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### **Hidden Cracks in the Leaking Stem Pipeline: Retention Within First-Generation Latinx Students in Baccalaureate Stem Programs at Predominately White Institutions**

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HIDDEN CRACKS IN THE LEAKING STEM PIPELINE:  
RETENTION WITHIN FIRST-GENERATION LATINX STUDENTS IN BACCALAUREATE  
STEM PROGRAMS AT PREDOMINATELY WHITE INSTITUTIONS

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A Thesis

Presented to the

Faculty of

Pitzer College

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In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Arts

in

Chicana/o-Latina/o Studies

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By

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## ABSTRACT

This thesis documents the lived experiences of first-generation Latinx students navigating through predominately white institutions while attaining or attempting to attain a STEM degree. To examine this, twelve students from five different institutions were interviewed in semi-structured focus groups to better understand the educational trajectories of students in STEM. Inadequate high school preparation, educational disparities, mental health, and lack of institutional support were some of the reoccurring concerns students had across all focus groups. Students also highlighted that cultural competency across faculty in STEM, support from identity groups, and returning back to their Latinx community to serve as professionals was what has sustained them in STEM. To conclude, suggestions are offered to administration and institutions so they can support and retain first-generation Latinx students in STEM.

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## CHAPTER 1 INTRODUCTION

A National Science Foundation (Anon 2017) report on college Science, Technology, Engineering, and Mathematics (STEM) enrollment reported that in 2014 only 14% of enrolled students were Latinx<sup>1</sup> and 54% were White. In that same year, 635,915 STEM Bachelor's degrees were awarded, with 11% of those degrees awarded to Latinx students and 58% to White students. In the same NSF report, Latinx students intended to major in some STEM discipline at higher rates than White students, 45% to 40%. This is a growing issue concerning the retention of Latinx students in the STEM disciplines. Representation of Latinxs is low in STEM fields and the STEM workforce. The lack of STEM graduates has become a national priority of the United States, and the President's Council of Advisors on Science and Technology has argued that retaining students is the most efficient method for improving the workforce in the sciences (Chen and Soldner 2013). Thus, it is important to consider what factors contribute to the lack of Latinx STEM graduates overall and how accountability in institutions may increase retention within their STEM programs and the science workforce. The proposed research question for the project is, what factors have contributed to the retention or exclusion of first-generation Latinx students in STEM at predominately white institutions (PWIs)?<sup>2</sup>

Multiple factors contribute to the low retention of first-generation Latinx students studying in STEM programs at PWIs. This paper does not include all possible factors, but more so, the most relevant and reoccurring factors in the literature and in Elaine Seymour's *Talking about leaving* which initially guided this research. Factors included are high school preparation, stereotype threat,

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<sup>1</sup> A person of Latin American origin or descent (used as a gender-neutral or non-binary alternative to Latino or Latina)

<sup>2</sup> Used to describe institutions of higher learning in which Whites account for 50% or greater of the student enrollment

and financial concerns. Factors that positively influence retention included certainty of one's Latinx identity, instructional methods of teaching within courses, and institutionally implemented programs for first-generation Latinx students in STEM. These positive and negative factors reoccurred throughout various publications, but not all of these publications centered first-generation Latinx students in STEM at PWIs. This study will highlight this gap and address the issues specific to these students.

Retention across STEM is a national issue and more so within the Latinx community. In order to improve the workforce, there needs to be intentional efforts for retaining groups with low retention rates in STEM, such as the Latinx community. While there have been studies on Latinx students in STEM, such as Latinas in STEM and undocumented students in STEM (Yuen 2018), many do not address the issues on multi-faceted layers such as being first-generation and attending PWIs. What this study does that others have not, is observe first-generation Latinx students in STEM at PWIs. The purpose of these added layers is to understand the experiences of those students at these institutions and to compare the experiences of Latinx students at other institutions. By using intersectionality first coined by Kimberle Crenshaw, defined as the interconnected nature of social categorizations such as race, class, and gender as they apply to a given individual or group, regarded as creating overlapping and interdependent systems of discrimination or disadvantage (Crenshaw 1991), we look into the complexity of the Latinx and first-generation college student identity. As this study looks at Latinx and first-generation college students, it is important to acknowledge that the experiences these students are facing does not look at their identity as independent of each other, but rather holistically.

## LITERATURE REVIEW

Multiple factors contribute to the low retention of first-generation Latinx students studying in STEM programs at PWIs. Latinx first-generation college students have different experiences than their white peers when going through higher education. They are more likely to come from low socioeconomic backgrounds and may have limited access to quality K-12 education (Ovink 2017). Since they are often the first to attend college in their families, these factors may limit their familiarity with the college process and thereby affect what programs they choose to enroll in (Reyes and Nora 2012:13). Limited knowledge often results in Latinx students leaving STEM at higher rates in comparison to their white student counterparts (Fernandez 2018; Pascarella et al. 2004; Seymour 1997).

Early research on minorities in STEM prompted the need to focus on retention for these groups of students in higher education. Elaine Seymour's book (1997), *Talking About Leaving*, showcases a study conducted on students at seven different institutions through an ethnographic approach. Her study concluded that underrepresented minorities who remained in STEM and those who switched out of STEM did not feel any different from each other when asked about their feelings towards their education. Both switchers and non-switchers in high percentages expressed:

Poor teaching by S.M.E faculty, inadequate departmental or institutional advising or counseling about academic, career, or personal concerns, and choosing an S.M.E. major for reasons that prove inappropriate (P. 32).

Seymour highlights many important issues at hand on the topic of retention in STEM for minorities. Watkins and Mazur (2013) support these claims by stating, "Although most students who switch out of a science major list 'interest in another major' as their primary reason for leaving, about 40% of students criticize the poor quality of instruction as a cause for leaving science" (36). This insight allows for researchers to look past the top-down structure of retention and take into

account the student voices and how these students pursuing a STEM education feel about the education they are receiving. However, Seymour and Watkins do not address intersectional factors of being both Latinx and first-generation. While issues overlap in each identity, there is a unique experience for those who are both Latinx and first-generation. The tables in Seymour's book presented several rows of reasons why students left STEM but failed to include demographics of the students and limited the variables only to switchers and non-switchers in STEM. While it is important to recognize the reasons why students leave STEM, one must also keep track of student demographics and other variables that contextualize and enrich the data.

Similar studies have been conducted to validate and uplift the experiences of Latinx students in higher education. *Latino Access to Higher Education: Ethnic Realities and New Directions for the Twenty-first Century* by Martin Urbina and Claudia Wright (2015) discusses the obstacles that Latinx students face in higher education. The book is divided into various parts which were interpreted to be part of an extensive research paper. The first few chapters contextualize why this is an ongoing issue in the historical context and statistics on Latinx students in higher education. The authors emphasize that although this is a current problem for all Latinx students, the study would hone in on Mexican American individuals that reside in the Lone Star State, Texas. After the historical background, the authors begin to look at the trends and emerging issues in higher education, followed by the empirical data on all Latinxs on a national level. Following that, they begin to explain the process of their case study done at Sul Ross State University in Texas. After the explanation of their methodology using a qualitative approach, the authors dedicated the following two chapters to their findings, as well as the analysis and implications of their findings. They end with ways of revolutionizing the current education system and optimism for Latinxs in higher education.

Their study resonated closely with how the data will be collected for this study. The authors wrote:

...Adhering to Laura Rendon's validation theory to provide participants their voice, participants were able to share their stories relative to their college-lived experiences, an essential component to reveal the influence of social capital in accessing and succeeding institutions of higher education (Urbina and Wright 2015:80).

Using Rendon's validation theory, defined as, "An enabling, confirming and supportive process initiate by in- and out-of-class agents that foster academic and interpersonal development" (Rendon 1994), this theory focuses on student's lived and in-class experiences as a conceivable method to emphasize student voices, validating the need to attend to the concerns that students have about their experiences in higher education. However, the framework that they are proposing to use throughout the study is a revised Social and Cultural Capital model. This transforms the model from a linear to a more recursive overlapping model in order to focus on the student experiences: centering needed social capital (familial and non-familial), social network members, and institutional agents as revealed via the participants' voice (Urbina and Wright 2015).

The issue with this model was that while social and cultural capital is a significant concern in all higher education, the framework used in the study may have only applied to the location and population. The authors wrote that the students did not have much social capital because their sample size was limited to only first-generation Latinx transfer students while looking only at a Hispanic Serving Institution (HSI). In this study, there is another added layer of difficulty/complexity because this study solely looks into predominately white institutions. This means that although the students (in more traditional models) do not have social capital in either situation, the fact that the students have a more substantial Latinx presence in an HSI versus a PWI will potentially yield different results.

However, the definition of social capital is subjective to the model used to define it. Reflecting on Tara Yosso's *cultural wealth model* represents a framework to understand how students of color access and experience college from a strengths-based perspective (Yosso 2005). Her framework defines capital and is manifested in six forms: aspirational, linguistic, familial, social, navigational, and resistance. If Urbina and Wright were to have used this model, the study being conducted for this thesis and their findings might have correlated and reflected each other more.

Another critique about this book was in the section about college-going factors and how it was generalized to all students; it reads:

M. Jeanne Read and James Moore's document that successful college students credit their readiness for college to four primary factors: (1) effective relationships with high school personnel, (2) registering for courses in Advanced Placement, (3) involvement with college preparatory opportunities, and (4) involvement with high school outside the classroom (P.81).

The book critiques this because it does not consider a cultural analysis. One can generalize this to all students, but once one starts considering first-generation Latinx students, there has to be a consideration for the type of education the students have received. Education that is often not comparable to students who could afford a high school education of higher quality. In general, if a student went to a private or charter school, they are more likely to be more prepared than those who attended under-funded public high schools. However, many other scholars such as Silvia Hurtado (2008, 2010), Freeman Hrabowski (2016), and Tricia Hinojosa (2016) write about high school preparation and how there is no such correlation for students of color and success in higher education. In his book, Hrabowski (2015) writes that, regardless of how a minority student performed in high school, more than often those students do not succeed at high rates in STEM. Even those who were valedictorians and took the most AP courses could not finish their STEM

Bachelor's degree (Hrabowski 2016:54). While knowing this is about STEM retention and not higher education retention in general, the underlying message is that there is a lot that goes into the success of a first-generation Latinx student and solely looking at academic achievement in high school may not be an indicator of how one will perform in higher education in STEM.

The results of the study and the findings allow for this thesis research project to have current research to compare and contrast once data is collected. If any of the conclusions overlap with Urbina and Wright's findings (2015), then there might be significant findings that could be highlighted and looked at more in-depth for future studies. One surprising thing was the way higher education institutions respond to inequalities and inaccessibility to higher education. Universities like to say that bias, treatment, prejudice, or discrimination are "things of the past" and that things are different and not like they used to be (Ng 1994). This framework of institutional racism no longer existing, and the lack of accountability institutions have taken to support first-generation Latinx students is a reason for why retention rates are so low for these communities in higher education. Institutions must reform and begin supporting these students if a change is to come.

### *High School Preparation*

The idea that high school preparedness and GPA correlate with success in college has circulated for years among scholars in education (Sadler and Tai 2001). This may be true, but with limitations. Prior research suggests that an above average high school GPA correlated with a high college GPA (Cole and Espinoza 2008). This remains true solely if high school GPA is influenced by the cultural capital that Latinxs bring to college and the consideration of high school GPA as a measure of cultural capital. Thus, meaning that if a student did well in high school but still attended an under-resourced high school, that does not necessarily reflect that they will perform well in college. However, Hrabowski (2016), argues that underperformance in STEM courses comes from

students that score high on standardized tests, have an excelling school GPA, and take various honors classes. While these results contradict each other within the context of high school success, this discrepancy will allow for data collected on Latinx first-generation students to be supported by either Cole or Hrabowski's claim on the significance of GPA in high school. Silvia Hurtado (2008) also adds that high school GPAs for Latinx students in 2006 were lower than that of their white peers. About 55% of Latinx males and 65% of Latinx females reported a GPA of B+ or higher in comparison to 60% white males and 75% white females (Hurtado et al. 2008). Hurtado's data is over a decade old now, which leaves room for this current thesis research study to revisit these claims with current data and compare the GPA of students, as well as how much of an indicator high school GPA is for Latinx STEM success.

In Trisha Hinojosa's report (2016), she identifies key studies about high school indicators that attribute to the success of students in STEM education. In figure one of her report, she states that courses in high school, interest or confidence in STEM, and math and science aptitude or achievement all had at least eight separate studies supporting these indicators for the success of students in STEM. However, while this applies to all students in the study, she discovered that this was not the same for Latinx students and that there is no correlation. This study allows room for further research to be conducted solely on Latinx students in STEM to understand better why there is only an association of high school preparation for all students, but not when Latinx students are the isolated demographic. This study may also reinforce the claim Hrabowski makes about high performing high school minorities and underperformance in STEM, and how it may not be educational barriers that hold these students back from performing at their full capacity. However, academic barriers are not the only barrier that minorities face in higher education. We will see how identity and perception of one's identity may hinder their success in the following section.

### *Stereotype Threat*

Stereotype threat has been deemed a factor in why minorities and women leave STEM (Steele and Aronson 1995). Stereotype threat is initially defined as, "Being at risk of confirming, a self-characteristic, or a negative stereotype about one's group" (Steele and Aronson 1995:12). Steele and Aronson's studies concluded that stereotypes do hinder the performance of students if they are the group being stigmatized. Through a series of studies conducted in his published study, Steele concluded that if African American participants were made vulnerable to judgment by negative stereotypes before taking a standardized test, their intellectual ability depressed, and they performed worse in comparison to white participants. In study 4 of his overall study, there was enough of a correlation that even if Black participants recorded their race, they would perform worse even when the test was not diagnostic to ability. Steele compares stereotype threat to being tokenized. Being a token means that a minority is the only minority in an otherwise homogenous group. He states:

Although probably in the same family of effects as stereotype threat, token status would be expected to disrupt cognitive functioning even when the token individual is not targeted by a performance-relevant stereotype, as with, for example, a White man in a group of women solving math problems (P. 810).

While stereotype threat and token status are different processes, these two can often co-occur, such as when a student is the only minority in a classroom. Stereotype threat is an underappreciated source of a deficit in standardized testing for Blacks and other stereotyped-threatened groups such as lower socioeconomic status and women in mathematics (Spence, Steele, and Quinn 1995). Lastly, Steele and Aronson state that stereotype threat establishes a predicament in the testing environment where it still has the power to undermine standardized test performance and contributes to the pattern of group differences that have characterized since their inception (Steele and Aronson 1995:810). Although conducted over two decades ago, researchers continue

to use Steele's stereotype threat as a factor in why underrepresented minorities underperform in standardized tests and academics (Aronson, Fried, and Good 2002; Schmader and Johns 2003; Stone et al. 1999).

Beasley and Fischer (2012) modeled their study after Steele's work and theory by researching stereotype threat as a reason students considered to remain in STEM majors or leave. What the study concluded was that Hispanics, Blacks, and women disproportionately left their STEM fields because the lack of representation in STEM was equated to being incompetent in their field (Beasley and Mary Fischer 2012). Silvia Hurtado's (2008) research supports this claim that Latinx students believe that their academic abilities are not up to par with other White students. The study displayed the self-rated academic ability in this order: White Males, Latinx Males, White Females, Latinx Females (Hurtado et al. 2008). The problem with looking at quantitative data is that it does not consider factors outside of academics such as non-cognitive reasons for why academic ability is not as high for Latinx students. One must also look at non-computable reasons for why a student is underperforming because this is where one understands why they are not doing well. It is not enough to notice that a student is not performing well; one must look at the internal and external factors that are causing low performance.

Seymour's (1997) book also touches on stereotype threat stating that students of color will often blame themselves for their lack of success before suggesting it is the institution's fault or the faculty members (Seymour and Hewitt 1997). This lack of confidence often leads to these students leaving the STEM field and going into a non-STEM major. DeCuir-Gunby and Schutz (2016) add that student of color interactions with faculty and fellow students affects the confidence levels of the minority students. This is important to consider because if a Latinx student goes to a PWI where there are fewer minorities across administration, faculty, and students, then there is a high

chance that the student will have lower levels of confidence. However, if PWIs would foster a more inclusive environment such as those in HBCU's and HSI's, the confidence levels of these students would increase (DeCuir-Gunby and Schutz 2016).

### *Financial Issues*

First-generation Latinx students are more likely to remain in college if offered financial aid and work-study opportunities (DeCuir-Gunby and Schutz 2016). While this may be true, this only benefits Latinx students in supporting them to attend the institution and does not assist with the financial load and responsibility students carry to help back at home while attending school. A student in the DeCuir-Gunby and Schutz (2016) article described that at times, they would have to plan their class schedule around their work schedule which can often harm and influence a student's grades as well as for deciding whether to continue persisting in STEM education (DeCuir-Gunby and Schutz 2016). Seymour continues to write about how students with financial responsibilities found it relieving to be able to fulfill financial and family responsibilities while also being able to maintain grades within a major that was less demanding (Seymour and Hewitt 1997:342).

A qualitative study done by Strayhorn (2012), further supports the evidence demonstrating the financial responsibilities Latinx students have to take on when going into higher education. The students he interviewed shared that they would often have to work 25 hours or more a week and therefore limit the amount of time available between classes for homework, extracurricular involvement, and a sense of belonging at the school. The feeling of not belonging at a school because of lack of participation can increase if Latinx students attend a PWI where there is already a lack of diversity — combining this experience with the federal loans and grants that first-generation Latinx students often have to take out leaves students pressured into finish their schooling in whatever way possible to begin the process of paying back their student loans

(Strayhorn 2012:35). This pressure acts as another contributor to weave students out of STEM programs that are often more rigorous and time demanding than non-STEM majors. Strayhorn highlights that intersectional identifiers such as being first-generation, race/ethnicity, and class are all issues that must be addressed in research as a whole and not as individual factors for the study to be impactful.

### *Identity*

In Terrell Strayhorn's (2012) book, he emphasizes the importance of identity within minorities by stating:

For some students, especially students of color attending PWIs, severing supportive relationships with members of one's culture of origin can lead to serious psychological issues, dissatisfaction, a loss of cultural connectivity (what I refer to as 'cultural suicide'), and thus academic failure (P.36).

Strayhorn emphasizes the idea of a sense of belonging rather than assimilation. He found, through his analysis of the data from the College Student Experiences Questionnaire, that Latinx students felt less of a sense of belonging at PWIs because of the lack of representation. However, these students felt a sense of belonging when there were interactions with diverse peers. Byars-Winston goes on to state that when minorities engage with other ethnic groups and build a connection, they tend to have higher STEM self-efficacy, which then translates into having higher interest and greater value for obtaining a math or science degree (Byars-Winston et al. 2010).

The idea of belonging when one does not identify with the majority of students at a PWI was fleshed out in Castellanos and Jones's book (2003), *Majority in the Minority*. PWIs expect Latinx students to mold and assimilate to the university settings (Feagin, Vera, and Imani 1996). Students often split themselves in half culturally, in order to live an academic life as well as a personal life and often do not feel they can entirely be themselves at a PWI. This has caused difficulty in cultural congruity which has been associated with an increased non-persistence for

Latinx students at PWIs (Gloria and Kurpius 1996). It is important for students not to lose a sense of what their cultural identity is while at a PWI and to search for communities that support; however they identify (Castellanos and Jones 2003). It is essential for students to not culturally assimilate for the sake of academic survival, and to find a sense of belonging among students who are going through the same experiences.

For some dispelling stereotypes about Latinxs was the turning point for students to be successful in higher education. The way students were supported in Torres and Magolda (2004), was through "validating students' capacity to know, situating learning in their experience, and defining learning as mutually constructing meaning" (344). Learning about their identity and dispelling what it means to be Latinx means that these students were more self-aware and secure about their own identity as Latinxs. Identity often times is everchanging and can be influenced by many outside factors; it is important that institutions foster an environment that allows Latinx students to explore what it means to be so.

### *Instructional Methods for Teaching*

Instructional methods and teaching pedagogies have played a significant role in student performance across different universities. Jessica Watkins and Eric Mazur (2013) conducted a study on a group of students using a peer instructing method in a course for introductory calculus-based physics at Harvard University from 1990-1996. Peer instructing is an interactive teaching method that centers the students and allows them to discuss a question proposed by the professor. Once the students have discussed the question, the professor will offer feedback to the students and go over the correct answer. What resulted from the peer instructing courses was that students were less likely to switch out of STEM in all the years that were measured. The removal of the coldness of an introductory science course allowed the students to facilitate discussion among each

other as well as receiving feedback on their classroom performances (Watkins and Mazur 2013:39). Watkins and Mazur acknowledge the uniqueness of their study sample and note that this study would need to be replicated multiple times at other institutions other than Harvard University, specifically a university with a more present Latinx student population in order to see how successful this would be with first-generation Latinx students.

In Meling's study (2012), a Hispanic-Serving Institution (HSI) used a supplemental instruction (SI) approach to retain minority students in high-risk courses. Supplemental instruction modeled by Dr. Deanna Martin uses peer-assisted study sessions by having students who have completed traditionally challenging courses to teach students who are currently enrolled in those courses (Burmeister and Martin 1996). This supplemental instruction proved to be successful when implemented into a college algebra course among Hispanic students. As long as the student participated in the SI sessions, the student's grades were higher than those that did not participate. This study concludes that implementing and prioritizing SI programs needs to be considered when conversations about retention strategies are brought up. This study was successful at a HSI which already has a more significant number of Latinx students. However, there is no way of knowing whether there would be the same effect on Latinxs at another institution such as a PWI unless further studies are conducted. Regardless, these findings are enough to say that supplemental instruction was an active form of retention for Latinx students in STEM at the HSI this instruction method was implemented.

Although these two studies were done and replicated at institutions that were not specific to the demographics of the study being conducted, i.e., the general student body at Harvard, or Latinx students at a HSI, it is essential to recognize the importance of pedagogy. Students are not uniform, and it is important to understand that not all students are receptive to the standard lecture-

based learning. The extra individualized attention given to students in the introductory course at Harvard proved to reciprocate higher test scores. While at the HSI, extra review sessions also proved to be helpful for students who were not performing well. While peer instruction and supplemental teaching are only two alternative pedagogies for teaching, it is essential to reflect on different teaching methods and be open to methods that will ultimately support students to greater lengths.

### *Institutionally Implemented Programs*

Numerous studies have supported that mentoring is a significant contributor to minority STEM retention (Meling et al. 2012; Seymour 1992, 1997; Watkins and Mazur 2013). Wilson et al. did one such study (2012), by creating an academic mentoring program at Louisiana State University (LSU) with their Howard Hughes Medical Institute (HHMI) Professors Program. This mentoring program proved to be successful through mentoring, undergraduate research opportunities, and academic intervention. LSU-HHMI uniquely selected academic underperformers and turned out higher retention rates in STEM for two cohorts of LSU-HHMI students in comparison to non-participating STEM undergraduates and thus proving this academic mentoring program successfully retains students. While this program proved to be successful at Louisiana State University, the results may not hold if this program were implemented at another institution. However, the program can be modeled and adjusted to other institutions in an attempt to retain students just as it did in the LSU-HHMI Professors Program.

Freeman Hrabowski's book (2016),  *Holding Fast to Dreams*, demonstrates how an institutionally implemented program can successfully retain students in STEM. The Meyerhoff Scholars Program began as a program for academically excelling African American Men who were pursuing a STEM degree at the University of Maryland Baltimore County in 1989. Since

then, the program has expanded to all students and encourages all students to apply to this selective program. Through evaluation process of the program, students across all cohorts rated community, financial support, program staff, research, campus academic environment, and professional development as the contributing factors to the academic success of the students in the Meyerhoff Scholars Program. Hrabowski writes:

My colleagues and I have been on a mission since the late 1980s. And we have had success. Since the inception of the Meyerhoff Program, more than 200 graduates have gone on to earn the Ph.D. or MD-PhD, more than 100 have earned an MD, nearly 250 have earned a master's degree, and more than 200 are currently enrolled in a graduate or professional degree program (P. 122).

While this program has proven to be successful at UMBC, this may not be the case for every other institution. UMBC, although considered a PWI, is slowly moving towards a more diverse student population. In 2013, 45 percent of the student population was white, 16 percent black, and 6 percent Hispanic (Hrabowski 2016:86). Hrabowski credits this gradual shift in diversity as well as the invested faculty at UMBC to the success of the Meyerhoff Scholars Program. To mirror this successful program, institutions must be supportive of minorities in STEM at all institutional levels, from the administration to the peers of the students in this selective program.

Reflecting on the previous literature reviewed, my thesis will cultivate these themes while also allowing students to express their concerns. My study will be different from those previously conducted but will continue to build off of the foundational results that these studies have contributed to. Different because I will be looking at first-generation Latinx students in STEM at PWIs which to my knowledge has not been done before. Although the group of students is specific to first-generation Latinx students in STEM this intersectionality of identities will allow for future studies to build off of previous studies.

## METHODOLOGY

The data collecting process of this study was conducted qualitatively through focus groups. In order to ensure that student experiences were centered, Laura Rendon's validation theory (1994) was used to justify and support the experiences of first-generation Latinx students in STEM. Using a Latina/Latino critical theory (LatCrit) in the framework of Solorzano and Bernal (2001), and Crenshaw's theory of Intersectionality (1991), questions were framed to highlight intersectional first-generation Latinx college student experiences. Bernal's Latina/Latino critical theory recognizes the complexities of identity and theorizes around issues such as language, immigration, ethnicity, culture, identity, phenotype, and sexuality. The emphasis on these experiences is essential in order to understand the complexities of identity better, and how that has impacted the education and experiences in higher education of first-generation Latinxs.

The purpose of placing students at the forefront of the data collecting process is because only they know what their experiences are in the classroom and at their institution. Since the study emphasizes student experiences in relation to their success in their STEM programs, it was only appropriate for them to assess their own experiences and explain what they have gone through during their time in STEM. By approaching this study from a bottom-up structure, students experiences are validated and serve as a basis for an accountability system from institutions searching to improve retention among minorities.

The focus groups consisted of first-generation Latinx students from five different predominately white institutions. Initially, there was an attempt to have five participants from each institution to diversify the experiences presented. Unfortunately, each focus group consisted anywhere between two to four students. Using snowball sampling similar to Biernacki and Waldorf's method (1981), first-generation Latinx students were contacted at each institution that

was being used in the study and was asked to disperse the message about the study to both their Latinx and first-generation affinity groups. Most of the communication was done by word of mouth, or through computer communication. Snowball sampling was used to contact students most quickly and efficiently. The predominately white institutions that were used in the study did not have a significant amount of first-generation Latinx students in comparison to all student enrollment, and therefore the snowball sampling was useful because the original students that were contacted knew the students respectively through shared mutual friends or Latinx and first-generation affinity groups.

The institutions that were chosen were chosen specifically because of their specialization of specific disciplines, yet they uniquely intercross resources amongst each other, allowing students to benefit from all five institutions. Justice College is a small private liberal arts school that specializes in environmental issues and social justice. The College of Liberal Arts, a small private all-women liberal arts college is known for its interdisciplinary curriculum. Carter's School of Economics (CSE) a private liberal arts college specializes in economics, finance, and government. These three institutions were chosen because of their joint science department, Krik Science Center, in which students from all three institutions are able to take STEM courses there. The last two institutions included in the study are Leadership College and Industrial College. Leadership College which is the oldest and most selective liberal arts college of the five and specializes in interdisciplinary studies. Lastly and the most STEM orientated is Industrial College, a small private liberal arts institution that specializes in only STEM. Although each of these institutions specializes in different disciplines, all of them offer STEM degrees, and a few have joint STEM departments. These institutions were ideal to use for this study because there is a lack of literature around first-generation Latinx students in STEM at predominately white institutions.

With the institutions in the study, not only are these conditions covered, but one can also look at these experiences and realize that these are not isolated experiences to STEM or non-STEM specific institutions.

Before conducting the focus groups sessions, IRB approval was received to conduct the study at hand. For the sake of the participants, all names have been changed for both the participants and institutions used for the study. All participants were asked to sign consent forms, to be voice recorded, which stated that they would all be given pseudo names to ensure confidentiality. This confidentiality allowed participants to honestly respond to how their experiences have been at their respective institution. The qualifications for participating in the focus group were minimal. The participants had to be first-generation, Latinx, and either currently in a STEM discipline or had the intention of majoring in STEM during their entrance into higher education.

The focus groups were arranged initially into groups of five but ultimately varied from two to four. Each focus group was semi-structured and allowed for the conversation to flow in whatever way was suitable for the participants. Participants were allowed to freely speak about their experiences pertaining to the questions asked. The questions asked in the focus groups all related to the relevant themes that appeared in the literature review. Themes such as high school preparation, stereotype threat, and financial concerns were asked of the participants as well as more positive retention factors such as identity, instructional methods, and institutionally implemented programs. Apart from the focus groups, participants were also issued a questionnaire that included demographic information of their high school and questions that would allow for a more holistic understanding of the learning environment they received prior to enrolling at their predominately white institution.

All the focus groups were completely different from each other. The participants will be briefly mentioned as more detail about who they are, and their educational trajectory will be described in the subsequent chapters. Starting with Justice College, this focus group included three students: Yasmine, Mariela, and Edwin. Yasmine is a second year who is still in STEM and a double major in human biology and sociology. Mariela is currently a third year and a biochemistry major. Lastly, Edwin is a fourth-year pre-med student majoring in human biology. The focus group with these students was held in a study room at Justice College and was pretty straightforward and lasted around 50 minutes. The second focus group took place at the College of Liberal Arts in a study space with Laura and Jessica. Laura is currently a second year and majoring in biochemistry while Jessica is a fourth-year majoring in human biology. While this focus group was much smaller than the previous, the focus group was far more emotional than the previous. I reaffirmed the students that they were allowed to step out or stop altogether if they felt the need to, but they insisted on the focus group to continue.

The third focus group at Carter's School of Economics was held in the apartment of the three students. Julissa, Valeria, and Kristen are all currently fourth years. Julissa is an economics major, Valeria is psychology and government, and Kristen is biology and government. The focus group with the students lasted about two hours and was quite powerful. The participant described many traumatic experiences that directly tied in with being first-generation Latinas at a predominately white institution. When the focus group finished, they described it as relieving and therapeutic because they were finally able to express their emotions that have been repressed. Next off, I held the focus group with Leadership College at the library where they had all agreed to meet. This focus group was composed entirely third years. Francisco a molecular biology major, Joel molecular biology and sociology, and Anais a Latin American studies major. This focus group

was pretty straight forward, lasting about an hour and described an experience that was different from the others because these three students had been taking classes in STEM together since their first year. The conversations around STEM flowed well because of how comfortable they had been with each other. Lastly, I interviewed Maria from Industrial College. Because of the extremely rigorous amount of work that Industrial students have and later finding out about the lack of first-generation Latinx students, I was only able to interview Maria who is a fourth-year engineering student. Speaking to her, helped me understand the different experiences that she has had in comparison to the other students who did not attend a STEM-intensive institution.

The focus groups were transcribed and coded for themes around those presented in the literature and themes that arose from the student's lived experiences in higher education, which included: imposter syndrome, gender dynamics, and mental health concerns.

Preliminary results held that each focus group had different responses and experiences, which is what was expected, given that they went to institutions that were all distinctly different from each other. The focus groups were semi-structured, the flow was easily kept, and participants were allowed to speak on what was being asked of them. At times, the participants went off in tangents, and they were reassured that they may speak on whatever they felt was relevant to their experience and their academic trajectory. It was evident that students had not been able to express their concerns before these focus groups because some of the participants were quite emotional, even at times crying. Some described the time they spent speaking in the focus group as "therapy sessions," which may imply that some of these experiences may have been traumatic repressed experiences that they had to recount. Participants were reminded that if the focus group was too intense for them, they were free to opt out of the session. The focus groups were believed to be fruitful for both the participants and me because it allowed them to be able to speak about their

painful experiences in school. Many of the participants had overlapping experiences with those from other institutions, but at the same time had distinct differences that could be attributed to their specific institution. The following chapters will discuss the results that were found at each institution and how they not only relate to each other but with the literature as well.

This research is intended to be presented openly to higher education institutions. While the participants attended predominantly white institutions, the experiences that they have faced are not unique to only these institutions, as was seen in the literature review done before the focus groups in the data collecting process. Once the thesis is completed, the data will be distributed to administrators and faculty who have reached out and requested a copy. With their support, I hope to incite some systematic and institutional change to better retain first-generation Latinx students in STEM.

As someone who had begun higher education as a STEM major and later on transitioned into a non-STEM major, participating in the focus groups was exhausting and emotionally taxing. Hearing the experiences that all the students have had for choosing to remain or refrain from STEM at their institutions, prompted continuous self-reflection. At times it was difficult to keep composure due to the parallels in the experiences and how their difficult experiences resonated with my own, but empathy was expressed after the focus group was completed to keep the focus group on the participants rather than on myself. I made sure to validate their experiences and emotions while also reaffirming that I too often felt the same emotions that they felt when I was still pursuing a mathematics degree. Documenting the experiences faced by first-generation Latinx students in STEM will be an essential catalyst for critical institutional policy changes, or at the least to inform stakeholders about creating a sustainable plan to retain students in STEM.

### *Limitations*

The number of participants for the study was lower than expected. As initially proposed, each institution was to have five participants, but the day of the scheduled focus group, participants did not arrive at the focus group location. They did not arrive at the focus group because most had work commitments and could not afford to meet at the times when most people were available, which is a concern raised in the later chapters addressing work-school balance. Focus groups are difficult to reschedule, and therefore the focus groups were conducted with fewer participants. Regardless of the number of participants, the data collected was invaluable to the study, and I thank the participants for their vulnerability and openness. The complexity of a marginalized intersectional identity such as being Latinx and a first-generation college student separates those experiences from other underrepresented minorities because of the interlayered identities they encompass. Because of significantly low numbers of first-generation Latinxs in STEM programs, this study will not be looking at Latina and non-binary students separately, but all Latinx collectively within the context of being a first-generation college student. As understood by Bernal's Chicana Feminist Epistemology, the research conducted does not look at gender exclusively in this study when observing the experiences of first-generation Latinx students and must be researched more in depth in future studies. Bernal's work encourages that Chicanas be the center of the conversation to ensure that their experiences are highlighted along with the identities that they possess. Acknowledging this framework, this study does not center Latina voices primarily because of the lack of first-generation Latinx students in STEM and the predominately white institutions this study took place at. Although most of the participants in the study identified as women further research must be done to further understand the experiences of first-generation Latinas in STEM since this study did not factor gender as a requirement to participate in the study

and questions in the focus group were not specific to gender. One participant, Edwin did reflect on gender. He found that in his courses most of the people that identified as Latinx in STEM were women, and often he found it challenging to be able to join in group work because there were not many men of color in STEM. He reflected and pointed out this difference because, in the STEM fields outside of college, professions continue to be dominated by men.

Since the experiences that participants were interviewed from were specific to these institutions, one cannot conclude that the results shown here apply to all other institutions. Instead, one should observe the results and replicate the study done here to other institutions to see if the data collected yields the same results. It is important to be able to replicate this study because Latinxs are enrolling in higher education faster than other ethnic group and thus these results may be imperative to the future of Latinxs in STEM.

## CONCLUSION

First-generation Latinx students are not graduating from STEM degrees at sufficient rates. Although these students are showing an interest in STEM at higher degrees than other ethnic groups, they are still one of the lowest ethnic groups to graduate with these degrees. With this in mind, this study questions why there is an educational disparity in degree attainment. The results showed that STEM programs are not retaining first-generation Latinx students and for those that persist, they do so at the cost of more than just educational challenges. Institutions must be held accountable in order to better retain these students as well as improve the graduation rates of first-generation Latinx students in STEM.

## SUMMARY OF CHAPTERS

In the following two chapters I will analyze the experiences of twelve first-generation Latinx students at five different predominately white institutions. Chapter two will follow the educational trajectories of the twelve students before entering higher education and highlight the educational disparities in high school preparation. In the latter half the chapter the narrative shifts to the transition from high school to college and observing the various ways that students were or were not supported in that transition. Chapter three is split into three sections: leaving, staying, and change. Leaving includes the various barriers that students had in STEM and outside of STEM. The students shared why they ended up switching out of a STEM major and also shared the difficulty of maneuvering and surviving at a predominately white institution. Staying includes the stakeholders that made the difference in students staying and persisting in their STEM degree. Many shared that it was because of faculty often women and faculty of color, identity groups, and looking at life beyond college that encouraged them to persist in STEM. Lastly, change includes an extensive amount of suggestions to begin looking at plausible changes that the administration can implement in order to increase retention in STEM. The last section of this thesis includes the conclusion which overlays the importance of this work and contextualizes the need to reform and create changes institutionally to raise retention rates in STEM.

## CHAPTER 2 THE ROAD INTO HIGHER EDUCATION

Coming from various educational trajectories, the participants in this thesis had to sacrifice a lot just to be admitted into their institution, but their sacrifices did not just end there. They have faced many barriers and continue to succeed in ways that often go unrecognized. This chapter will highlight the barriers faced, and how they were supported or not in their transition into higher education.

### THE ROAD BEFORE

The first-generation Latinx participants in the study all came from various backgrounds. Some lived in low-income communities of color while others came from the suburbs of California. With this comes educational disparities and different efforts taken to get them to the elite institutions that they are currently attending. The focus groups reflected one reoccurring theme, the level of readiness for higher education. Whether because of coursework, type of school or college, all but one participant found that they were not prepared for higher education in STEM at their current respective institutions. This feeling of inadequacy was not limited to academic purposes, with students feeling ostracized and isolated during their transition into higher education.

At every institution that focus groups were conducted, students agreed that AP courses did not help with preparation for their STEM courses now. Valeria from Carter's School of Economics (CSE) said, "To be honest, they felt like regular classes but just with AP on it. I think the AP classes were just given more of a workload but not necessarily more challenging. I guess the challenging part was that you just had more homework." This sentiment was seen from Jessica at the School of Liberal Arts (SLA) as well, who did not have to put much effort into her coursework because it was all formulaic. The high school that these students were coming from had not been preparing them for higher education, and it seemed as if these schools were only preparing them

for the AP tests that would help them in college. Francisco of Leadership College adds on his experience, “I think it was just a lot of AP courses, it was not more like learning the material but more like learning how to take the test so you could do well on it.” The issue with this type of teaching is that once these students began taking classes at their college, they had no foundation to build off of and therefore have not been able to transition well into their college. This teaching of the AP test rather than the teaching of the concepts was seen clearly across those who came from public high schools or public charter schools. This is not to say that all public high schools were not preparing their students, but most participants were coming from predominately Black and Brown communities and went to high schools that were majority minority. This speaks to the level of educational support provided to these students from these communities.

Valeria from CSE said the following about her public charter high school:

My school only had AP classes for funding purposes because it was a charter school and so they get outside funding to try to make the school look a little bit better. AP Gov for example, everything we were doing was just in preparation for the AP exam. I mean my school forced everyone to take the AP Gov.

Valeria felt as if her high school was putting the best interest of the school first rather than their students. Julissa also at CSE attended a public high school and shared that she only had to work hard in AP Calc and even highlighted that one student who transferred from her high school to another in the district made it a point to say that the regular classes at the other school were easier than the AP classes at Julissa’s high school. What we are beginning to see is that AP classes are not indicative of how one will perform in higher education, further supporting Hrabowski's (2016) claim, that even those students who performed well, had high test scores, and were ranked amongst the highest in their high school, did not correlate with how they would transition into higher education.

Edwin from Justice College expressed the same feelings of uneasiness, "Coming into college I felt uncomfortable with general chemistry and with physics; I got good grades in these classes, but I did not feel comfortable learning them, and I feel that insecurity really affects your ability to learn." His feelings of not being confident with the foundational knowledge he developed in high school were not limited only to him.

However, this uneasiness was not felt by a few of the participants from the focus groups, specifically those who did have access to private high school education. Maria from Industrial College attended a private high school on a scholarship that catered to Black, Latinx, and Pacific Islander students. Maria explained that she had smaller class sizes and excellent teachers that prepared her for her AP Calc course and "gave her a good foundation in math." This preparation and foundation extending passed the AP test were also seen in Kristen from CSE who also went to a private high school. Kristen described her high school as being predominately white and wealthy, which reflected in her educational experience and resources she had readily available during her time in high school. Kristen explained that her high school teaching styles were different from all of the previous participants and mentioned:

The teaching style was probably more conceptual than regurgitation or like memorization I know they tested if you understood the concept versus just like repeating the words... yeah overall, I think it was difficult, but I do know passing rate was pretty high within all of the AP's that we had at my school.

The educational opportunities that the participants had at their high schools were reflected in what type of high school they attended. AP classes were not the only obstacle that these students had faced when transitioning into the college that they are currently attending. Many of the participants explained feelings of inadequacy; I would often hear them say, "I do not know how I got here." Although they may feel as if they do not belong, it is important to recognize that they

are attending elite private liberal arts institutions and that they deserve to be at the institutions they are at.

However, on the other side, it is the institutions and high schools that do not do enough outreach to the communities that these students come from or support the students in their high schools. Many of the students had not heard of the elite institution that they are attending and would not have if they had not received the support from college access programs, mentors, or outside support other than their high school counselors. Francisco explained how his high school only had ten counselors for a student population of over 3000 and did not receive sufficient support during his time there. He was not a part of any college access program because his sophomore year he did not meet the cut-off GPA to receive extended support from his high school, despite finishing 6<sup>th</sup> in his class by graduation. However, later on, he was able to find support outside of his high school. This clearly shows how students are tracked early on, and only those that show potential at an early stage in high school are supported through the process. This is an issue because, for first-generation college students and even high school students, one may not even know that higher education is attainable and an option if there is no guidance available.

Julissa shared the same experience of having more attention from her high school granted only because she was the valedictorian of her class. Her high school had the similar structure of only believing that the top students of the class had the potential to go to college because "there were only ten students who got a lot of attention and then the rest just did not matter." Her counselor took the time to sit down with her and figure out the schools that she should apply to while also securing fee waivers and financial support for her to apply to college. This support is not seen across many public high schools, especially in California where Julissa went to high school. California is known to have, on average, a counselor-to-student ratio that is 1:1040 and to

top that off, a survey of undergraduates' college decision-making processes , showed that of 1993 freshman, 60% mentioned that their high school counselors advice was not very important to them (McDonough, Korn, and Yamasaki 1997). The counselors are not to blame in this situation, but it is also important that this does not go unrecognized, that the counselor-to-student ratio problem needs to continue to be explored.

Julissa was also a part of a scholarship program that would take their scholars to college fairs which exposed her to different universities. Out of all the participants that attended public high school, this was the trend seen, that only those essentially deemed worthy of receiving college support were granted it. That is, most had to look for outside college access programs that provided them with support outside of their high school because they were not being exposed to colleges through the high school curriculum.

Although the structure of charter schools is different, with often smaller student populations, the structure in terms of college support mirrored those from public high schools. Joel, who currently attends Leadership College, attended a public charter school. What this meant was that he went to a much smaller school than the neighboring high school, but because it was a public school, anyone was allowed to attend. He described the school as bimodal because the school was split between students that were motivated to go to college and others who were not as interested in traditional education. As others have previously mentioned, the school counselors primarily focused their attention on the students that took AP courses and so he received much support during the admissions process. Joel was also in a college access program that supported him with SAT prep and waivers, but he was only one of ten students at his school that received this form of support.

At the public charter school that Valeria attended, this was also the case. She explained that the counselors used the same divisive tactics reflected by Joel and Julissa. Valeria's high school counselor exposed her to the reality of college outside of community colleges, Cal States, and UCs. This exposure was limited only to those students who were in the highest percentile of their class. She mentioned, "You really see the way that teachers and the college counselors treated them and guided them versus students who maybe were not as high in the rankings." Even with the separation and more attention given to those who ranked higher Valeria did not receive sufficient support only as much as starting the Cal State application. Most of her support came from a selective college access program that guided her and gave her exposure to colleges and universities. As we see, Joel and Valeria did not receive the support they deserved despite attending a charter school with smaller class sizes, because all students deserve access to higher education.

Comparatively, Anais a student at Leadership College also attended a charter school in Chicago. She described herself as being privileged for being able to attend a smaller high school that did give her and everyone else the resources and support necessary to apply to college. Her high school had more flexibility in terms of courses and was even assigned a course her senior year solely for meeting with college counselors and brushing through the application process. She explained that they walked her through the financial portion of applying and the network of schools that she applied to held college fairs. The top institutions such as Stanford and Harvard would send representatives to these college fairs, but just like the other participants, GPA was a barrier, and only those who qualified were allowed to attend the info session. As seen time and time again, GPA and the quality of education being received has been a barrier for many of the students who came from both public high schools and charter schools.

Academic limitations to resources were not the only barriers that the first-generation Latinx students faced prior to going into higher education. For Kristen a student at CSE, she described herself as being the “other,” at her private high school, rarely seeing students like herself at her school. She attributed this “othering” to not being the type of student that her private school attracted. Her father had been the custodian at the high school that she attended and said that this is the only reason she had attended that high school and not another. Despite it all, she had been a high achieving student finishing as one of the top students in her class. Although her school did have the available resources, such as having college recruiters come and visit, she was discouraged from applying to top-tier institutions despite having over a 4.0 GPA. She recalled her high school counselor telling her the following, "I am a leader of my people and that my people are behind, and that will be hard to even in the future with a partner to find someone who is adequate enough to be at the same level as me because of how behind my people are." She added that this same counselor told her to only apply to schools that prioritized diversity because that was the only way she was going to be accepted into college. Kristen felt isolated from the lack of support that she received from her high school. From what she recalled; no other student received the same remarks from the high school counselor as she remembers being the only Latina at her high school. Feeling alone, she turned to her sister for college guidance since she had also attended the same high school and was already enrolled in college. Kristen’s sister had also received the same response from the high school counselor who had told her that she should consider attending a city college; her sister is now an alumna of USC. Barriers are presented to first-generation students and continue to be manifested in ways unimaginable and unjust. Assumptions of one’s race and how, “my people” are behind everyone else is something no one should ever have to experience, especially someone who was salutatorian of their senior class.

Of all the participants, Maria was the only one to not report any form of barriers in terms of applying and attaining higher education. College enrollment was an expectation, as the charter school's mission was to prepare low-income minorities to go to college. With her class size only being 60 students, she was able to receive individualized attention from her counselors who were open to speaking to her about college. She described that it was "nice to be part of that community because everybody had the same goal and came from similar backgrounds." Maria was sponsored to attend the charter school and one day she had complained that she was struggling with SATs and her sponsor asked her if she wanted a tutor for her SATs. To that, she responded, "I can ask for a tutor?" This was something that she did not know was available to her and explained that this is something that is probably normal for wealthier people. Wealth disparity can often limit academic resources and adds more barriers to the already preexisting limitations that first-generation Latinx college students face. What does all of this mean? This means that there are layers as to why Latinx students are not receiving the support they rightfully deserve to attend college. Whether it be through insufficient educational preparation in high school courses, inadequate college counseling, or racial and economic barriers, the first-generation Latinx participants have faced a multitude of obstacles while attending the elite predominately white institutions that they are all currently at. According to Berkner and Chavez (1992), data from NELS:88 showed, nearly 25 percent of academically qualified first-generation students did not enroll in any postsecondary institution (two- or four-year) within two years after high school compared to less than 5 percent of students whose parents had college degrees. It is important to recognize that often time it is not that first-generation students are not academically prepared for higher education but instead can be caused by factors they have no control of. Many did not have the opportunity to earn a four-year degree right out of high school, and it is important to recognize

that many other students aren't being supported in a path towards higher education. For those that did have these opportunities, their obstacles do not end there as they continued to face more barriers as they transitioned their way into these institutions.

#### TRANSITIONING INTO THE UNKNOWN

As the first in their families to attend college, the transition into an elite predominately white institution has been anything but smooth for the participants. While they faced many educational barriers just to be admitted into the institution they are attending, the struggles and the new path they are taking does not end there. They have continued as the first in their family to attend higher education and will be the first to receive a college degree. The transition itself has been met with mixed responses with some students crediting their successful transition because of their summer STEM bridge programs and scholarships. Others did not have it as simple, as few have had to figure out how to balance work, lab, and classes as STEM students. Regardless of difficulty in transition, these students are paving the path for future Latinx generations who will follow their footsteps into higher education.

Francisco's transition into Leadership College began when he was invited to be a part of a summer program and cohort that provided him with a stipend, a summer transitional English and math class, and a faculty mentor for future research. As a STEM student, this was important because he was able to build rapport and integrate himself into the lab experience. However, this program that he was a part of was only available for four years because the program had run out of funding. That means that only after the first year, these students were able to participate in the cohort program. The program was funded through the Howard Hughes Medical Institute and could not be renewed. Faculty went to Leadership College's administration to petition to continue the summer program but were denied; and thus, the program was disbanded. Joel was also in the same

cohort as Francisco and added that the bridge program was beneficial in transitioning into higher education. He reiterated that towards the end when the program was starting to lose its funding, there was a lack of support from the institution even though the administration was continuing to support the other summer bridge cohorts in all forms.

At Justice College, Edwin and Yasmine both participated in their summer bridge program called Summer Science Transition (SST). SST is a two-week immersion program for minorities and first-generation college students. Edwin appreciated being a part of the program because he was able to network and maintain friendships with the other 50 STEM minority students who participated. He said:

I built my way before orientation, and so once orientation started I actually felt really cool in that after our long trip like the three day orientation trip, after dinner Magdalena and Marisol, who were upperclassmen from SST came with like some other friends, and they like called for me to go and watch a movie or something and I left my OA group which looked pretty cool.

Edwin alluded to having a secure foundation of friends that he made through the SST program he participated in the two weeks before the orientation for all students had started. Although students at Justice College spend their first week meeting new people through orientation, the uncertainty of finding new friend groups is an added factor to this already entirely new experience for students who are first-generation college students. Edwin was able to dispel this feeling as SST created new friendships with students who were also minorities and as a student at an elite predominately white institutions, it was vital for him to find people he could relate to. He continued by saying, "Before school started, I had already known professors, had made friends from other schools as well, and when it came to studying I could already pinpoint people I have spoken to before and speak to them." Again, Edwin talks about the foundational support he had through SST, and he believes that some students have a problem not feeling welcomed in STEM

or have a terrible experience because they were not a part of SST. One caveat that Edwin mentions is that he wishes that the Krik Science Center would advertise SST more instead of having it hidden on their website. The program has had funding issues before and Edwin suggested that they should invest and expand the program because it was instrumental for his transition into higher education in STEM.

Similarly, Jessica also had a similar experience like Edwin at SST. Her smooth transition into higher education is thanks to SST. She said, "I met a lot of new people when I got here which was comforting and gave me a lot of confidence coming in because I did not have to worry about the social aspect which I feel like a lot of other people might have been challenged by." It was almost as if Jessica's experience mirrored that of Edwin's during their time in SST.

Summer bridge programs were not the only reason why the participants transitioned into higher education so easily; other factors came in forms of financial stability such as financial aid and scholarships. For many first-generation college students, being able to afford higher education is an important part of choosing and remaining at that institution. Laura, a student at the School of Liberal Arts, shared that her school gave her a generous financial aid package and with her outside scholarships she will be able to graduate from the school with her STEM degree and without any debt. Although she would be graduating without any debt, her school did take away her work-study which worried her because she would still have to be dependent on her family for financial support and felt guilty. Institutions must recognize that often times the money that students earn from work-study jobs does not remain with them but is used to support family members back home who may be struggling financially. Work-study is federally awarded money to students who can work to earn that money and use for personal expenses. However, Seymour (1997) writes that

students use that funding from work-study to fulfill family responsibilities and to support financially back at home.

For the other participants, mental health correlated with the financial support their institution gave them. During her first two years, Mariela had been struggling to support herself at school. She described it as the following:

I think my first two years I had work-study and I was very much stressed out about like needing to work many hours, but also needing to study, and also working in lab because I had joined a lab at Krik. It was just a strict schedule to balance and manage, and I think I did it but like at the cost of my mental health.

Although she was able to deal with the intense schedule that she had her first two years, it took a toll on her mental health and that is something to consider when observing retention rates across communities that do not have the luxury of being financially supported by family back home. Mariela considers herself "lucky" for having been awarded a STEM scholarship from Justice College for her last two years there and no longer has to take out any loans or pay for tuition. If it were not for that scholarship, she would still be in the same situation of needing to balance work, school, and extracurriculars. She finished off by saying, "Having work-study is a big obstacle that a lot of first-gen students face because the time you dedicate to working is time that you cannot dedicate to your studies."

Like Mariela, Jessica also had to work many hours in order to make ends meet. She came from a single parent household and explained that her financial aid package has been substantial and that she was awarded work-study to offset any other costs. The tradeoff is that she did not have much time to do her schoolwork and because she is a slow learner could have benefitted from the extra time that she dedicated to her jobs. She mentioned that at one point she was taking five courses, which is above average for the College of Liberal Arts and working two and a half jobs including weekends. Time management was key for her to be able to accomplish all of that, but

just like Mariela, Jessica was put under much stress during this period and was not able to perform as academically well as she would have if she were given time solely for her academics.

Being able to solely focus on coursework is something that Edwin also reflected on. Edwin was also awarded the STEM scholarship that Mariela received his first year at Justice College. When he received the scholarship, he mentioned that it was one of the few times he had ever cried in his life and explained how life changing having his education funded was going to be: “I was able to receive the scholarship and since the beginning I didn’t have to take out any loans or worry about financial needs which made it super easy for me in terms of mental health and I’ve been able to devote my entire time here to basically study.” He also mentioned that the scholarship has also covered his lab fees and offered opportunities to build relationships and rapport with faculty. The scholarship that Edwin and Mariela earned has significantly impacted their experience and their ability to dedicate a majority of their time to their studies, which is often not the case for first-generation college students. However, even if students have to work to support their family back home, institutions may still be able to support these students in other ways.

Yasmine was able to work in a low-stress environment in which the school allowed her to study and work at the same time. She also received a scholarship for Justice College where her tuition was covered for and was even awarded work-study. While some may argue that work-study will force her to divert her time from school work to her job, she explained that she received a work-study job from the study abroad office in which she would not have to do much work and could use the time that she had when not working to study. This was the only reason that she took the job and she was able to support her family while also working for the school.

During Valeria's first year, she had received a scholarship that covered full-tuition with the condition that she majored in both a STEM and non-STEM. For her this was no problem,

considering that she was already invested in becoming a STEM major. However, once she had begun taking STEM classes and realized that STEM was not for her, she could not drop the major because she was bound to the scholarship that she accepted. This was added stress to her because she had to fight financial aid while already having to deal with the STEM classes, she was enrolled in. She described it as the following:

I think it messed with my mental health. I ended up dropping the scholarship, but when you look at the cohort of students that do have the scholarship many of them are students of color who are low-income and probably come from similar backgrounds as me, where they were not prepared but decided to take the scholarship. However, now that they want to drop the scholarship they cannot because they need this scholarship in order to continue coming here.

There are many factors why first-generation college students choose the majors that they pursue. This can manifest in ways that may be out of their control, such as the financial opportunities that they have at the institution they have chosen to attend. Ultimately, many students like Valeria are dissatisfied with the major they pursue and may sacrifice their mental health in order to remain at their college and be able to afford to stay at their institution.

Receiving aid and scholarships is not as easy as it seems, especially at elite predominately white institutions. For students like Julissa, the idea of coming from a poor low-income household was foreign to the financial aid office at her school, and that meant she had to spend a lot of time fighting and explaining her situation. This is how she explained her situation:

My first year I was really going through so much and trying to hold onto whatever I could so that I could stay in the three-two program and at the same time I was fighting financial aid and going into their office all the time. I would leave feeling so defeated, and I remember I would try holding my tears in until I returned to my room to have a meltdown. I remember standing in their office explaining to them how I bought my clothes, how I pay for health insurance, my phone bill, and what kind of conditions I live in because it is impossible to afford to pay rent with the money my mom made. It was absolutely humiliating to have to go through that my first semester at CSE. I have had to go back to financial aid every year because I come from a non-traditional immigrant family. I live in a single-parent household with an immigrant mother and my sister because my father was

deported many years ago. This situation has put my family in a difficult financial situation and having to repeat this every year to financial aid does not make it any easier.

Questioning why someone is poor is not something that someone should have to deal with at an institution year in and year out. Repeating traumatic life experiences such as living in poverty and having your father deported to explain the living conditions you are under is not what an institution should be worried about and what they should be doing is supporting their students who need financial aid and support such as Julissa.

This harassment by financial aid was not only felt by Julissa but by Valeria and Kristen at CSE as well. "They [financial aid] are so unhelpful, and they make you feel like you are doing something wrong for trying to get money the institution promised you. I think the anxiety and stress they make you go through to get that money is just unreasonable and some form of abuse." Valeria has had her fair share of experiences with financial aid at CSE of which all have been stressful and made her jump through hurdles to receive the money she has rightfully been awarded. Kristen had a similar experience to Julissa when having to describe her family situation:

I do not think they [financial aid] are prepared to deal with students coming from very particular households and I think they need to be more accepting and open to those households. I come from a household where my dad is self-employed, and my mom is disabled, and I think they should not question if someone has a disability. That is something that I had to clarify for the first three weeks of school, and it is something that they almost did not believe. This is something you do not need to be proving yourself for like that is already a sensitive topic I think they should know that the first five times is enough. They need to think of the student's mental health, sometimes it feels like harassment.

Kristen had to explain in detail her household situation, especially with something as sensitive as the situation with her mother is not something she should be questioned about from financial aid. As Valeria mentioned earlier, the financial aid office is supposedly there to help the students, but reflecting on hers, Kristen, and Julissa's experience, it seems as if the office only really has its best intentions for the institution and not the students.

Financial barriers continued to manifest in various ways for the participants. Francisco was not able to enroll in his courses because he was not able to pay his tuition. He says:

I do not expect my parents to pay for tuition because they have enough to deal with at home. I think what was discouraging is that Leadership has this policy if you do not have your entire account paid for, they will lock you out of your account before registering for classes, and that is horrible because it is classist and getting into certain classes is important for your major. I am not registered and my existence for next semester is not technically secured, and I remember a lot of people were talking about that this semester where Leadership was locking accounts and students were not going to be allowed to register.

This added stress is another that first-generation college students like Francisco have to deal with. The difficulty of having to navigate around having holds on his account because he has to pay his own tuition are unnecessary institutional barriers often neglected by financial aid.

As a first-generation Latinx student, venturing into higher education is something entirely new for many. With this in mind, students have been met with many obstacles to be able to attend their institution and have continued to embrace and navigate higher education in its entirety. Now that majority of the participants have had some form of grounding in their higher education journey; the following chapter will analyze their experiences and reasons for leaving or persisting in STEM.

## CHAPTER 3 STAKEHOLDERS FOR LEAVING, STAYING, AND CHANGE

Navigating through higher education as the first in your family is no small undertaking. With many barriers faced as first-generation and Latinx. The participants in the focus groups were candid in why they decided to stay or leave their STEM program at their respective institution. They were torn between leaving or staying. This chapter will explain in-depth their experiences as instrumental in the decision to ultimately continue or leave STEM programs. Reasons described for leaving included: Imposter Syndromes<sup>3</sup>, lack of academic support, and isolation. For those who continue in STEM, often it was dependent on faculty who did reach out and support, self-awareness through their first-generation Latinx identity, professions in the medical, and the broader implications of being a STEM major, and teaching style that professors adapted to the classes. Many times, it is not isolated events, but the environment that students are placed in that support or push students away from performing to their full potential. Lastly, but most importantly the students offered their advice on how stakeholders can make a difference in their education to best retain not only them, but future first-generation Latinx students in STEM.

### LEAVING

The participants of the study all entered higher education intending to major in STEM. However, barriers such as Imposter Syndrome, lack of support across all institutional levels, the feeling of being isolated, and other barriers eventually, led them to drop out of STEM into a non-STEM major. More attention must be focused on these students in order to better retain them because having students switch out of STEM for non-academic reasons is not something institutions should be turning their eye from. Imposter Syndrome is commonly seen across first-

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<sup>3</sup> The persistent inability to believe that one's success is deserved or has been legitimately achieved as a result of one's efforts or skills.

generation college student community (Davis 2012; Gardner and Holley 2011; Stebleton and Soria 2013). It was seen and felt by all the participants in the focus groups, and many continue to feel it even in their final year as fourth years. Julissa expressed that she feels as if she does not belong at her institution: "I feel like that literally every single day... I do not know I think about it every single day like did they just slide my paper to the right and accept me on accident or something because I do not know why the fuck I am here now." She believes that her acceptance was accidental although she was the valedictorian of her high school and will soon be graduating from Carter's School of Economics. For Valeria who also attends CSE, she felt Imposter Syndrome because of her educational background and lack of opportunities in comparison to the other students at her school. "My high school did not have any music programs, we did not have a cafeteria and sat in the parking lot eating our food because, at the end of the day, my high school was a tiny shoebox of a school." Going to CSE means that Valeria attends a college with students who came from elite private high schools and for her, she felt out of place because her high school was not private and did not have the resources that she noticed other students clearly had coming in. Albeit, Kristen also went to a private high school but did not have the same experience as those who attended her high school; Due to the fact that she was Latina at a wealthy predominately white high school.

I always worked hard since I was younger because my dad was the janitor of my school, so I had an understanding that I had to be known to work a certain level just to be at the level of the other students that were all predominately white at my school. Their parents are in the one percent of the United States, but you know I was trying to make the top of my class because I would be in class and outside the window was my dad cleaning the bathroom or classroom. I have an understanding of being the other... when I came to college I questioned if I got in because of my GPA or cause of my extracurriculars or because of my ethnicity and it was something that I continue to question after coming to CSE.

Kristen's Imposter Syndrome had her internalizing and questioning whether she was only admitted into higher education because she was a minority. This feeling of filling in a diversity quota reflects what she mentioned in chapter two when her high school counselor at a predominately white high school essentially told her that she was not ever going to do well at an institution unless she was admitted because of her race. This internal questioning of being accepted because of her accolades or ethnicity linger on within her to this day, even weeks before graduation.

Attending an elite predominately white institution meant that some of the participants had faced some form of culture shock<sup>4</sup> as they began attending institutions with different student demographics that they are not accustomed to being around. For Valeria, she felt Imposter Syndrome the moment she stepped foot at CSE. She shared the following story:

I think before coming to CSE I did not even know what it was to like to be the minority. I think cause my school was all Latinos, it was all Black students. My community was all Latinos, all Black students. Everywhere I went you would hear people speaking Spanish and so I never thought about it I did not know what a PWI was I like knew that it was hard to get into these schools, but I did not realize what it would be like to be a Latina student here. It was move-in day, that is when it hit me. I was in the dining hall with my parents, and some people were sitting down at the table, and my dad was kind of like those people look familiar. I was like dad who are you going to know here? [my dad is a gardener] He was like I think I used to garden for that guy like ten years ago and I was like there is no way that you did, and so my dad being my dad went up to him and introduced himself. Hey I'm Rodrigo like I feel like I worked for you a while ago and like smallest school in the world and like turns out he did know this dude, my dad gardened for this dude ten years ago he was sitting there with his wife and his son who was also a first-year and that's really fucking weird. That is like what am I supposed to make of this. So, then I go we have our little orientation group meeting, and their son is in my orientation group. It was not until that moment where you realize, shit, you are way up here, and I am way down here, and I get that now we are in the same spot, but it was a weird feeling being there.

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<sup>4</sup> the feeling of disorientation experienced by someone who is suddenly subjected to an unfamiliar culture, way of life, or set of attitudes.

For Valeria, being at CSE was foreign to her. She had grown up in a Spanish speaking neighborhood in Southern California where the majority of the people in her community are Black and Brown. She was exposed to racial and class differences the first day she moved into CSE. This is seen from the interaction she had at the dining hall with her father and his former employer. It had been years since her father and the man whom he worked for had seen each other, but nonetheless, this culture shock encompasses the interactions and feelings of other first-generation Latinx students who attend elite PWIs. She compared herself to being at the bottom of society and that man's family and son at the top due to different race and class statuses between the two families. Often it is not that students cannot succeed in school, but when you are put into environments that induce higher levels of stress because of cultural differences, it can make succeeding academically that much harder.

Imposter Syndrome is not limited to the students at CSE but was felt by all the participants across all five institutions. At Leadership the participants have felt a more hostile competitive learning atmosphere in their STEM courses. Joel who is a part of the STEM cohort for minority students at Leadership, remembers students who were not in the cohort telling them that they were glad they were in the "easy" course and that now they will be able to perform well in the class. The reality is that the students who were in the cohort section actually had the professor that was known to be the most difficult. Francisco added on that these same students would question why there was a cohort to begin with and complained that the minority students in the cohort are not deserving of having a STEM cohort for them. Educational disparities and needed support for those who did not have the same amount of support is frowned upon and not understood by students who had come from different educational backgrounds.

Edwin at Justice College felt Imposter Syndrome early on when he was in his general chemistry course. He had feelings of inadequacy when his friends told him about the type of education that they had before enrolling at Justice College. However, the turning point for him was when he realized that everyone was struggling in his chemistry course and it was not just him. "The moment you realize everyone is struggling it makes you feel better about yourself." This feeling of everyone struggling and struggling together was not the same sentiment Yasmine felt in general chemistry. "I was not welcomed and did not belong. For example, when I would go to lab nobody would work with me and well the majority of the class was white and assumed that I did not know what I was doing. I often had to do the group work alone." Unlike Edwin, Yasmine did not have to the opportunity to struggle together with her classmates because they would not pay attention to her, resulting in her having to do group work on her own, inducing feelings of isolation. Nonetheless, this isolation did not stop her from producing good exam grades and excelling in her course.

Passing courses and achieving good grades can be difficult when there is not enough academic support to succeed. Maria explained that there is a lack of support for students to receive mentorship for course material. She explained that tutoring was only available for students who were on academic probation and so this means that only when a student is failing will they receive help. Continuing, she mentioned that the tutors are not helpful because the prerequisite for these students to even tutor is that they had passed the course with an "A" when they took the course. While students may have passed, this does not mean they know the material enough to teach it. This was the same form of tutoring being held over at Justice College with Edwin:

I believe there is no mentoring, they have tutoring which is nice but a lot of it is by students as well, which is good and bad in that they can be a lot of like informal help which can be useful if you are afraid to speak to the professor. However, likewise, it is students who have done well in the class before and it has often been a while since they have learned the

material. I've been a tutor before for biology and I will tell you right now that I was one of the worse mentors because I knew that mentoring wouldn't affect me and I would try to teach the students the material through multiple methods, but at the end of the day if the student didn't understand it, I would just say that I honestly tried my best and leave it at that. I know that this is bad, but this was the mindset of the majority of the tutors.

Edwin's honesty speaks to the flawed academic support system that Justice College has for their STEM students. This lack of support for those who do not understand the subject matter makes it that much more challenging to do well in courses where support is not accessible for STEM classes outside of the professor. This lack of outside support led to some of the participants feeling isolated when pursuing their STEM degree.

Isolation is something that Maria has felt both in the classroom and outside within the Industrial College community. She explained that she had studied abroad, but upon returning she did not have any of her closest friends left. One of her closest friends had dropped out of Industrial College entirely and the other two were ineligible to return. Hearing her experience about being isolated at school not only spoke on the difficulty of being Latinx in a PWI but also spoke volumes about the push-out that students of color feel in higher education, as seen here by three of her closest friends who were all students of color. Maria felt lonely as she finishes up her last year at Industrial College since her closest friends were no longer with her at the school. This isolation as a first-generation Latina carried over into her classroom experience.

I had this conversation with some of my friends and sometimes you will get up and well not get up but look around the classroom and this is really bad but there is really no Latinos at Industrial, and if there are, they are mostly white-passing. You would not even know, and you look for those who are brown-skinned but there really are not any. I do not mean it in a demeaning way because those students are very much Latino, but just because there are Latinos that does not mean I necessarily connect to them.

The in-class isolation that Maria felt is multi-faceted and complex. At the base of it all, the lack of physical representation in STEM has been an obstacle for Maria. As seen in the Steele and Aronson (1995) article, the lack of representation in a classroom can cause doubts of belonging in

the sciences, and this was the case for Maria, often feeling Imposter Syndrome about being capable of completing her degree in engineering. Isolation is not only felt between the community and in classrooms but can manifest in the interactions with professors. Maria had trouble reaching out for help in her courses and the one time that she did, she was humiliated and did not go back for help after that. She said, "I have been having a hard time asking for help...I was lost and looked like an idiot, I remember the professor was frustrated. He asked, 'why don't you know this? Why are you coming now with such a basic question?' I never went back." She explained that it was a white professor who said these comments to her and made her feel terrible. After that experience, Maria refused to go to office hours to receive help in her classes, which resulted in her doing poorly academically. She described it as being in a cycle and not being able to get out of the cycle until her senior year; she finally decided to go and seek help from her professor who was a woman and much more accommodating than her previous professor who was a white man.

## STAYING

The participants who did remain in STEM and those who did, unfortunately, end up leaving shared experiences about what had helped them in their academic trajectory while they were still in STEM. The most important, and reoccurring form of support was through faculty members. Students also expressed that exploring their identity, seeing the end goal of why they were achieving a STEM degree, and different teaching methods all served as supporting factors in their success and willingness to continue in STEM.

Joel and Francisco on multiple occasions spoke about Dr. Oak and how her willingness to support them was critical in their choice to remain in STEM. During his first year, Joel was not doing well with his STEM courses and was at the point of dropping out. He told himself he would give it his all one more semester and if he did not do well, he would switch and try out a different

major. During lab tours he noticed that Dr. Oak's lab was welcoming and cared a lot about her students. After the tour, Joel reached out to Dr. Oak regarding research positions and soon after she offered Joel a position in her lab. He was able to gain research experience as well as to use work-study money from lab work to support himself financially. Because of this confidence she had in him, Joel has been able to succeed in STEM and thanked Dr. Oak for her support. Francisco had a similar story about Dr. Oak:

Dr. Oak had confidence in me, even if my academic work was not at the same level of caliber as the other students. She would give me the benefit of the doubt like maybe something else was going on, or she would not just automatically assume that I was less intelligent or capable than the other students. She made sure to give me more resource for support.

This added support from Dr. Oak was crucial for Francisco because Dr. Oak understood that Francisco needed more resources to be successful. Dr. Oak was empathetic towards other students of color too. She encouraged students to participate in class and was respectful if a student did not answer a question correctly. For Francisco, what separates Dr. Oak from other professors at Leadership is her willingness to learn about her students. According to him, she is culturally competent and willing to learn about him outside of the class. She learned about his deep interest in the drag queen culture and was one of the few professors that he knew of who attended the optional workshop on DACA and how to be a support system for students who identify as such. Although Francisco does not identify as DACAmented, it is important to see that there are faculty members like Dr. Oak who are invested in protecting and caring for their students.

Maria, who has had a difficult time at Industrial College finds support and refuge in the few faculty of color on campus. One faculty member, Dr. Sanchez, who is an Industrial College alumnus returned to back to Industrial after receiving his Ph.D., and whenever he sees Maria, he would say, "Hola" or "Adios" to Maria. While only a small gesture, for Maria, this means a lot to

her and is comforting for her. Although he is not her professor, she stops by his office to talk about life at Industrial and enjoys her conversations with him because he understands the experiences that she is feeling and can relate to them back when he was a student at Industrial. “I feel comfortable around professors of color and women,” she even began performing better academically because she started going to office hours with a professor who identifies as a woman. As we have seen with Maria, Joel, and Francisco, professors who are empathic towards their identities and lived experiences, have made a difference in their STEM experience.

While professors contribute to the success of the students, students expressed that finding support through friends and communities tied directly to their own identity have been beneficial to their continuation in STEM. Laura found her community within her on-campus organization called Café Con Pan. She found other Latina students who identified as first-generation, and although they were not all in STEM, she had people that she could relate to in that way. Jessica felt the same way when she described her experience in Café con Pan. She not only found her mentor through there but also found more community when she was a part of the Summer Science Transition program her first year. She also credits the Black women on campus who have been mentors and friends to her, especially Tatissa, who was a brilliant student and researcher at the School of Liberal Arts.

At Justice College, the students there also found support from other first-generation Latinx students. Mariela who now holds a leadership position for her first-generation club on campus mentioned that this group was why she felt welcomed at Justice the moment she stepped onto campus. Her sophomore year she met another first-generation Latina in the same science department as her and became close to her. For Mariela, this was important to find someone who

was not a white male in which she could confide and study with because the student she met understood the complexities of being a first-generation Latina in STEM.

However, not all of the participants bonded over the camaraderie of being first-generation and Latinx. The Leadership College participants explained that it was the stress of courses that unified them. Anais explained that finding her Latinx community on campus was not difficult, but it was the stress and all-nighters that she pulled with Joel and Francisco that got her to become so close to them. Broadly speaking, this is a double-edged sword, while Anais is able to connect with the others, the basis of their friendship should not be because they are having to stay up all night doing coursework which highlighted an issue at Leadership. Nonetheless, they were used to spending a lot of time together because they are a part of the same STEM cohorts at Leadership for first-generation minority students. Because they are able to take courses with other minority students, they have been able to maneuver through STEM and build close networks with other students that they have shared identities with. The cohorts were also helpful because they were assigned professors like Dr. Oak who was understanding and empathetic towards first-generation students. Through his cohort, Francisco received a stipend, free courses, and a faculty mentor the summer before he started at Leadership. This program shaped his experience in STEM and solidified his decision to stay in STEM because he was being supported institutionally by his school.

Others such as Kirsten look at being a Latina in STEM holistically and what that means not only for those who look up to her but what that means for her community as a future physician.

One of the things that motivate me is the fact that I am one of the few Latinas in the STEM department and hopefully the freshmen that are coming in can see that a senior has made it through the other side. I tell them that they have to keep going because I am proof that it is possible and that they can do it. They are what motivates me, even when I am at home. Keeping the end goal in mind has also sustained me.

Kristen sees the younger generation of students at her school as motivation and hopes that she can be a role model to them as well. She also mentioned that keeping the end goal in mind was important to her, which for her is medical school and eventually to practice as a medical doctor. Her desire to become a doctor is fueled by her interaction with a surgeon when she had to become a translator to her grandmother and tell her that her grandfather had to be taken off of life support because the doctor could not speak Spanish. She experienced first-hand this lack of cultural competency in the medicinal field, and she hopes to one day be someone in the field who can disrupt that narrative and make healthcare accessible to all communities.

Similarly, the other participants are looking forward to putting their STEM degrees to use for their communities. Edwin plans to attend medical school after graduating from Justice College. His degree will not only be for him but for his family and plans to use his education to uplift his community through health. Yasmine plans to use her degree in STEM to research problems around health in Latinx communities. She is interested in looking at diabetes and “why it occurs in the populations that it attacks.” Although Jessica originally wanted to be a medical doctor, her vision has changed and now wants to pursue a career as a healthcare provider and is looking forward to leaving the School of Liberal Arts to continue down that educational path.

To get to that point of graduating and moving forward in their career trajectory the participants pointed out different teaching pedagogies that were crucial in their educational success. Since not all students learn in the same way and form, it was important for students to be able to explore different teaching methods that professors instilled into their classrooms. For Maria who already felt alone and isolated in her STEM courses, being enrolled in an engineering course that was flipped was beneficial to her. This meant that she would watch the lectures on her own and get quizzed on the material from the lecture. If she had any questions, she would be able to go

and talk to the professor after class. It helped her a lot because she often does not ask questions in class because she does not want "to look stupid." At Leadership Francisco has thoroughly enjoyed the active learning that professors have taken on. In Dr. Oak's course, she implemented more active learning, visuals, and group work which supported his learning process. The group work was important for him because he said his attention span was longer and he was able to learn more because not only would he have to share with his group he would learn the material from a student's perspective. Joel added that his school implements learning communities in which a student is hired to teach the material to students who are currently in the course, similar to the supplemental instruction mentioned in the literature review. These were beneficial to him because he could ask questions and receive help in a smaller more intimate learning space.

On a more institutional level, Edwin and Mariela also chose to attend Justice College for their smaller class sizes. Since Justice College is a liberal arts college, the class sizes are much smaller even for classes in STEM. Mariela enjoys that before exams, professors will host reviews sessions in a smaller group setting where students can ask questions on the exam or homework. This form of review sessions is similar to the peer-instruction methods that were used at Harvard. Edwin also appreciated that smaller class sizes led to more group work between students and that the professors were able to readily meet more often with students if they had any questions or concerns with the coursework.

The support that the students have received from their institution has come in various forms, whether that be through individuals such as professors, students or affinity groups. They also persisted through keeping the end goal in mind and appreciating that professors initiated various forms of instruction to support their learning process. Nonetheless, these students had many suggestions for various stakeholders in order to best retain students into STEM.

## CHANGE

To conclude the focus groups, all participants were asked what they believe will be instrumental in increasing retention of first-generation Latinx students in STEM. To emphasize the importance of each participants experiences and suggestions all of their experiences will be implemented and categorized by the institution that they attend.

Maria of Industrial College suggests, for one, hire more faculty of color. As shown through the various sections, having faculty of color, and more specifically, those who are empathetic and understanding of student's background and lived experiences has proven to be supportive of all participants who continued in STEM. She continues to share that core courses need to be re-evaluated because they are creating unnecessary pushout especially when students are just beginning to discover what exactly they want to study. In particular, her physics department prides itself in the fact that they are a rigorous department and argues the competitiveness is unnecessary and has kept students from learning the course material. Lastly, she offers that the institution needs to create a mentorship program for first-generation college students because she thought that there were many more first-generation students at Industrial and turns out that there is not. For her, representation has been important, and to see that there are so few, meant that she could potentially see some form of support or mentorship program with the few that are at Industrial College.

The implementation and continuation of mentorship programs is a concern of students at the College of Liberal Arts as well. Laura who did not participate in the SST Summer bridge program but wished she had, suggested that the program continue because she has seen how effective it has been. She raised an important point about not ending the program after the first year, but instead, continuing programming and keeping the cohorts together throughout their four years, similar to the cohort system at Leadership College. On the same topic of the Krik Science

Center at the College of Liberal Arts, Jessica suggested that there be a dean specifically for the Krik Science Center. This dean would help all students in the department but could also specifically support minorities and first-generation college students, who come from educational backgrounds that had limitations. She continued and generalized that there needs to be an extra person there who could design some mentorship program or further guide students to being successful at Krik because Jessica and many others have had to navigate their department entirely on their own. This lack of support past the first year was observed at Leadership College as well.

“Leadership needs to do a better job in keeping up with the support after freshman year because you can argue that some of the programs have higher retention rates in STEM.” Francisco who was part of the retention program that was defunded was not able to have the same support that other programs at Leadership provide to their students but seeing how other retention programs are successful proves that Leadership needs to invest more in all of these programs, not just a few. He believes that the cohort system has done well but is disappointed that the core courses are only in place for the first year. “When you no longer have cohort courses, the students are dropped into organic chemistry with a ton of white students who they have never interacted with because they were taking courses in the cohorts.” Francisco believes that cohorts should continue together or transition students easier rather than being placed in a completely different class dynamic. To him, these cohorts are advertised as a tactic to make students believe that Leadership is diverse and inclusive because when the students raise concerns about who is teaching the cohort section, administration turns the other way and does not address concerns. For example, Francisco heard many complaints from one of the chemistry professors, Dr. Green, because his courses were so difficult that a 40% on a test would earn you a "B," with a curve so large, he argues that students were not even learning in the course.

Even within the cohorts, Francisco mentioned that those in the cohorts need to be inclusive of other first-generation students who for some reason were never put into the cohort. Students need to reach out to those students and be more intentional in creating community within those who were excluded, to begin with. Alternatively, the institution needs to do a better job of recognizing those who are not in the cohorts, because as Francisco mentioned, Dr. Oak pointed out that not all students were in cohorts in her chemistry courses.

Adding on, Joel suggested that the entire general chemistry course that Dr. Green and other faculty teach at Leadership needs to be reconsidered. For one, removing the competitiveness of the course and making it more collaborative, or even offering different forms of teaching, because lecture-based learning may not be the best method for all students to learn. Joel agrees with Francisco in that the first year cohort students should not suddenly be thrown into the organic chemistry course without other cohort students. More broadly, Leadership needs to do a better job of explaining to faculty and students what precisely the cohorts are because there is confusion across all parties. Professors need to understand that they are teaching students who are often first-generation, low-income, and minorities in the cohort sections and therefore need to have some form of cultural competence and empathy towards those who had limited educational opportunities. As for the students, they need to know that the cohort sections are not "watered down" and that they are not easier than regular courses, Joel argues that if that were the case why would Leadership assign Dr. Green as the cohort professor who is known across campus to be the most difficult chemistry professor at the school. Comments and remarks about the quality of education being received in the cohorts also affect the cohort students because many already do not feel welcome at the school. To finish off, Joel, argued that it is not the cohort students that are the ones who are receiving the most support. He gave the following example:

Leadership gives so much leeway for students who are not low-income or first-generation. For example, there was this one professor whom everyone wanted to take organic chemistry with, Professor Lenny, and there was another that students did not like Professor Simpson. Virtually impossible to switch courses, this girl whose parents are engineers and have college degrees came for parents' weekend, and they saw Simpson teach and were able to convince staff to switch her to the other course with Lenny. I do not know why staff are not giving everyone an equal chance. If she is stuck there, she should be stuck there. If nobody else is given a chance to switch, I don't know why she was able to.

It is imperative to understand that in order for programs like the cohort system to retain students better, not only do the cohort students need to support themselves but so do faculty, administration, and the rest of the student body, in order for cohorts to function in their entirety.

Justice College participants agree in the sense that institutions need to institutionalize and understand the backgrounds of first-generation students. Mariela suggested that they implement more programs like Summer Science Transition (SST) and more research opportunities for minority students to expose them to STEM outside of the classroom setting. She also touched on the topic of not being able to do lab work and work-study, she suggests that students should be able to earn course credit for labs or be incentivized through work-study. For her, it was important to know what professors were supportive of her first-generation identity because being first-generation in college is not something that can be seen on a person. Something as simple as a professor announcing in class that they are allies to first-generation college students allows for students to know to feel comfortable in talking to that professor and disclosing their concerns that are tied to their identity.

Edwin was also in agreeance that professors should actively announce that they are supportive of minority students or students that are first-generation. It is important for professors to establish this early on because that is where it matters most, to know that students can look towards support from faculty. He explained that he had a professor that emailed their students weeks before the course started and asked their students what three things the professor should

know about them, and then she would respond to the email acknowledging what the students had written. Something as little as that created transparency in what the professor should know about the student and they could disclose that they are first-generation and thus have a conversation with professors on how they can support them in their education. Yasmine added that it is important for professors to acknowledge when their students are hurting.

I had one of my STEM professors last semester address the political climate when Trump denounced DACA before starting class, and we had a moment of silence, and that made me feel comfortable in that space and thankful for acknowledging that.

For Yasmine who knows people who are beneficiaries of DACA, it was reassuring to know that her professor was willing to take time out of the class to reflect on issues that affect students at Justice College.

Lastly, Carter's School of Economics had many suggestions from the three participants. Kristen feels that her school does not have the intentions of supporting students of color. There is no alumni network or mentorship for students of color who need support in the career path that they intend to pursue. For Kristen, it has been difficult for her to feel supported to pursue medical school because she has not been able to afford any test preparation material for her MCAT and other qualification exams. She is hopeful that someday students will be able to receive aid in the form of financial support from CSE to pursue the career of their choice. Kristen has also invested between one to two thousand dollars on lab fees and lab equipment. This is money she did not know she had to invest and wishes that there was some form of financial aid or scholarships that would cover these costs because over time this money does accumulate to substantial amounts.

For Julissa, she wished that she had some form of tutoring when she was in calculus and physics and to receive help without being judged. Even as a senior to this day she has to justify that she came from a public high school and is questioned why she does not understand her work

rather than receive the help that she deserves. In agreement with other participants, Julissa wants professors to have some form of cultural competency because it is not fair to her to be treated differently because she is first-generation and Latina.

Valeria has had a traumatic experience at CSE. She reflected on her observations of the focus group and highlights that they should not have been crying and describing their experience in STEM as torturous and traumatic. Kristen added on:

I remember seeing you (Valeria) from the outside and I saw it tore you apart from the outside I cannot imagine what it was doing to you in the inside. Obviously, it was stressful for me, but I could definitely see it in you.

Continuing, Kristen suggests that students like Valeria should have received some form of disclaimer that STEM can be stressful and if they need some form of support, there is Monsieur and other resources to protect your mental health. Transparency for students in STEM is important in order for these students to be able to navigate the resources available to them.

Julissa finishes off with her feelings about CSE and how these feelings are typical to a lot of first-generation college students. She said:

I feel like Valeria, you've seen me the most these last two years but like my first year like I had no one and like I remember taking my midterm for calculus and after it some kid came up to me and was like that was so easy and I walked to the middle of the field and called my sister and told her that I'm dropping out and I was so ready to drop out. I did not and she convinced me not to. You are right it was torture and those are things that I still carry with me every day and I still do not know why I am here. Every day I struggle to go to class and I do not know like these are not feelings we should be having. I do not even want to walk at graduation and like I hate this place so much and that should not be a thing.

These powerful emotions are not limited to Julissa's experience at CSE. It is without a doubt that many other students feel the same way as Julissa and is why we see low numbers of first-generation Latinx students staying in STEM and in higher education. There needs to be much more support for these students, and we need to prioritize those voices that are affected the most. There is potential to improve retention rates and the overall health of these students at institutions

that do not do enough for them, the time is now to make a difference in the lives of these individuals, and future first-generation Latinx students in STEM.

## CONCLUSION

Retaining first-generation Latinx students in STEM is an issue that needs more attention. As we see an increase of Latinx students enrolling in higher education, we should also be seeing higher rates of degree completion, but unfortunately, this is not the case. As observed in the literature cited before the focus groups conducted, six reoccurring themes were observed: high school preparation, stereotype threat, financial concerns, self-awareness of identity, various teaching methods, and institutionally implemented programs. These themes split between positive and negative factors were used as the basis for the qualitative study conducted. The study included 12 participants from five different predominantly white institutions: Justice College, College of Liberal Arts, Industrial College, Leadership College, and Carter's School of Economics. While all five schools have an emphasis on different disciplines, all five offer STEM degrees with three of the five schools sharing a joint science department, called Krik Science Center. All participants were interviewed in focus groups and lasted anywhere from 45 minutes to two hours. The focus groups were semi-structured guided by the reoccurring themes researched beforehand. However, the participants were not limited to the questions in the study because it was important for me to make sure that students were guiding the interview. The purpose of the focus groups was to highlight what they feel has not been working at their institution and to give them a platform to make sure they can express what they believe needs to be done to improve retention in STEM.

The results from the study aligned with and added to the previous literature. The discussion of results were split into two chapters: Transitioning into Higher Education and Stakeholders in Leaving, Staying, and Change. The former chapter encompasses the experiences of the participants both prior to and after entering into higher education. During the section on high school preparation themes around AP courses, not being academically prepared, and the lack of counseling were all

barriers discussed for the majority of the participants. This section profoundly highlighted educational inequities through the different educational systems that the participants came from, such as private, public, and charter high schools. Within this section, it was evident that participants who came from a public high school had to put in much more effort in order to receive the same support that students from private schools were receiving. This translated into how well the participants were able to adapt to higher education. Many gave credit to their summer bridge program for their successful transition while others dealt with financial concerns as the lingering issue for why they were not able to fully thrive in higher education. This was accompanied with having to sacrifice mental health to have some form of work-school-life balance in which many did not have the luxury of doing as students who had to support not only themselves but their family as well.

The final chapter holds the most important information in which stakeholders can learn from students who are in STEM and not thriving as well as they should be able to. *Leaving* speaks on the experiences that eventually pushed them out of STEM and to the brink of dropping out. Participants spoke on Imposter Syndrome, which is something that all participants felt at some point, and few seniors continue to feel. The lack of support that they felt across all institutional levels caused these feelings of not belonging to magnify. Finally, the feeling of isolation lingered among many throughout their time in STEM. Students would cry because they felt as if they did not belong and felt inadequate, which were common feelings expressed by individuals across all five schools.

Although leaving outweighed the staying feeling of why students remained, *staying* speaks on what the participants believed to be the key people and programs that helped students continue in STEM. The students gave credit to individual professors who were culturally competent and

expressed empathy, by stating that they were mainly the reason why they continued to stay in STEM. Others were able to hold onto their desire for STEM by keeping the broader picture of becoming doctors or healthcare providers in mind. Most importantly, the students expressed that they were not able to do it on their own; they were able to persist because of the support they received from their first-generation and Latinx communities. After expressing why they remained, the students also expressed their suggestions to better retain students in their institutions.

If institutions want to continue retaining students in STEM, it is vital that they consider these suggestions because it is the students that are the ones who understand their own experiences better than anyone else. They are the ones who are asking for help and the institution, administration, faculty, and other stakeholders need to listen. *Change* is divided up into each institution to highlight what each institution individually and collectively must do to support their current students and future STEM students further. Suggestions included the need for more faculty of color in STEM and specifically faculty that are culturally competent and are empathetic towards those that identify as first-generation and Latinx. Another important suggestion included was the intentionality of the institution and lack of bridge and retention programs. It is not enough to advertise the diversity and inclusion of these programs if those who are in charge do not listen to the feedback that students are providing for improvement. Often the reason that the cohort programs had been successful was because of the labor of professors of color and specifically women and women of color who taught in STEM.

It is important to continue working towards the support of first-generation Latinx students. As a student who started as STEM my first year and switched to a non-STEM major, the experiences that the participants felt all resonated with my own experience in STEM. This thesis

allowed me to reflect on my trajectory and validated not only my experiences but of those that participated as well.

This work is important because it builds off of previous scholarly literature. To see that this thesis is in accordance with the previous literature is important to note because although this study centered first-generation Latinx students, many studies have a variance of the institutions that the studies are conducted at. To observe correlations between previous studies is important in order to solidify results and create institutional change.

As we see Latinxs enrolling in higher education at the highest rates in comparison to all other ethnic groups (Anon 2017) and continue to rise, we must recognize that these students need to start receiving more educational support. It is not enough for these students to enroll in higher education; there needs to be an active effort across all stakeholders to start supporting these students to attain a college degree. If institutions want to see change, they need to actively recognize that they are doing an injustice to students of color in STEM and specifically those who are first-generation. Institutions must be open to criticism and feedback if they want to truly support their student body. The experiences of these students in this study are not isolated events. Institutions must begin to listen, starting with the voices of these twelve students.

## APPENDIX

### FOCUS GROUP GUIDE

#### SECTION A: HIGH SCHOOL PREPARATION

I will begin by asking questions about your high school experience.

##### A. Academics

1. How challenging were your courses? AP Courses?
2. How much effort did you have to put into your courses to receive good grades?
3. Could you talk more about the teaching methods that your teachers used? For example, were courses memorization, discussion, practical, etc.
- 4.

##### B. College Support

1. Did you all have a college counselor that guided you through the college process? How was that?
2. Did you have college recruiters attend your school? College fairs?
3. How was your experience with your high school supporting you in where you are now?
4. Were you apart of a college access program? Was it within school or an outside program? How did that help with the college application process?

##### C. STEM

1. Why did you decide to major in STEM?
2. How prepared were you for STEM classes in College?
3. Were you apart of any STEM-related programs outside of the classroom setting?

#### SECTION B: STEREOTYPE THREAT

Now, I will ask questions about stereotype threat within the institution and STEM classroom setting.

##### A. Institution

1. Have you ever been questioned as to how you got to these institutions? If so, how often and what is your reaction?
2. Do you often question whether you belong at these institutions? Have feelings of Imposter Syndrome? Why?
3. Would you say your confidence is affected by your day to day interactions at a PWI? How do you would feel if you were at a MSI, HIS, or HBCU?

##### B. In-class

1. Have you ever felt like you are reaffirming a stereotype because you are not doing well in your STEM course?
2. Have you ever been considered the token Latinx in your classroom?
3. How often are there students like yourself in your STEM classes? Professors of color?
4. Do you feel like it is your fault that you are not doing well in your STEM courses?

5. How are your interactions with your professors and peers in your STEM courses when you seek out assistance?

### **SECTION C: FINANCIAL ISSUES**

1. Are you on financial aid? Do you feel like your school has been generous with your financial aid package? Do you have scholarships? How much does it cover?
2. Are you on work-study? How many hours a week do you say you work? What kind of job? Do you feel like you have to plan your courses around your work schedule?
3. Why do you work? Do you have financial responsibilities back home? Support family members? Yourself?
4. How has it been having to balance work and STEM. Is this a factor in you switching out of STEM? To better accommodate your work/school schedule?
5. How has student debt influenced your decision in choosing a major?

### **SECTION D: IDENTITY**

1. As a Latinx student, how has it been finding your community on these campuses? Have they been supportive and helpful and getting you through your time here?
2. Do you feel like you have to assimilate to the STEM classroom setting?
3. Have you felt like you have to check your identity out the door before you enter your STEM classroom?
4. Would you say you embrace your Latinx identity?

### **SECTION E: TEACHING METHODS**

1. What kinds of instructing methods have your professors used for better understanding the material? Group-sessions? Review sessions, tutors? How successful has this been?

### **SECTION F: INSTITUTIONALLY IMPLEMENTED PROGRAMS**

1. Are you apart of any STEM program that guides you and supports you while working towards your STEM degree?
2. College retention program? Cohorts?
3. How has the school provided you with resources to help you succeed in your STEM programs?
4. Mentors?
5. Fellowships?
6. Funding to do summer research?

### **SECTION G: CONCLUSION**

1. Ultimately, what was the deciding factor for you to stop majoring in STEM if you decided to leave and for those that continue in STEM, what have been your main motives?

2. How would you like your institution to better support you while you work towards a STEM degree at your institution?
3. Where do you feel they must better improve so that first-gen Latinx retention increases in the STEM disciplines?
4. Any last second concerns you want to raise about your conversations on first-generation Latinx retention in STEM.

## BACKGROUND INFORMATION

Where did you grow up and what were the demographics of where you lived?

What kind of school did you go to? was your school public? Private? Charter?

What were the demographics like? PWI? Low-income? How many students were in enrolled at your high school? Do you know if dropout rate was high for your school?

Why did you decide to come to these colleges?

How did you do academically at your high school? GPA? What was your class rank? AP classes? Extracurriculars?

What year are you in, and what is/are your major/s? Are you still majoring in STEM?

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