview with participants who were two college students who graduated from STEM programs in the colleges identified in the study but whose data were not included in the data analysis in this study. A field test can provide the researcher with insights before actually engaging with participants of the study (Patton, 2015). An expert with qualitative research experience was also identified to observe in the pilot interview. The expert was an individual with experience in qualitative research, had experience coaching and mentoring others in qualitative research, and also had completed coursework in qualitative research. The researcher was observed by said

expert while performing the pilot interview. The expert then provided feedback on interview skills, the interview instrument, and the protocol used.

**Triangulation of Data**

Patton described that the triangulation of data is ideal because it imbues strength into a research study by combining methods. A researcher can use triangulation in a study by combining different methodologies of collecting and analyzing data, as for example, collecting and analyzing participant interviews, observations, and artifacts (Patton, 2015). For this study, in addition to conducting interviews, the researcher asked participants to share artifacts such as journals, emails, or other documents related to the research to show their persistence to STEM degree completion or other areas identified by the researcher as relevant to the study. The names, titles, and materials collected from participants were redacted for anonymity. Several artifacts collected for triangulation are included in Appendix K.

**Data Collection**

Interviews were selected as the most appropriate form of data collection for this study. Face-to-face, in-person interviews were the preferred method of collecting the interviews. Participants were also offered the opportunity to interview via Zoom if an in-person interview was not possible. A benefit of interviewing via Zoom is the ability to record interviews and easily archive the media. Recording the interviews and being able to see the subject in the recording was highly valuable to the validity of the data being collected and analyzed.

**Participant Data**

All of the participant data was stored in an external hard drive. As participants were interviewed, each interview was recorded, saved to an external hard drive, and backed up on the cloud. The interviews were labeled. Each interview was given a number to maintain anonymity and to maintain the security of the interview participant. A list of the interviewee names and their corresponding number was saved in a different location than the interviews themselves. Each interview recording was transcribed, and notes were transferred into a digital format. All interview materials and notes were saved with the corresponding interview number. All interviewees were sent a copy of their interview transcription and any related notes. All information was password protected, and the hard drive was kept in a locked area of the researcher's home. All of the data collected were destroyed after 3 years.

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**Data Analysis**

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According to McMillan and Schumacher (2010), inductive analysis in qualitative studies is the process through which qualitative researchers synthesize and make meaning from copious amounts of data. Qualitative researchers start with specific data, for example, recorded interviews and artifacts, and end with categories and patterns. Thus, they move from general and broad to identifiable patterns and themes. Unlike quantitative data analysis, for qualitative data analysis there is no set rule or formula for analyzing the data (Patton, 2015).

1.  The researcher reviewed the interview responses from the recorded transcripts to identify themes that aligned with the research questions of the study.

2. The researcher coded the data using NVivo software and explored the frequency of themes to determine whether they were effectively answering the research questions. Charts and frequency tables were developed to assist in the organization and analysis of themes to determine the findings of this study aligned with each research question.

## Interrater Reliability

In qualitative data collected via in-depth interviews, the researcher examines the interviews to determine themes and analyze the data. In this study, a peer researcher analyzed 10% of the coding and the description of the study's themes (Patton, 2015). The peer evaluator coding process was reviewed against the researcher's coding process to increase accuracy in the coding procedures and to improve intercoder reliability.

The percentage of reliability that was acceptable and viewed as valid is 80%, and the peer researcher was able to meet this requirement in her review of 10% of the data.

## Limitations

There is no research study that does not have limitations. Limitations may be financial, geographical, or personal to name a few (McMillan & Schumacher, 2010; Patton, 2015). This study was limited to researching the lived experiences of 12 Latinx students who graduated from a 4-year STEM program in the southern California area in selected universities within the last 5 years. The research subjects must also have graduated from a nonprofit university or college located in Southern California. The results of the study cannot be generalized to other institutions or to all Latinx students who graduated from these Southern California STEM programs.

## Summary

This qualitative phenomenological study focused on the lived experiences of Latinx students who graduated from the University of California system 4-year STEM programs. Following a review of the purpose of the study and the research questions, this chapter gave a detailed explanation of the processes for collecting and analyzing the data to respond to the research questions. This chapter demonstrated alignment between the research methodology and the various study components including research design, study population, sample criteria, and instrumentation. Chapter III also addressed data collection procedures, data organization, and data analysis procedures as well as the limitations of this study. Chapter IV presents the study data findings in detail as well as the data analysis results. Chapter V describes conclusions from the study findings. Chapter V also delves into the implications of the research findings and makes recommendations for further research.

CHAPTER IV: RESEARCH, DATA COLLECTION, AND FINDINGS

Chapter IV explains the process for this study including the research, data collection and findings of the study. In particular, this chapter covers the data collected from 12 interviews with Latinx students who graduated from 4-year STEM college programs located in universities and/or colleges in Southern California. The purpose statement and research questions have been restated in this chapter. The methodology, data collection information and population have also been provided. Next, Chapter IV presents the analysis of the data related to the Latinx graduates from STEM programs and their perceptions of how the culture of their STEM program affected their educational experience. This chapter concludes by summarizing the key components related to the study's research, data collection, and findings.

## Purpose Statement

The purpose of this phenomenological study was to explore how Latinx college graduates who have achieved STEM degrees perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.

## Research Questions

### Central Research Question

How do Latinx college graduates who have achieved STEM degrees perceive university and STEM program culture as supporting or not supporting a Latinx college students' persistence to graduation?

### Research Questions

1. How do Latinx graduates of 4-year university STEM programs perceive the

culture of STEM programs at 4-year universities to have influenced or not to have

influenced their persistence to graduation?

2. In what ways do Latinx graduates of 4-year university STEM programs perceive

that learning to assimilate into the university STEM department culture influenced

or did not influence their persistence to STEM degree completion?

### Research Methods and Data Collection Procedures

Phenomenological research studies the way people interpret the world, and a main

assumption of a phenomenological study is that there is a shared meaning that relates to

commonly occurring phenomena within a culture (Creswell, 2014). A phenomenological

design is also particularly suited to individuals and groups for which there is little

published research (Creswell, 2014; Patton, 2015). Limited studies about Latinx students

in 4-year STEM programs were found and no research related to the effects of the culture

of STEM programs on the persistence of Latinx students to graduation. Therefore,

phenomenology was an appropriate method to explore the lived experiences of Latinx

students who graduate from 4-year college STEM programs (Patton, 2015). After an

exhaustive review of research design methods, a qualitative phenomenological approach

was the methodology selected to explore how Latinx students who graduate from 4-year

college STEM programs perceive the culture of their STEM program in affecting their

persistence to graduation because this research intends to describe the lived experiences

of the participants.

### Population

According to Patton (2015), a population is defined as a group that a researcher is

interested in studying. Also, a population is a group of people who conform to or are

consistent with a set of common characteristics or criteria (Creswell, 2014; McMillan & Schumacher, 2010). The population of this study were college graduates of Latinx descent who graduated from 4-year college STEM programs in the last 5 years. These graduates share similarities in that they either transferred into a traditional 4-year college or university or were admitted into a 4-year college as freshmen. The Latinx STEM career majors graduated with degrees in science, technology, engineering, or mathematics.

In 2016, 1.8 million bachelor's degrees were awarded. Of that total, approximately 331,000, or 18%, were in STEM fields. To break that figure down even further, of the 331,000 STEM degrees that were awarded, 15% were earned by Latinx students. To put this number into further perspective, of the 1.8 million bachelor's degrees that were awarded in 2016, only 49,650 were STEM degrees earned by Latinx students (National Center for Education Statistics, 2019b).

## Sample

In scientific studies, researchers often collect data from a representative subset of the population. This is referred to as a sample population (McMillan & Schumacher, 2010). Sample size is another aspect of data collection. Participants who met the criteria were selected for this study. In qualitative studies such as phenomenological studies, sample sizes are often smaller than sample sizes of quantitative studies. Patton (2015) stated that there are "no rules to sample size in qualitative studies" (p. 311). He also noted that the value of in-depth studies that involve a smaller group of participants is high when the "cases are information-rich" (p. 311). This is due to the nature of qualitative research. Qualitative research is concerned with gathering an in depth understanding of a

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phenomenon. The in-depth interview work associated with gathering qualitative data is much more concerned with drawing connections and understanding the lived experiences of the participants than testing a hypothesis.

## Demographic Data

All 12 participants in the study had to have these following purposeful characteristics:

- participants who graduated with a STEM major in the last 5 years with either a science, technology, engineering, or mathematics degree;

- participants who identified as Latinx students;

- participants who graduated from schools located within Southern California Counties. Southern California includes Los Angeles, Imperial, Riverside, Orange, San Bernardino, Santa Barbara, San Diego, Ventura, Kern, and San Luis Obispo Counties ("World Population Review," 2023);

- participants who graduated from one of either of the University of California or California State University schools or private not for profit universities located within Southern California.

The public nonprofit universities in this study include five University of California 4-year schools: UC San Diego, UC Riverside, UC Irvine, UCLA, and UC Santa Barbara. It also includes 12 California State University campuses: San Diego State University, CSU San Marcos, CSU Fullerton, CSU San Bernardino, CSU Pomona, CSU Long Beach, CSU Dominguez Hills, CSU Los Angeles, CSU Northridge, CSU Channel Islands, CSU San Luis Obispo, and CSU Bakersfield. Table 1 supplies the gender, major,

university/college, graduation year, student's legal status to be in the United States, and the participant status as a first-generation college student.

Legal status in the United States was not a determining criterion for participation in this study. For the study, being a first-generation college student was not a requirement to be a participant. Upon interviewing the participants, they all shared, independently and without being asked, what their legal status in the United States was. Therefore, the information is included in Table 1.

**Table 1**

*Participant Demographics*

| Participant | Gender | Major | University/college | Grad year | First generation |
|---|---|---|---|---|---|
| 1 | Male | Applied mathematics | Cal Poly Pomona | 2021 | Yes |
| 2 | Female | Kinesiology | Chapman University | 2019 | Yes |
| 3 | Female | Bio chemistry in cell biology | UC San Diego | 2022 | No |
| 4 | Male | Civil engineering | Cal Poly Pomona | 2021 | Yes |
| 5 | Female | Applied mathematics | Cal Poly Pomona | 2020 | Yes |
| 6 | Female | Computer science | Cal Poly Pomona | 2021 | Yes |
| 7 | Male | Computer info systems | Cal Poly Pomona | 2019 | Yes |
| 8 | Female | Chemistry | CSU Fullerton | 2019 | No |
| 9 | Male | Aerospace engineering | San Diego State University | 2021 | Yes |
| 10 | Female | Biology | CSU Long Beach | 2019 | Yes |
| 11 | Female | Enviro science | CSU Fullerton | 2019 | Yes |
| 12 | Male | Computer science | CSU Dominguez Hills | 2021 | Yes |

## Data Collection

Interviews were selected as the most appropriate form of data collection for this study. Face-to-face, in-person interviews were the preferred method of collecting the interviews. However, participants were also offered the opportunity to interview via Zoom if an in-person interview was not possible. All participants chose to participate in the research via Zoom. A benefit of interviewing via Zoom was the ability to record interviews and easily archive the media. All participants signed consent and verbally gave consent to being recorded. Utilizing the recorded interviews was highly valuable to the validity of the data being collected and analyzed. Also, the research questions were the guide for the development of the interview questions. The interviews were both structured and semistructured. Participants were permitted to ask clarifying questions and the interviewer also had the ability to ask probing questions.

In addition to interviews, the researcher attempted to collect artifacts from participants. The desired artifacts were personal journals, examples of correspondence from faculty, and copies of transcripts. Participants did not wish to provide physical or digital copies of artifacts, so the researcher provided some organizational symbols of where several participants who were not STEM in employees in national organizations. These artifacts are provided in Appendix K.

## Data Analysis

The central research question of this study was "How do Latinx college graduates who have achieved STEM degrees perceive university and STEM program culture as supporting or not supporting a Latinx college students' persistence to graduation?"

# Research Question 1

*How do Latinx graduates of 4-year university STEM programs perceive the culture of STEM programs at 4-year universities to have influenced or not to have influenced their persistence to graduation?*

The research questions were based on the theoretical framework created by Tinto. Tinto's (1975) framework depicts the success of a student being contingent upon the student's commitment to their goal of graduation and to their commitment to their institution (see Figure 1, repeated here for convenience). The presentation of the data focuses on the themes derived from the interviews and observations collected as part of the study.

**Figure 1**

*A Conceptual Schema for Dropout From College*
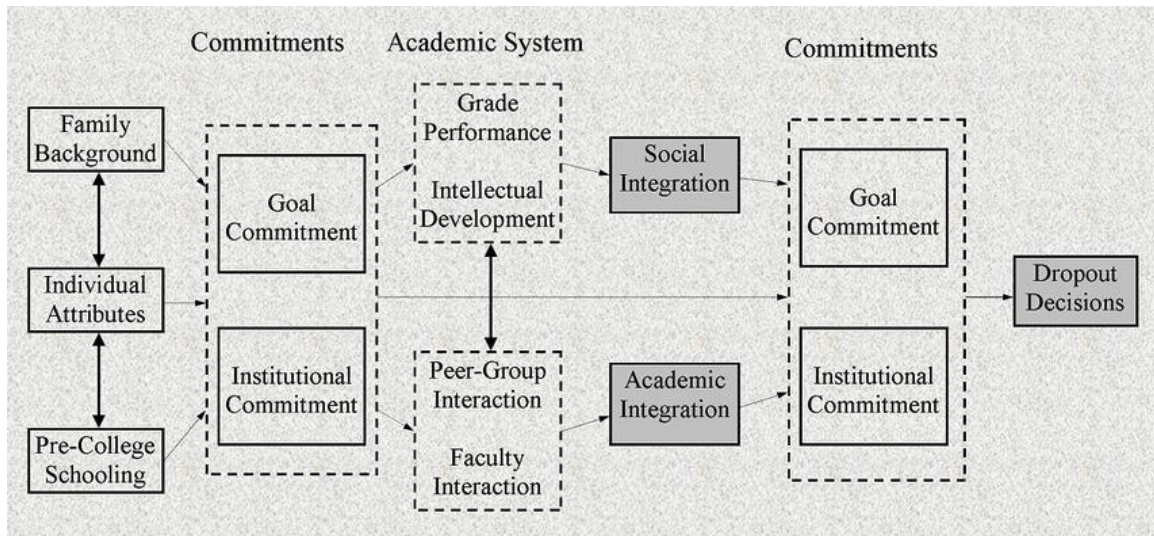


*Note.* From "Dropout From Higher Education: A Theoretical Synthesis of Recent Research," by V. Tinto, 1975, *Review of Educational Research*, *45*(1), p. 95 (https://doi.org/10.2307/1170024).

In Tinto's (1975) framework, a student's commitment to their goal and their school will work to connect the student to the academic system. The academic system in

Tinto's framework also requires the student to connect to peers and faculty so that social and academic integration are successfully achieved. This relates specifically to the research question because, per Tinto, a student will experience success in college if they integrate into the culture of their university and major. Therefore, it was relevant to explore how Latinx students perceived STEM program culture and its influence on their persistence to graduation. The data collected indicated that the top themes related to Research Question 1 were as follows (see Table 2):

- connection to peers in STEM program

- creating connections with faculty in STEM fields

- competitive nature of STEM programs

**Table 2**

*Participant Connection to Peers and Faculty*

| Theme | Number of respondents | % based on N | Interview sources | Frequency of reference/code in data |
|---|---|---|---|---|
| Connection to peers in STEM program | 12 | 100.0% | 12 | 64 |
| Creating connections with faculty in STEM fields | 12 | 100.0% | 12 | 123 |
| Competitive nature of STEM programs | 12 | 83.3% | 10 | 80 |

*Note*. The *N* for interview participants = 12.

**Theme 1: Connection to Peers in STEM Program**

One of the primary factors in Tinto's (1975) framework for dropout behaviors is the development of peer relationships within the student's university. In addition, in his research, Tinto also espoused the value of creating long-lasting relationships that benefit

graduates upon graduation. In more modern vernacular, Tinto delved into the importance of creating relationships with peers to build a support and career network. In Tinto's research, assimilation into the prevalent culture of peers, faculty, and the university was of great importance to prevent dropout behavior. Tinto defined assimilation as an integration of a student into college systems whereby the students shed their previous culture and cultural perceptions in favor of the predominant culture of their university. As demonstrated in Table 2, all participants provided data indicating that they perceived peer relationships within their STEM major as important and valuable for them. All participants also indicated difficulty establishing relationships or friendships with their STEM peers.

For example, a study participant studying aerospace engineering worked in the catering department at his university. He mentioned that most staff in the catering department was Latinx. His STEM peers often saw him working in the food hall and never acknowledged him. He remembered approaching a few of his classmates from an engineering course and was met with total silence. He told the researcher that he felt awkward and did not know what to do, so he walked away and never approached his peers in the food hall again.

Another example comes from a participant who was a biology major recounted that in her organic chemistry class she approached several peers to talk about assignments and lab work. She stated that a couple of people ignored her completely and another group told her to go talk to the teacher. She said she felt stupid and rejected, which then added to the difficulty she experienced relating to her peers. Both students recounted

searching for other Latinx students to partner and collaborate with due to the rejection they faced from their STEM peers of other ethnicities.

The importance of peer support in achieving persistence to graduation was a prevalent theme in the data collected for this study. Tinto (1975), in his study on dropout behaviors of college students, found that assimilation into peer groups and social connection were key elements in predicting the dropout behaviors of college students. In Tinto's study however, he focused on the assimilation of the college student into the prevalent culture of the university. For this research, the predominant culture that participants were exposed to was also the culture of their STEM program.

### *Internships, Study Groups, and Peer Connection*

Research participants unilaterally perceived internships and study groups were as valuable for gaining career experience and building social networks. This perception is in line with Tinto's (1975) research on dropout behaviors and degree completion. Where the data diverge from Tinto's findings is that participants found it difficult to connect with their non-Latinx STEM peers, experienced rejection when seeking internships, and cited not being included or invited to join study groups. For example, a participant in the computer sciences major told the researcher that one of his courses required a group assignment and students were required to create their own groups. He said he was not invited to join a group and had to ask the professor for help. When the professor intervened, the first group did not accept him, and the professor had to find a different group that would allow another member.

Table 3 examines the difficulty that research participants had connecting with their non-Latinx peers. Nine out of 12 participants found it difficult to connect with their

non-Latinx STEM peers. The difficulty in creating connections with their STEM peers was perceived to be caused by a lack of understanding of each other's culture and communication style. For example, one participant explained that he was a high school football player. He also went to a community college before attending Cal Poly Pomona. This participant said he had some challenges building a friend group with his STEM peers because he was older than them and most of them were White and Asian and he came from Fresno, a primarily Latinx community and a farming background.

**Table 3**

*Difficulty Connecting and Rejection*

| Data finding | % based on *N* | Interview sources | Frequency of reference/code in data |
|---|---|---|---|
| Difficulty connecting with non-Latinx STEM peers | 75% | 9 | 49 |
| Experienced rejection when seeking internships | 75% | 9 | 27 |
| Not being included to join study groups | 100% | 12 | 36 |

*Note*. The *N* for interview participants = 12.

He said that he did not immediately see much in common with his STEM peers aside from their schoolwork. When the researcher followed up and inquired whether he was invited to join study groups, he said that he was not. He asked to join a couple of study groups and was not included. This participant cited his resilience because of his previous experience as a football player. He also said that he understood that he was at school to achieve a goal; not to make friends: "Friends are nice, but your friends aren't

going to pay your rent when you graduate. Plus, I made friends outside of my classes anyway."

Another participant, who was male who majored in engineering, stated that he did not expect socialization from his peers because they were all "science geeks." He stated they had difficulties connecting socially to anyone and that in computers and a lot of his engineering classes, the students stayed to themselves. A participant who majored in computer science also shared a similar experience. She stated that studying computer science meant that you spent most of your time alone in front of a computer so lots of her peers were not good at socializing.

A female participant said she felt very lonely in her program. The occurrence of feeling lonely was echoed by six out of the 12 participants. The loneliness was perceived to be attributed to being excluded from study groups, social gatherings and not being selected as a lab partner by their peers. Tinto's (1975) research indicated that students who experience a lack of connection to their peers will demonstrate a higher frequency of dropout behaviors. When participants were asked whether feeling lonely or rejected made them feel like quitting or changing majors, all six participants also stated that they felt lonely, and experienced frequent thoughts of dropping out or changing their STEM major. In fact, all 12 participants shared that they questioned their ability to be successful in their STEM major and thought about dropping out or changing their field of study.

Four of the female participants who majored in biochemistry, chemistry, environmental science, and biology stated that they felt excluded from study groups because of their Latinx background. When asked to explain more about their experiences, one participant who was a biology major at CSU Long Beach described a situation that

happened to her in organic chemistry. She stated that she approached several people in her class about creating or joining a study group and was rejected by the males who were White and Asian.

She found two other Latina students to form a study group with. In recounting this experience to the researcher, the participant explained that her Latina friends also experienced the same exclusion from their male, Asian, and White counterparts. The participant's perception was that the exclusion was because her STEM peers were racist and sexist or biased about her intellectual ability because of her cultural background and gender.

**Theme 2: Creating Connections with Faculty in STEM Fields**

The importance of faculty interaction was studied by Tinto (1975) and appears in his schema for dropout. According to Tinto, for students, faculty interaction creates a commitment to the institution as well as deepening the commitment to the goal of graduation. In Tinto's 1975 study, his depiction of faculty interaction was largely describing camaraderie and mentorship. However, the data from this research revealed 27 instances when 10 of the 12 research participants described experiences in which they perceived that they were negatively judged by faculty.

One participant described a time that he went during a professor's office hours to seek help from his mathematics professor. The participant recounted that the professor told him that the math would only get harder and perhaps he should consider changing majors. The participant reported that he considered changing majors as the faculty member suggested to him.

Ultimately, however, this participant chose to stay in his major because, as he recounted, "I've been put down before. People hear my accent and think I'm dumb or whatever. I must keep going and do what I want to do." This participant is now an engineer for Tesla and lives in Texas. He said the experiences he had with faculty helped him to increase his resilience and learn how to work with all types of individuals. His coworkers at Tesla are also engineers from other countries including India, the Middle East and Europe.

Figure 12 describes how participants perceived interactions with their faculty. Most participants, 10 of 12, stated that they perceived the interaction with their faculty to be valuable. Yet participants also stated that they were afraid or apprehensive to ask questions or ask for support from their professors. When asked some probing questions during the interview, one respondent gave an example. She had shared with her professor that she was an undocumented student and that is why she could not attend a conference that she had been invited to.

The conference was in another state, and she was unable to travel freely like the other students attending the conference. Her professor offered her the name of a "lawyer friend" and gave her the advice to go study in Europe and he further advised that then she could come back to the United States with a degree. The research participant who shared this interaction with the researcher also shared that it made her understand how different her world was than the world that the faculty must live in. In her experience, she stated that she felt the professor was trying to be helpful but did not understand that if she left the United States she would not be allowed to return and therefore would not be able to

see her family ever again. The participant said she never asked for help from faculty after that interaction.

**Figure 12**

*Research Participant Perceptions of Faculty Interactions*
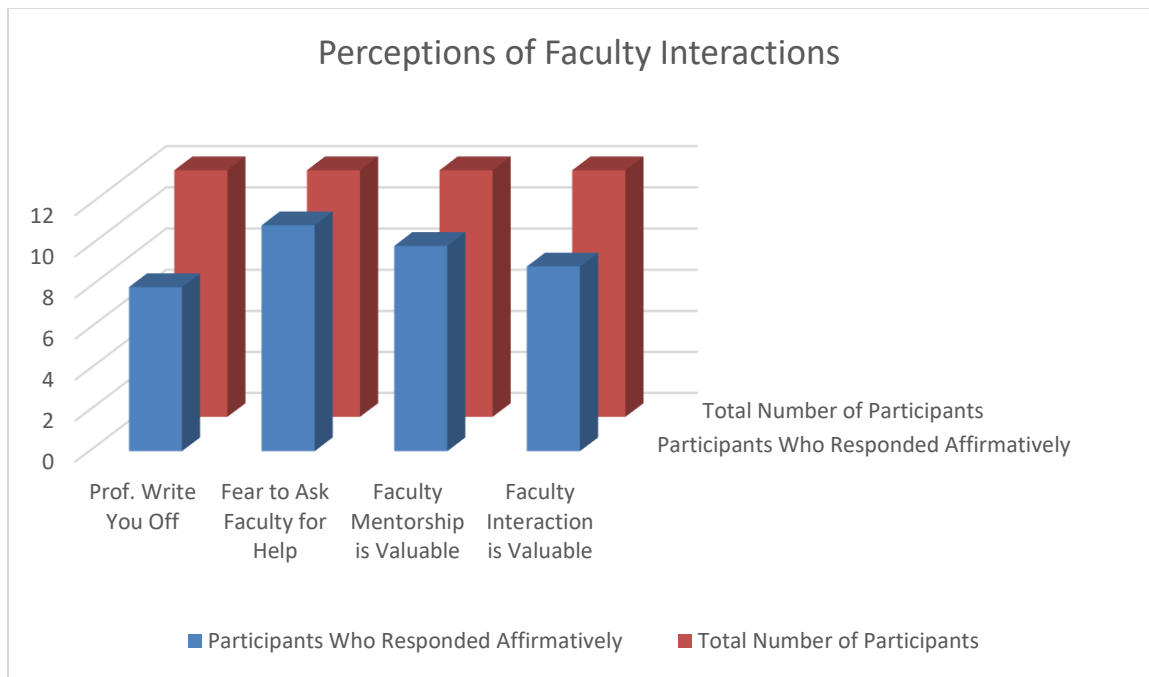


Another participant shared that before COVID, he was afraid to raise his hand and ask questions in class. Professors, in the participant's experience, routinely shut down questions or ignored students who appeared to ask questions frequently. When the pandemic sent students home, questions became easier to ask because there was more anonymity and students were asking similar questions in the chat box during Zoom lectures. When asked about office hours, the respondent said that he often had to work and was not able to attend but when he was able to ask for help during office hours, he found that his professors were more apt to be supportive and he perceived that his questions were received in a more positive manner.

Ten of the 12 respondents said they would have felt motivated to ask questions and approach faculty for mentorship if faculty made themselves available in more casual circumstances. For example, two of the research participants who attended Cal Poly Pomona said that a Latinx faculty member attended a Day of the Dead event on campus. They were able to drink Champurrado and eat tamales with their professor and just socialize. This interaction created the perception that the faculty member was approachable and friendly. All respondents said that they perceived having more Latinx faculty in STEM would create a more diverse and welcoming environment for students.

Female respondents reported that they were given less attention and opportunity to ask questions than their male peers. This was true for all the female research participants. The data revealed that all the female research participants perceived that male students were called upon more frequently, were given more responsibility in faculty labs and males were also represented more frequently in teacher assistant positions in STEM classes. Females in this study shared their perceptions about both Latinx culture as well as gender bias behaviors.

Overall, participant data revealed that they perceived faculty interaction and mentorship as valuable. Yet on 13 separate coded instances across eight interviews, participants stated that they perceived faculty to not be understanding of the experiences Latinx students go through. When asked to elaborate, participants said that many faculty, especially the "older" faculty did not take into account that many Latinx students have to work or have family responsibilities in addition to school.

Participants stated that office hours should be offered more frequently, and faculty led or initiated study groups would also benefit students greatly. The value of connecting

with and establishing positive relationships with faculty is a tenant of Tinto's (1975) model on dropout behaviors. Tinto contended that students who are able to build connections with faculty will be more invested in their university and therefore more invested in the goal of completing their degree, which will support them in persisting to graduation.

**Theme 3: Competitive Nature of STEM Programs**

Ten of the 12 participants in this study mentioned competition among their STEM peers as having affected their experience in college. There were 28 separate coding references related to competition in the data. In reviewing the interviews, the researcher found that the 10 participants who spoke about competition also related that they experienced feelings of inadequacy and perceiving that they were less prepared academically than their peers. There were 10 instances in the coding from six participants who shared that they felt inadequate in comparison to their STEM peers. The researcher asked for further clarification from the participants who experienced feeling inadequate.

*Participant Self-Perception of Program Readiness*

One participant explained that she came from a home where she was the first in her family to go to college, she was working, going to class and struggling with the material. She had not taken as many AP classes as many of the "White and Asian kids." This participant said that what added to her feelings of inadequacy was that her family could not help her with connections.

She said, "These kids said, Dr. Fulanito (Fulano translates to So and so) is going to give me an internship this summer. My dad and him work together. My parents don't know any doctors and they can't help me like that." Another participant said he felt like

he could not compete with many of his STEM peers because he had to work. He worked in the school catering department and said that he worked as much as he could to pay for his education but that it hurt his grades because sometimes, he had to choose between work and studying.

For this research study, the perception of not being able to compete with his peers was because he financially could not afford the free time that they had to participate in unpaid internships, study groups, or school clubs. What he described was having lower grades, less networking opportunities, and the perception that his teachers and peers viewed him as less intellectually successful. The other participants who gave responses indicating that they perceived competition in their STEM program also echoed the statement, not verbatim, that they felt less prepared and had competing priorities that prevented them from accessing all of the opportunities other STEM students had.

Tinto's (1975) diagram, "A Conceptual Schema for Dropout From College," lists family background, personal attributes, and precollege schooling as the primary factors that influence a student's commitment to their educational goal and to their university. The commitment to attending the university as a goal can then influence the student's performance and peer interactions. The student's performance and peer interactions relate back to the commitment the student has made toward their educational goal and peer interactions, which then influence academic and social success. Tinto's research focused mainly on student's assimilating into their university culture and fitting in to the social and institutional dynamics created by faculty, university staff and students.

Research participants who described perceiving themselves as, inadequate, less prepared than their STEM peers and as having less access to support and networking

opportunities, according to Tinto's (1975) research, would have less commitment to their academic goals, peer and faculty interactions. Yet all participants for the research study had to be STEM program graduates. Participants described adapting to their negative self-perceptions by doing the opposite of what Tinto suggested would happen. They increased the commitment to their goal of graduation as demonstrated by research participants stating that difficult circumstances, lack of support, or lack of peer connection "weren't going to get me down," or "I had to remember to keep my eyes on the prize."

Participants also mentioned thinking of their parents and family to motivate themselves to continue pursuing their goal of graduation. One participant stated,

I'm the first in my family to go to college. My mom made it to second grade and my dad finished elementary school. They work hard all day, every day and I couldn't let them down by quitting school, no matter what.

*Competition*

One participant explained that when they completed their general education studies and prerequisites and entered their STEM major coursework, they found that they were lonely and had difficulty connecting with their peers. This participant was a male and stated that he did not believe it was because of his race, but rather competition among students. He gave me an example. The participant stated that a peer in his class said he would not help others with homework or projects because they were all competing for the same jobs and helping the competition would not benefit him. All participants stated that students often compared their grades and scores on assignments. While the comparisons were described by participants as casual and common, eight participants stated that they

perceived the competition as negative and detrimental to making connections and friendships with peers in their courses.

One participant who studied computer science stated that the competition began to affect his mood. When asked how it affected his mood and what he did in response, the participant stated that he felt unmotivated to seek help, disconnected from the social groups forming in his science classes and that "It felt like being the last kid picked for a team." His response was to remember his reason for being in school.

He reminded himself that the goal was to graduate and do better in his life so that he could help his family and help himself; and the priority was for him not to make friends. This was the second instance where a research participant specifically mentioned that making friends was not a motivating factor in persisting to graduation. Based on Tinto's (1975) research, making friends is essential to persisting to graduation. For Tinto, making friends and assimilating into the prevalent university culture denotes the commitment level the student has toward reaching their goal of graduation.

For Latinx students who come from a culture where family and community are more important than an individual assimilating into an individualistic and competitive culture such as STEM program culture could leave them at greater risk for dropping out of college (Arbona et al., 2018). Research participants adapted to the stressors of succeeding in a competitive STEM environment by utilizing the family support they already had in place and engaging with other Latinx peers through affinity groups.

**Research Question 2**

*In what ways do Latinx graduates of 4-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?*

Tinto (1975) explained that integration is to assimilate into the prevalent culture of the university, which will in turn strengthen the student's goal to reach graduation. For participants in this study, assimilation was defined as shedding their home culture and adopting the prevalent culture of their peers and faculty. As Tinto's "Conceptual Schema for Dropout From College" indicates, the three initial components that are indicators for persistence to college graduation are family background, individual attributes, and precollege schooling.

For this study, family background, individual attributes and precollege schooling were relevant to the determination of whether the research participants felt influenced by STEM program culture to persist to graduation. These factors were also an important component in determining whether participants perceived that assimilating into STEM program culture was relevant to their success. In this context, success is defined as the completion of their chosen STEM degree.

Of all 12 participants who were interviewed, only two were not first-generation college students. The two participants who were not first-generation college students both confirmed that their parents had attended some college though their parents had not earned a 4-year degree. Within the interviews, all participants indicated that they perceived family support and affinity groups to be influential factors in their success.

When participants were asked whether they shed their home culture in favor of the culture of their STEM program, all 12 subjects responded that they did not.

**Theme 4: Family Support**

When asked about their educational background, one participant responded, "We're not White you know. My parents couldn't afford to send me to after school stuff or pay for tutors. That doesn't mean they didn't help me though." Table 4 shows that 11 of 12 participants found family support and support from affinity groups to be important.

**Table 4**

*Research Participant Perception of Importance of Family Support and Affinity Group Support*

| Data finding | % based on $N$ | Interview sources | Frequency of reference/code in data |
|---|---|---|---|
| Family support | 91.6% | 11 | 40 |
| Affinity groups | 91.6% | 11 | 49 |

*Note*. The $N$ for interview participants = 12.

When asked to clarify, the participant compared herself to White peers at her university. She said that many of her peers had the benefit of parents who could pay for tutoring during high school, pay for science camps and other enrichment activities and also support them financially while in college. She described her family support coming in different forms. For example, this participant explained that her mom and dad made sure she had a car so that she could commute to school without having to take the bus.

Another participant said that her mother prepared meals for her, made coffee and snacks for late night study sessions, and often gave moral support by saying things like, "Hechale ganas mija!" or "Tu sigue estudiando que yo me preocupo de lo demas."

Translated, that means, "Give it your all my daughter!" and "You keep studying and let me worry about the rest." This participant said that her mother had no idea how valuable it was to hear those words or how much the packed lunches and late-night coffee breaks with her mom helped to bolster this participant's dedication and commitment to graduating.

Figure 13 shows that all 12 participants included the distance from their home and family to their university as a major factor in determining their school of choice. Seven of the 12 participants lived on campus within a 2-hour driving distance of their home and four others opted to live at home while attending college. Only one participant wanted to live further than 2 hours away from home. Therefore, the majority of research participants perceived that being close to their family was an important contributing factor to their university success.

**Figure 13**

*Research Participant College Housing Demographics*



Participant College Housing Demographics

Legend:
- Lived on Campus
- Lived More than 2 Hours from Home
- Lived 2 Hours Driving Distance to Home
- Lived at Home
- Distance from Home a Determining Factor in College Choice
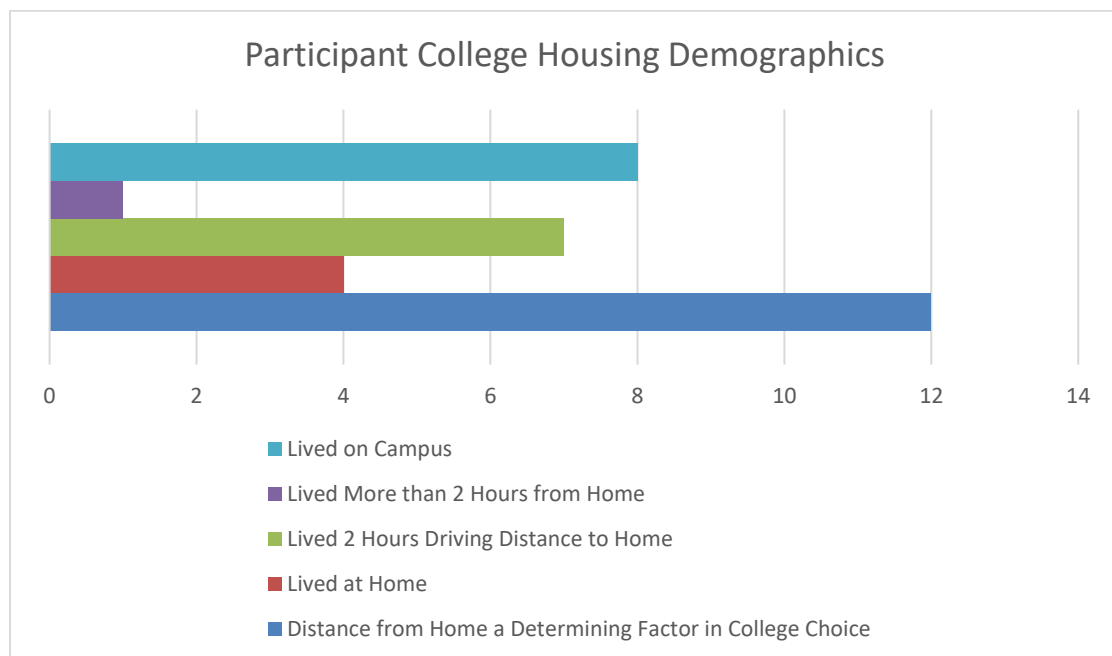
Another participant not only cited family support as a determining factor in his reaching graduation but also said that his grandfather was the reason he went to college to study computer science. This participant's family comes from a small town in Mexico, and his grandfather is a farmer. This participant was the first in his family to go to college and he promised to purchase a new tractor for his grandfather upon graduating. For this participant, the promise he made to his grandfather carried him through the "tough days" when he wanted to quit school and go home. Table 5 demonstrates the number of participants who cited that family support was influential to their success and persistence to graduation.

**Table 5**

*Family Support Being Influential to Student Success*

| Theme: Family support being an influential factor to student success | # of participants | % based on N | Interview sources | Frequency of reference |
|---|---|---|---|---|
| Family support – Was positively influential to school success | 11 | 91.6% | 12 | 44 |
| Did not influence school success | 1 | .08% | 12 | 5 |
| Family supportive but not knowledgeable of the academic rigors or social and professional challenges of college | 10 | 83.0% | 12 | 21 |

*Note*. The *N* for interview participants = 12.

Most of the research participants stated that their family was a great source of support for them. Many participants also expressed that their family did not understand their lived experience of going to college. For example, one participant stated that both her parents worked labor jobs and they were accustomed to working hard. Yet they had not attended college full time and did not understand that as a student in a STEM

program, there was constant pressure to study, work, intern, and this student had no one in the family to ask for guidance.

The participant expressed that her parents did not always react positively to her staying on campus late into the evening because they thought she could be studying at home. What this participant explained in her interview was that she was participating in a study group. Her peers lived on campus and did not have to negotiate family expectations on their time. Therefore, they had more flexibility to gather with their peers and participate in activities on campus.

For five of the 12 participants, family expectations resulted in the participant having to take a break from school in order to provide support for their family. Two of the 12 participants had to become full-time caretakers for a family member, and three additional participants had to leave school for a semester or more to assist in financially supporting their family. Family obligations for these participants pulled them out of school awhile, and they experienced difficulty in returning to school.

One of the challenges in returning to school was that their established peer group had advanced or graduated. Another challenge was that participants felt that faculty did not understand or approve of their choice to take time off from school to care for family. One participant who had to return home for a semester to help care for her siblings said that she remembers feeling judged negatively by one of her professors for her decision to take a break from school. This participant stated that the experience with her professor made her feel like a failure and she nearly did not return to finish her degree because of it.

What made her return was an email from the university saying they noticed she was not registered for an upcoming semester. According to this participant, the email she received was auto generated. She ignored it at first and then received another email inviting her to talk to an academic advisor and plan her return. She said that the second email motivated her to go back to school and register. Digging a little deeper, the researcher discovered that the participant felt like her university noticed her and the email felt like she was connected and maybe someone actually cared that she reach graduation.

The connection the research participant perceived upon receiving an email from the university helped guide her decision to return to her STEM program. This is in alignment with Tinto's research on dropout behaviors. Where the research diverges is on the importance of assimilation to prevent dropout behaviors. The participant, mentioned previously, demonstrated dropout behaviors by leaving her studies. Her plan, along with the support of her family, was to return to her studies when the family crisis was under control. The participant's decision to not return to school as planned was due to the negative experience she had with faculty and peers within her STEM program. This participant went on to state that she wanted to return to school so badly that an automated email was enough to pull her back to her studies. It was not assimilating that motivated her return, it was her own motivation and desire to finish her studies.

**Theme 5: The Value of Affinity Groups**

There were nine participants who articulated that they researched the percentage of the school population that was Latinx and used that information as a decision-making factor when choosing which university to attend. All participants relayed the importance of connecting with their STEM peers. Ten of the 12 participants said that in their

experience it was beneficial for them to have Latinx friends and classmates. The rationale for this statement varied but some of the coded responses included statements indicating that other Latinx students understood and were experiencing similar challenges as the research participants. These challenges included being an undocumented student, having family responsibilities and the need for a welcoming place to seek support from peers.

An example that one participant gave was that during a particularly stressful time in his program, he went to the Masa house on campus. This was a location where Latinx student associations often gathered. There were lockers available to store items, group tables to study and chairs and couches to relax in. The participant entered Masa house and sat at a table. He said, "I couldn't hold it in anymore and I started crying." The participant said that other students in the space comforted him, "lifted [him] up," and helped him release the stress.

A participant who attended UC San Diego recounted a story during her interview. She said that she joined a pre-med student organization and was the only Latina student there. The faculty sponsor told the participant that she would be better served by joining a race-based affinity group on campus. The participant described feeling rejected and excluded because of her race. In fact, only four participants described feeling welcomed and accepted by their non-Latinx STEM student peers. The participant from UC San Diego said that she did find a Latinx STEM club and attended the meetings and events. She met friends and found a community of other Latinx STEM students who offered her valuable information on internship opportunities, choosing and scheduling courses, and other resources on campus. This participant said that although she had a negative

experience with her initial attempt at joining a STEM student organization, she did find a supportive community with the Latinx student organization she joined.

When Tinto's research was published in 1975, he did not include any findings on race or ethnicity-based affinity groups as being a positive influence on student persistence. Furthermore, Tinto did not include or mention the concept of an affinity group. The university groups in Tinto's research that most closely resemble present-day affinity groups were academic and social clubs. During the 1960s and 1970s when Tinto's research was developed, social clubs such as fraternities could exclude students from membership based on their race, religious belief, and/or financial background. Academic clubs could also set exclusionary parameters for membership (Allen et al. 2002; Ayres, 1982).

Assimilation into a culture that has historical roots in excluding people of color, including the Latinx population studied in this research, has had negative impacts on student persistence to graduation (Bickel, 2008; Cabassa, 2003). For the Latinx students involved in this study, assimilation would have meant to drop their family culture. The study participants perceived rejection and exclusion from faculty and peers in their STEM programs. If study participants had assimilated into STEM culture as Tinto's research recommends, the participants would have been left without their family support system, without a cultural or affinity-based support system, and without support from their STEM major.

## Triangulation

The interview data were triangulated with the postgraduation results of all participants. All participants graduated from their STEM major as this was a stipulation

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to being a participant in the study. However, all participants also reported what their

postgraduation activities were, as noted in Table 6.

**Table 6**

*Participant Demographics Postgraduation*

| Participant | Gender | Major | University/college | Grad year | Postgraduation self-reported |
|---|---|---|---|---|---|
| 1 | Male | Applied mathematics | Cal Poly Pomona | 2021 | Employed in STEM |
| 2 | Female | Kinesiology | Chapman University | 2019 | STEM graduate program |
| 3 | Female | Bio chemistry in cell biology | UC San Diego | 2022 | STEM graduate program |
| 4 | Male | Civil engineering | Cal Poly Pomona | 2021 | Employed in STEM |
| 5 | Female | Applied mathematics | Cal Poly Pomona | 2020 | Employed in STEM |
| 6 | Female | Computer science | Cal Poly Pomona | 2021 | Employed in STEM |
| 7 | Male | Computer info systems | Cal Poly Pomona | 2019 | Employed in STEM |
| 8 | Female | Chemistry | CSU Fullerton | 2019 | Employed in STEM |
| 9 | Male | Aerospace engineering | San Diego State University | 2021 | Employed in STEM |
| 10 | Female | Biology | CSU Long Beach | 2019 | Non-STEM graduate program |
| 11 | Female | Enviro science | CSU Fullerton | 2019 | Employed in STEM |
| 12 | Male | Computer science | CSU Dominguez Hills | 2021 | Employed in STEM |

Triangulation in qualitative research enhances the validity of the data collected in

interviews (Patton, 2015). In this study, postgraduation employment and educational

pursuits support the validity of the data through demonstrating the persistence of the

participants in continuing within a STEM field. Only one participant has left the STEM

field and is now pursuing a graduate degree as a marriage and family therapist. All other participants are continuing their STEM studies or working in STEM fields. The fact that 11 of the 12 participants are still working in the STEM field validates the persistence of these students using some of the factors Tinto identified in his research and additional factors this researcher identified when Latinx students graduate from STEM college programs. Some examples of STEM employers of the participants in this study and their organizational logos are provided in Appendix K.

## Summary

This chapter's focus was about analyzing the data and identifying findings derived from interviews collected from 12 Latinx STEM graduates. Table 7 shows the themes that identify the key findings in this study.

The interview questions were created utilizing the main research questions outlined in Chapter III. The researcher coded the data and analyzed the findings to derive themes of significance. The larger themes, family support, peer support, and faculty interaction, were identified and compared to Tinto's theoretical framework. Chapter V presents conclusions, implications for action, recommendations for further research, closing remarks, and a reflection.

**Table 7**

*Key Findings*

| Research Question 1: |
|---|
| *How do Latinx graduates of 4-year university STEM programs perceive the culture of STEM programs at 4-year universities to have influenced or not to have influenced their persistence to graduation?* |

| Key finding | Tinto's finding |
|---|---|
| *Theme 1: Connection to peers in STEM program* | |
| • Research participants perceived relationships with their STEM peers as valuable and important. <br> • Participants also experienced rejection and exclusion from their STEM peers. This included being excluded from study groups and social opportunities. <br> • Rejection by STEM peers created feelings of loneliness and inadequacy for some research participants. <br> • Research participants found different social and academic support systems outside of their major | • Students who assimilate into the prevailing university culture will create more friendships with peers and be more committed to their goal of graduation, which will lead to less dropout behaviors. |
| *Theme 2: Creating connections with faculty in STEM fields* | |
| • Participants perceived value in connecting with STEM faculty. <br> • Research participants perceived that STEM faculty was not approachable or supportive. <br> • Some participants experienced faculty members discouraging their continued STEM studies. <br> • Female participants perceived that male students were called upon more in class and were offered more opportunities to connect with faculty | • Tinto's research indicates that student relationships with faculty are important to motivate and support students to persist to graduation |
| *Theme 3: Competitive nature of STEM programs* | |
| • Research participants perceived competition in STEM majors as a negative attribute of STEM culture. <br> • Participants also perceived competition in STEM as unnecessary and exclusionary. <br> • Competition in STEM was also perceived to add unproductive stress <br> • Research participants perceived that it was emotionally healthier for them to not assimilate into STEM culture | • Tinto's research on dropout behaviors indicates that students who do not successfully assimilate into university culture will exhibit higher dropout behaviors than students who do assimilate |

Table 7 (*continued*)

| Research Question 2: |
| --- |
| *In what ways do Latinx graduates of 4-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?* |

| Key finding | Tinto's finding |
| --- | --- |
| *Theme 4: Family support* | |
| • Most research participants perceived that the support they received from their family was instrumental in helping them graduate. <br> • Research participants perceived that graduation was as important or more important to their family as it was for themselves. <br> • Most research participants were first-generation college students | • Tinto's research indicated that students from poor economic backgrounds and who come from parents who did not attend college will have a higher probability of dropping out |
| *Theme 5: The value of affinity groups* | |
| • Research participants perceived that Latinx affinity groups were valuable to their success and persistence to graduation. <br> • Participants found emotional and academic support from Latinx affinity groups at their university | • Tinto's research from 1975 did not explore affinity groups as a support system for college students. |

CHAPTER V: SUMMARY, CONCLUSIONS, IMPLICATIONS, and

RECOMMENDATIONS

## Summary

Chapter V summarizes the research study. It also reiterates the purpose statement, research questions, methodology, population and sample of the research study. Furthermore, this chapter lists the key findings as well as the conclusions drawn from the key findings. The theoretical framework for this study was Tinto's (1975) "Conceptual Schema for Dropout From College" taken from his seminal work titled "Dropout From Higher Education: A Theoretical Synthesis of Recent Research." Tinto's research was selected as the theoretical framework for this study because Tinto is considered to be the founder of persistence research (Cavazos et al., 2010; Synnott, 1979). Subsequent research on college persistence builds on the theories that Tinto presented in his research (Crisp & Nora, 2012; Davidson & Wilson, 2013; Terenzini & et al., 2017). Tinto's (1975) theoretical framework posits that college students who create relationships with faculty and peers are less likely to exhibit dropout behaviors. Tinto also stated that students who assimilate into university culture will have higher rates of persistence to graduation. The findings of this study partially align with Tinto's tenets of student persistence and Chapter V lists the major findings and how they align with Tinto's research. The unexpected findings will also be discussed in this chapter. Additionally, Chapter V describes the implications for action and recommendations for further research surrounding this topic. At the end of the chapter, the researcher shares final comments and reflections.

## Purpose Statement

The purpose of this phenomenological study was to explore how Latinx college graduates who have achieved STEM degrees perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.

## Research Questions

### Central Research Question

How do Latinx college graduates who have achieved STEM degrees perceive university and STEM program culture as supporting or not supporting a Latinx college students' persistence to graduation?

### Research Questions

1. How do Latinx graduates of 4-year university STEM programs perceive the culture of STEM programs at 4-year universities to have influenced or not to have influenced their persistence to graduation?

2. In what ways do Latinx graduates of 4-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?

## Methodology

Phenomenological research studies the way people interpret the world, and a main assumption of a phenomenological study is that there is a shared meaning that relates to commonly occurring phenomena within a culture (Creswell, 2014). A phenomenological design is also particularly suited to individuals and groups for which there is little published research (Creswell, 2014; Patton, 2015). The researcher found limited studies

about Latinx students in 4-year STEM programs and no research related to the effects of the culture of STEM programs on the persistence of Latinx students to graduation. Therefore, phenomenology was an appropriate method to explore the lived experiences of Latinx students who graduated from 4-year college STEM programs (Patton, 2015). After an exhaustive review of research design methods, a qualitative phenomenological approach was the methodology selected to explore how Latinx students who graduated from 4-year college STEM programs perceived the culture of their STEM program in affecting their persistence to graduation.

## Population and Sample

The population of a research study is defined as the total group of individuals who possess a common set of characteristics to which the results of the study can be generalized (Creswell, 2012; McMillan & Schumacher, 2010). For this study all 12 participants had to have the following purposeful characteristics:

- participants who graduated with a STEM major in the last 5 years with either a science, technology, engineering, or mathematics degree;

- participants who identified as Latinx students;

- participants who graduated from schools located within Southern California Counties. Southern California includes Los Angeles, Imperial, Riverside, Orange, San Bernardino, Santa Barbara, San Diego, Ventura, Kern, and San Luis Obispo Counties ("World Population Review," 2023);

- participants who graduated from one of either of the University of California or California State University schools or private not for profit universities located within Southern California.

**Major Findings**

The phenomenological approach of this study produced findings from the lived experiences of 12 Latinx graduates from 4-year university STEM programs located in Southern California. The study sought to identify behaviors and factors that helped the research participants persist to graduation. Factors that research participants experienced as negative or detrimental to their college persistence were also identified. The study participants shared their lived experiences and perceptions during semistructured interviews. The qualitative data were analyzed, and the major findings of the research are as follows.

**Research Question 1: Major Findings**

*How do Latinx graduates of 4-year university STEM programs perceive the culture of STEM programs at 4-year universities to have influenced or not to have influenced their persistence to graduation?*

*Major Finding 1*

Research participants all felt that creating relationships or connections with their STEM program faculty was valuable and important in supporting them toward degree completion. This is in line with Tinto's (1975) research, which also indicates that creating relationships or bonds with faculty helps to minimize dropout behaviors. A research participant in this study stated, "I wouldn't have felt like I couldn't ask questions if my [chemistry] professor had said, 'Hi' or even acknowledged I was in the room with him."

The perceived value of establishing connections with STEM faculty was high, participants also indicated that they perceived the majority of their faculty to be unapproachable, difficult to establish connections with, and unsupportive. For example; a

participant stated that their professor, "didn't even know [they were] alive." They also said, "If he had just said hello, or noticed I improved on my paper, it would have gone so far to motivate me." Research on Latinxs in STEM and in higher education also illustrate the negative factors Latinx students experience that inhibit their ability to connect to faculty (Arbona et al., 2018; Arcidiacono et al., 2016). This finding demonstrated a barrier that Latinx STEM students perceived as a hinderance to their college success. As a result, when faculty connections were difficult to broker, participants described seeking out alternative supports to help them persist to graduation such as joining Latinx-based affinity groups and seeking out support from family.

### *Major Finding 2*

Building relationships with peers is another component of culture that Tinto deemed as necessary for students to commit to the goal of graduation. Similar to Tinto, research participants also perceived value in developing relationships with their STEM peers. Most participants however described experiencing difficulty connecting with and building friendships with their STEM peers. More than one participant stated that their peer support groups were mostly outside of their STEM majors. A participant stated, "I tried to make friends in my math classes, but it was so hard. It was like nobody wanted to connect. I didn't want to think it was because I'm Mexican, but it felt that way." In attempting to engage in STEM study groups, other academic or social interactions, research participants described experiencing rejection and difficulty establishing connections with non-Latinx STEM peers.

Research participants described the desire to make friends in their STEM classes. Several participants described approaching peers within their science classes and asking

to join study groups or join up with peers for group assignments. These participants were rejected and told they could not join or participate. The rejection participants experienced or perceived they experienced prevented them from building social ties to their STEM peers. Research participants described perceiving the importance of building a social support system in STEM to aid in academics and building professional networks. This perception is in alignment with Tinto's research. Tinto illustrates the importance of connection to peers and building commitments to social groups within his "A Conceptual Schema for Dropout From Behaviors" (see Figure 1). According to Tinto, students who create connections with their peers in college will demonstrate more commitment to their goal of graduation through exhibiting persistence behaviors. Though the lived experiences of the research participants indicate that they did not perceive positive experiences or acceptance from their STEM peers, they persisted to graduation anyway.

**Research Question 2: Major Findings**

*In what ways do Latinx graduates of 4-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?*

*Major Finding 3*

Assimilating into the STEM culture through the university STEM departments was perceived as having a negative effect on participant's confidence and self-esteem. Tinto's (1975) contention, however, is that students who assimilate into the prevalent university culture demonstrate less dropout behaviors and are more committed to their goal of graduation. For this study, the competitive culture, of STEM programs, on the contrary, was perceived as a hinderance to participating or assimilating in STEM culture

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as well as a hinderance in persisting to graduation for Latinx STEM students. A computer science major and participant of this study said,

> Before class people would be talking about their grades, saying they got a 90 or a 91 on that assignment or some test. And if you show up with an 89, you're dumb. I already felt dumb. So I stopped trying to talk to them before class. I would go to my seat, listen to the lecture, and leave.

Study participants perceived the competitive culture of STEM majors as negative and detrimental to building relationships with peers as well as building a positive self-image as a STEM student. During interviews, research participants stated that they felt "rejected and lonely" as well as judged negatively or perceived as less capable by their non-Latinx peers.

### Major Finding 4

Research participants indicated that the support they received from their family and Latinx affinity groups played pivotal roles in supporting them to graduation. This is particularly relevant because most of the research participants indicated that they were the first in their family to attend college and also came from a below-poverty or poverty-level backgrounds. For Tinto (1975), students who come from poor backgrounds or have a family history that does not include educational achievement are more likely to drop out and not succeed. Therefore, it is of particular importance for students from poor and noncollege educated parents to assimilate to university culture. The study findings are not alignment with Tinto's theoretical assertions. A participant illustrated this finding when she said,

My mom made it to second grade. She had to stop going to school and help take

care of the house. She might not be a doctor or a lawyer, but she is smart, she

works hard and she taught me not to give up and to work hard. That's what I do

and that's why I graduated from college.

Latinx students who participated in this study perceived that losing or giving up their

family culture and adapting their behaviors to the STEM university culture would have

left them without a support system and would have made them far more vulnerable to

dropping out of their chosen STEM major or college entirely.

*Major Finding 5*

Research participants perceived that joining Latinx affinity groups provided

significant academic and social-emotional support for them. Research participants

perceived rejection and feeling alienated by their STEM peers and faculty. Yet they

described different experiences with Latinx affinity groups. For example, 11 of 12

participants described participating in a Latinx-based affinity group. The one participant

who did not participate in a Latinx-based affinity group said that he did not feel the need

because most of his work peers at the university catering department were Latinx and

provided a support system and social group for him to rely on. Latinx study groups,

clubs, and advocacy groups provided information on careers, academic support, and

emotional support for the participants of this study.

*Major Finding 6*

Research participants indicated that they felt supported by their parents and

family. Specifically, participants reported perceiving that their parents and family

motivated them to continue their education and not drop out of school. Yet participants

also reported that in spite of the support they received from their parents; their parents did not totally understand the rigors and responsibilities of a university level STEM program. Study participants perceived a duty to graduate, not just for themselves, but also for their parents, siblings, and family. One research participants stated he was motivated to continue his education because the thought of his grandfather working in the fields and the sacrifices his family made to support his education could not be discarded or devalued by his dropping out of college.

This major finding does not align with Tinto's research. Tinto's research indicates that students who come from backgrounds where parents did not attend college will be more likely to drop out of school. Additional research from Borman et al. (2017) in the paper *Associations Between Predictive Indicators and Postsecondary Science, Technology, Engineering, and Math Success Among Hispanic Students in Texas* supports Tinto's research. Castillo et al. (2006), in the article, "University Environment as a Mediator of Latino Ethic Identity and Persistence Attitudes" support the findings in this research study. Castillo et al. support the research findings of this study because the study participants exhibited "persistence attitudes" and all graduated from STEM programs even though they came from backgrounds indicated by Tinto as being at higher risk of dropping out. Eleven of 12 participants described their family as being a significant and important source of support and comfort that helped them persist to graduation.

<div align="center">**Unexpected Findings**</div>

**Unexpected Finding 1: Undocumented Status**

An unexpected finding was that students who were undocumented were not a part of research studies undertaken by Tinto regarding the impact and effects of entering

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higher education in the United States without having legal residency or citizenship status. It was unanticipated that research participants would reveal their legal or illegal U.S. immigration status to the researcher. No research questions regarding U.S. legal residency or citizenship status were asked to participants. Through the data analysis of the research, it was found that having undocumented legal status in the United States impacted participants' lived experiences in STEM programs. Furthermore, participants revealed whether or not their parents had legal status in the United States and how the participants' academic experience was affected by their parent's legal status (see Figure 14).

**Figure 14**

*Participants' U.S. Residency Status*
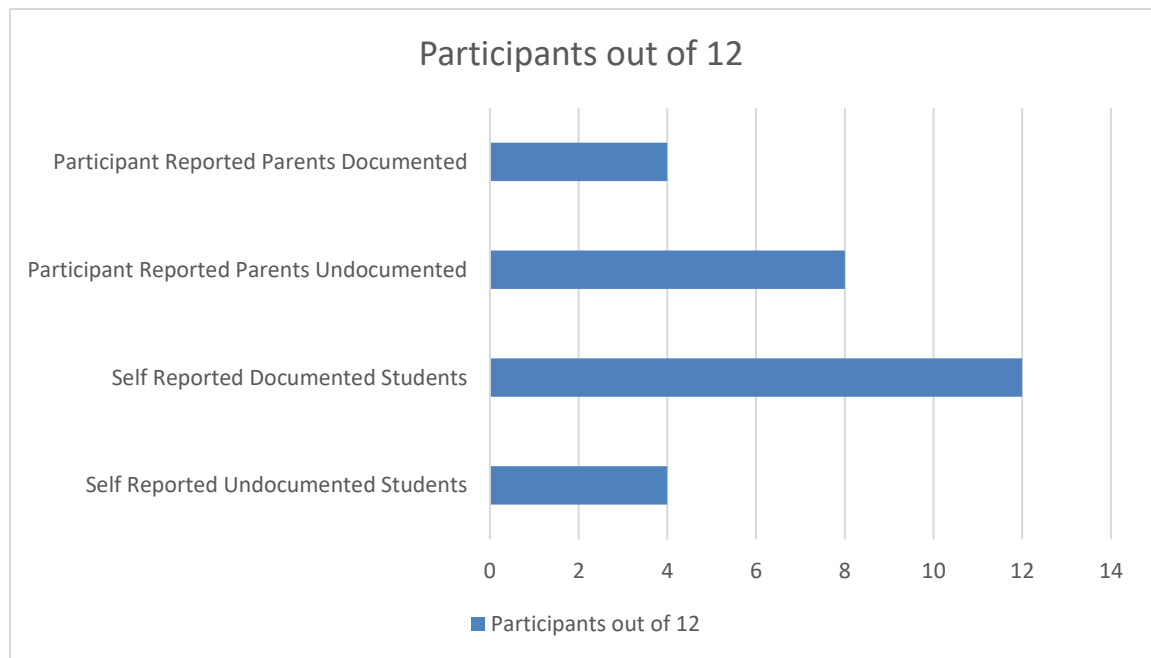


For example, one participant who attended San Diego State University could not have visits from his parents for the duration of time he was in San Diego. Their inability

to visit, as explained by the participant, was that they, his parents, did not have legal resident status in the United States. Crossing the Orange County border into San Diego County meant that his parents would be exposing themselves to California Border Patrol crossings in that location. The risk of being detained and deported was too great; therefore the participant's parents never visited San Diego State University and did not attend his graduation.

Other participants also described difficulties they encountered because of their legal status in the country. One participant said that she had difficulty participating in clubs and internships because the STEM groups she joined often had field trips, get togethers or travel to other counties and cities outside of the location of CSU Pomona, where she attended school. She described feeling scared to leave the university because of the risk of being detained by U.S. Immigration and Customs Enforcement (ICE) or having peers find out that she was attending school because of Deferred Action for Childhood Arrivals (DACA). Another DACA student said she lived in constant fear that the president would overturn DACA and she would lose her ability to continue studying.

Yet another participant who revealed that they went to school due to the DACA program created a community of peers who had similar experiences to him. He became involved in organizing supports for other DACA students and in lobbying for the support of the DACA program. He said that his focus shifted more toward political and social justice organizing and this caused his grades to suffer. He recalled a conversation with his mother. In this conversation she told him that she cleaned houses so that he could have a better future. She was proud of the work he was doing, but it would be of no service to him if he did not help himself in the process. She urged him to get back on track and raise

his grades and the participant said that if it had not been for this conversation with his mother, he may not have successfully graduated with a degree in applied mathematics.

For other participants who did have legal status but whose parents did not, there was a communicated sense of kinship with their undocumented peers. One participant said she chose to attend CSU Pomona because it was close to home and she felt comfortable to have her undocumented parents tour the school. She cited the proximity to her family as one of the major factors in her choice to attend CSU Pomona. She also said she researched the number of Latinx students attending the school and included that as a factor in her decision to attend as well. In fact, for 11 participants, the proximity to home and family was a contributing factor when deciding which school to attend.

**Unexpected Finding 2: Perceptions of Latinx Females in STEM**

The research for this study focused on the Latinx STEM student experience overall rather than isolating participant experience by gender in addition to their Latinx background. Female research participants indicated that they perceived faculty and peers in STEM as having lower academic expectations from the women in class than they did of the men. For example, female research participants described being called on less frequently than their male counterparts; Latinx or from other racial and cultural backgrounds.

The perception that female research participants described is supported by research from Jones et al. (2013) who studied stereotypes affecting females in engineering. Their study found that many engineering faculty held beliefs that engineering is a subject where men have higher aptitudes and potential for academic success than their female counterparts. The beliefs held by faculty that men are inherently

better engineers than females meant female students were called upon less frequently and received less support and opportunities than their male counterparts.

**Unexpected Finding 3: COVID 19 and the Pandemic**

The pandemic was an unforeseen variable in this study. Figure 15 shows that 31% of participants graduated during the pandemic.  All participants experienced at least 2 years of traditional in person teaching prior to the onset of the pandemic.

**Figure 15**

*Participants Graduating Prepandemic or During Pandemic*
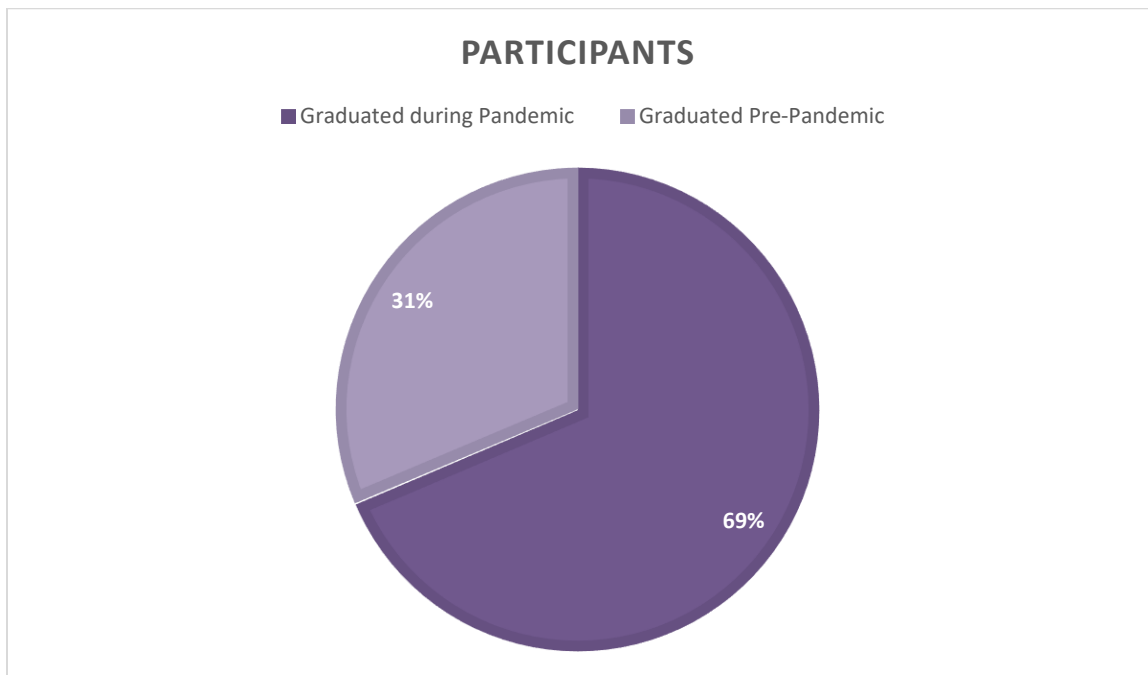


Overwhelmingly, all of the participants in this study recounted difficulties connecting socially with their STEM peers. One additional factor that was found to have negatively affected peer connection was the onset of the COVID-19 pandemic. Seven of the 12 participants graduated college during the pandemic. Shifting from an in-person college experience to a completely virtual college format presented unforeseen challenges

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for these participants. One participant who studied aerospace engineering in San Diego stated that he had been living in the dorms. When the pandemic hit, the dorms were closed and he had to go home. The presumption was that he would return to campus when the pandemic was over. All of his classes switched from a physical classroom to Zoom. In this participants experience, the pandemic distanced him from his peers because many students viewed lecture recordings instead of attending live Zoom meetings. If they did attend the live Zoom meetings, many students did not turn on their cameras. Also, as professors adjusted to the new format, the expectation for collaboration among peers decreased.

For another student who attended CSU Dominguez Hills, the pandemic created challenges but also created opportunities. When this participant was attending courses in person, he felt self-conscious because he was older than his peers. He transferred from Long Beach City College and was approximately 27 when he entered CSU Dominguez Hills. In recounting his college experience he stated he felt like he was "behind all of the younger kids in my classes. I felt like the old man in comparison to all these 18- and 19-year-olds." The pandemic, according to this participant's experience, relieved much of his own self-consciousness. He stated that he was able to participate in classes and ask as many questions as he wanted in Zoom chats without "worrying about sounding stupid." Also, when professors recorded Zoom lectures, the questions and discussions in the chat were also recorded and they helped him to study and review for exams. For this participant, the pandemic allowed him to form study groups with peers he did not feel comfortable connecting with in person, and he was able to build connections that supported his progress to graduation.

<center>**Conclusions**</center>

Based on this study, several conclusions were drawn regarding the culture of STEM programs supporting or not supporting Latinx students in persisting to graduation.

**Conclusion 1**

The first conclusion of this study is that Latinx affinity support groups play an important role in the academic achievement of Latinx STEM students and are a valuable factor that aids Latinx students to persist to graduation in STEM university programs. In this study, Latinx students in STEM sought to build connections to STEM peers through study groups and social opportunities but perceived rejection from STEM peers, which was a barrier in effectively establishing the desired connections. For example, one participant described approaching a STEM peer for help with a homework assignment. The participant was told by the peer that he would not help because helping the competition would not benefit him. Another experience that a participant shared was that they approached a group of students from their math course. The group ignored this participant completely and the participant walked away and did not approach other study groups in that course. The perceived and experienced rejection that Latinx students in this study described drove them to build connections and relationships with peers outside of their major.

Research participants in this study sought connection with STEM peers but described being unsuccessful creating social connections with their non-Latinx peers. Per Tinto (1975), the behavior of socially and academically engaging with peers leads to commitment to the goal of completing college. Though most research participants in this study experienced challenges in creating friendships and being included in study groups

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or other social and academic functions with their STEM peers; Latinx students built relationships and support groups with peers in other majors and organizations. The support systems that research participants created for themselves provided motivation to continue studying, support during challenging times, and a social outlet for relaxation and community. Peer support was also valuable in connecting Latinx students to resources and opportunities for additional academic support, internships and jobs. Peer interactions are an important

**Conclusion 2**

The second conclusion of this research is that STEM university faculty need to provide support systems and welcoming access to students who are from cultures other than White and Asian backgrounds. In this study, research participants perceived STEM faculty to be unapproachable and difficult to connect with. The perception that STEM faculty was unapproachable created academic challenges for research participants. For example, some participants stopped attending office hours, asking for help, or clarification on assignments and concepts. For some, this behavior created academic difficulties resulting in poor grades and course repetitions. One participant said that her experience with faculty was negative because she perceived that many STEM professors favored males. Participants also stated that the overwhelming majority of STEM faculty were White males. Study participants perceived that these faculty members did not value or understand the cultural differences between their Latinx students and them, which resulted in participants experiencing difficulties in establishing the connections with faculty that they desired to have.

**Conclusion 3**

The competitive nature of STEM program culture creates rejection and negative experiences that are detrimental to STEM program persistence and graduation rates. Study participants perceived that competition created by comparing grades, excluding peers from study groups, and jockeying for faculty attention created an unsupportive and psychologically destructive environment for all students. One research participant stated, "I got better grades than most people in class but what good does it do for me rub that in someone's face and then not help them do better?" That sentiment within that statement was echoed by additional study participants. Latinx STEM students also perceived the competition to be isolating and difficult for all STEM students, not just Latinx students. The challenge of the competitive STEM environment divided students and minimized the influence and added value of diverse experiences, strengths and points of view inside the classroom as well as outside of the classroom.

**Conclusion 4**

Family support was overwhelmingly important to study participants. Most participants were the first in their family to go to college. They expressed feeling a sense of gratitude and responsibility to persist to graduation. Participants perceived that by graduating they would be demonstrating respect and gratitude for the hard work and sacrifices that their family made to make their education possible. One participant who graduated and is now in medical school stated that her family might not be able to give her financial support, but, the emotional support they give is far more valuable to her. Her sentiments were not unique in that most participants perceived the support they received from their family as being one of the key reasons they persisted to graduation.

**Conclusion 5**

Affinity groups within STEM or outside of STEM are a positive and influential source of support for Latinx STEM students. Participants reported participating in clubs for Latinx STEM students, Latinx academic organizations, Latinx university-sponsored social clubs, and university organizations supporting undocumented Latinx students. One research participant said that without the support of student organization supporting undocumented students, he would not have been able to continue his education. Several participants who self-reported as participating in DACA, received legal support, financial support, and academic support from their university-sponsored DACA organization. In addition to DACA, participants said they perceived the support from other Latinx STEM students as valuable and supportive. They were able to discuss issues and concerns that they had with other Latinx students. Participants said they felt supported by people who understood them and knew where they were coming from because they had similar experiences. Affinity groups provided the community and space for Latinx students to connect with peers and feel accepted and valued as students and members of their academic community.

## Implications for Action

The findings and conclusions of this research indicate that Latinx STEM students perceive value in creating relationships with their peers and faculty. Latinx STEM students also want to feel included and connected to their university. This is in alignment with Tinto's (1975) research on dropout behaviors. The chasm exists in the barriers that Latinx students face when attempting to make connections to their peers and faculty. The

following are implications and recommendations for improving university experiences for Latinx STEM students.

**Implication 1**

Historically, Latinx students have experienced discrimination in primary, secondary, and university level educational institutions (Estrada et al., 2016; Fiebig et al., 2010). A recommendation for improving the academic experience for Latinx STEM students is to implement education and training for STEM faculty and staff in STEM pedagogy. Also recommended is further training for STEM faculty and staff in communication strategies, active listening, and self-analysis to support faculty and staff to identify their own biases and assess how those biases inform the way they communicate and relate with their students. Training STEM faculty and staff in the aforementioned topics would be a positive step toward increasing persistence rates of all STEM students but particularly Latinx STEM students.

**Implication 2**

Based on the findings of this study, Latinx STEM students described their faculty as unapproachable. Faculty was also described as not understanding the experiences of Latinx students. Communication training as well as cultural awareness training for faculty would improve their ability to connect with students. Improving the relationship building skills among STEM faculty could result in increased retention and persistence to graduation within STEM majors. For example, a research participant noted that faculty in STEM were focused on research and not students, the classroom was not their priority. Other research participants described faculty arriving to class, lecturing and leaving without greeting students, engaging in conversation, or checking in on their learning.

Giving faculty techniques to check for understanding and engaging with students would foster a more accepting learning environment and open pathways to create meaningful interactions between faculty and students.

**Implication 3**

Latinx STEM students in this study perceived the individualistic and competitive aspects of STEM program culture to be negative. Study participants expressed that these aspects of STEM culture created barriers for students to access support and seek help when needed. Changing the culture of STEM programs to value and teach collaboration among peers would facilitate retention and persistence in STEM majors. In addition, announcing and advertising internship opportunities, research assistantships, and lab positions to all students would provide access for all students to apply, including Latinx students.

**Implication 4**

Mentorship provides valuable support and guidance for students. In this study Latinx students expressed an interest in connecting with a mentor in a STEM career or major. A recommendation for universities is to create mentorship programs for Latinx students to connect with faculty or STEM professionals. Mentorship programs for STEM would serve to teach Latinx students about careers in STEM as well as provide networking opportunities to build relationships in academia and the professional setting. Latinx people are underrepresented in STEM education and STEM careers (Arcidiacono et al., 2016). Mentoring can be pivotal in removing barriers or supporting the resilience to overcome barriers for Latinx STEM students.

**Implication 5**

A recommendation for increasing goal commitment and decreasing dropout behaviors of Latinx students is to encourage faculty and staff to participate in social and cultural events on campus. For example, a participant mentioned that one of the Latinx affinity groups they were a part of hosted a Christmas party. Students brought food, the organization provided a space on campus and students invited friends and peers to socialize. This participant mentioned seeing one of her math professors at the event. She expressed feeling more connected to him because he greeted her and she shared food with him. This student's perception of her professor changed. Where she previously saw him as an unapproachable faculty member who did not know she existed, after the event, she felt seen, comfortable saying hello, and felt more welcome in his class. After graduating, the encounter she shared about her math professor was still important and she indicated it was a turning point for her. It humanized her professors and made it easier for her bridge the distance between learner and teacher. This is interaction aligns with Tinto's (1975) theoretical framework, which states that students who connect with faculty will exhibit less dropout behaviors and be more committed to their goal of graduation.

**Implication 6**

Research participants indicated that the majority of their STEM faculty were male and White or Asian. Very few participants said they had a Latinx faculty within STEM coursework. Female research participants said they experienced bias because faculty tended to call upon males much more frequently than they called upon female students. A recommendation to improve Latinx student persistence and graduation rates in STEM majors is to diversify faculty and university leadership by including more women and

people from Latinx backgrounds. Faculty from diverse backgrounds can provide different examples and representations of professionals in STEM.

**Implication 7**

All research participants indicated that they worked and went to school at the same time. A recommendation to support Latinx students in STEM is to record study sessions and office hours so that students can view these sessions at a time that is convenient for them. In addition, faculty can coordinate other methods to accept questions and adjust office hours based on the needs of their students. Several research participants stated that they were unable to attend office hours or tutoring because the hours that these were offered conflicted with their work schedules. Yet when the pandemic drove courses to Zoom, Latinx students stated that they more readily emailed their questions to professors and received responses. Students also benefitted from recorded lectures that included transcripts of the chats, stating that many helpful questions and answers were documented in Zoom chats during lectures.

**Implication 8**

A final recommendation for improving retention and persistence to graduation for Latinx STEM students, would be for universities to offer additional academic supports and smaller class sizes for prerequisite STEM courses. A participant in this study stated that the prerequisite classes such as calculus, biology, organic chemistry, or beginning computer science were auditorium courses with 100 or more students. The number of students in class made it difficult to get academic support from faculty, and, it created anonymity for students. For this student, anonymity was explained as follows:

A student in a large class can be anonymous. If they fail, the professor will not

know who they are and will not care because there are 100 other students in class.

Therefore it is much easier to drop out and nobody will notice.

Prerequisite classes are the gateway to upper division science courses and they can also

be the barrier for a Latinx student to continue in a STEM major. Additional support, more

faculty interaction, and fewer students could translate to higher retention rates in STEM

majors for Latinx students.

## Recommendations for Further Research

Based on the findings of this research study, the recommendations for further

research are as follows.

### Recommendation 1

Universities with highly competitive STEM programs should utilize a qualitative

ground theory research approach to study the effects or influence of STEM university

culture on postgraduation STEM career outcomes for Latinx students. One purpose of

this research would be to determine how many Latinx students continued in STEM

careers, how satisfied they are in their careers, and what recommendations they have to

improve the pipeline of STEM graduates shifting into STEM professions.

### Recommendation 2

Psychological experimental research should be conducted to determine the effects

of isolation and perceived institutional rejection on Latinx students in STEM fields. The

purpose of this study would be to identify effects of isolation and rejection as well as

determine ways to improve the lived experiences of Latinx STEM students in higher

education.

**Recommendation 3**

A Delphi study of the current methods used to prepare STEM faculty for teaching to gauge the efficacy of teaching methods implemented by STEM faculty at 4-year universities and Latinx persons who have persisted to graduation is recommended.

**Recommendation 4**

It is recommended that universities utilize an experimental group comparison research design to study the benefits and value of faculty-sponsored affinity groups for Latinx STEM students and Latinx STEM student persistence rates. Based on the research findings of this study, further examination on improving faculty participation and interaction with Latinx students in STEM is required.

**Recommendation 5**

A highly valuable study would be phenomenological research on the lived experiences of Latinx students who changed out of their STEM major or dropped out of school entirely. Gathering the perceptions of students who did not complete their STEM program could garner valuable information about the university barriers and academic factors and influences that prevented program completion. This information could provide great value in understanding the factors that lead Latinx students to drop out so that institutional, curricular and cultural improvements can be made at the university level.

**Recommendation 6**

A recommendation for a future study would be a comparative analysis of the effects of STEM students working in a culture of collaboration in comparison to a culture of competition. This study would serve to establish whether there is a difference in

academic achievement and student persistence among Latinx students in STEM programs

when the culture of the program is more collaborative or competitive. A comparative

analysis of the two cultures could also benefit faculty and the development of

professional development for educators and staff in STEM programs.

### Concluding Remarks and Reflections

This study sought to understand the lived experiences of Latinx students in STEM

majors. Past research posits that students need to assimilate into university culture to

experience academic success and reach graduation. For the Latinx STEM program

graduates interviewed for this research, assimilation into STEM culture would have

stripped them of their protective behaviors and support systems. Research participants

described leaning on their families and friends during difficult times, and there were

many.

Interestingly, the Latinx students who were interviewed went on to create

"families" at their campus. Their university family was composed of Latinx students in

other majors, supportive office staff, work colleagues, and others who gave support and

were open to receiving support as well. This reminded me of my undergraduate studies at

USC. I was one of three Latina women in the film production program and I felt isolated,

unworthy, and was struggling with a severe case of imposter syndrome. I was told that I

had been admitted because of affirmative action and I did not actually deserve my spot at

the prestigious School of Cinematic Arts. I was crying in the bathroom one day and an

angel from the university cleaning crew walked in. She spoke to me in Spanish and told

me to pick my head up, wipe my face and never let them see me cry. She said I was doing

this; going to school, for all the other Latinos who could not. I cried and held on to her

and told her I could not make it. She was not having it. She grabbed me by the shoulders and said, "It's done. You already made it. You are here and now you're going to wash your face, put one foot in front of the other and finish." She also told me not to let those rich White kids get me down because what they had had come easy but what I had was earned. I washed my face, wiped up with a rough paper towel, and took a deep breath. That day I stepped out of the bathroom and I still felt scared, but I put one foot in front of the other and graduated. I never saw my angel again. I looked for her and asked the other facilities workers about her but nobody could tell me her name or what buildings she was responsible for. I never knew her name, but she saved me from dropping out. I have thought about my USC angel often while writing this dissertation.

I think about what would have happened to me if I had dropped out and what angels supported the STEM graduates I interviewed. They described grandfathers with leathery skin from years of working in the sun calling randomly to say, "you can do this!" They described hot cups of coffee and sweet bread that magically appeared during late night studying and tired smiles from mothers and fathers who took on extra hours to pay for computers, books, food, and whatever else was needed to make it possible for their student to graduate. I think about the Latinx students who changed majors or dropped out of college entirely because the obstacles were too big and they did not have enough money, hope, resilience, or support to continue.

Those are the students who STEM programs are missing and undervaluing. Diversity in STEM majors is necessary for science to continue evolving. Different ideas, backgrounds, and ways of solving problems are essential for universities to continue providing the world with innovation and opportunities. Not every student gets an angel

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like I did. It is up to universities and university leadership to facilitate student success.

This can be achieved by diversifying faculty, training STEM faculty how to engage with

students and building educational partnerships with companies to provide career

mentorship and opportunities for Latinx students.

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APPENDICES

# APPENDIX A

## IRB Approval Letter

**Carmen Gonzalez <cgonzal9@mail.umassglobal.edu>**

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### IRB Application Approved: Carmen Gonzalez
1 message

**Institutional Review Board** <my@umassglobal.edu>       Sun, Jan 22, 2023 at 8:36 AM
Reply-To: webmaster@umassglobal.edu
To: cgonzal9@mail.umassglobal.edu
Cc: ddevore@umassglobal.edu, ljohnso3@umassglobal.edu, irb@umassglobal.edu

Dear Carmen Gonzalez,

Congratulations! Your IRB application to conduct research has been approved by the UMass Global Institutional Review Board. Please keep this email for your records, as it will need to be included in your research appendix.

If you need to modify your IRB application for any reason, please fill out the "Application Modification Form" before proceeding with your research. The Modification form can be found at IRB.umassglobal.edu

Best wishes for a successful completion of your study.

Thank You,

IRB
Academic Affairs
**UMass Global**
16355 Laguna Canyon Road
Irvine, CA 92618
irb@umassglobal.edu
www.umassglobal.edu

This email is an automated notification. If you have questions please email us at irb@umassglobal.edu.

**Participant Information Letter**



DATE:

Dear

I am a doctoral student in the University of Massachusetts Global School of Education. I am conducting a study to capture the perceptions of Latinx students who have graduated from four-year STEM programs. It is the goal of this study to document how Latinx students perceive university culture as an influence on their persistence to graduation.

I am asking your assistance in this study by participating in an interview which will take from 45-60 minutes and will be set up at a time that is convenient for you. If you agree to participate in the interview, you may be assured that it will be completely confidential. No names will be attached to any notes or records from the interview.

All information will remain in locked files accessible only to the researcher. No employer, colleague, peer, classmate, previous teacher, or other person will have access to the interview information. You will be free to stop the interview and withdraw from the study at any time. Further, you may be assured that the researcher is not in any way affiliated with any person from your university or workplace.

The Dissertation Chair, Dr. Lisbeth Johnson is available at xxxxx@xxxxx.xxx if you have any questions. Your participation would be greatly valued.

Sincerely,


Carmen Gonzalez M.A.S.E.

APPENDIX C

**Synthesis Matrix**

| Article/Authors | Historical | Persistence | Race/Ed | Culture | STEM Workplace | STEM Education/Culture | Population | Affirmative Action | Research methods |
|---|---|---|---|---|---|---|---|---|---|
| Aguinaga, A., & Gloria, A. M. (2015) | | x | x | | | | | | |
| Allen, W. R., Teranishi, R., Dinwiddie, G., & González, G. (2002) | | | x | x | | | | x | |
| Anderson, E.S. (2004) | x | | x | | | | | | |
| Arbona, C., Fan, W., & Olvera, N. (2018) | | x | x | | | x | | | |
| Arcidiacono, P., Aucejo, E.M., & Hotz, V.J. (2016 | | x | | | x | x | | | |
| Ayres, Q.W. (1982) | x | x | | | x | | | | |
| Bahi, S., Higgins, D., & Staley, P. (2015) | | x | | | x | | | | |
| Crouch, B. A. (1997) | x | | | | | x | | | |
| Bean, J.P., Metzner, B.S. (1985) | | x | | | | | | | |
| Bickel, R.D. (2008) | | x | x | | | | | x | |
| Boddie, E.C. (2016) | | | | | | | | x | |
| Bolger, M. (2020) | | | x | | | | | x | |
| Borman, T., Margolin, J., Garland, M. etc. (2017) | | x | x | | | | | | |
| Butler, G.L. (1994) | | | x | | | | | x | |
| Cabassa, L.J. (2003) | | | x | x | | | | | |
| Caldera, Y.M. etc. (2003) | | | x | x | | x | | | |
| California Department of Health Care Services. (n.d.) | x | | | | | | x | | |
| CSU and UC Locations | | | | | | | | | x |
| Campbell, P.J. (2016) | | | | | x | x | | | |
| Cano, M.A., 7 Castillo, L.G. (2010) | | x | | x | | | | | |

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| Article/Authors | Historical | Persistence | Race/Ed | Culture | STEM Workplace | STEM Education/Culture | Population | Affirmative Action | Research methods |
|---|---|---|---|---|---|---|---|---|---|
| Castillo, L.G., Conoley, C.W., Choi-Pearson, C. etc. (2006) | | x | x | | | | | | |
| Cavazos, J. et al. (2010) | | x | x | x | | | | | |
| Chang, J. M., Kwon, C., Stevens, L., & Buonora, P. (2016) | | | x | | x | x | | | |
| Chapman, T.K. (2014) | x | | | | | | | x | |
| Chen, X. (2013) | | | | | x | x | | | |
| Cherlin, A.J. (2010) | x | x | | | | | | | |
| Chun, H., Marin, M.R., Schwartz, J.P., Pham, A. & Castro-Olivo, S.M. (2016) | x | x | | | | x | | | |
| Clark, W. A. V., & Blue, S. A. (2004) | x | | | | | | | | |
| Cohen, J., Segal, D. R., & Temme, L. V. (1992) | x | | | | | | | x | |
| Comas-Díaz, L., Hall, G. N., & Neville, H. A. (2019). | x | x | | | | | | | |
| Contreras, A. R., & Leonard, A. V. (1994). | x | | | | | | | x | |
| Cox, M. S. (2006). | x | | | | | | | | |
| Creswell, J. W. (2014) | | | | | | | | | x |
| Crisp, G., & Nora, A. (2021) | x | | | | | x | | | |
| Cullen, G.T., & Tinto, V. (1975) | | x | | | | | | | |
| Davidson, C., & Wilson, K. (2013) | | x | | | | | | | |
| Del Toro, J., & Hughes, D. (2020) | | x | x | | | | | | |
| Desmond, M., & Turley, R. N. L. (2009) | | x | x | | | | | | |
| DuBois, W.E.B. (2013) | x | | x | x | | | | | |
| Durkein, E (1966) | x | x | | | | | | | |

| Article/Authors | Historical | Persistence | Race/Ed | Culture | STEM Workplace | STEM Education/Culture | Population | Affirmative Action | Research methods |
|---|---|---|---|---|---|---|---|---|---|
| Eastman, M. G., Miles, M. L., & Yerrick, R. (2019) | | x | x | x | | x | | | |
| Ennis, S. Rios-Vargas, M. & Albert, N. (2011 | | | | | | | x | | |
| Estrada, M. Burnett, M. et al. (2016) | | | x | x | x | x | | | |
| Estrada, M., Hernandez (2018) | | | | | x | x | | | |
| Ethier, K., & Deaux, K. (1990) | | x | x | x | | | | | |
| Garcia, A.M. (1999) | x | | x | x | | | | | |
| Garmezy, N. (1991) | x | x | | | | | | | |
| Glasener, K. M., Martell, C. A., & Posselt, J. R. (2018) | | | x | | | | | x | |
| Graham, S. (2016) | x | | | | | | | x | |
| Gramlich, J. (2017) | x | | x | | | | | | |
| Guiffrida, D. A. (2006) | x | x | | | | | | | |
| Harper, S. R. (2012) | x | x | x | | | | | | |
| Hartley, M. T. (2011) | x | x | x | | | | | | |
| Hernandez, J. C., & Lopez, M. A. (2004) | | x | x | | | | | | |
| Herzig, A. H. (2004) | | x | | | | x | | | |
| Hipolito-Delgado, C. P. (2016) | | x | | | | x | | | |
| Holt, J. L., Mahowald, B. G., & DeVore, C. J. (2002) | | x | x | | | | | | |
| Hughey, M. W. (2019) | | x | x | | | | | | |
| Johnson, M. (2017) | x | | | | | | | x | |
| Johnston-Guerrero, M. P. (2016) | x | x | | | | x | x | | |
| Jones, B. D., Ruff, C., & Paretti, M. C. (2013) | | x | | | | x | x | | |
| Kerby, M. B. (2015) | x | x | | | | | | | |

| Article/Authors | Historical | Persistence | Race/Ed | Culture | STEM Workplace | STEM Education/Culture | Population | Affirmative Action | Research methods |
|---|---|---|---|---|---|---|---|---|---|
| Kidder, W. C. (2012) | x | x | x | | | | | | |
| Krogstad, J. (2016) | | | | | x | | x | | |
| Lisberg, A., & Woods, B. (2018) | | x | x | | | x | | | |
| Lutz, A., Bennett, P. R., & Wang, R. (2018) | x | x | | | | | | | |
| Majors, A. T. (2019) | x | x | | | | | | | |
| Malkiel, N. W. (2016) | x | | | | | | | x | |
| Mattila, J. P. (1978) | x | | | | | | | | |
| Mau, W.-C. J. (2016). | | | x | x | | x | | | |
| McGee, E.O. (2015) | x | x | x | | | x | | | |
| McGee, E. O. (2016) | | x | x | | | x | | | |
| McMillan, J., & Schumacher, S. (2010) | | | | | | | | | x |
| Mills, K. J. (2020) | | x | | | x | x | | | |
| Morales, E. E. (2010) | x | x | x | x | | | | | |
| NCES.ed.gov/ipeds/college map/. (2021) | | | | | | | x | | |
| Nora, A. (2001) | x | x | | | | | | | |
| O'Meara, K., Griffin, K. A., Kuvaeva, A, Nyunt, G., & Robinson, T. N. (2017) | | x | x | x | | | | | |
| Ortiz, A. M., & Sriraman, V. (2015) | | x | | | | x | | | |
| Palmer, R. T., Maramba, D. C., & Dancy, T. E. (2011) | x | x | | | | x | | | |
| Patton, M. Q. (2015) | | | | | | | | | x |
| Polat, H. H. (2019) | x | | x | x | | | | | |
| Rahat, E., & Ilhan, T. (2016) | x | x | x | x | | | | | |
| Rochmes, D. A. (2007) | x | | | x | | | | x | |

| Article/Authors | Historical | Persistence | Race/Ed | Culture | STEM Workplace | STEM Education/Culture | Population | Affirmative Action | Research methods |
|---|---|---|---|---|---|---|---|---|---|
| Ross, T., Kena, G., Rathbun, A., KewalRamani, A., Zhang, J., Kristapovich, P., . . . National Center for Education, S. (2012) | x | | x | | | | | | |
| Rothstein, R., & Economic Policy, I. (2014) | x | | x | | | | | | |
| Scarritt, A. (2019) | x | | x | | | | | | |
| Spiers, E. F., Coder, J., & Cleveland, R. W. (1971) | x | | | | | | | | |
| Strayhorn, T. L., & Johnson, R. M. (2014) | x | x | x | x | | | | x | |
| Strum, P. (2014) | | | | | | | | x | |
| Synnott, M. G. (1979) | x | x | x | x | | | | | |
| Thelin, J. R. (2008) | x | x | x | | | | | | |
| Tinto, V. (1975) | | x | | | | | | | |
| Tinto, V., Cullen, John. (1973) | | x | | | | | | | |
| Trevino, N., & DeFreitas, S. (2014) | | x | x | x | | | | | |
| U.S. Bureau of Labor Statistics (2013) | x | | | | | | x | | |
| *University of California Accountability Report*. (2015) | x | | | | | | x | | |
| Wagner, J. M. (2015) | | x | x | x | | | | | |
| World population review. (2023) | x | | | | | | x | | |
| Xu, Y. J. (2016) | | x | | | x | | | | |
| Zurita, M. (2004) | | x | | | | | | | |

## Interview Questions

## Interview Questions as aligned with Research Questions and the Theoretical

## Framework

**Research Questions:**
**Central Research Question**
      How do Latinx college graduates who have achieved STEM degrees perceive university and STEM program culture as supporting or not supporting a Latinx college students' persistence to graduation?

**Sub questions**
1. How do Latinx graduates of four-year university STEM programs perceive the culture of STEM programs at four-year universities to have influenced or not to have influenced their persistence to graduation?
2. In what ways do Latinx graduates of four-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?

### Opening Statement to Participant
      As you are aware, the purpose of this research study is to:
*...explore how Latinx college graduates who have achieved STEM degrees and when enrolled in a STEM college major perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.*

**Open Ended Interview Question(s):**
1. Since you confirmed that you identified as a Latinx student when you were sent the definition of what a Latinx student is and a summary of what their family cultural upbringing might be, please share what type of familial cultural background you were raised in.
2. Would you share some perceptions of the differences between your familial cultural background and a person raised in a general American cultural familial background or upbringing in food, family structure, belief systems, music, dress, festivals, ideas or anything that comes to mind.

3. How did you select your university and major? What influenced your decision to pursue a STEM degree?

4. Which University did you graduate from and in what STEM major?
   When you enrolled in a STEM program at the university you graduated from, did you perceive the culture of your university STEM program as similar or different to the Latinx culture you were raised in?

**Supporting Prompt**: Please share what you would identify as similarities or differences between the culture you were raised in and the culture of the STEM major in the University you were enrolled in?

**Research Question #1:**

*How do Latinx graduates of four-year university STEM programs perceive the culture of STEM programs at four-year universities to have influenced or not to have influenced their persistence to graduation?*

5. Was your enrollment in a STEM program difficult or easy?

   **Supporting Prompt:**
   In what ways was your university supportive or not supportive in influencing you to graduate from a STEM program and in what ways were they not? Please explain.

6. Were there any differences in the culture you were raised in and the university culture you were enrolled in that became barriers to your goal to graduate in a STEM major? Please elaborate.

7. Did you perceive yourself to be as academically prepared for the rigors of a STEM major as your non-Latinx peers and how did that support and/or not support your commitment to graduate from a STEM major at the university you were enrolled in? (Alignment with Theoretical Framework)

8. Did the differences in the culture you were raised in and the University STEM culture separate you or connect you to the social activities of your peer students at the university? Please explain. (Alignment with Theoretical Framework)

9. Did the university STEM department professors or administration take an active interest in influencing and or supporting you in persisting in your goal to graduate and achieve a STEM degree? Please provide examples.

10. Were there any times you can recount when you were discouraged by the university to persist in achieving your goal of graduating from the university with a STEM degree. Please provide examples.

**Research Question #2:**
In what ways do Latinx graduates of four-year university STEM programs perceive that learning to assimilate into the university STEM department culture influenced or did not influence their persistence to STEM degree completion?

11. Vincent Tinto, a university persistence researcher, describes assimilation as the integration of a student into college systems whereby the student sheds their previous culture and cultural perceptions in favor of the predominant culture of their university. Do you perceive that you assimilated into the university culture

and was your assimilation or non-assimilation supportive or not supportive in achieving your goal of graduating?

12. Please respond and explain for each lettered segment of the question below:

    How would you describe the culture of your STEM program in terms of how you perceived your treatment by the university in the following areas?

    A.  Professor accessibility
    B.  Social acceptance
    C.  Inclusion by your peer group or the STEM department professors, and
    D.   Whether or not you felt welcomed and valued?
    Please give some examples. (Alignment with Theoretical Framework)

13. How valuable and influential did you perceive faculty interaction with you to be and did they support or not support the commitment you had to graduating from a STEM program and the commitment you had to staying at your university? Please give some examples.

14. How valuable and influential did you perceive your peer interactions with you to be and did they support or not support the commitment you had to graduating from a STEM program and the commitment you had to staying at your university? (Alignment with Theoretical Framework)

15. As a Latinx student in a STEM program, did you perceive that you were treated well or viewed differently or the same as your non Latinx peers? What examples can you share? (Alignment with Theoretical Framework)
    **Supportive Prompt:** How did this treatment influence you to persist to graduating with a STEM degree?

16. As a Latinx student in a STEM program, were you given the same opportunities to participate in study groups, internships, teacher assistantships or research as other STEM students? What examples can you share?

17. Finally, as you may know, the percentage of Latinx students who choose a STEM major at a university is critically low to the need for Latinx students to pursue this major and be employed by STEM companies. 50 % of Latinx students that begin a STEM program at a university either change majors or drop out completely.

    What advice might you give to universities about how to engage and sustain Latinx students who may be coming from a culture different than the university STEM culture they are enrolling in so these students persist to graduation in this major?

APPENDIX E

**NIH Certificate**

**Certificate of Completion**

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Carmen Gonzalez** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 05/17/2017.

Certification Number: 2397584.

# APPENDIX F

## UMASS Global Research Participant's Bill of Rights



## UMASS GLOBAL INSTITUTIONAL REVIEW BOARD Research

### Participant's Bill of Rights

Any person who is requested to consent to participate as a subject in an experiment, or who is requested to consent on behalf of another, has the following rights:

1.  To be told what the study is attempting to discover.

2.  To be told what will happen in the study and whether any of the procedures, drugs or devices are different from what would be used in standard practice.

3.  To be told about the risks, side effects or discomforts of the things that may happen to him/her.

4.  To be told if he/she can expect any benefit from participating and, if so, what the benefits might be.

5.  To be told what other choices he/she has and how they may be better or worse than being in the study.

6.  To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study.

7.  To be told what sort of medical treatment is available if any complications arise.

8.  To refuse to participate at all before or after the study is started without any adverse effects.

9.  To receive a copy of the signed and dated consent form.

10. To be free of pressures when considering whether he/she wishes to agree to be in the study.

If at any time you have questions regarding a research study, you should ask the researchers to answer them. You also may contact the UMASS GLOBAL Institutional Review Board, which is concerned with the protection of volunteers in research projects. The UMass Global Institutional Review Board may be contacted either by telephoning the Office of Academic Affairs at (949) 341-9937 or by writing to the Vice Chancellor of Academic Affairs, UMASS GLOBAL, 16355 Laguna Canyon Road, Irvine, CA, 92618.

| UMass Global IRB | Adopted | 2021 |
|---|---|---|

**UMASS Global Research Participant's Bill of Rights (Spanish)**



### Declaración de Derechos del Participante de Investigación

Cualquier persona a la que se le solicite que acepte participar como sujeto en un experimento, o que se le solicite que acepte en nombre de otro, tiene los siguientes derechos:

1. Que se le informe lo que el estudio intenta descubrir.

2. Recibir información sobre lo que sucederá en el estudio y si alguno de los procedimientos, medicamentos o dispositivos son diferentes de los que se utilizarían en la práctica habitual.

3. Que se le informe acerca de los riesgos, los efectos secundarios o las molestias de las cosas que pueden sucederle a él / ella.

4. Que se le informe si puede esperar algún beneficio por participar y, de ser así, cuáles podrían ser los beneficios.

5. Que le digan qué otras opciones tiene y cómo pueden ser mejores o peores que estar en el estudio.

6. Que se le permita formular cualquier pregunta relacionada con el estudio, antes de aceptar participar y durante el curso del estudio.

7. Que se le informe qué tipo de tratamiento médico está disponible si surge alguna complicación.

8. Rechazar participar antes o después de que el estudio se inicie sin ningún efecto adverso.

9. Recibir una copia del formulario de consentimiento firmado y fechado.

10. Estar libre de presiones al considerar si él / ella desea estar de acuerdo en participar en el estudio.

Si en algún momento tiene preguntas sobre un estudio de investigación, debe solicitar a los investigadores que las respondan. También puede ponerse en contacto con la Junta de Revisión Institucional de UMASS GLOBAL, que se ocupa de la protección de voluntarios en proyectos de investigación. Se puede contactar a la Junta de Revisión Institucional de UMASS GLOBAL llamando a la Oficina de Asuntos Académicos al (949) 341-9937 o escribiendo al Vicerrector de Asuntos Académicos, UMASS GLOBAL, 16355 Laguna Canyon Road, Irvine, CA, 92618.

UMASS GLOBAL IRB                    Adopted                    April 2018

APPENDIX H

**Informed Consent Form**



**Information about:** Help or Hinderance: Latinx college graduates from STEM majors perceptions of university culture following Vincent Tinto's theoretical framework of student persistence.

**Responsible Investigator:** Carmen Gonzalez, M.A.S.E.

**Purpose of the Study:** The purpose of this phenomenological study was to explore how Latinx college graduates who have achieved STEM degrees and when enrolled in a STEM college major perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.

The study will strive to discover the perceptions of Latinx students who have graduated from four-year STEM programs in the Southern California region regarding the benefits or hinderances of their university culture as it pertained to their persistence through college. The results of this study may assist in developing student support techniques that can equip larger numbers of Latinx students to enter into and graduate from four-year STEM college majors. This study may also provide much needed data about the lived experiences of Latinx students who graduated from STEM majors.

By participating in this study, I agree to participate in an individual interview. The interview(s) will last approximately 45-60 minutes and will be conducted either in person or electronically via Zoom, depending upon the researcher's availability. Completion of the individual interviews will take place June through July of 2022.

I understand that:

a) There are minimal risks associated with participating in this research. I understand that the Investigator will protect my confidentiality by keeping the identifying codes and research materials in a locked file drawer that is available only to the researcher.

b) I understand that the interview will be audio recorded. The recordings will be available only to the researcher and the professional transcriptionist. The audio recordings will be used to capture the interview dialogue and to ensure the accuracy of the information collected during the interview. All information will be identifier-redacted, and my confidentiality will be maintained. Upon completion of the study all recordings will be destroyed. All other data and consents will be securely stored for three years after completion of data collection and confidentially shredded or fully deleted.

c) The possible benefit of this study to me is that my input may help add to the research regarding coaching programs and the impact coaching programs have on developing future school leaders. The findings will be available to me at the conclusion of the study and will provide new insights about the coaching experience in which I participated. I understand that I will not be compensated for my participation.

d) If you have any questions or concerns about the research, please feel free to contact Carmen Gonzalez at xxx-xxx-xxxx or at xxxxx@xxxxx.xxx; or Dr. Lisbeth Johnson, Dissertation Chair, at xxxxx@xxxxx.xxx.

e) My participation in this research study is voluntary. I may decide to not participate in the study, and I can withdraw at any time. I can also decide not to answer particular questions during the interview if I so choose. I understand that I may refuse to participate or may withdraw from this study at any time without any negative consequences. Also, the Investigator may stop the study at any time.

f) No information that identifies me will be released without my separate consent and that all identifiable information will be protected to the limits allowed by law. If the study design or the use of the data is to be changed, I will be so informed, and my consent re-obtained. I understand that if I have any questions, comments, or concerns about the study or the informed consent process, I may write or call the Office of the Vice Chancellor of Academic Affairs, UMASS GLOBAL, at 16355 Laguna Canyon Road, Irvine, CA 92618, (949) 341-7641.

I acknowledge that I have received a copy of this form and the "Research Participant's Bill of Rights." I have read the above and understand it and hereby consent to the procedure(s) set forth.

**Signature of Participant**

**Signature of Principal Investigator**

**Date**

**Informed Consent and Audio and/or ZOOM Recording Release**



**Information About:** Help or Hinderance: Latinx college graduates from STEM majors perceptions of university culture following Vincent Tinto's theoretical framework of student persistence.

**Responsible Investigator:** Carmen Gonzalez M.A.S.E.

**Purpose of the Study:** The purpose of this phenomenological study was to explore how Latinx college graduates who have achieved STEM degrees and when enrolled in a STEM college major perceive the culture of their university and the STEM program they were enrolled in as supporting or not supporting a Latinx college student's persistence to graduation.

The study will strive to discover the perceptions of Latinx students who have graduated from four-year STEM programs in the Southern California region regarding the benefits or hinderances of their university culture as it pertained to their persistence through college. The results of this study may assist in developing student support techniques that can equip larger numbers of Latinx students to enter into and graduate from four-year STEM college majors. This study may also provide much needed data about the lived experiences of Latinx students who graduated from STEM majors.

Your participation in this study is voluntary and include an interview with the identified student investigator. The one-to-one interview will take approximately 60 minutes to complete in-person or via ZOOM and will be scheduled at a time and location of your convenience. The interview questions will pertain to your perceptions and will be confidential. Each participant will have an identifying code and names will not be used in data analysis. The results of this study will be used for scholarly purposes only.

**I understand that:**

a) The researcher will protect my confidentiality by keeping the identifying codes and research materials safe-guarded in a locked file drawer or password protected digital file to which the researcher will have sole access.

b) My participation in this research study is voluntary. I may decide not to participate in the study, and I can withdraw at any time. I can also decide not to answer particular questions during the interview if I so choose. Also, the Investigator may stop the study at any time.

c) I understand that the interview will be audio recorded and or recorded from ZOOM. The recording will be available only to the researcher and the professional transcriptionist. The audio and/or ZOOM recordings will be used to capture the interview dialogue and to ensure the accuracy of the information collected during the interview. All information will be identifier-redacted, and my

confidentiality will be maintained. Upon completion of the study all recordings, transcripts and notes taken by the researcher and transcriptionist from the interview will be destroyed.

d)  If you have any questions or concerns about the research, please feel free to contact Carmen Gonzalez at xxx-xxx-xxxx or at xxxxx@xxxxx.xxx; or Dr. Lisbeth Johnson, Dissertation Chair, at xxxxx@xxxxx.xxx.

e)  My participation in this research study is voluntary. I may decide to not participate in the study, and I can withdraw at any time. I can also decide not to answer particular questions during the interview if I so choose. I understand that I may refuse to participate or may withdraw from this study at any time without any negative consequences. Also, the Investigator may stop the study at any time.

f)  No information that identifies me will be released without my separate consent and that all identifiable information will be protected to the limits allowed by law. If the study design or the use of the data is to be changed, I will be so informed, and my consent re-obtained. I understand that if I have any questions, comments, or concerns about the study or the informed consent process, I may write or call the Office of the Vice Chancellor of Academic Affairs, UMASS GLOBAL, at 16355 Laguna Canyon Road, Irvine, CA 92618, (949) 341-7641.
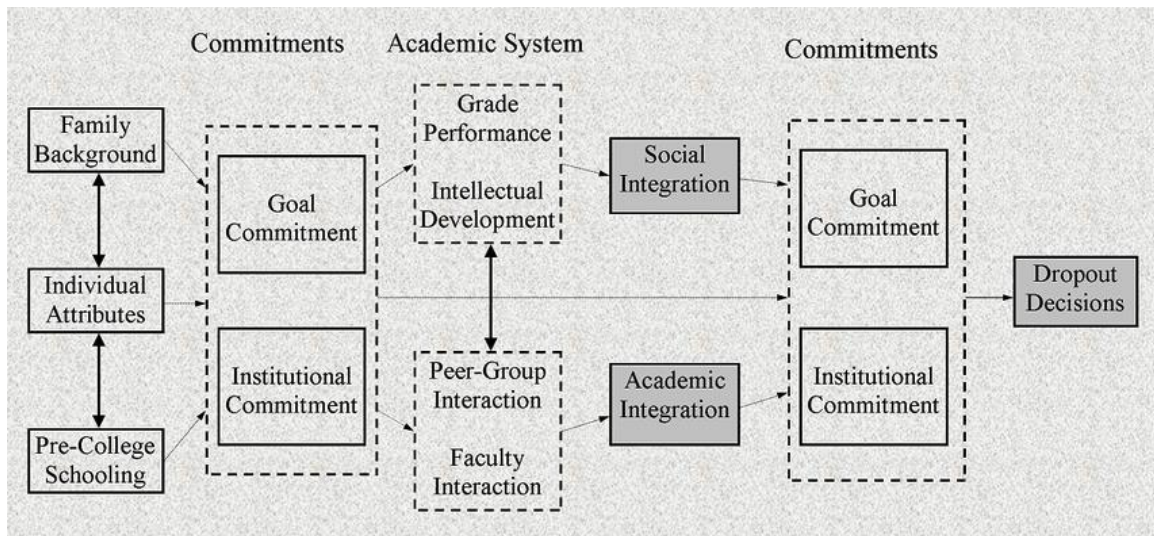**I acknowledge that I have received a copy of this form and "The Research Participants Bill of Rights." I have read the above and understand it and hereby consent to the procedure(s) set forth.**

_____

**Signature of Participant**

_____

**Signature of Principal Investigator**

APPENDIX J

**Theoretical Framework**



*Note*. From "Dropout From Higher Education: A Theoretical Synthesis of Recent Research," by V. Tinto, 1975, *Review of Educational Research*, *45*(1), p. 95 (https://doi.org/10.2307/1170024).

APPENDIX K

**Triangulation Artifacts**

| | |
|---|---|
|  | **One participant has moved to Texas to work as an engineer for Tesla.** |
|  | **One participant is now in medical school in New Mexico** |
|  | **One participant is working in Aerospace Engineering at Northrup Grumman** |
|  | **One participant is working at Google as a programmer** |