

A CASE STUDY OF HISPANIC STEM TEACHER PREPARATION

A Dissertation

by

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ABSTRACT

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There is a shortage of Science, Technology, Engineering, and Mathematics (STEM) teachers in the US (Aragon, 2016; National Science Board, 2003). Hispanics are underrepresented in STEM teaching (Aragon, 2016; Texas Education Agency, 2017; US Census Bureau, 2016b; US Department of Education, n.d.). In order to improve the state of STEM teaching in the US we must tap into this underrepresented group. This exploratory case study examined the experiences of Hispanic students pursuing STEM teacher preparation and how the UTeachRGV program impacts student persistence and retention.

UTeachRGV is a STEM teacher preparation program at the University of Texas Rio Grande Valley (UTRGV) located in the southernmost region of Texas with a Hispanic population in the region that exceeds 90% (US Census Bureau, 2016b; UTRGV, 2016). UTRGV is designated a Hispanic Serving Institution (HSI) with a Hispanic student population that exceeds 89% and has a goal of serving these students as part of its vision (UTRGV, n.d.; UTRGV, 2016).

Sources of data included document analysis, an email questionnaire, focus groups, semi-structured interviews, and on-going field notes. All data were analyzed thematically within and across multiple data sources by searching for themes and subthemes. The major, overarching themes that emerged were support and shared experiences. Students benefitted from the support

of Master Teachers, their UTeach family, and financial support. Students shared experiences in the program such as how they were recruited, why they stayed, the value of field experiences, and the supportive features of their HSI.

Findings from the study indicate that Hispanic STEM students pursuing STEM teacher preparation within the context of UTeach experience systems of support and share experiences that contribute to their retention in the program. Findings suggest other STEM teacher preparation programs include incorporating multiple systems of support with mandatory advising checkpoints, faculty or other mentors, and financial support.

DEDICATION

This dissertation is dedicated to my family: my husband David who took care of everything while I went to classes at night, and my boys, Aiden, Gabe, and Wes. Thank you for your patience and support. I also dedicate this work to my UTeach students who provided the inspiration for this study. You will forever be part of my UTeach family.

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CHAPTER I

INTRODUCTION

This study explored the experiences of Hispanic Science, Technology, Engineering and Mathematics (STEM) majors in a teacher preparation program at one of the largest Hispanic-Serving Institutions (HSI) in the continental United States (US). This section will describe the problem and the purpose followed by the research questions. Key terms are defined.

Statement of the Problem

The availability of well-prepared STEM teachers in kindergarten through 12th grade in the US has reached a critical situation. There is a national shortage of certified STEM teachers as well as shortages in Texas and the South Texas region (Aragon, 2016; US Department of Education, 2016; Yang, Lee, Park, Wong-Ratcliff, Ahangar, & Mundy, 2015). Hispanic teachers are underrepresented at the national level, in the state of Texas, and in the South Texas border region served by the Region One Education Service Center (Aragon, 2016; Texas Education Agency, 2017; US Census Bureau, 2016b; US Department of Education, n.d.). In the US, 25% of public-school students are Hispanic while only 8% of public-school teachers are Hispanic (US Department of Education, n.d.). Hispanic males constitute only 2% of the teaching workforce (US Department of Education, n.d.). In Texas, the Hispanic population is 39% while the Hispanic teaching workforce was about 25% during the 2015-2016 school year (Texas Education Agency, 2017; US Census Bureau, 2016b). Even in the South Texas border region

where there is a student population that is over 97% Hispanic there is still a discrepancy. The Hispanic teacher population in this region is just under 90% (Texas Education Agency, 2016). The Hispanic population of South Texas exceeds 90% and represents 89% of the University of Texas Rio Grande Valley (UTRGV) undergraduate population (US Census Bureau, 2010; UTRGV, 2016). These numbers indicate a shortage of Hispanic teachers at the national, state, and local level, even in an area that is predominantly Hispanic.

Hispanic students historically have had few role models in STEM, thus with little opportunity to observe Hispanic role models in these fields. Although 18% of the US population is Hispanic, Hispanic workers only account for 6% of the STEM workforce (Beede et al., 2011; US Census Bureau, 2016c). In a synthesis of research on the STEM crisis, Xue and Larson (2015) found that there is a shortage of STEM workers to meet the demands of the labor market. Finally, few Hispanic teachers in STEM compounds the problem.

More Hispanic STEM teachers are needed to fix the leaky pipeline of Hispanic STEM workers from STEM education to STEM fields. Gershenson, Hart, Lindsay and Papageorge (2017) found that race-matching of students and teachers in primary school resulted in students who were less likely to drop out of high school and more likely to have college aspirations (p. 15). They looked at longitudinal data of black students randomly assigned to a black teacher for one school year in 3rd, 4th or 5th grade. The effect was greatest amongst black boys living in poverty. This points to a need for more minority teachers, in particular underrepresented minorities such as Hispanics.

Purpose of the Study

The purpose of this study is to explore the experiences of Hispanic STEM majors who are pursuing teacher education in the UTeach program at a major HSI. The study will examine

how UTeachRGV students experience the practices utilized by the UTeach program. Furthermore, the study will explore how the UTeachRGV program is serving Hispanic students in particular. The proposed study seeks the perspectives of Hispanic STEM majors pursuing their degrees at a large HSI situated in the southern most region of the US on the border with Mexico. Findings from this study lead to meaningful insights and recommendations related to recruitment, retention, and how to best serve Hispanic students pursuing teacher preparation. The present study addresses the following research questions:

1. What are UTRGV Hispanic students' experiences with STEM teacher preparation within the context of UTeach teacher preparation?
2. In what ways does UTeachRGV endeavor to impact Hispanic student persistence and retention in STEM teaching?

Definitions

The terms used in the study and their definitions are as follows:

- 5E Lesson: A learning cycle that consists of an engagement, exploration, explanation, elaboration, and evaluation (Bybee et al., 2006).
- Apprentice Teacher: Student teacher in the UTeach program.
- Hispanic: A person who is from or is a descendent of someone from a Spanish speaking country living in the US (Merriam-Webster, n.d.).
- Hispanic-Serving Institution (HSI): Higher education or post-secondary institution with at least 25% Hispanic student enrollment (HACU, 2017a).
- Induction (Inductees): Program to support UTeach alumni during the first two years teaching kindergarten-12th grade post-graduation. (UTeach Alumni during the first two

years post-graduation.)

- Legacy Institution: one of the institutions consolidated to create UTRGV; the University of Texas at Brownsville or the University of Texas Pan American.
- Master Teacher: Professor and field supervisor for the UTeach program.
- Replication Site: University where the UTeach program has been established.
- STEM education: Science, Technology, Engineering, and Mathematics, including computer science (STEM Education Act of 2015, 2015).
- Step 1: The first course in the sequence of UTeach courses; a recruitment course (The UTeach Institute, 2013).
- Step 2: The second course in the sequence of UTeach courses; a recruitment course (The UTeach Institute, 2013).
- UTeach: A program designed to give students majoring in STEM the opportunity to earn a teaching certificate concurrently with their STEM degree (UTeach Institute, 2017b).
- UTeachRGV: The UTeach program at the University of Texas Rio Grande Valley.
- UTeach Institute: The entity that promotes and supports the replication of the UTeach program (The UTeach Institute, n.d.).
- UTRGV: The University of Texas Rio Grande Valley.

Conclusion

There is a national shortage of STEM teachers. Hispanics are underrepresented in teaching and STEM teaching. Tapping into the Hispanic population, the largest and fastest growing minority population in the US, could support an increase in the number of STEM teachers and ultimately STEM workforce employees in the US (Pew Hispanic Center, 2009).

The proposed study aims to understand the experiences of Hispanic students' pursuit of STEM

teaching degrees in the UTeach program at a large HSI in the southern region of the US along the border with Mexico. The goal of this study is to understand how the program endeavors to recruit and retain Hispanic students.

I found that Hispanic students in the UTeachRGV do not perceive barriers to success. They utilize systems of support such as peers, faculty, advisors, and financial support to be successful as they pursue STEM teacher preparation. I also found that Hispanic UTeachRGV students share a set of experiences that, in some cases, contributes to a sense of community and supports their success in the program. I found that small things made a big difference. Findings contribute insights related to serving, recruiting, and retaining Hispanic STEM teacher candidates in the UTeachRGV program, in other teacher preparation programs, and in universities.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to develop the context and rationale for this study. Through a review of the relevant literature I will describe the conceptual framework used to drive the study at hand.

There are shortages of STEM graduates in the US and these shortages are greater amongst underrepresented minorities (Beede et al., 2011; Carnevale, Smith, & Strohl, 2010). Teachers play a major role in impacting a student's decision to major in STEM. In order to get more students to major in STEM we need to increase the number of quality STEM teachers, in particular underrepresented minorities (Beede et al., 2011; PCAST, 2010). Since Hispanic students historically have few role models in STEM teaching, they are deprived the opportunity to observe role models in these areas which may result in underrepresentation in these fields.

Conceptual Framework

I base my conceptual framework on Eccles (2009) expectancy-value theory and Bandura's (1977) social learning theory. I use expectancy-value theory to explore the experiences of Hispanic STEM students as they pursue teacher preparation and how they are served by the UTeach program. I use social learning theory as a lens to explore student experiences and programmatic efforts to support student success, recruitment and retention.

Expectancy-value theory explains how identity is formed by choices primarily related to task value and expected outcome (Eccles, 2009). Task value is the personal value we attach to a behavior and contributes to the likelihood we will select and attempt a task. It has four major components: interest-enjoyment value, attainment value, utility in helping one attain goals or rewards, and the cost of engaging in the task such as emotional or financial costs (Eccles, 2009). Expected outcomes are whether or not we believe we can be successful at achieving an outcome. The model predicts that a person is likely to attempt something if they believe they will be successful at it and place a high value on accomplishing the task. Expectancy-value theory also tells us that people are motivated to behave in certain ways based on the expected outcomes.

In addition to Eccles (2009) expectancy-value theory I use Bandura's social learning theory and self-efficacy construct, which is central to the social cognitive theory, to examine the perspectives of Hispanic students majoring in STEM who attempt and persist in the UTeach program (Bandura, 1977; Bandura, 1997). According to Bandura's (1977) social learning theory, behavior is learned first through modeling. We learn by seeing a behavior and reflect on it before imitating the behavior ourselves. The self-efficacy construct relates to an individual's perceived capabilities to achieve certain goals, influence outcomes, and exert control over events in his or her life (Bandura, 1997). When individuals believe they can achieve certain goals they are more likely to attempt them (Bandura, 1997). According to Bandura (2008), individuals differ in self-efficacy with regard to strength, level, and generality. There are four ways to build self-efficacy: (a) mastery experiences, (b) social modeling, (c) social persuasion, and (d) states of physiology (Bandura, 2008).

Mastery experiences are successes that help build self-efficacy (Bandura, 2008). Social modeling can contribute to self-efficacy by allowing people to observe other individuals similar

to themselves who have been successful through perseverance (Bandura, 2008). Social persuasion is a way to build self-efficacy that involves the influence of others (Bandura, 2008). Bandura's (1977) social learning theory and Eccles (2009) expectancy-value theory are the lenses which informed the analysis and interpretation of my findings.

Review of Research

The review of research begins by outlining the state of STEM education in the US. This is followed by a discussion of the UTeach program and UTRGV. Finally, I discuss Hispanics in higher education.

STEM Education

There is a national shortage of certified STEM teachers (US Department of Education, 2016; Yang et al., 2015). The terms STEM and STEM education have various definitions; for this study STEM education will be defined as stated in the STEM Education Act of 2015 as "education in the subjects of science, technology, engineering, and mathematics, including computer science" (2015). Public schools with large populations of minority students are more likely to have difficulty or are unable to fill vacancies in math and science (National Center for Education Statistics, 2015). In South Texas this shortage is pronounced due to the number of high needs school districts; districts with high poverty and low number of students who "Met State Standard" in math and science (Yang et. al, 2015, p. 55). The South Texas region has an underrepresented minority population that exceeds 90% (US Census Bureau, 2010).

Increasing the number of Hispanic STEM teachers could result in an increase in the number of Hispanic high school students interested in pursuing STEM degrees in college. Peralta, Caspary, and Booth (2013) conducted a study to assess whether Hispanic students felt their home life and school life helped or hindered them in preparation for pursuing STEM

education. They found that many of the participants felt a lack of support from their schools resulting in low motivation to enroll in science courses. For others, the lack of support resulted in resistance capital that compelled the students to prove their oppressors wrong. Resistance capital is defined by Peralta, Caspary, and Booth (2013) as “the knowledge and skills developed in opposition to oppression” (p. 913). Many participants reported that a family played a major role in their education, despite not understanding the system or not knowing the language. Parents supported education by asking about grades, providing words of encouragement, reminding them that they did not want to end up doing the same hard work as their parents, and reminding their children how they did not have the opportunity to go to school (Peralta, Caspary, and Booth, 2013). This support shows that the Hispanic parents in the study value education in spite of limitations like poverty and a language barrier.

I have personally witnessed this phenomenon in one the school districts where I observe my student teachers. The schools I visit are in one of the highest poverty areas of the country with free breakfast, lunch and dinner available to all the students. 96% of the students in this district are considered economically disadvantaged compared to 59% in the state of Texas (Texas Education Agency, 2018). Despite the level of poverty, the school district earned a grade level of “B” from the Texas Education Agency and boasts standardized test scores similar to, and often above, the state average (Texas Education Agency, 2018). In spite of high poverty, these students are successful academically. Teachers may play a role in this success.

The Hispanic teacher population in South Texas is just under 90% (Texas Education Agency, 2016). Cherng and Halpin (2016) found that students’ perceptions of teachers vary by race/ethnicity. When students of all racial/ethnic backgrounds compared minority teachers to their White counterparts, minority teachers were perceived more favorably (Cherng & Halpin,

2016, p. 411). This may be due to minority teachers being able to more easily relate to and be more culturally sensitive of minority students even without race-matching (Cherng & Halpin, 2016). Minority teachers often have valuable sociocultural insight into the realities of their students (Irizarry, 2007). This leads to a potential for relating better to their students and consequently serving them better academically (Irizarry, 2007). By increasing the number of Hispanic STEM teachers, we are creating future role models for Hispanic students considering STEM as a career and other minorities as well. The high percentage of Hispanic students at UTRGV provides a unique opportunity to study the efforts to recruit and retain this group. One program that is successfully attracting and retaining Hispanic and other underrepresented minority students to become teachers is the UTeach program: 32% of UTeach participants nationwide are underrepresented minorities (The UTeach Institute, 2017).

UTeach

UTeach is a program that allows STEM majors to earn a teaching certificate concurrently with a degree in their content area (UTeach Institute, 2016). It was established in 1997 at the University of Texas at Austin with the aim of recruiting STEM majors to become teachers (The UTeach Institute, n.d.). UTeach has increased STEM teacher production during a national lag in teacher production with 61% of UTeach graduates teaching in schools with a low-income population (Backes, Goldhaber, Cade, Sullivan, & Dodson, 2016; UTeach Institute, 2017b). The UTeach program is helping fix the leaky pipeline of underrepresented minorities in STEM: 32% of UTeach graduates are underrepresented Hispanic, Black American, and American Indian populations (UTeach Institute, 2017a). UTeach has increased the production of STEM teachers overall and the math teacher graduates are more likely to be Hispanic than graduates from other

programs (Backes, Goldhaber, Cade, Sullivan, & Dodson, 2016). UTeach replication sites recruit from pools of existing STEM majors to try out teaching.

One study found that having a UTeach graduate as a teacher for Algebra 1 or Biology results in the equivalent to an additional 3.6 months of learning in math and 4.9 months in science for their students (Backes, Goldhaber, Cade, Sullivan, & Dodson, 2016). Walkington et. al (2012) conducted a study to see who earned higher ratings during observations: UTeach graduates, Noyce Scholar UTeach Graduates, Noyce scholars with other certification routes, and non-Noyce scholars with other certification routes (Walkington et. al, 2012). Noyce Scholars are recipients of the Robert Noyce Teacher Scholarship from the National Science Foundation who excel in STEM and who plan to enter the teaching field (National Science Foundation, n.d.). They used a novel instrument that accounted for recent research in the areas related to improved student outcomes by placing more emphasis on teacher subject matter expertise than previous instruments (Walkington et. al, 2012). They found that UTeach graduates earned higher ratings than other groups, even the Noyce scholars from other certification routes (Walkington et. al, 2012).

In a study conducted by Daily, Bunn, and Cotabish (2015) at a UTeach replication site, it was found that the decision to try the first course (Step 1) fell into one of three categories: a previous interest in teaching, advice from an advisor, or the low risk associated with trying the course. This resonates with Eccles (2009) expectancy-value theory described in my conceptual framework which explains how identity is formed by choices primarily related to task value and expected outcome. The low cost of engaging in the Step 1 recruitment course, both financially and the level of risk involved, could contribute to students attempting it. Hutchinson explains that

based on case studies of first year teachers the STEM teacher shortage can be addressed with a support team approach that includes effective recruitment into the teaching profession that is supported through scholarships and consistent academic advising and mentoring followed by induction-year mentoring and professional development (Hutchinson, 2012, p. 549).

Irizarry (2007) found that the recruitment and retention of minority teachers could be aided using financial, academic, and social support. The UTeach program at UTRGV is currently the largest UTeach program of the 45 affiliated programs in the country making it a leader in recruitment and retention (The UTeach Institute, 2017). This makes the UTeachRGV program a good context in which to study recruitment and retention efforts.

UTRGV

UTRGV is an HSI in one of the highest poverty areas in the US with a STEM teacher shortage (US Census, 2016a; HACU, 2017b). UTRGV was established in 2013 through consolidating the University of Texas at Brownsville (UTB) and the University of Texas Pan American (UTPA), and began serving students Fall 2015 (UTRGV, 2017). The distributed campuses span more than 70 miles in the lower Rio Grande Valley in Texas. During Fall 2017, enrollment at UTRGV was 27,809 with Hispanic students comprising 89% of the student population making it the second largest HSI in the US. As of Fall 2017, the faculty at UTRGV was 40% Hispanic and the staff was 80% Hispanic (UTRGV, 2017). Historically, UTPA was ranked as the top public university nationwide in the enrollment and graduation of Hispanic students and therefore serves as a model for how to achieve success in these areas (Santiago, 2008). At UTB, the College of Education earned accreditation from the National Council for the Accreditation of Teacher Education (NCATE) (Best Value Schools, 2019). This accreditation

signifies a high level of excellence in teacher education through a variety of measures (CAEP, 2015). The high number of Hispanic students, the success of the legacy institutions, and the fact that the UTeachRGV program is the largest of all the UTeach programs in the US presents a compelling reason to conduct a study of Hispanic students pursuing STEM teacher preparation at this location.

Hispanics in Higher Education

Hispanic serving institutions. HSIs are degree-granting institutions with at least 25% enrollment of Hispanic students (HACU, 2017a). There are currently 472 HSIs in the US, representing 13.8% of non-profit colleges and universities that enroll the majority of all Hispanic students. In US higher education, as of 2018 63% all Hispanic undergraduates were enrolled in colleges and universities designated as HSI (HACU, 2018). Out of the 45 UTeach replication sites, five meet the criteria to be an HSI (HACU, 2017b; The UTeach Institute, 2017a). 11.4% of UTeach replication sites are designated HSIs compared to 7% of four-year institutions in the US carrying this designation (HACU, 2017b; The UTeach Institute, 2017a). The number of HSIs, including two-year and four-year colleges and universities, has grown dramatically over the past couple of decades reflecting a growing number of Hispanics in the US: from 229 institutions in 2000, to 245 in 2005, and 472 in 2015 (HACU, 2017a).

HSIs are designated by enrollment numbers of Hispanic students and not their attempts to serve this population; however, many are overt in their efforts to serve them (Santiago, 2008). In a study of top performing HSIs several trends emerged: academic support, community outreach, and data to inform support programs and decision making. HSIs and emerging HSIs have been found to effectively increase the academic self-concept of Hispanic students more so than non-HSI institutions (Cuellar, 2014). HSIs appear to do much to mitigate the many barriers faced by

Hispanic children. This points to a need to study HSIs and how they are serving their students so that we can better serve the growing number of Hispanic students in higher education.

Barriers faced by Hispanic students. Hispanic students encounter a number of barriers shown to impact educational outcomes. They are more likely to have parents with no high school education: 30.6% of Hispanic parents have less than high school completion compared with 3.8% for White parents and 11.2% for Black parents (Ross et al., 2012). Despite an increase in bachelor's degree attainment, the Hispanic population has the lowest educational attainment at the high school, associate's and bachelor's level when compared to non-Hispanic Whites, Blacks or Asians (Camille & Bauman, 2015). They are also more likely to be living in poverty: 31.9% of Hispanic children live in poverty compared to 12.7% of White children. Hispanic students are more likely than other minority groups to speak a language other than English at home and to speak English with difficulty (Ross et al., 2012). Finally, Hispanic students are less likely to be diagnosed with a learning disability (Ross et al., 2012). Parental education level and poverty are both related to college completion (Dubow, Boxer, & Huesmann, 2009). This is important to my study because the participants were largely low-income families where the parents had a high-school education or less. I hope to uncover how Hispanic STEM students are overcoming these barriers as they pursue STEM teacher preparation.

Recruitment and retention of Hispanic students. The underrepresentation, high attrition, and STEM attrition of Hispanic students in higher education should make them a natural target for recruitment and retention efforts. Hispanics are not only the largest minority group in the US they are also the youngest (Pew Hispanic Center, 2009). Considering the number of Hispanics in the US and that 25% of all newborns in the US are Hispanic, this group is poised to be a major part of the workforce in the coming decades (Pew Hispanic Center,

2009). The UTeachRGV program is located in an area that is predominantly Hispanic: the population of school-aged children is over 97% Hispanic, the regional Hispanic population exceeds 90%, and the university has an undergraduate population that is 89% Hispanic (Texas Education Agency, 2016; US Census Bureau, 2010; US Census Bureau, 2016b; UTRGV, 2016). UTeachRGV is a leader in recruitment and retention as the largest UTeach program in the country making this an excellent cite to study the recruitment and retention of Hispanic students (The UTeach Institute, 2017).

Summary

There is a national shortage of STEM teachers, particularly underrepresented minorities. The South Texas region is impacted by the shortage of STEM teachers. UTRGV is a major HSI that serves as a UTeach replication site. It has an enrollment of over 89% Hispanic students and articulates a vision to actively serve these students. The UTeachRGV program intentionally recruits STEM majors to try out teaching who may not have otherwise considered teaching as a career. It is the largest program of its kind in the US. The critical mass of Hispanic students and proven record of recruitment and retention in the UTeachRGV program make it an excellent site to explore the experiences of Hispanic STEM students pursuing teacher preparation. The following research questions were designed to examine the experiences of Hispanic STEM students in the UTeachRGV program:

1. What are UTRGV Hispanic students' experiences with STEM education within the context of UTeach teacher preparation?
2. In what ways does UTeachRGV endeavor to impact Hispanic student persistence and retention in STEM teaching?

CHAPTER III

METHODOLOGY

Chapter three presents the methodology for the study. I begin by describing the research design and context for the study. This is followed by a section describing my positionality. I then discuss the participants and data sources. Finally, I describe the data collection and analysis.

Research Design

I used an exploratory case study to examine the perceptions and lived experiences of Hispanic STEM majors who attempt and persist in the UTeachRGV program. Case studies investigate phenomena in real-life context using multiple sources of evidence (Yin, 2003, p, 13). According to Yin (2003) the case study should be used to address exploratory research questions that ask “how” and “why” with a focus on contemporary events. This study delved into “how” students experienced STEM teacher preparation and “why” they persisted or failed to persist making the case study a good fit for the research design.

I utilized a qualitative approach to explore 2 research questions:

1. What are UTRGV Hispanic students’ experiences with STEM education within the context of UTeach teacher preparation?
2. In what ways does UTeachRGV endeavor to impact Hispanic student persistence and retention in STEM teaching?

According to Saldana (2015), the qualitative approach is appropriate for exploring experiences and perceptions through the lens of the participants. I received Institutional Review Board approval (See Appendix A) to conduct human subjects research. I collected data from multiple sources seeking convergence: documents, a questionnaire, two focus groups, three interviews, and reflective fields notes.

Positionality

I am a current Assistant Professor in Practice for the UTeach program at UTRGV, colloquially referred to as a Science Master Teacher by the UTeach Institute, and have served in this capacity for the past five years. In this role I teach classes and do the field supervision of students majoring in Mathematics and Science, often working with them closely for several years. I actively recruit students to the program, serve the students throughout the program as a field supervisor, and continue to support them beyond graduation via the induction program.

I am native to the Rio Grande Valley and have lived here my entire life other than when I left for college. Both of my parents and one sibling attended the legacy institutions and I attended one of the legacy institutions for both my Master's degree and Doctoral degree. My children attend schools served by graduates of both UTRGV and the legacy institutions. I taught in a local school district for 10 years prior to working at UTRGV. I have a deep, vested interest in the educational outcomes for the university and in my community. I grew up in the Hispanic culture although I do not present as Hispanic and speak Spanish poorly. This may have impacted the responses of the participants, but I took measures to establish rapport and make the participants feel comfortable disclosing their thoughts. In order to avoid undue influence or bias related to my role I only recruited from students who had either left the program, graduated, or were about to graduate.

Context

For this study, I chose to look at something that seems to be working rather than focusing on something that is not. The study utilized qualitative data collected from UTRGV, a research institution in Texas that shares a border with Mexico. The campus is distributed across a large geographic area with campuses over 70 miles apart and data collection occurred on the different campuses according to the needs of respondents. Portions of the campus itself directly abut the US/Mexico border and some of the students even walk across the international bridge, through a checkpoint to the campus from Mexico daily to attend class. Consequently, there is a large population of Hispanics: the university is located in Texas which has a Hispanic population of 39%, the regional Hispanic population exceeds 90% and the university has an undergraduate population that is 89% Hispanic (US Census Bureau, 2010; US Census Bureau, 2016b; UTRGV, 2016). The university has been a UTeach replication site for the past seven years (The UTeach Institute, 2017a). This makes the site an excellent place to study experiences related to STEM teacher preparation unique to Hispanic students. The site has been recognized as a national leader in enrollment and degrees awarded to Hispanic students making it an ideal location to study Hispanic STEM majors attempting to earn a teaching certificate (Santiago, 2008). UTRGV states in its Strategic Plan that part of its vision is to not just be an HSI, but to be the premier HSI in the US (UTRGV, n.d.). This is relevant to the study because UTRGV is not just an HSI due to enrollment numbers, but takes extra measures to support Hispanic students intentionally, unlike other HSIs. In addition, there is a critical mass of Hispanic students at this university for the respondent pool.

Participants

I used purposeful respondent recruitment to consist of graduates of the UTeachRGV program, former participants, and current students in the program. According to Seidman (2013) purposeful sampling is the most common form of sampling when you need to make connections between the participants. Participants who self-identify as Hispanic, Latino/a, Mexican, or Mexican American are the target group of the study. The participant inclusion criteria were indicated in the recruitment email. The recruitment email was sent to all students who registered for a UTeach course between September 2017 and December 2018 and those who graduated during this same time period. From that pool I recruited participants for two focus groups so that the groups would be large enough to generate conversation but not so large that some participants got excluded (Spickard, 2017). A total of nine participants responded to the focus group invitation for Brownsville and seven responded to the invitation for Edinburg. Due to scheduling difficulties, four participants engaged in the focus group in Brownsville and two in the Edinburg focus group. I invited those respondents who were unable to attend the focus groups for one-on-one interviews. I also invited a student who had left the program to participate in a one-on-one interview because none of the focus group participants represented this viewpoint. I had a total of 48 participants in the questionnaire and nine respondents for focus groups and interviews from the pool of 48.

Data Sources and Collection

Data sources consisted of documents including fliers, websites, and handbooks, a questionnaire, two focus groups, three one-on-one interviews, and on-going field notes. Participants were limited to those individuals who self-identified as Hispanic, Latino/a, Mexican American, or other related ethnic groups. I began by contacting the UTeach UTRGV program

directors for permission to conduct the study at the site. Once I had permission to conduct the study, I sought IRB approval. Once I received IRB approval (See Appendix A) I started document analysis.

Document analysis. I began the study by conducting document analysis. Document analysis was conducted on the UTeach Operations Manual, UTeachRGV website, promotional items, and the websites of four UTeach sites. The documents were treated similarly to narrative interview data to compare UTeachRGV to other programs in terms of how they impact students. According to O’Leary (2014) one way to analyze documents is to treat them like any other narrative data such as an interview participant.

I started by looking at the UTeach Operations manual to see how the UTeach institute describes recruitment, retention, and the experiences of UTeach students. I then looked at the UTeachRGV website and read through the website and the UTeachRGV handbook located on the website. I looked at current and past fliers for the UTeachRGV program including recruitment fliers and scholarship advertisements. I read through the websites of the original UTeach program at the University of Texas at Austin and three UTeach replication sites: the University of Houston, Florida International University, and Louisiana State University. The University of Houston and Florida International University are both chosen due to begin HSIs. Louisiana State University was selected randomly to represent a non-HSI. I conducted document analysis to look for differences and similarities in the publications of these UTeach programs.

Questionnaire. I requested contact information for students who participated in the program, specifically those who took a course with the prefix UTCH, between September 2015 and May 2018 from the Strategic Analysis and Institutional Reporting (SAIR) office at UTRGV. I then sent an email (See Appendix B) to the 412 individuals identified by the SAIR office with a

link to the questionnaire in Qualtrics. The questionnaire is found in Appendix C. It is adapted from a study about student engagement (Vaca, 2016). According to Spickard (2017) questionnaires can be useful for gathering shallow information from a large pool of people. The questionnaire addressed demographic information and questions related to Tinto's theory of student departure: interactions with peers and faculty, plans and intentions, and background (Tinto, 1975). Those who completed the questionnaire were invited to provide contact information to participate in follow-up focus groups.

Focus groups. Focus groups were conducted on each campus in order to accommodate the students. The university is distributed across a large geographic area and is served by a bus system, but I felt it was important to minimize transportation issues and conduct a focus group on each campus. The focus groups were conducted with the questionnaire participants who provided contact information and responded to follow-up emails. There were several questionnaire participants who provided contact information, but did not respond to scheduling emails. Based on the responses that I received indicating a preferred time and date, I sent a calendar invitation to the remaining contacts. According to Spickard (2017), focus groups can be useful for gathering primary data about attitudes and opinions. They can also help get an idea about the thoughts of a group rather than individuals (Spickard, 2017). The focus groups interviews were audiotaped with the permission of the participants and were about an hour in length. When the protocol questions were complete I shut off the audio and continued talking to the participants in a more conversational manner. The participants were aware that this was still a part of the study and I took notes on our conversations. These notes were rewritten in my field notes. All of the audio recordings were transcribed, reviewed for content and edited to show translations where participants switched between Spanish and English.

The location, time and date of the focus group were determined by the availability of those who agreed to participate. The participants were asked to sign informed consent documents and an audio release form. It was made clear to participants that there are no benefits associated with participating in this study other than contributing to the body of knowledge. All measures were taken to ensure confidentiality by using pseudonyms and no personally identifiable information was collected. A set of questions found in Appendix D was used to guide the focus group discussion. The focus group recording was transcribed by a professional transcriber, coded and analyzed. After the focus groups I conducted one-on-one interviews.

Interviews. In order to explore deeply held opinions and attitudes I conducted in-depth interviews with focus group participants (Spickard, 2017). Initially, I planned to invite all focus group participants back for interviews. However, I felt that the focus group participants had been forthcoming and I had reached the point of redundancy and saturation (Strauss and Corbin, 1998). According to Strauss and Corbin (1998), saturation is the point at which no new relationships emerge. I made the decision invite outliers and those who were not able to be in the focus groups. Two of the students who left contact information in order to participate in the focus group were not able to attend at the agreed upon date and time. They both offered to come in for a one-on-one interview, so I made the decision to begin with these two students as my interview subjects. In addition, I purposely selected a student who had left the program to come in for an interview so that this viewpoint would be represented. I conducted one interview with each participant and left open the possibility of calling them for a follow-up phone interview in case I needed some clarification. According to Glesne (2011), the number of interviews needed depends on many factors including the type of questions asked, skill of the interviewer, and responsiveness of the participant. I conducted focused interviews to solicit the

viewpoints and experiences of Hispanic STEM students in the UTeach program as they pursue teacher preparation. Focused interviews involve open-ended questions and are conversational; however, they also follow a set of questions (Yin, 2003). The interviews were planned to be approximately one hour in length, which is appropriate for a focused interview and is generally considered the point of diminishing returns (Glesne, 2011; Yin, 2003). The interviews were conducted on campus in order to be convenient to the students. Participants were asked to sign an informed consent document that ensures the confidentiality of their interview and an audio release form. Audio recording can be useful for allowing the researcher to listen closely during the interview and have an accurate account of what happened (Yin, 2003). Participants were informed that there are no known risks associated with participating in the study and that they may remove themselves from the study at any time. It was made clear to participants that there are benefits associated with participating in this study other than contributing to the body of knowledge. The questions were open-ended and based on the questions found in Appendix E. Interviews were transcribed verbatim by a professional transcriber, coded, and analyzed. All measures were taken to ensure confidentiality of the interviews by using pseudonyms and no personally identifiable information was collected.

Field notes. I collected field notes both during and after the data collection process (See Appendix F). The field notes were used to add narrative data. In the field notes I documented discussions that took place before and after the transcribed portion of the focus groups and interviews, my thoughts on the data, and anecdotes that related to the emergent themes. I used a two-column system where I recorded occurrences on the left and my thoughts on the right.

Data Analysis

Analysis of narrative data followed a qualitative approach. This approach is best suited to

analyze documents, questionnaire data, focus group transcripts, and interviews because it can bring to light patterns and help us understand meaning (Spickard, 2017). A combination of a priori coding and thematic analysis was done. A priori codes were the basis for the interview and focus group questions. Thematic analysis followed the protocol established by Braun and Clarke (2006). This process involves six phases: 1) familiarizing yourself with the data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining and naming themes, and 6) producing the report (p.16).

I used Saldana's (2013) method for coding qualitative data. This involves coming up with initial codes that are further categorized into subcodes or overarching categories (Saldana, 2013). These categories were used to identify major themes and concepts used to make assertions (Saldana, 2013). All narrative data was analyzed thematically. I asked two participants to each read a different excerpt of the findings to ensure that I accurately captured their thoughts. The design and implementation of this study was an iterative process using multiple data sources to find patterns and create dependability.

Summary

Chapter 3 described the study design, context for the study, multiple data sources, and analysis process. Chapters 4 and 5 will present findings and a discussion of study findings.

CHAPTER IV

FINDINGS

In this chapter I present the findings of UTRGV Hispanic students' experiences with UTeachRGV STEM teacher preparation. With a shortage of STEM teachers nationally, in the state of Texas and in the region, UTeachRGV is one of the pathways to earn a mathematics or science teacher certification in the Rio Grande Valley. I explored UTRGV Hispanic students' experiences with STEM education within the context of UTeachRGV teacher preparation and the ways UTeachRGV endeavors to impact Hispanic student persistence and retention in STEM teaching. Characteristics of the respondents are described first. Findings are organized first by research question and then by each data source. The types of data collected included document content analysis, a questionnaire, focus groups, interviews, and field notes. Pseudonyms are used to maintain confidentiality of respondents. The data addresses the following research questions:

1. What are UTRGV Hispanic students' experiences with STEM teacher education within the context of UTeach teacher preparation?
2. In what ways does UTeachRGV impact Hispanic student persistence and retention in STEM teaching?

Characteristics of Respondents

Questionnaire

Recruitment emails were sent to the 412 students or former UTeach students who fit the criteria of having taken at least one “UTCH” course from Fall 2017 through Spring 2018 requesting participants who self-identify as Hispanic or related ethnicity such as Mexican, Mexican-American, Latino/a, or Chicano to complete a questionnaire. The “UTCH” prefix is used to identify the six courses that are exclusively part of the UTeach course sequence at UTRGV. Some left questions blank but I counted as completing the questionnaire if they answered the majority of the questions. In my informed consent document I articulated that participation was entirely voluntary and respondents could skip questions or stop participation at any time. If the majority of questions were complete the data was used. If only a few questions were answered it was understood that the respondent had withdrawn from the study. Forty-eight respondents completed the questionnaire. Twelve respondents identified as male and 36 as female. The majority of respondents identified as Hispanic or Mexican-American: 30 identified as Hispanic, 10 identified as Mexican-American, and others identified as Mexican, Latina, Chicano, and South Asian. Their ages ranged from 18-43, but most were in their 20s with a median age of 22. Self-reported GPAs ranged from 2.1-4.0 with an average of 3.36. Participants included 17 Biology majors, four Physics majors, two Chemistry majors, 23 Mathematics majors, and two other. They all described their academic success in high school as being in the top 50% academically: 15 reported being in the top 5%, nine reported being in the top 10%, 16 reported being in the top 25%, and eight reported being in the top 50%. Four UTeach graduates participated in the questionnaire, 41 current students, and two who left the program. The respondents also have plans to continue their education: 60%, plan to complete a master’s degree

while 36% plan to continue on to a doctoral degree. The questionnaire also collected information about parental education level and household income level.

Nearly a third of the respondents reported a maternal education level as less than a high school diploma while nearly half reported a paternal education level as less than a high school diploma. Parental education levels are shown in Table 1. The questionnaire then asked about household income level. The majority of respondents reported growing up in a low-income home: 25% reported having an annual income of less than \$20,000 annually and 42% reported being in the \$20,000 to \$34,999 annual income bracket (US Department of Health and Human Services, 2018). Additional characteristics of respondents were collected from the focus group and interview participants.

Table 1.

<i>Parental Education Level</i>		
Education Level	Maternal	Paternal
Did not complete high school	17 (35.42%)	21 (43.57%)
High school diploma	12 (25%)	13 (27.08%)
Post-secondary school other than college	1 (2.08%)	4 (8.33%)
Some college or associate's degree	9 (18.75%)	2 (4.17%)
Bachelor's degree	7 (14.58%)	4 (8.33%)
Master's degree	2 (4.17%)	2 (4.17%)
Medical degree	0	2 (4.17%)
Law degree	0	0
Doctorate	0	0

Focus Groups

Focus groups were conducted at both the Brownsville campus and Edinburg campus to be convenient for the students. Table 2 shows the interview number for each of the interviews conducted, the code assigned to each interview and the number of participants.

Table 2.

Focus Group and Interview Participants

Interview #	Focus Group/Interview Code	Number of Participants
1	FG1	4
2	FG2	2
3	I1	1
4	I2	1
5	I3	1
Total	7	9

Table 3 shows the pseudonym for each participant and their participant code. Both the focus group and interview participants were purposively selected to represent UTeach program participants from September 2017 through December 2018.

Table 3.

Participant Codes

Interview #	Pseudonym	Participant Code
1	Monica	1A
1	Julia	1B
1	Isaac	1C
1	Carolina	1D
2	Lana	2A
2	Melissa	2B
3	Raul	3A
4	Anita	4A
5	Belinda	5A

Focus group 1. “I knew you were Raza!” When asked about her experiences as a Hispanic person pursuing STEM teacher preparation Monica told a story in which a member of the UTRGV grounds crew said this to her. This focus group was conducted on the Brownsville campus of UTRGV to accommodate students and graduates living closer to this campus. Geographically this campus is located directly on the Rio Grande River and the US border with Mexico, which may contribute to a unique makeup of students. International bridges flank the ends of the campus. All of the participants in this focus group were non-native English speakers

and two of them were currently living in Mexico, crossing an international bridge to attend classes.

Although nine people signed up, only four participants attended this focus group. We had to accommodate their work schedules to find a meeting time convenient for everyone. All were current students at the time. Two of the participants were entering their apprentice teaching semester and the other two were one semester away from apprentice teaching. “One graduate had to back out at the last minute due to school district training. Another graduate did not show up but didn’t contact me to let me know” (Pamela Groves’ Field Notes, 2018, p. 6). They arrived in pairs. This helped with the rapport of the group and they definitely seemed to feed off of each other’s responses. “I think they all knew each other and this helped with rapport. It felt awkward for just a brief moment and then went very smoothly” (Pamela Groves’ Field Notes, 2018, p. 6). One pair of students arrived very early so we had extra time to discuss various things and the others were only about five minutes early. “Two students arrived to the focus group early by around 30 minutes. The other two were around five minutes early. We chatted a bit and then I told them about the research project. I broke the ice by telling them about keeping what we discussed in the room, but obviously we can’t be completely anonymous because we can all see each other. They all laughed. They seemed to arrive in pairs” (Pamela Groves’ Field Notes, 2018, p. 4). Before, during and after the focus group we talked about the program and the participants’ plans for the future. “The whole group stayed after to ask questions and we talked for 20 more minutes or so. They were interested in things like job outlook (Pamela Groves’ Field Notes, 2018, p. 4).

All the students have future plans to pursue a master’s degree within the next five years. Carolina wants to begin an accelerated program in curriculum and instruction immediately after

graduating. She said “I think I want to go for my master’s. I want to continue like right after I graduate” and “I want to do the accelerated program. The curriculum and instructional program.” Monica wants to buy her own house and then start her master’s degree. “I see graduating now. Getting a job, work for one year.” She followed up by saying “I’m buying that house and then after like giving a good down payment - now I’m going to pursue my masters. And then just... take it from there.” Julia would like to start working and save up for her master’s degree because she pays semester by semester. “Well in my case... they offer you like a Mexican waiver [where you] pay the school like you were American. So I want to work for one year and then, before I have 24 years [of age], I want to start my master’s.” She is interested in possibly pursuing a master’s in physics or curriculum and instruction with an emphasis in mathematics. Isaac is in the same situation where he has the age deadline to complete his master’s degree without paying as an international student and has to pay monthly for his tuition. This is a university policy for students from Mexico. International students are not eligible for federal financial aid.

Focus group two. “I...saw the change that needed to happen.” This is a quote from a participant in focus group two when asked about what made her decide to go into teaching. Focus group two was held on the Edinburg campus of UTRGV. While this focus group had a greater number of students accept the invitation to participate, it ended up with fewer attendees. There were seven people scheduled to attend; however, on the day of the focus group only three showed up and one of them only came to let me know that he was not able to participate. “The focus group ended up with just two participants. It went really well. I gave a bit of time to develop rapport. The students didn’t know each other and were at different points in their program. One has finished (?) CI and the other has only finished step 1” (Pamela Groves Field Notes, 2018, p. 6). I conducted the focus group with the two remaining attendees which resulted

in a rich dialogue both during the official focus group question and answer session and after the recorder was turned off. The participants stayed more than an hour after we had finished the questions I came with. They stayed to ask questions about the program and continuing their education.

The participants in this focus group did not know each other, unlike the first focus group, so I took some time to establish rapport. They were also at very different points in the program: one had only taken the first course and the other was close to finishing the program and graduating. This resulted in less dialogue where they bounced ideas off of each other due to common experiences. From the beginning this group was different than the focus group conducted in Brownsville. They did not describe having a connection with other students in the program like the Brownville participants did. They do not have a campus community of peers to rely on. “They talked about the physics faculty being distant and scary” (Pamela Groves’ Field Notes, 2018, p. 7). One has some mentors that provide support in her academic endeavors: a family member and a physics faculty member. The other mentioned that she is actively seeking to make connections at the university. “They exchanged information and seemed eager to continue talking to each other and me in the future” (Pamela Groves’ Field Notes, 2018, p. 7).

Both participants reported aspirations of pursuing higher education within the next five years. Melissa envisions herself teaching high school physics and working on an online master’s degree in physics. She mentioned “I’m really excited about graduating and there’s this online master’s program in physics with a concentration in education and I just want to get into.” Lana is at a far earlier stage so she sees herself finishing her undergraduate degree and getting into the classroom to “make the change that I want to see.” She would like to teach middle school

science. She ultimately sees herself pursuing higher education and getting at least a master's degree if not a doctoral degree as well.

Interviews

Interview participants. The first interview was conducted with a current student I will call Raul. He was about to begin his apprentice teaching semester at the time of the interview. He arrived at the Edinburg focus group but only came to tell me that he had been scheduled to go to work and could not stay. He agreed to interview individually at a later time because he felt it was important. "We talked a little beforehand and I thanked him for coming. He said he knew it was important" (Pamela Groves' Field Notes, 2018, p. 9). Raul's ultimate goal is to pursue higher education in Biology. He stated, "I'm planning to teach for two years...the first year will be getting experience to become the best teacher I can, and then the second year try to continue with my education probably in the biology field."

The second interview was conducted with a current UTeach student who came to the interview despite having car trouble. I will call her Anita. Anita had wanted to participate in the focus group, but was unable to do so due to her work schedule. "Student came despite car trouble" (Pamela Groves' Field Notes, 2018, p. 9). She envisions herself working in a middle school, ideally near the US-Mexico border so that she can continue crossing over to Mexico to visit her mother who lives there. She aspires to begin her master's degree after her first year of teaching. "I really want to do my master's...I think maybe like waiting a year--if I get a job right away after graduating...if I don't find a job here in the valley, I'm not scared of looking, going up north to Texas and all that stuff. But I see myself having a master's and working in a middle school."

The third interview was conducted with a student I will call Belinda. Belinda left the program after taking Step 2, the second semester recruitment class. This student was purposively recruited for an interview as a program leaver so that the data would reflect this differing viewpoint. She aspires to pursue a bachelor's degree in physics and a master's degree in physics, possibly at UTRGV. Otherwise she is uncertain of her future goals. She is currently looking into whether she wants to do applied physics or go in the medical physics direction. She also said that "I guess physics is very rare, I guess, to find in a teaching field so if my other plans fell through I could always come back to it as another option."

There were 48 participants in the questionnaire. Of the 48, nine participated in the focus groups and interviews. Questionnaire data was collected during Spring 2018-Summer 2018. Focus group and interview data was collected at the end of the summer in hopes of accommodating potential participants, including those who might be starting class or student teaching soon. The data is organized and presented based on the research question it addresses. The major theme or themes that emerged are then discussed, followed by a report of the relevant data collected from the five sources: document analysis, a questionnaire, focus groups, interviews, and on-going field notes.

Research Question 1

I analyzed the data by reading through the UTeach operations manual, the UTeach handbook on the UTRGV website, looking at UTeachRGV fliers and looking at the websites of other UTeach programs. This helped me begin to develop a set of a priori codes based on these documents and the extant literature. I then began analyzing and tabularizing the questionnaire data, continuing to add to and refine my coding system. I then listened to the audio files as I read through my hand-written field notes. I read through the transcripts, corrected any errors, and

replayed the audio when clarification was needed. As I read through the transcripts I started coding using the a priori codes. I began identifying major themes and subthemes. The major themes related to Hispanic students experiences in the UTeach program are discussed here.

Major Themes

Support. Support is a major theme that emerged when coding the data about UTRGV Hispanic students' experience with STEM teacher education. Four major areas of support were identified: Master Teacher support, UTeach Family support, Family support, and Financial support. As a Hispanic person pursuing STEM teacher education, no one reported any major barriers or experiences when asked directly; however, when they shared their stories, experiences related to being a Hispanic person pursuing STEM teacher preparation emerged. Many of the interview and focus group participants speak Spanish as their native language. They felt that this was a salient feature of their experience as a Hispanic person seeking STEM teacher preparation. Isaac mentioned "I have troubles, you see, with the language so I have trouble speaking in English." He also mentioned

I used to do everything in Mexico, Spanish, for example physics and mathematics. I had a lot of trouble...to understand the concepts in English. So it was interesting because we started taking the classes online with subtitles and it helped a lot referring to he and Julia. Isaac and Julia reported having a language barrier, even struggling to pass the English language exam. Julia stated

we needed to take like the TOEFL and we needed to get like 26 points for example and we got 24 and so I'm sad that we were very sad and everything and the other teachers were like, "Don't worry! We will build you up!"

Despite the language barrier, they felt that their professors were supportive of them saying that many of the professors are bilingual and/or Hispanic and are patient with them. They also mentioned having many Hispanic professors who understand their culture. Julia mentioned “most of the professors in STEM fields are also like internationals or bilingual. They also have like the accent so they don’t really care if (you have one).” Monica agreed saying “even if they’re not Hispanic, they are also from like different cultures. They like also have their different accent and that’s why they take their time to make sure we understand.”

Master Teachers. The importance of the Master Teachers to the experiences of these students came up as an important aspect found in document analysis, in the questionnaire, focus groups, and interviews. When describing the Master Teachers, Monica said “They’re very patient! I love it because you’re like ‘oh it’s because a teacher has like this idea and this topic’ and like they come up with lesson plans like [finger snapping] like it’s magic. It’s amazing!” The Master Teachers were frequently described as patient: Isaac said

I remember, when we were in Step 2 when we had to go to a middle school, and we were in the biology class? But in our case we didn’t know anything about biology, and we walked in like “what can we do?” I remember that [my Master Teacher] gave us a lot of material to work with.

Isaac and Julia mentioned Master Teachers by name who helped them with practice for the TOEFL. Melissa mentioned several Master Teachers by name stating

they’re great! And they’re so helpful and they really motivate you. They’re so gentle in the way that they put “That was really crappy you need to improve it” but they say it in such a great way that you’re like “yeah I can do this!”

Lana had similar feelings mentioning a Master Teacher by name:

she was so amazing, she was really nice, very supportive. I was like SUPER nervous like going into my first lesson ever and I was like “I don’t know if I can do it. Should I not show up? Should I do it, I don’t know.” And she was like, “You guys are going to be fine. Just calm down, just breathe.”

UTeach family. Participants talked about the importance of UTeach advisors, other students, and professors in the UTeach program as a key element. Mentoring/advising was reported to be the most influential factor for success in STEM in college by questionnaire participants. The program advertises in-house advisors dedicated to UTeach students. Julia mentions “the support we get inside the program is awesome” and goes on to discuss how the dedicated advisor was helpful and quick to make recommendations.

Before we used to do like our own schedules, like what classes we needed to take, ... but then when we starting on the program. We can go with [a UTeachRGV advisor] and explain like everything like, “Oh yes! She will help us out” and “Oh no I don’t recommend this, you can do this.” So you can discuss it with her and she’s very fast on that.

Studying with peers was reported as the second most influential factor for success in STEM in college by questionnaire participants. Monica mentions the support of peers stating “we basically know everyone.” She said that in college

You’re here you’re scared and you don’t like, like know anyone and once you’re in the program and you’re like “Oh I don’t know how to do this” and someone might ask you “hey you know like there’s this other person that already had a lesson similar to that.” and you feel like you can go and ask that person, say that “Hey I heard that you know, can you help me?” And they help each other.

Julia added an experience where she was discussing an exam she needed to take

and then I don't know an upper classmate uh... she was like a senior? She came to me, "I listened that you were talking about this?" and I was like, "yes!" and she was like, "No! You don't need to do that! You do this and this and this."

Carolina said "Even then, we're like struggling with something and they're like 'Oh do you need my notes? I have some of my notes for that.' Like not 'go help yourself' or 'we don't have time' or whatever." Melissa had the experience of getting to do Step 1 with her best friend as a partner.

Belinda mentioned

having the people that are in the program around me, helped me become more successful in my major because I've seen how they study how they practice like their work in their majors and how they're always on top of something, their task, like doing things. So I guess that helped me also.

This experience relates to my social learning theoretical lens. According to Bandura's (2008) theory about social modeling behavior is first learning through modeling. In addition, self-efficacy can be built by observing others who are successful at a task through perseverance (Bandura, 2008).

Family support. Family support was mentioned by many of the focus group and interview participants. Julia said

family's support is something that is so crucial. In my case, for example, my mom and my dad don't speak English but it's funny because when we need to practice for lessons they're like "Don't worry! You can give us the lessons."

Carolina felt similarly: “My family’s support. Always giving me the time that I need to like, stay in school. I think that has a lot to do with it.” Melissa received a significant amount of support from a family member. She stated:

I had a family member help me get there, because I was kind of lost, I didn’t know what to do. And like the whole “it’s a marathon not a sprint” that was him telling me because I was frustrated. I’m in my mid-twenties and I don’t have anything to show.

The families found a way to support these students regardless of education and language.

Financial support. Some of the students get federal financial aid. Carolina mentioned “I get financial aid. Right now, I qualify for the Pell grant. Monica also qualified for financial aid and receives “the Texas grant, the Pell grand andthe top 10% grant.” As international students, Julia and Isaac do not qualify for federal financial aid and have to rely on making monthly tuition payments. They did, however, qualify for and receive financial aid through a UTeachRGV scholarship. The majority of the participants discussed having a job at some point in our conversation indicating the importance of and need for financial support.

Shared Experiences. The other major theme that emerged from my data analysis was that of shared experiences. From looking at the websites of UTeach replications sites to the responses from the interviews and focus groups it became apparent that UTeach students have a common set of experiences. These common experiences include the classes they take, how they were recruited, and when they decided to become teachers. Raul valued his field experiences mentioning “the best experience will bein the field in the high school, and that I get to know the students...” Isaac mentioned “the experience in the classrooms. Really, really important.” And “we really like the experience UTeach gives us. Like being in the middle school and high school and everything is very, very important.” They shared experiences such as being

international students or being non-native English speakers. They have family in Mexico. Anita said “my mom lives in Mexico. She can’t pass through here, so I always go and visit her during vacations.” Monica mentioned “for them just to bring us here [to the US], like that’s a great accomplishment for me, for them, you know?” Isaac and Julia currently live in Mexico. More than half of the focus group and interview participants are native Spanish speakers.

Discussion of Research Question 1

Document Analysis

UTeach handbook. The student handbook gives specific information about the expectations of UTeach students. It has a strong emphasis on professionalism and states that this will be emphasized throughout the coursework. It states that “each student should recognize his/her transition into a profession and reflect professional behaviors at all times” (UTRGV, 2018). It presents specific protocols for professional communication such as addressing people as Mr., Ms., or Dr. stating that “academic administrators (deans, department chairs, etc.) and most of your instructors have a doctorate in their fields of study. It is appropriate to address them as ‘Dr. ___’” (UTRGV, 2018). This serves to inform students who may not otherwise know how to properly communicate in professional settings. Some students may not have been taught this type of communication so it could help them assimilate and persist in a new environment by teaching them the social norms. It lists the dispositions of educators, which is a checklist of attitudes and behaviors expected of professional educators (UTRGV, 2018). It clearly outlines the dismissal process from the program if dispositions are not demonstrated.

Website. The website provides an overview of the program and how it allows candidates to complete a bachelor’s degree in mathematics or science in four years while getting a secondary teacher certification. The wording makes the program and graduates sound elite using

words like “rigorous” and saying that “UTeach graduates are highly sought after.” In the “Why UTeach?” video featured on the website there are people of color represented, but not many Hispanic people, if any. It has students talking about their experiences passionately, but they are not from the UTeachRGV program. “The UTeach program is amazing. It allows you to get into the classroom earlier than most programs allow you to” is one of the anecdotes told by a UTeach student in the “Why UTeach?” video. It talks about a critical shortage of mathematics and science teachers. It talks about needing these “gifted people” to teach math and science. There is a link to the student handbook which was updated August 2018. Overall the website appears very up to date. The website features recent photos of UTeach activities.

Having an up-to-date website makes accessing information about the program for current and future students quick and seamless. It shows a commitment to attracting and retaining students. When potential students are able to get timely, accurate information about the program they are might be more likely to attempt it. Having information clearly laid out and accessible may also support student retention.

When I first landed on the website for UTeachRGV there are pictures of the UTeachRGV Master Teachers and there is a link to a photo gallery. Many of the Master Teachers have Hispanic surnames, six out of nine, but the percentage does not match the representation of Hispanic people in the area. Compared to the number of Hispanic surnames for other UTeach sites this number is high: there is one Hispanic surname amongst the UT Austin Master Teachers, there are possibly two Hispanic surnames amongst the University of Houston Master Teachers (an HSI), there are no Hispanic surnames amongst the Master Teachers at the Florida International University (an HSI), and there are no Hispanic surnames amongst the Master Teachers listed for Louisiana State University. The representation of Hispanic surnames amongst

Master Teachers at UTRGV could potentially contribute to deeper mentoring relationships due to cultural matching.

Questionnaire Data

Data was collected via questionnaire to gather background information about the students served by the UTeach program. It also gathered information on the participants experiences in and feelings about various aspects of the UTeach program. The vast majority of participants reported feeling confident that they will graduate from college with a bachelor's degree: 39 participants strongly agreed, three somewhat agreed, and one neither agreed nor disagreed.

Students selected mentoring/advising as their most influential factor for success in STEM at college (53%) followed by studying with peers (37%) and involvement in student organizations (5%). Students indicating other influential factors specified “going to lectures” and “understanding science concepts and how they overlap and relate to each other.” The majority of participants had a mentor with a STEM background: 77% reported that they had a STEM mentor, 19% did not have a STEM mentor and 4% were uncertain. 68% had a female primary mentor while 32% had a male primary mentor. They reported varying levels of satisfaction with their primary mentor: 57% were very satisfied, 32% were satisfied, and 5% were neither satisfied nor dissatisfied. They reported spending anywhere from zero to 12 hours per week with their primary mentor (not academic advisor) with an average of two hours per week for all respondents.

Only two participants reported involvement in student organizations as an influential factor in their success in STEM although 27 participants reported participating in at least one STEM-related student organization. Despite this, more than half of the respondents (27) reported participating in a STEM-related organization with most indicating several hours a week

participation. The majority of respondents indicated that they do not participate in non-STEM organizations and only five reported participation in a minority student organization.

Nearly all of the respondents spend time each week preparing for class with peers. The reported number of hours spent studying/preparing with peers ranged from zero to 30 with an average of 6.6 hours per week for those who reported studying with peers. This relates to the Bandura's (2007) social learning theory which is part of my theoretical construct. By observing peers who are successful in a task the students have a model of how to behave in order to be successful. It also relates to Eccles (2009) expectancy-value theory whereby the students are more likely to engage in a task if they believe it will help them attain their goals. In this case the selected task is studying with peers and the expected outcome is academic success. The participants reported spending an average of 11.6 hours studying on their own each week.

Focus Groups and Interviews

Table 4 addresses the a priori themes as well as themes that emerged during the focus groups and interviews to address the first research question: What are UTRGV Hispanic students experiences with STEM teacher education within the context of UTeach teacher preparation? The experiences are not ranked; however, they appear in the order they emerged during the interview process. Subthemes are identified by the key words used by the participants. Interviewees who reported the experience or subtheme are identified.

Table 4.

Student Experiences

Experience	Subtheme	Interview Participant(s)
1. Recruitment	Orientation fair	1A, 4A
	Class Outreach	2A
	Friend/Family	1A, 1D, 2B
	Flier	3A
	Advising	1B, 1C
2. Deciding to teach	Enjoyed tutoring/teaching	1B, 2A, 2B, 4A, 5A
	Had always considered it	1C, 1D, 2A 5A
	Not initially interested	1A, 1B, 2A, 2B, 3A
3. Positive experiences	Friend in program	1A, 1B, 1C, 1D, 2A, 2B, 5A
	Master Teachers	1A, 1B, 1C, 1D, 2A, 2B, 3A,
	UTeach family	1A, 1B, 1C, 1D 4A, 5A
	Field Experiences	1B, 1C, 1D, 3A, 4A, 5A
4. Negative experiences	Classes not offered	1A, 1B, 1C, 1D, 4A
	Travel to Other Campus	1D, 2B, 4A
	TEXES Preparation	3A
	Not informed about program	1B, 1C
	Registration issues	1A
5. Hispanic in STEM teaching	No barriers	3A, 5A
	Imposed barrier	3A, 4A
	Non-native English Speaker	1A, 1B, 1C, 1D, 3A, 4A
	Professors understanding of differences	1A, 1B, 1C, 1D
6. Remaining in program	Family	1A, 1B, 1D, 3A
	Master Teacher Support	1C
	UTeach Family Support	1A, 1B, 1C, 1D
	Fieldwork	1B, 1C
7. Work	Financial concerns	1B,1C, 2A, 2B
	Having a job	1B, 1C, 2A, 2B, 3A, 4A

Focus group 1. All focus group and interview participants were asked a set of questions found in Appendix B. The students were first asked what initially interested them in the program and how they were recruited. Some of the students were initially interested in becoming a teacher while others were not. Monica and Carolina had gone to a high school that changed to an education pathway high school while they were students there. Monica had to choose the

education pathway in order to stay at the high school and later realized she was interested in teaching.

So like, I chose that, and then it was within the transition where the zoning were gonna change. So I was like, I need to be accepted into whatever pathway to like, to like stay in the school. So it wasn't because I like was interested in it, but because I needed a reason to stay. Once I was in the program I was like, wait a minute, this is actually like interesting! It wasn't until then that I had considered it as one of my, one of my options.

Carolina entered the university with plans to become a teacher, but was initially interested in becoming certified as a bilingual teacher,

when I started at University, I said "I want to be a teacher" but I was actually bilingual- I was starting as a bilingual major, and I was two years into my career when I was like "I'm not liking this theory" because it was just theory and like learning the theories and all these theories behind it, like the psychological. And I had only taken one class from the education classes, only one sent me to actually visit schools.

This prompted her to really consider what she wanted to do with her life, stating "I want something that I can actually help people." A friend told her to look into teaching mathematics: "why don't you go for math?" because at that moment I was taking the math requirements. And I really liked that I was doing really well."

Julia and Isaac had attended high school together in Mexico and reported having really bad experiences with their physics teachers. This compelled Isaac to want to pursue teaching physics "because physics is a really beautiful topic, a really beautiful class, it has a lot of hands on activities and everything so... I wanted to like have a formal preparation to be a teacher." Julia had never considered teaching, but after getting a tutoring job she realized she was good at

teaching and liked it. She later found out from an advisor that she had the option of adding a teacher certification to her physics degree so she decided she wanted to pursue this pathway. This was how both Julia and Isaac were recruited to the program, which was another topic we discussed during focus group one.

The students were asked how they were recruited to the program. Julia and Isaac heard about the program from their advisor during their junior year. They had not been informed of this degree option or heard of the program prior to hearing about the program from their academic advisor. Julia said “I didn’t know that you could like go into teaching when you were in physics.” After meeting with multiple advisors she was informed of the possibility of majoring in Physics and getting a teaching certificate through UTeach.

Monica was recruited by a student recruiting for the UTeach program and club during an orientation involvement fair that all incoming freshman are required to attend. The UTeach program had a booth where members of the UTeach club were recruiting students during the orientation involvement fair. Monica said

right afterwards I remember they told us, “OK now choose your classes.” We didn’t even know like - what am I gonna get? So I was like UTeach courses because the girl gave us a flyer and that’s when I realized that that’s what I wanted to do and I’ve been there ever since.

Carolina was told about UTeach by a student who had heard about the program from a sibling participating in it. She was taking education courses and had always wanted to be a teacher, but it concerned her that she was not going out into the field. The student told her about her sister who was always out in local classrooms. This prompted Carolina to go visit the UTeach advisor. The students were then asked when they decided to become a teacher.

The point at which UTeach participants decide to become a teacher is relevant because the program is designed to recruit people to the teaching profession who may not have otherwise chosen this pathway. Both Carolina and Isaac reported wanting to enter the teaching profession since they were in high school. Julia and Monica did not make the decision to become a teacher until they were already in college.

The participants were asked to share their best and worst experiences in the program. I drew from the direct responses and the participants as well as comments made throughout the focus group. Best experiences are largely reported with the second research question as they related to persistence and retention. Monica was vocal about an issue she experienced when she was not allowed to progress and take the next class in her sequence of courses thus setting her back a semester when a classmate in the same situation was allowed to progress. She ended up having to take extra, unnecessary courses because she was not given the special help to get admitted to a class that another student received. She said “like my worst worst experience was that they couldn’t fix that block when I was in the exact same situation as another student.” She also had a negative experience with her mentor teacher in the local school district where she was completing observation hours: “with my partner, she was just like with her students she was so lovely and so bubbly personality - but with me? It was like the worst experience ever.” Julia reported a worst experience that turned into a best experience. She did not have a high enough score on the TOEFL (Test of English as a Foreign Language) to progress in the program, but she received support from a professor in the UTeach program and the Master Teachers in the program. When Carolina talked about her worst experiences she brought up having classes in Edinburg and the difficulty of traveling back and forth due to classes not being offered in

Brownsville. She mentioned having family problems and having to deal with juggling work and school. She said, “so I think that was the worst thing. That the classes weren’t offered here.”

After I finished the questions from the focus group protocol, I turned off the recorder, but we continued talking. They shared stories and asked questions about job outlook. While their responses related to their experience as a Hispanic person pursuing STEM education did not lead to much information, they shared stories that gave some perspective to their experiences. Monica told a story about how she would say hello to everyone on campus, even the man working on the flowerbeds. After having done this for some time he asked her where she was from. When she told him that she was from Matamoros, the town just across the Rio Grande River on the Mexican side of the border, he said, “I knew you were Raza!” The word “raza” refers to indigenous people of Mexico, but there is a deeper meaning related to these people having been conquered and subjugated by Spanish explorers (Oxford Dictionary, n.d.). This interaction sheds light on the fact that even within a major HSI, comprised of 96% Hispanic students, people are still divided into groups: in this case Mexican versus Hispanic. Often, students who identify as Mexican are not actual international students due to having citizenship in the US. Assimilation into American culture occurs in a different and limited way when you are minutes from Mexico and your “America” is still culturally very much like Mexico. During the focus groups it was apparent that describing the experiences of Hispanic students pursuing STEM education was nebulous at best when everyone else is a Hispanic student in a predominantly Hispanic area. Distinctions do exist though: people are careful to use the word Hispanic instead of Mexican because many people are quick to point out that they are not from Mexico (even though abuela is). This distinction became apparent when another student shared her story.

Julia shared a story about her relative isolation as a Mexican student at the University. She said that she initially had no friends and said that she was friends with the people who cleaned the bathrooms (Pamela Groves' Field Notes, 2018, p. 5). She would go to them between classes just to say hello and talk. As she recounted one particular story, you could see the tears brimming in her eyes. She told about how she got rained on and the custodian lady rushed to her aid and helped her get dried off before her next class. Students who cross over from Mexico to attend classes often do not have the luxury of going home between classes because this would mean waiting in a line at the international bridge, going through customs, and paying a toll to cross the bridge both ways. At certain times of the day it can take more than an hour to cross the bridge, adding to the burden of being an international student (Pamela Groves' Field Notes, 2018, p. 5).

Isaac was quick to point out that his biggest issue in college is the English language barrier. He grew up in Mexico and learned everything in Spanish and now had to understand concepts in English. He said having online classes and using subtitles was helpful. Julia also reported having a language barrier. However, she reported that "most of the professors in STEM fields are also like internationals or bilingual." She felt that because of this they were understanding of their students' language barriers and were "very patient in listening to you." Isaac added "they try to understand you."

Focus group 2. After spending some time to develop rapport and sign the consent documents, I began the second focus group by asking about what initially interested them in the program and how they were recruited. Melissa had heard about the program from a family member and after talking to a UTeach advisor decided to try the program. She had taken a circuitous route to the program having tried other fields first, but liked working with kids. She

had taught children in an extracurricular activity and would tutor peers. Lana had not initially planned on pursuing teacher preparation until she went to a conference that had her think about her values. This made her realize she wanted to go into teaching. She had experience volunteering in youth centers and had worked in an elementary school and “found that [I] was really passionate about it.” She “saw the change that needed to happen.” Even though she is in the first year of the program, she sees herself continuing.

My next question was about worst experiences in the program. For worst experiences, Melissa talked about having to do an initial meeting before she could enroll in Step 1 and was told “maybe STEM is not for you” after they saw her education history. “When I first transferred to the university I just messed up, so they were looking at that and then the first thing that they told me was ‘maybe STEM is not for you.’” She felt discouraged from attempting the program even though she had many personal factors contributing to her educational history: she was a working parent, had cancer, and had let her GPA slip during a time where she was uncertain about what to do. She thought at the time,

it had taken me a long time to get to this point, and I know my grades aren’t fantastic but I also have a child, have to work... And there’s also the extra caveat that when I transferred back I had cancer, and that kind of influenced everything.

Lana did not have to speak to anyone before signing up for Step 1 so she did not encounter this type of barrier. Melissa also mentioned that many of her courses were not available at her home campus creating the burden of commuting between campuses (Pamela Groves’ Field Notes, 2018, p. 7).

The students were then asked if they had any experiences specifically related to being a Hispanic person pursuing STEM teacher preparation. Melissa said “I guess because of the area

that we're in, we don't really notice a difference. I know in Dallas I did, because that university was 90% Caucasian." She also mentioned her nebulous position as a Hispanic person who is light skinned. She mentioned that the underlying racism she encountered at her previous university contributed to her wanting to leave. She felt she was treated oddly and stated, "I'm not going to pay 50 grand to be told I don't belong." They were then asked about their Spanish speaking skills. Both spoke English as their first language and Melissa mentioned, "I like don't know Spanish even though I'm like very Mexican. Like 100% Mexican." Later, however, she told a story where her daughter asked why she was "talking like grandma." This indicated that she did not consider herself a Spanish speaker, but did in fact know some Spanish. Lana mentioned that she grew up near Houston away from Spanish speaking family members. People will often speak to her in Spanish and she will respond in English.

I grew up...over there in Houston so yeah I never like had, like family members that were close to over there that were Spanish speaking so I never was like very exposed to Spanish growing up and I was like always just speaking English and I always like understand Spanish, I just don't personally speak it. So like a lot of people that I communicate with that speak Spanish, they'll talk to me in Spanish. I'll talk back to them in English. It's always that kind of conversation.

This concluded the official focus group questions; however, we stayed for more than an hour with the recorder turned off. I took field notes during this part of the conversation and the students were aware that it was still part of the focus group. During this time the students asked questions about the program and talked about concerns such as financial concerns. Lana's parents did not go to college so she feels like she is on her own. She is really struggling financially. She gets financial aid and work-study, but her work-study job only allows her to

work 10 hours a week even though her financial aid allotment is for 19 hours per week. They both expressed concerns about their grade point averages. Melissa is a working parent who struggles to maintain a high grade point average. They have a clear need for a support group and exchanged phone numbers with each other as we walked to our cars (Pamela Groves' Field Notes, August 8, 2018).

Interview 1. Raul is very pragmatic about his pursuit of STEM teacher preparation. His initial interest is in Biology and he would like to pursue advanced studies in this area; however, he feels that going into education will lead to a secure job. He mentioned, “the thing that interested me was the, that you could secure a job I guess, because you learn it with a certification already and ready to work.” He also said

initially I just wanted to study biology... but I did not see a direction? Right? And I um, I think I saw a flyer and I said ‘You know what? I think that’s a direction.’ From there I can build, if I want to continue, at least I know that being a teacher is a decent job. It’s a good job. And from there if I want to continue um, teaching will give the flexibility to continue to study.

He was recruited his freshman year in college by a flier. He met with one of the Master Teachers and decided to sign up. His worst experience is related to preparation for the state teacher exams. He expressed disappointment that he did not learn enough in his classes and was forced to prepare for his exams outside of class which was inconvenient for him. He felt that the material covered in his classes was not always relevant to what would be on the state test. He thought that the online review program required by UTeach should have been embedded in his course work if it was going to be a program requirement. He also felt that one of his professors gave a tremendous amount of homework just to make the course more intensive. He wished that

his courses should “focus more on what is more important which is passing the test (state exams)”.

I asked Raul about his experiences as a Hispanic person pursuing STEM teacher preparation. He never felt barriers or any bias, stating “we can go where ever we want. Right?” He said, “there’s no limitation like, ‘oh you’re Spanish. You should go into teaching, but no engineer.” He did mention that people outside of the university had advised him against higher education thereby transmitting their perceived limitations on him. He shared a story about a family friend that told him not to bother to go to school at all and that he can have a good life. He was told that he could work the fields and follow the crops around the country.

They said “No mijo what you shall do, you know, these are the culture jobs and forget about school” you finish working and you travel from here all the way to Michigan and work over there for, um, seasonal jobs, and ... you have that opportunity to go up north and work six months over there and then come back here and work another six months right here in the valley.

He was told that if he worked the fields he would get to travel and when there is no work it’s like a vacation.

You can even get the chance to travel. You can get the chance to, when you get vacation, let’s say there’s no job because there’s no crops growing...it’s vacation for you...And then what you do is you ask for unemployment benefits, you get food stamps, you get a lot of you know – social services.

Despite this advice, he continued his pursuit of higher education.

Interview 2. I began by asking Anita what initially interested her in the UTeach program. She decided to go into teaching as she was working on her associate’s degree and realized that

the career path she had been interested in since she was a child was not very promising. She switched to an education pathway and initially wanted to teach elementary. She then started tutoring and decided she liked to teach math. “I saw the struggle for the students when I explained...they were missing the basics.” She felt that many of her community college classmates dropped out because they could not pass college algebra and she attributes this to math skills that were not mastered as early as middle school. She heard about the program at an orientation involvement fair, but had already decided that this was the career path she wanted to pursue.

For her worst experience Anita mentioned availability of classes after the merging of the two original campuses.

I think it's the merge that happened because--I think it's a real issue. I have seen it in all the classes--I mean, it's not the students, it's not the teachers, it's this merge that happened that when they did that, they didn't thought about the little details.

She struggled with the lack of classes offered on her campus. Video conference courses were one solution created to offer classes on both campuses; however, this resulted in having a lack of interaction with the professor and difficulties completing group work. She made it clear that it's not necessarily UTeach that has these issues; it's all of the classes. She mentioned,

I do like the ITV, but I think like...for example, right now I'm taking a math class, it's Measurements of Geometry-something like that, and I don't have anything with the teacher: he was really nice, he explains really good, but he's not interacting with us. I mean, sometimes he's like, “Okay get in groups and decide this,” and then we have good ideas, and we don't share it. It's like...I dunno, I don't like that thing.

I then asked Anita about her experiences as a Hispanic person pursuing STEM teacher preparation. This question prompted her to share an anecdote about her mother. Her mother lives in Mexico and is unable to cross the border so she was visiting her mom during her first semester at the University after transferring from the community college. She told her mom that she had decided to become a math teacher and her mom was concerned about whether she would be successful in it. She had to convince her mother that she was going to be taught the things she needed to know in order to be successful. “I told my mom, ‘Oh I’m going to be a high school math teacher,’ and she was like ‘Anita, but that’s really hard. I mean, do you think you can do that?’ ...She just did some high school, right? And I was surprised that she didn’t believe in me.” Her mother had not finished high school and was worried that her daughter was taking on too difficult a task. She related the experience of being a Hispanic person pursuing STEM teacher preparation to her mother’s concern about striving for a goal that is too difficult to reach. Despite her mother’s concern, she felt confident that she would be successful in becoming a math teacher.

Interview 3. Belinda took the two recruitment courses for UTeach, Step 1 and Step 2, before deciding that she wanted to pursue physics without the teaching option. I asked Belinda what her best and worst experiences were in the program and she said “well, I enjoyed everything!” She enjoyed the camaraderie of the program and was very involved in the club, spending a significant amount of her time in the UTeach workroom. For her worst experience she said “there wasn’t any horrible experience or anything,” but that she found herself doing most of the work when she was partnered with other students.

I next asked if Belinda had any particular experiences as a Hispanic person pursuing STEM teacher preparation. She felt that her experiences as a female in STEM stood out more

than as a Hispanic person in STEM. She said “I didn’t really consider pursuing a career in physics or STEM in general until I took my physics course in high school and my teacher was actually a Hispanic woman.” She had a high level of respect for this teacher and was told “you can do this if you want. You can do anything.” She also had a Hispanic female chemistry teacher who told her “you should do physics. You’re really good at math. You’re really good at science. Don’t let it go to waste.” Belinda was the last interview I conducted.

Research Question 2

Major Themes

Support. As I analyzed the data I came across the theme of support over and over again. Here I report the data specifically related to how the program endeavors to impact Hispanic student persistence and retention. Master Teachers came up as an important part of students’ persistence and retention in the program. The participants were also vocal about their “UTeach family” which I define to include the professors who teach UTeach courses, UTeach advisors, and the students in the program.

Master Teachers. Master Teachers are a program feature of all the UTeach replication sites and were frequently mentioned as an important aspect of the program. The participants were vocal about the support they got from Master Teachers, often mentioning the Master Teachers by name. The Master Teachers helped with things like studying for the TOFFL exam and the content exam. They were described as patient, helpful, and knowledgeable. Monica stated, “they’re very patient.” Isaac added “you were very patient...with the language, so I have trouble speaking in the English. But you help...a lot with that.” Lana talked about the Master Teacher she had for Step 1:

I just like the kind of support and they just really care for students and it was just nice to see that, coming from the job that I had? And seeing how they're very passionate about that and they're like to make sure that every student has the proper resources. I really like how they teach equity instead of equality, because I think that's so important. And seeing that there, I'm like "this is what I want to be a part of." I really like, enjoy seeing that.

Master Teachers are a program feature that appears to work.

UTeach family support. Peer support was reported during the questionnaire and focus groups. The program model calls for allocated funds for peer networking and a student organization showing that it acknowledges the importance of networking with peers (UTeachRGV, 2018). The UTeach model calls for a dedicated program advisor with the website stating "the advisor/student relationship is an essential component of your academic experience" (UTeachRGV, 2018). The UTeach advisors were mentioned by interview and focus group participants. Before she started the program, Melissa met with the dedicated advisor, "I went and talked to [UTeachRGV Advisor] and she gave me more information." Julia mentioned "when we starting on the program we can go with [UTeach Advisor] and [she will] explain like everything."

Financial support. The participants self-reported income and discussions during the focus groups and interviews point to a need for financial support. The availability of scholarships and internships found on the website show an awareness of this issue. The UTeach program model includes budgeting for student financial support. Melissa discussed receiving financial support from the UTeach program. The UTeach Operations Manual talks about the budget and providing aid to students (The UTeach Institute, 2013). The UTeach website provides information about scholarships and internships prompting the students that "scholarships and

internships are available to students throughout the year” (UTeachRGV, 2018). Additionally, initial models of the program call for reimbursement to take the Step 1 and Step 2 recruitment courses (The UTeach Institute, 2013). These features set the program apart from other teacher preparation programs.

Discussion of Research Question 2

Document Analysis

Handbook. Catalog descriptions of all the courses are provided, as is a map of the flexible entry points into the UTeachRGV program. The flexible entry points may support student persistence and retention because they allow students to enter the program at varying points in their pursuit of a bachelor’s degree without necessarily extending the time they will need to graduate. The handbook discusses UTeach advising and points out that the advisors are there to assist in all manner of issues that might arise such as problems in class, health problems, or other events that may challenge academic success. The language embedded in the section signifies relates to helpfulness and individualized support. The acknowledgement of the students’ individual hardships indicates an effort to support persistence and retention in the program. The students are told that there is mandatory advising each Fall and Spring semester.

UTeach Operations Manual. The UTeach Operations Manual covers the topics found in the handbook and website (The UTeach Institute, 2013). Students in the UTeach program begin with a one-hour recruitment class where they teach three lessons at local elementary schools. The operations manual stresses the continuous support of UTeach students by Master Teachers, and Mentor Teachers. The UTeach model incorporates early and intense field experiences to give aspiring teachers a sense of what teaching is really like and whether it is a career path they want to consider (The UTeach Institute, 2013).

Website. The website talks about giving students the opportunity to try out teaching in a one-hour course (UTeachRGV, 2018). It talks about the support of Master Teachers who will “teach you, coach you, mentor you, observe you in the schools as you learn to teach, and supervise your field experiences.” It talks about a dedicated advisor to help keep students on track. It talks about the community of support, the student organization, and support following graduation. It mentions the national reputation of the program. There is a photo collection showing students participating in social events and professional development. The classroom activities and professional development shown in the images depict hands-on activities using a wide range of materials. There are pictures of the alumni advisory board, but no information on how to participate. There is information about the induction support program for two years after graduation and being a part of UTeach nation indicating different avenues of support for recent graduates and new teachers. There is a link to scholarship information with a previous scholarship advertisement posted. It is a substantial scholarship of up to \$13,150 each year for juniors or seniors in the program with high grade point averages.

The website describes the program and courses that students will take. The first UTeach course students take is a recruitment class aimed at enticing STEM majors to consider adding a teaching certificate to their degree. It provides a low-stakes entry into the field because it is a one-hour course marketed as a recruitment course. In this class students are given a well-developed 5E lesson guide from which they develop a scripted 5E lesson working with a partner. They are given feedback on their lesson plans and they practice teaching their lesson with a Master Teacher, Student Intern and peers in class. They then go teach their lesson in a local elementary school to a group of students that they have already observed. As they teach, they are observed by both Master Teacher and Mentor Teacher, who provide both written and oral

feedback afterward. They teach three lessons through the course of the semester: one cotaught, one as lead, and one as a helper. These experiences help the students achieve mastery and build self-efficacy.

When trying to compare the UTeachRGV website to those of other UTeach replication sites, some differences emerge. For instance, the Master Teacher names are largely from Hispanic or Latino origins on the UTeachRGV website while this was not the case on one other UTeach replication websites selected for document analysis. I looked at the websites of two other HSIs. One particular school did not have a special page for its UTeach program.

Fliers. Fliers for recruitment and scholarships were analyzed. Some recruitment fliers were specific to the semester with course information including course number, meeting days and times, and the campus for the section (Edinburg or Brownsville). Other fliers gave general program information such as “UTeach advisor on each campus” and “learn to plan and teach lessons from the start.”

Fliers for scholarships were analyzed. Three types of scholarships were found. One of the scholarships targets current UTeach students with a high grade point average who demonstrate financial need. The other targets UTeach students in general who meet minimum grade point averages of 2.75 in their content area and 2.5 in their UTeach courses. The amount of these scholarships is not indicated. The program also offers a National Science Foundation scholarship for up to \$13,150 for each academic year. This scholarship is renewable and requires a two-year commitment to teaching for each full-year of the scholarship received.

Questionnaire Data

UTeach program features related to persistence and retention that emerged during the questionnaire are presented here. The participants were largely decisive about finishing the

program: 90%, indicated that they strongly agree they intend to graduate from college with a bachelor’s degree in STEM teaching, 7% indicated they somewhat agree and 2% indicated they disagree. Practicing teaching with real students was reported to be the most influential factor for teaching success by 69% of respondents as seen in Table 5. 22% of respondents reported practicing lessons with mentors as their most influential factor for success.

Table 5.

Frequency of Hispanic Student Perceptions of Most Influential Factor for Teaching Success

Measure	Frequency	%
Practicing lessons with peers	2	4
Practicing lessons with mentors	10	22
Practicing with real students	31	69
Other	2	4
Total	45	99

Focus Groups and Interviews

Focus Group 1 During the focus group I asked the participants about their best experiences in the program and I include them here because they relate to persistence and retention. The students were vocal about their best experiences when asked directly and through their indirect responses. Carolina spoke about her professor for a UTeach course saying “The professor, she’s a lovely lady, though. Her class was amazing. Like every day, like we would only go on Fridays so it was like super fun.” Julia and Isaac had a best experience when they received support from two Master Teachers and a professor to help them improve their scores on their TOEFL. Julia reported being told “Don’t worry! We will build you up!” Monica reported receiving support from another student and the Master Teachers as she prepared for her content exam. Monica said “I mean we’ve had great experiences like, it’s not like you can just name one

because there's been like so many good experiences..." Carolina added that overall, "the professors... were really helpful."

I then asked if there was anything in particular that contributed to their remaining in the program. Isaac said that for him it was the "experience in the classrooms." Julia agreed with this statement and talked about liking having a dedicated advisor that would explain everything whereas before she started the program she had to figure everything out herself. She said "Before we used to do like our own schedules, like what classes we needed to take, we started taking it between us two, but then when we starting on the program we can go with [the UTeachRGV advisor]." Isaac then mentioned "support from the Master Teachers" as something that contributed to him remaining in the program. Monica liked about the program that "we basically know everyone." She even commented that a family member who had gone to the same university was surprised at the number of friends Monica had on campus because she had not experienced that. Julia had a similar experience saying that UTeach students "are very supportive and they always share everything." She told a story about how she was talking to another student about whether she needed to take a particular standardized test or not and a UTeach student overheard and let her know that she did not need to take the test. Carolina felt the same about the UTeach students and said their advice on classes made things "a little bit easier." Issac reported that this sense of community does not happen in other clubs at the university.

I asked the students about the factors that contributed to their success in the program other than just the support of Master Teachers and their UTeach community. Carolina felt that her family's support was crucial to her success as well as having a job that was flexible. Julia also felt that family support was crucial and shared how she would practice her lessons with her parents even though they could not understand them in English. Monica described how going

through hardships helped her become stronger. She wants to set an example for her siblings and to be successful for her family. She aspires to go beyond just a bachelor's degree and told herself "you didn't know English, you were not good at school, (and) you made it through college." She said:

My dad didn't even make it to sixth grade. So you know, for like them to able to be HERE like we're here? For them just to bring us here [to the US], like that's a great accomplishment for me, for them, you know? And for them to see like all my sisters and is already a teacher and I'm like "Ok for now I want to be a teacher, but I don't want to settle with a bachelor's" Like, let's go for that master's!

Focus Group 2. I include responses collected from the participants best experiences as data related to persistence and retention. Melissa had more to share due to being in the program longer; however, both Lana and Melissa agreed that the help and support of their Master Teachers was one of the best experiences. Melissa in particular appreciated the motivation and feedback to help her become a better teacher. Lana was really nervous before her first lesson and considered not going, but her Master Teacher calmed her down and told her she could do it. Melissa was partnered with her best friend for Step 1, which I include in best experiences. Lana had a similar experience: she also had a good friend as a partner for Step 1.

The next question asked about factors that contributed to remaining in the program. Melissa felt that she could contribute to society by teaching. She said, "I'm not going to do something magnificent or discover something great probably, but maybe I can be the teacher of the person that does that." She also had family related reasons for remaining in the program such as a child at home and the influence of family members who were educators. Lana mentioned the

caring Master Teachers as part of her reason for remaining in the program. She said “they just really care for students and it’s nice to see that” and “ they’re very passionate...”

I then asked about factors that contributed to their success in the program. Melissa mentioned that family support and finding a mentor in her content area were crucial to her success in the program. She felt that her department was distant and scary so she sought out a mentor. She also mentioned a specific UTeach professor that has been supportive of her. Lana met a student assistant who provided her with important advice who she continues to keep in touch with. She acted as a peer mentor.

Interview 1. Raul’s best experiences were getting to know the students in the field and their teachers: “the best experience will be the um, that I get to have experienced, you know, in the field in the high school, and that I get to know the students.” He is hopeful that these professional connections may help him in the future. He also liked learned about learning theories. He mentioned that the Master Teachers have been very helpful as well. “The other thing will be, there’s very helpful teachers right? In the UTeach? Those others, no too much.” He also felt that he was provided valuable information throughout the program that helped him grow as a professional such as the importance of punctuality and the importance of making connections.

I get to know the different professors. Right that um, may help in the future, right? I think that would be. Oh! Another thing is uh the background information ...for the uh, different theories for teaching? Because in science you don’t see those teachings, like it’s a um, these for the memory theory - because they introduce you to that.

I then asked Raul about what has contributed to him staying in the program. His main reasons for staying in the program are related to job security and family. He is aware that the job market in his desired field, biology, is not very good in South Texas. He feels the need to remain

close to his family to help out in case they need anything and to support a younger sibling in their academic efforts. By having a teaching certificate he will be able to remain close to home. By remaining in the program, “I’ll get my diploma and I’ll get the certification. You know sometimes you want to do biology but there’s not too many opportunities in the Valley, right?...you’d have to leave. That’s the thing. And I don’t want to leave.”

Interview 2. I asked Anita to share her best and worst experiences in the program. One of her best experiences has been the support of so many Master Teachers. She mentioned two Master Teachers by name saying “they’re really supportive and I like [that I] have actually to practice with her.” She mentioned friends in another program who have to seek out their own mentors in a local school and come up with their own lesson plan to teach. In UTeach, the Master Teachers arrange the field experiences and provide the lesson ideas to be taught during the first introductory course. When discussing her experiences with the program she said “I mean I really enjoy being in the UTeach program and I have never thought about changing.”

I then asked about factors that had contributed to her success in the program. Anita was quick to mention the field experiences because they gave her the opportunity to really test her lesson plans. She also felt she benefitted from the input of her Master Teachers, mentioning that “at the beginning I didn’t like it,” but that she grew to appreciate the input. She said, “those comments that we receive from the teachers after we give a lesson plan, a lesson, I think that’s helping me to prepare.” She also valued her intense preparation in mathematics: “I think that you really need to understand the content of what math is so you can teach it, even if it’s going to be basic.” This mirrors a key UTeach program element of providing students with deep content knowledge (The UTeach Institute, 2013).

Interview 3. I asked Belinda the same set of questions as the other participants with some slight modifications beginning with what initially interested her in the program. She said that she had tutored people throughout high school and college and had wanted to be a teacher since she was a child. “Most of my high school career I would always tutor people, and I still do that today, so I’ve always taught people which I took classes with.” While she still tutors people, she said “ultimately, I do want to do something else with my major other than teaching.” She also mentioned that she was told about the program when she applied to UTRGV.

I then asked her if there was anything in particular that compelled her to choose a different career route. She said that the idea that she had other options prompted her to change career paths. “The idea that I could do something else different with my major and I didn’t have to just focus on teaching as my major” contributed to her decision to leave the program.

Belinda was very clear about how much she enjoyed participating in the UTeach program. She said

I made a bunch of friends which I still talk to them every day. We did Thanksgiving socials...in the work room. We would all bring something, like a dish or a drink, we would all get together and it was kind of just like a little I guess party? A little, just, to get our minds off of school? And to enjoy each other’s company.

She was active in the club and would attend volunteer opportunities: “I got to volunteer in the orientations and tell people about the program. And I think it helped that in the orientations we had actual people in the program to give their experiences if people had questions.” She also mentioned the connections she made with her Master Teachers. She enjoyed working with children and learning how to phrase things so that other people can understand her better.

Despite the UTeach program features in place to help persistence and retention, Belinda felt that pursuing teaching was not the right career path for her.

Summary

The participants of this study were Hispanic STEM majors who participated in the UTeach program between Fall 2017 and Fall 2018. They were predominantly first-generation college students, the majority of whose parents had not completed high school, from low-income families at or near the poverty line, and who report low levels of involvement in clubs and organizations at the university. I conducted document analysis of the UTeach operations manual, the UTeachRGV website and fliers, and publicly available documents from four UTeach replication sites. I conducted two focus groups and three interviews to get a deeper understanding of Hispanic UTeachRGV students experiences as they pursued STEM teacher preparation. Two major themes emerged: support and shared experiences.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

In this chapter I present the conclusions and recommendations of findings from my study of UTRGV Hispanic students' experiences with STEM teacher preparation. Hispanics are underrepresented in STEM teaching nationally, within the state of Texas, and locally within the Rio Grande Valley in South Texas. The study explored the lived experiences of Hispanic students pursuing STEM teacher preparation and how the UTeachRGV program serves them. I conducted an exploratory case study where I collected data from document analysis, a questionnaire, focus groups, interviews, and on-going field notes to address the following research questions:

1. What are UTRGV Hispanic students' experiences with STEM education within the context of UTeach teacher preparation?
2. In what ways does UTeachRGV endeavor to impact Hispanic student persistence and retention in STEM teaching?

A discussion and analysis of the findings are found here organized by major themes and subthemes. This is followed by a discussion of the limitations of the study, significance, and implications for future studies and practitioners.

Major Themes

Two overarching themes emerged from the data: support and shared experiences. Here I share an analysis and interpretation presented by theme and subthemes. I begin by discussing the theme of support along with its subthemes: Master Teacher support, UTeach family support, family support and financial support. This is followed by a discussion of the second theme, shared experiences, along with its subthemes: recruitment, deciding to teach, positive/negative experiences, experiences related to being a Hispanic person in STEM teaching, remaining in the program, and other shared experiences.

Support

Support emerged as a theme related to the experiences of Hispanic STEM student students as they pursue teacher preparation as well as in the ways the program endeavors to impact persistence and retention in STEM teaching. The participants received support from many sources. The four main sources of support participants identified are Master Teachers, their UTeach family, family, and financial support. Master Teachers are defined by the program as professors and field supervisors who serve students throughout the program. The UTeach family consists of peers in the program, their program advisor, and program faculty. These sources of support may have contributed to the task value and expected outcomes described by expectancy value theory (Eccles, 2009). In particular, the support provided by the program may have increased the interest-enjoyment value and decreased the cost of engaging in the program both emotionally and financially (Eccles, 2009). Findings concur with a study of minority students in a teacher preparation program, where Szecsi and Spillman (2012) found that three types of support were important to minority teacher candidates: academic, financial, and social (p. 28).

The main sources of support identified by my study are Master Teachers, the UTeach family, family and financial support.

Master Teacher Support. Master Teachers emerged as a component of support for the students. Part of their support may be due to social persuasion. Social persuasion is a way to build self-efficacy that involves the influence of others (Bandura, 2008). A credible persuader can not only convince a person to believe in their success, they can also arrange situations in which a person is likely to experience success through effective scaffolding (Bandura, 2008). The Master Teachers arrange field experiences for students throughout the program and practice lessons with them beforehand so that they can be successful. Kaya and Bozdag (2016) studied several personal resources related to mathematics and science self-efficacy and that they impact academic achievement. Social persuasions were one of the personal resources significantly correlated with academic achievement (Kaya & Bozdag, 2016). Findings suggest that Hispanic students may benefit from additional support for reasons related to characteristics such as nontraditional student status or parental education level.

The median age of the participants in the study was 22 with 19% of the respondents falling into an age range consistent with nontraditional college students (National Center for Education Statistics, n.d.). Nontraditional students are often defined by age (being over the age of 24), background such as race and gender, residence (off campus), and employment (working full or part-time). Many of the interview and focus group participants would be considering nontraditional due to working part time.

The topic of work came up in the interviews and focus groups as well as my field notes: respondents could not participate in the focus group due to work, they would be coming to the interview right after work, or they were looking for a work-study job where they could put in

more hours. Nontraditional students are also defined by enrollment patterns such as not matriculating directly after high school, family status such as having dependents or a spouse, and having earned a GED instead of a high school diploma (National Center for Education Statistics, n.d.).

Only one interview participant mentioned having a spouse; however, from my field notes it is clear that many of the program participants have spouses and/or children. Nontraditional students are less likely to complete a bachelor's degree: 31% of nontraditional students have completed a bachelor's degree within 5 years compared to 54% of traditional students (National Center for Education Statistics, n.d.). The students also reported being first generation college students thus adding the navigation of higher education to the challenges faced.

The majority of students who participated in the study had parents whose highest level of education was a high school diploma or less. This indicates that many of these people are first generation college students who may not have a family member who can help them through the many new challenges higher education can present: applying for financial aid, registering for classes, and utilizing services. In a longitudinal study conducted over a 40-year time period, Dubow, Boxer, and Huesmann (2009) found that parental education level was positively related to educational level and occupational prestige of the children.

According to the UTRGV Fast Facts website 60.6% of the students enrolled during Fall 2017 were first generation college students (UTRGV, 2017). First generation college students are faced with a number of hardships they must overcome to be successful. According to Oikonomidou (2018), first-generation college students often experience difficulty transitioning to college, a lack of cultural capital, financial barriers, and a lack of a sense of belonging. These difficulties can be diminished by participation in a mentoring program, much like the mentoring

provided by Master Teachers or the UTeach advisors as described by respondents. Azmitia, Sumabat-Estrada, Cheong, and Covarrubias (2018) found that academic self-efficacy and sense of belonging are predictors persistence in college (p. 96). Master Teachers act as a mentor throughout the program. Oikonomidou (2018) found that first-generation college students who participated in a mentoring program had a stronger sense of belonging which translated into social and academic support.

Despite the hardships faced by the participants, they felt confident in their ability to be successful in college based on questionnaire data. This may be due to having already benefitted from mentoring within the UTeachRGV program. According to Eccles (2009) Expectancy Value Theory, a person is likely to attempt something if they believe they can be successful at it. It may be that the low-stakes entry of recruitment classes, combined with support on many levels, could contribute to students remaining in the program as suggested by the findings.

UTeach Family Support. Having a strong support network such as mentors/advisors and peers correlates with college performance (Hurd, Tan and Loeb, 2016; Snyder, Sloane, Dunk, & Wiles, 2016). Mentoring/advising was reported as the most influential factor for success in STEM by respondents. The UTeach advisors serve as a layer of support in addition to that provided by the Master Teachers. Program faculty were also frequently mentioned in a positive manner when the students were asked about their experiences. Hurd, Tan and Loeb (2016) found that having a mentor through the first year of college was associated with a higher GPA amongst underrepresented racial/ethnic groups and low-income students. Broome and Davis (2017) found that peer bonding and race-matched faculty mentors were critical components of Black males' persistence in college. My findings corroborate these prior studies. Peers in the program also provided support.

The students in UTeachRGV are paired with a partner as they teach lessons so they get to see a peer go through the same struggles that they are going through both in the program and in general: managing time with school and work, managing home life, working with others, using technology, and lesson planning. Peer-led team learning improved retention of students in an undergraduate biology course and improved academic outcomes (Snyder, Sloane, Dunk, & Wiles, 2016). Amongst underrepresented minorities, peer-led team learning reduced the number of Ds, Fs or Withdrawing from an undergraduate biology course (Snyder, Sloane, Dunk, & Wiles, 2016). Studies show that peer support, or lack of peer support, can play a role in college success (Dennis, Phinney, & Chuateco, 2005; Irizarry, 2007; Snyder, Sloane, Dunk, & Wiles, 2016). It is a strong predictor of college grades and adjustment for ethnic minority first generation college students (Dennis, Phinney, & Chuateco, 2005). Szecsi and Spillman (2012) reported that minority students benefited from working cooperatively and felt more comfortable working with other minority students. Findings from my study showed that students spend significant amounts of time studying together and are partnered together in various courses as a program feature.

The students in the current study also work with a mentor teacher employed in a local school whose classroom they observe and ultimately teach. Their mentor is often a graduate from the same university and has encountered similar struggles. The mentor teacher, peers in the program, and Master Teachers also contribute to social modeling. Social modeling is a component of Bandura's (2008) self-efficacy theory. Social modeling can contribute to self-efficacy by allowing people to observe other individuals similar to themselves who have been successful through perseverance (Bandura, 2008). Through social modeling an individual can see beyond their reality and increase their belief in their own ability (Bandura, 2008). The UTeach

program intentionally incorporates social modeling both peer-to-peer and via mentors. They take UTeach classes and classes in their content area with other program participants where they get to hear about the college experiences of others. They can participate in the UTeach club which offers another avenue to meet with and learn from program participants. In addition to the support provided by social modeling, UTeach offers students the opportunity to experience social persuasion, another experience that can build self-efficacy (Bandura, 2008).

The UTeach program incorporates social persuasion in several areas: peer-to-peer, mentor to students, and Master Teacher to student. Social persuasion occurs peer-to-peer as students work with their teaching partner and receive support from other program participants. Mentor teachers provide insights to teaching and supportive feedback to UTeach students after they teach.

The participants reported spending time with peers studying and many reported participating in STEM related clubs and organizations. However, they largely did not participate in minority clubs and organizations. This may be due to not needing to seek out support from their minority group when attending an HSI. The students do not have to seek out minority relationships due to the volume of minority students and faculty. Melissa mentioned feeling like she did not fit in at another university because of her minority status, but this is not the case for the participants in this study.

Family Support. Family support emerged as an experience of students in the program that related to their success. Families provided words of encouragement. They helped the students get a sense of direction. Family support was described as crucial. The families found ways to support the students despite poverty, language barriers, and education level.

Financial Support. Financial issues were found to be a salient feature of the data with financial support acting as a program feature to combat this. I found that the majority of the study participants were living at or below the national poverty line based on questionnaire data. According to Eccles (2009) expectancy value theory people are more likely to attempt something if they think they can be successful. It is possible that by decreasing the financial burden of becoming a teacher, students will be more likely to attempt and persist in this endeavor. The federal poverty level for a family of four is an annual income below \$25,100 (US Department of Health and Human Services, 2018). The high number of low-income students is unsurprising considering two of the counties served by UTRGV are listed in the top 30 highest poverty counties in the country according to the Small Area Income and Poverty Estimates (SAIPE) with the US Census Bureau (US Census SAIPE, 2016). With close to half of the participants reporting family incomes near the poverty line, these students may be experiencing financial hardships that are not typical for most college students. For instance, they may have to work to support themselves and their families. Many of the focus group and interview participants mentioned having jobs. They mentioned their jobs as we scheduled the interviews and focus groups and talked about wanting to be able to work more hours. They discussed how finances were a major concern. In addition, since many of these students are international students, they do not have access to federal aid to pay for their education. The availability of scholarships could attract or help retain students. These factors might make the availability of scholarships particularly lucrative.

Shared Experiences

Participants reported many shared experiences and commonalities while some are derived from the UTeach Operations Manual. The focus group and interview questions were designed to focus on certain program features, but others emerged as well.

Recruitment is a feature of the UTeach program that students experienced in different ways. Students were recruited at the orientation involvement fairs held for incoming freshman, by a friend in the program, by fliers, or by their advisor. Raul saw a flier that said “You want to become a teacher? You can become a teacher” and decided to try it out. Lana was recruited by someone who came to one of her classes to tell about the program:

they had a professor, um, kind of do like outreach where they would go to classes and tell us information about it and give us like cards and stuff. And so she was like telling us about the UTeach program, and I was like ‘oh that sounds interesting.’

Some had already decided they wanted to teach while others did not decide until after they took the recruitment courses. The UTeach program has increased the number of STEM teacher graduates and Hispanic math teachers in the US (Backes, Goldhaber, Cade, Sullivan, & Dodson, 2016). It is advertised as a way to increase your options with your STEM degree. Peer support can also play a role in the recruitment and retention of students of color in undergraduate programs and teacher licensure programs (Irizarry, 2007). It may be that active recruitment combined with peer support is contributing to the increase in STEM teacher graduates and Hispanic math teachers in the US. Another shared experience was field experiences which emerged as a positive program experience and is a programmatic feature of the UTeach replication sites.

Field experiences teaching in local classrooms are one of the positive experiences shared by participants. They reported field experiences as one of their best experiences in the program: 69% of respondents identified practicing lessons with real students as their most influential factor for teaching success. Program participants are engaged in field experiences teaching children in local schools starting during the first course they take. This differs from other teacher preparation programs in which field experiences, in particular teaching experiences, do not occur until later in the coursework. During their first course, students are given elementary level mathematics and science lessons that they turn in to a 5E lesson plan and go teach. They are placed in local elementary classrooms and meet their mentor teacher ahead of time. They go observe their students prior to teaching them. They practice their lesson with their classmates and Master Teacher before going out to teach. Finally, they go teach their lesson in a local classroom. These experiences are similar to the mastery experiences described by Bandura (2008). Mastery experiences are successes that help build self-efficacy (Bandura, 2008). Easy successes can contribute to being discouraged by failure whereas self-efficacy requires resiliency and resistance to the demoralizing effects of failure (Bandura, 2008). Mastery experiences teach people that they can overcome obstacles through perseverance (Bandura, 2008). The students have to prepare for and go teach actual lessons with real students making the experience authentic. This forces them to confront both successes and failures head-on, with Master Teacher support, building self-efficacy.

The field experiences in which UTeach students participate are a form of experiential learning. Experiential learning is a process whereby learners have concrete experiences from which they draw abstract conclusions (Kolb & Kolb, 2009). Schmidt (2010) conducted a study of recent graduates to see what they learned during their preservice teaching experiences and what

they found most valuable. The participants identified four types of teaching experience as most valuable with each attributing different levels of value to the experiences: peer teaching university-mandated field experiences, students teaching, and self-arranged teaching such as paid tutoring (Schmidt, 2010, p.135). All the participants found authentic lesson planning and sequencing were some of the most valuable skills gained from their experiential learning. They had experience writing lesson plans for classes; however, when they had to write lessons that they were actually going to teach, particularly those they were going to teach to children and not peers, it changed how they wrote their plans. They began to differentiate between writing a lesson plan and truly planning for instruction. They appreciated peer teaching experiences because it forced them to plan well. While one teacher found her university required field experiences to be of great value, the teachers found self-arranged teaching experiences such as tutoring to be their most beneficial learning experiences (Schmidt, 2010). The value of field experiences found in Schmidt's (2010) concurs with my findings. While experiential learning is an important contribution to an emerging teacher's understanding of the profession, social modeling can also play a role in how teachers develop. Master Teachers are an example of a social model which is another shared experience mentioned by interview participants, the UTeach handbook, and the websites of UTeach replication sites.

Master Teacher support is a program feature described in the UTeach handbook (The UTeach Institute, 2013). It calls for "on-demand" access to Master Teachers. Master Teachers were frequently mentioned by focus group participants on both campuses and during interviews. The Master Teachers and their contact information is listed on UTeach replication site websites. Identifying a Hispanic person in STEM was an experience shared by participants of the study due to it being a criterion for participation, but they also shared experiences that were related to

begin Hispanic.

The participants struggled to describe their experiences as a Hispanic person pursuing STEM teacher preparation. It may be that they are experiencing benefits from attending an HSI that they are not aware of. As of Fall 2017, the faculty at UTRGV was 40% Hispanic and the staff was 80% Hispanic (UTRGV, 2017). The Hispanic faculty and staff may be perceived as understanding of the students' cultural background helping them to better serve these students. Cherng and Halpin (2016) found that minority teachers are perceived more favorably by students and that "Latino" teachers were perceived more positively in all areas addressed by their study. They did not, however, find that race-matching between Hispanic teachers and students resulted in a more favorable perception of the teacher (Cherng and Halpin, 2016). Egalite, Kisida, and Winters (2015) found that race-matching of black and white students and teachers resulted in a significant positive influence on math and reading achievement. While some study participants spoke of a lack of family member support or concern that they could be successful in STEM, they reported feeling supported by the faculty. They specifically mentioned Hispanic and international faculty as supporting them.

Limitations

One limitation is the design of the study whereby I treated the entire university as a single entity when there is more than one campus. This limitation could have been overcome by having participants indicate their primary campus in the questionnaire so that the data could be disaggregated. Timing may have been a limitation of the study. I chose to deploy the questionnaire during summer when I thought the students would have more time to participate. This also gave me time to finish collection of questionnaire data and schedule focus groups and interviews at the end of summer before the students or graduates became too busy to participate.

It is possible that the students may not have checked their email during the summer thereby missing the out on the questionnaire. I also did not factor into my timing that some of the graduates would have extra summer trainings to attend due to being new teachers or that some school districts would begin their fall semester earlier than others. This may have limited the ability of graduates to participate in the focus groups and interviews.

Implications for Serving Hispanic STEM Teacher Candidates

Based on the findings I recommend that STEM teacher preparation programs adopt multifaceted systems of support to serve Hispanic students. These systems of support should include mandatory advising checkpoints to make sure students are on the right track. It could also involve having faculty mentors in addition to a dedicated advisor to support students through the duration of their college career. Finally, cultivating peer support should be a program focus. This can be accomplished by supporting the UTeach club, allowing students to choose their teaching partners, and having team-building activities embedded throughout the coursework. The implications from this study may apply to other teacher education programs or other UTeach programs.

Significance

This study is significant in that it builds on the discourse and confirms what others have found which is that support matters. This study shows that little things make a big difference: mentoring, faculty and advisor relationships, peer support, financial support, and shared experiences. The findings mirror other studies in the literature. Peralta, Caspary, and Booth (2013) found that Hispanic STEM majors did not feel accepted by their universities, but received support from their families. Much like the participants in this study the families found ways to support their children despite not understanding the system or not knowing the language. Szecsi

and Spillman (2012) found that three types of support were valued by minority teacher candidates: academic, financial, and social support (p. 28). According to Tinto's (1988) stages of student departure, making connections with faculty and peers is critical to social integration and transitioning to college (p. 446). Not only does a support network relate to social integration, it also relates to college performance (Hurd, Tan and Loeb, 2016; Snyder, Sloane, Dunk, & Wiles, 2016). The themes identified in this study weigh more heavily than in the literature.

Recommendations for Future Research

Future research should expand to other UTeach replication sites to see if Hispanic students are having similar experiences and are being served in a similar fashion there. This should be followed by an examination of STEM teacher preparation programs that are not UTeach replication sites. I would also like to delve into the experiences of other underrepresented minorities as they pursue STEM teacher preparation both within the context of UTeach teacher preparation and other STEM teacher preparation programs. Finally, a two-year follow up with the study participants who are part of the induction program could contribute valuable insights into future practice. The students are already tracked and supported via the induction program; however, this could be done in a more systematic fashion to get a better idea of how their preparation translated to their practice as teachers.

Conclusion

It is imperative that teacher preparation programs set goals aligned with technological advances and an increasingly diverse US population. Reducing disparities to increase the number of Hispanic STEM teachers must be a primary goal of universities. Recruiting, retaining, and serving historically underrepresented minorities should be addressed with increased focus by

STEM teacher preparation programs. HSIs may be uniquely situated to intentionally bridge gaps in the number of Hispanic STEM teachers.

This study highlights a need to provide multiple levels of support in order to serve Hispanic students seeking STEM teacher preparation. Hispanic students are more likely to be nontraditional, first generation college students from low income backgrounds, making them less likely to graduate. Types of support should address both the emotional and economic needs of these students through advising/mentoring and financial support. Despite the challenges faced by students in this study, they lacked awareness of the challenges unique to being a Hispanic student pursuing higher education. They did not exhibit the deficit thinking that is often heard in the discourse.

This study was conducted with a population embroiled in a turbulent political climate. During the study there has been a government shutdown to force the funding of a border wall, which has already been in place in this region for many years. This wall is not only visible from some of the campuses where students teach their lessons, but we also have to travel through the border wall to get to one campus. Some students cross this international border daily, having to pay a toll each way and often spending more than an hour waiting in line. There are people from an immigrant caravan that has traveled from parts of Central and South America sleeping on these international bridges, hoping to gain entry into the US. The participants were students during the Dream Act protests and the Deferred Action for Childhood Arrivals (DACA) immigration policy. It is likely they know people affected by these policies.

As I write this from a classroom at the Brownsville campus, more than one border patrol vehicle has driven past the university, patrolling the levy on the other side of a fence separating the university from the Rio Grande River and Mexico. I have personally witnessed arrests being

made by border patrol agents on the campus and have experienced a class in which I was a student begin canceled due to a gunfight occurring on the Mexican side of the border. Despite all of this, these students forge ahead in pursuit of their goals to become STEM teachers.

Teachers are the agents of change in society and teacher preparation programs should be the agents of change in teachers. Teacher preparation programs need to aggressively recruit underrepresented minorities and provide the support they need to be successful. The future of our nation depends on it.

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APPENDIX A

APPENDIX A

IRB APPROVAL



The Institutional Review Board for Human Subjects Protection (IRB)
Division of Research, Innovation, and Economic Development
Office of Research Compliance

June 28, 2018

To: Pamela Groves

From: Institutional Review Board

Subject: Approval of a New Human Research Protocol

IRBNet ID: 1245358-1

IRB# 2018-127-06

Project Title: A CASE STUDY OF HISPANIC STEM TEACHER PREPARATION

Dear Researcher,

The IRB protocol referenced above has been reviewed and **APPROVED ON June 28, 2018**.

Basis for approval: Expedited 6 and Expedited 7

Approval expiration date: June 27, 2019

Recruitment and Informed Consent: You must follow the recruitment and consent procedures that were approved. If your study uses an informed consent form or study information handout, you will receive an IRB-approval stamped PDF of the document(s) for distribution to subjects.

Modifications to the approved protocol: Modifications to the approved protocol (including recruitment methods, study procedures, survey/interview questions, personnel, consent form, or subject population), must be submitted to the IRB for approval. Changes should not be implemented until approved by the IRB.

Approval expiration and renewal: Your study approval expires on the date noted above. Before that date you will need to submit a continuing review request for approval. Failure to submit this request will result in your study file being closed on the approval expiration date.

Data retention: All research data and signed informed consent documents should be retained for a *minimum* of 3 years after *completion* of the study.

Closure of the Study: Please be sure to inform the IRB when you have completed your study, have graduated, and/or have left the university as an employee. A final report should be submitted for completed studies or studies that will be completed by their respective expiration date.

Approved by: Laura D. Seligman
Laura D. Seligman
Interim Chair, Institutional Review Board

APPENDIX B

APPENDIX B
EMAIL INVITATION

Hello,

My name is Pamela Groves I am a student from the Department of Teaching and Learning as well as an Assistant Professor in Practice with the UTeach program at the University of Texas Rio Grande Valley (UTRGV). I would like to invite you to participate in my research study to explore the experiences of Hispanic students pursuing STEM teacher preparation.

This research study has been reviewed and approved by the Institutional Review Board for the Protection of Human Subjects (IRB) at the University of Texas Rio Grande Valley.

In order to participate you must be 18 years or older. Participation in this research is completely voluntary, you may choose not to participate without penalty.

As a participant, you will be asked to complete an online survey which should take about 15 minutes to complete. All data will be treated as confidential to protect the identity of participants and the survey software will collect no identifiable information such as IP addresses.

If you would like to participate in this research study, please click on the survey link below and read the consent page carefully. If you would like to complete the survey, click on “I consent”. If not, simply exit the web browser or click on “I do not consent”.

Survey Link: https://utrgv.co1.qualtrics.com/jfe/form/SV_9nnMgFZssOdV0wt

If you have questions related to the research, please contact me by telephone at (956)244-6040 or by email at pamela.groves01@utrgv.edu . You may also contact my faculty advisor at (956)882-5704 or Karin.lewis@utrgv.edu .

If you have any questions regarding your rights as a participant, please contact the Institutional Review Board (IRB) by telephone at (956) 665-2889 or by email at irb@utrgv.edu.

Thank you for your cooperation!

Sincerely,

Pamela Groves

APPENDIX C

APPENDIX C
QUESTIONNAIRE

Survey of Hispanics in STEM Teacher Preparation

Directions: Please select only one answer for each question, unless instructed differently. Take your time in completing the questionnaire and answer all questions honestly. (Please note: *STEM* refers to *Science, Technology, Engineering, and Mathematics*) peers and faculty, plans and intentions, and background

- 1) What is your gender?
 - a) Female
 - b) Male
 - c) Transgender
 - d) Other. Please specify:
- 2) How would you describe your racial/ethnic background (e.g. Hispanic, Latino, Cuban, Spanish, Mexican-American)? _____
- 3) What is your age? _____
- 4) What is/was your cumulative college GPA? _____
- 5) What is the highest level of education completed by your *mother*?
 - a) Did not complete high school
 - b) High school diploma
 - c) Post-secondary school other than college

- d) Some college or associate's degree
 - e) Bachelor's degree
 - f) Master's degree (MA, MS, MBA, M.S.W., M.S.N.)
 - g) Medical degree (MD, D.O., DDS, or D.V.M.)
 - h) Law degree (JD)
 - i) Doctorate (Ph.D., Ed.D., D.B.A.)
- 6) What is the highest level of education completed by your *father*?
- a) Did not complete high school
 - b) High school diploma
 - c) Post-secondary school other than college
 - d) Some college or associate's degree
 - e) Bachelor's degree
 - f) Master's degree (MA, MS, MBA, M.S.W., M.S.N.)
 - g) Medical degree (MD, D.O., DDS, or D.V.M.)
 - h) Law degree (JD)
 - i) Doctorate (Ph.D., Ed.D., D.B.A.)
- 7) What is your family's socioeconomic status? (This refers to the family you grew up with.)
- a) Upper class
 - b) Upper middle class
 - c) Middle class
 - d) Lower middle class
 - e) Lower class
- 8) How would you describe your academic success in high school?

- a) Top 5% academically
- b) Top 10% academically
- c) Top 25% academically
- d) Top 50% academically
- e) Other: Please specify_____

9) What is/was your cumulative college GPA? _____

10) What is/was your major?

- a) Biology
- b) Physics
- c) Chemistry
- d) Mathematics
- e) Other: Please specify_____

11) What best describes your current student classification status?

- a) Freshman
- b) Sophomore
- c) Junior
- d) Senior
- e) Graduate
- f) UTeach graduate
- g) Other: Please specify_____

12) I intend to graduate from college with a bachelor's degree in STEM teaching.

- a) Strongly disagree
- b) Disagree

- c) Neutral
- d) Agree
- e) Strongly agree

13) I intend to graduate from college with a bachelor's degree in STEM, but not STEM teaching

- a) Strongly disagree
- b) Disagree
- c) Neutral
- d) Agree
- e) Strongly agree

14) I intend to graduate from college with a bachelor's degree in a non-STEM area.

- a) Strongly disagree
- b) Disagree
- c) Neutral
- d) Agree
- e) Strongly agree

15) I am confident that I will graduate from college with a bachelor's degree.

- a) Strongly disagree
- b) Disagree
- c) Neutral
- d) Agree
- e) Strongly agree

16) What do you perceive to be the most influential factor for your success in STEM at college?

- a) Involvement in student organizations

- b) Mentoring/advising
- c) Studying with peers
- d) Other. Please specify: _____
- e) Not applicable

17) What are your educational goals?

- a) Complete a bachelor's degree
- b) Complete a master's degree
- c) Complete a doctoral degree
- d) Other. Please specify: _____

18) What do you perceive to be the most influential factor for your success in STEM teaching at college?

- a) Practicing lessons with peers
- b) Practicing lessons with mentors
- c) Teaching real students in the field
- d) Other. Please specify:
- e) Not applicable

19) How many STEM-related student organizations do you belong to? _____

20) On average, how many **hours per week** do you spend engaged in STEM-related student organizations? _____

21) How many minority student organizations do you belong to? _____

22) On average, how many **hours per week** do you spend engaged in minority student organizations? _____

- 23) How many non-STEM student organizations (i.e. business fraternities, sororities, student government, etc.) do you belong to? _____
- 24) On average, how many **hours per week** do you spend engaged in non-STEM student organizations (i.e. business fraternities, sororities, student government, etc.)? _____
- 25) On average, how many **hours per week** do you spend studying/preparing for class with peers? _____
- 26) On average, how many **hours per week** do you spend studying/preparing for class alone? _____
- 27) **How many mentors** do you have who are readily available to advise you on academic and professional matters beyond your immediate coursework? (A mentor is *someone who you seek for professional advice and career guidance, and can be a professor, family member, friend, peer, or industry expert; NOT your academic advisor .*) _____
- 28) What is your relationship to your primary mentor (NOT your academic advisor)?
- a) Professor
 - b) Family member
 - c) Friend (NOT a peer)
 - d) Peer
 - e) Industry expert
 - f) Other. Please specify:
- 29) Does your primary mentor have a STEM background?
- a) Yes
 - b) No
- 30) What is the gender of your primary mentor?

- a) Female
- b) Male
- c) Other

31) What is the race/ethnicity of your primary mentor?

- a) American Indian or Alaskan Native
- b) Asian or Asian American
- c) Black or African American
- d) Hispanic or Latino
- e) Native Hawaiian or Other Pacific Islander
- f) White, Anglo, European American; not Hispanic
- g) Other. Please specify:

32) On average, how many **hours per week** do you spend meeting/talking with your primary mentor (NOT your academic advisor)? _____

33) How satisfied are you with the quality of the relationship between you and your primary mentor?

- a) Extremely dissatisfied
- b) Dissatisfied
- c) Neutral
- d) Satisfied
- e) Extremely satisfied

34) Would any of the following have helped to improve your level of satisfaction with your primary mentor? Check all that apply.

- a) More time

- b) Research guidance
- c) Better quality of time
- d) Teaching guidance
- e) Career/professional guidance
- f) Other. Please specify:

35) What do you perceive to be the most influential factor for your success in STEM teaching at college?

- a) Practicing lessons with peers
- b) Practicing lessons with mentors
- c) Teaching real students in the field
- d) Other. Please specify:
- e) Not applicable

APPENDIX D

APPENDIX D
FOCUS GROUP QUESTIONS

1. What initially interested you in the UTeach program?
2. When did you decide to become a teacher?
3. Share some of your best/worst experiences in the program.
4. Tell me more about your experiences in the program.
5. What have been your experiences as a Hispanic pursuing STEM Education?
6. What has contributed to you remaining in the program or leaving the program?
7. What factors have contributed to your success in the program?
8. Can you give me an example of something that contributed to your success in the program?
9. Where do you imagine yourself in 5 years?

APPENDIX E

APPENDIX E
INTERVIEW QUESTIONS

1. What initially interested you in the UTeach program?
2. When did you decide to become a teacher?
3. Share some of your best/worst experiences in the program.
4. Tell me more about your experiences in the program.
5. What have been your experiences as a Hispanic pursuing STEM Education?
6. What has contributed to you remaining in the program or leaving the program?
7. What factors have contributed to your success in the program?
8. Can you give me an example of something that contributed to your success in the program?
9. Where do you imagine yourself in 5 years?

APPENDIX F

APPENDIX F

FIELD NOTES EXCERPT

8/8/2018 The focus group ended up with just 2 participants. It went really well. I gave a bit of time to develop rapport. The students didn't know each other and were at different points in their program. One has finished (?) CI and the other has only finished step 1. They talked about the physics faculty being distant and scary. They don't really have a campus community of peers. One has some mentors: family and one physics faculty. The other mentioned that she is actively

Initial Themes:

Support Systems:

Master Teachers,
Family,
Students,
Club,
Student Intern

Recruitment:

Not Initially Plan for Work
Realized they like teaching(tutoring/helping)/were good at it
Orientation Fair
In class?
Advising?
One implication is to recruit from tutoring centers

Success Factors:

How to report findings.....

BIOGRAPHICAL SKETCH

Pamela Groves earned a Doctor of Education degree in Curriculum and Instruction with an emphasis in higher education in 2019 from the University of Texas Rio Grande Valley. She earned a Master's degree in Curriculum and Instruction with an emphasis in science in 2011 from the University of Texas Brownsville and a Bachelor's in Science in Biochemistry in 2005 from the University of Texas at Austin. She has experience teaching science at the middle school and high school level. She has experience teaching mathematics and science pedagogy courses at the college level. Mail correspondence should be sent to 2404 Wilson Road, Harlingen, Texas 78552.